

Supplementary Document 20:
Feasibility Study Report for Seyaab Subproject

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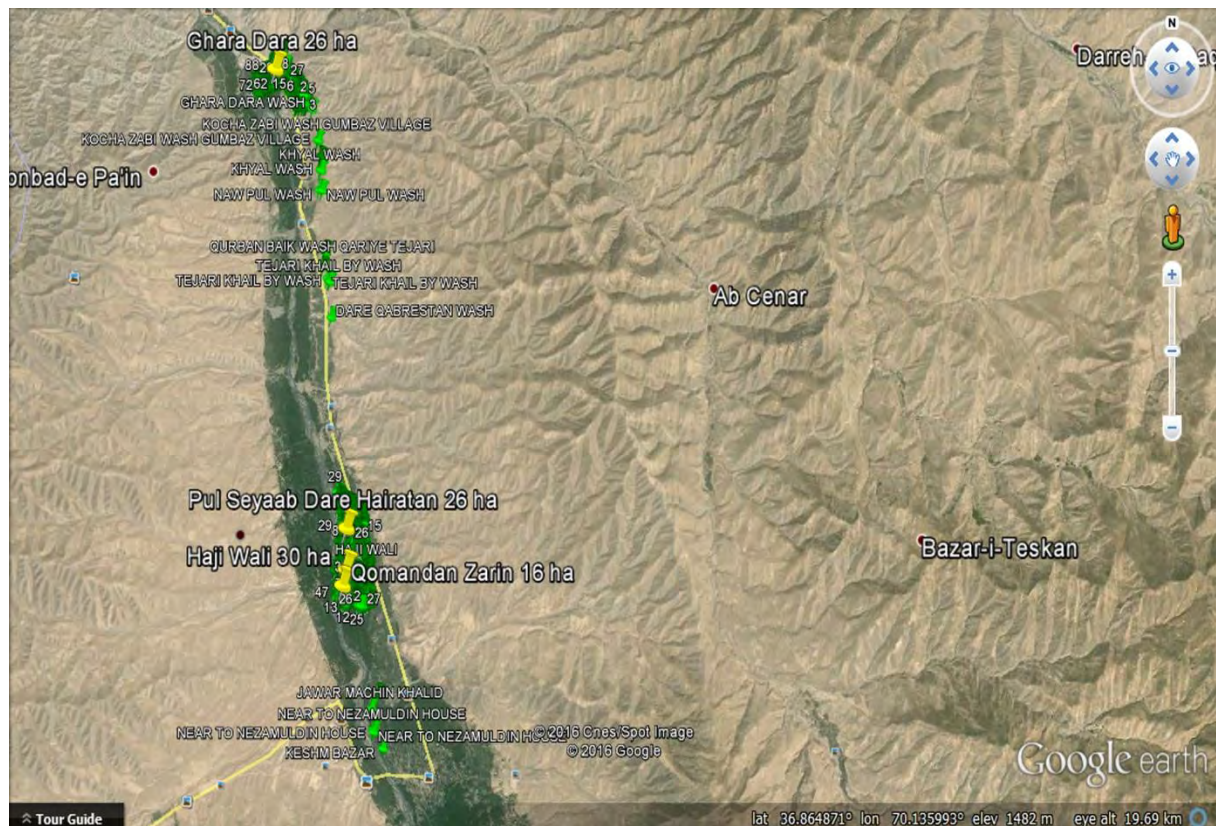
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Acronyms

AEP	Annual Exceedance Probability
ADB	Asian Development Bank
ADO	Agricultural Development Officer
AFN	Afghani
AHS	Afghanistan Health Survey
ALCS	Afghanistan Living Conditions Survey
ANDS	Afghan National Development Strategy
ASC	American Standard Code
BM	Bench Mark
BoQ	Bill of Quantity
CIA	Central Intelligence Agency
CSO	Central Statistics Organization
CV	Curriculum Vitae
DAIL	Department for Agriculture and Livestock
DGPS	Double Global Positioning System
EC	European Commission
EIRR	Economic Internal Rate of Return
EMA	External Monitoring Agency
EMP	Environmental Management Plan
ENPV	Economic Net Present Value
EOP	Environment-on-project
ETS	Electronic Total Station
EU	European Union
FAC	Final Acceptance Certificate
FFS	Farmer Field School
FS	Feasibility Study
GIAA	Green Initiative for Afghanistan's Agriculture
GPS	Global Positioning System
GRM	Grievance Address Mechanism
IA	Irrigation Association (and Implementing Agency)
ICB	International Competitive Bidding
ISC	Implementation Support Consultancy
LARP	Land Acquisition and Resettlement Plan
MAIL	Ministry of Irrigation, Agriculture and Livestock
MEW	Ministry of Energy and Water
MRRD	Ministry of Rural Rehabilitation and Development
NCB	National Competitive Bidding
N&E	North & East
NRM	Natural Resource Management
NRVA	National Risk and Vulnerability Assessment
O&M	Operations & Management
OFWM	On-Farm Water Management

P-ARB	Panj-Amu River Basin
PES	Payment for Ecosystem Services
PIO	Project Implementation Office
PMO	Program Management Office
PPTA	Project Preparatory Technical Assistance
RBA	River Basin Agency
RBC	River Basin Council
R&U	Rehabilitation and Upgrading
SBA	Sub-basin Agency
SBC	Sub-basin Council
SCLW	Supreme Council for Land And Water
SD	Supplementary Document
SEMP	Site Environmental Management Plan
SI	International System of Units
SMART	Specific, Measurable, Achievable, Relevant and Timebound
SPRSS	Summary Poverty Reduction and Social Strategy
SWIM	Strengthening Watershed and Irrigation Management
TA	Technical Assistance
TBD	To be determined
USAID	US Agency for International Cooperation
USD	United States Dollars
UTM	Universal Transverse Mercator
WB	World Bank
WFP	World Food Program
WRDIP	Water Resources Development Investment Program
WUA	Water User Association

Map of Subproject Area



I. Executive Summary

A. Subproject Rationale

1. Seyaab irrigation scheme's main canal covers a length of approximately 20km in Keshim district located on both sides of the Keshim Faizabad road up to the end of Gumbaz village. It has a command area of 400ha and is home to approximately 376 farming households, most of whom are poor with a median land holding size of less than 1 jerib, and household incomes (not per capita¹) of approximately \$1,615.10 in the head reach, \$1,351.10 in the middle reach and \$905.60 in the tail reach. Wheat is the main winter crop and paddy rice the main summer crop. In the summer, no land is fallow at the head, while approximately 10% is fallow in the middle reaches and 40% of land in the tail end. Subproject interventions of improving water distribution, through irrigation rehabilitation and upgrading (R&U) and the set-up of up of a WUA and IAs, will increase the irrigated area, particularly at the tail end, which will have significant benefits allowing more crops, including rice, to be grown. The irrigation system is often damaged from flash flooding both from the main river and in particular from washes. Subproject interventions of improved watershed protection and management (e.g. through the terracing or the construction of check dams) will help solve this.

2. The sub-project supports the goals of the Afghanistan National Development Strategy (ANDS) – specifically the National Water and Natural Resources Development Program which targets improved access to irrigation for 300,000 hectares, strengthening water-related institutions such as RBAs, SBAs, RBCs, SBCs, WUAs and IAs, and restoring 28,000 ha of rangeland through community-based management. The sub-project also supports the draft National Irrigation Program (NIP) which aims to achieve self-sufficiency in wheat with specific objectives including: improving irrigation services for 900,000ha through rehabilitated irrigation schemes; providing irrigation agronomic support (land preparation, in particular land levelling, etc) and extension service delivery (farmer field schools, FFS, exposure visits etc); and to establish WUAs and IAs in schemes for improved water management, operation and maintenance, with Departments of Agriculture, Irrigation and Livestock (DAILs) and Commune Development Councils (CDCs) having a support role.

3. The sub-project is not included in provincial development plans but provincial authorities have expressed their strong support, and the objective of the project to improve agricultural productivity is in line with provincial and district objectives.

B. Subproject Design

4. The impact of the sub-project is aligned with the overall project impact of *increased per-capita income and reduced poverty among rural and pastoral communities* (Afghanistan National Development Strategy - Agriculture and Rural Development Cluster ²).

5. The project outcome is *“Increased agricultural productivity in Seyaab canal irrigation scheme”*.

¹ Noting that there are approximately 7 people per household.

² Islamic Republic of Afghanistan. July 2010. *Afghanistan National Development Strategy, Prioritisation and Implementation Plan, Mid 2010-2013, Volume 1*. Kabul, Afghanistan.

6. In order to achieve the project outcome the following outputs are proposed. These are aligned with the design logic for the overall project.

7. **Output 1: Water allocation and availability improved.** This output provides the capacity and resources for the Kokcha Sub-Basin Agency (SBA) to: (i) improve the conveyance and allocation of water to the irrigated farm system through rehabilitating and upgrading of water conveyance infrastructure (main canals). This will include the repair of head works (two new gates), construction of four new off-takes (with measuring staff gauges) and cross-regulators with spill weirs, and the construction of four domestic and two livestock water access points. This will improve the availability of water, particularly for the tail end of schemes, increasing yields, cropping intensity and irrigated areas. To ensure structures are maintained post-project, construction will be subject to water users (through a WUA) signing up beforehand to O&M agreements with the project and government (SBA), while at the end of the construction period water users (through the WUA) will sign hand-over agreements with the project and government (SBA). This will engender sustainable irrigation management and transfer. **(Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded).** A WUA will be established and strengthened to operate and maintain (O&M) conveyance infrastructure in the scheme thus improving sustainability, to distribute water between the head, middle and tail end of the canal more equitably; and to work with RBA/SBA to facilitate water sharing between schemes along the river. **(Sub-component 2: WUA established and strengthened).**

8. **Output 2: Command areas enhanced.** This output provides the capacity and resources for Badakshan DAIL to: (i) improve irrigation infrastructure (at the secondary and tertiary canal level) in the secondary canals supported by improved offtakes under Output 1, in order to have an integrated approach. To ensure structures are maintained post-project, construction will be subject to water users (through the IAs) signing up beforehand to O&M agreements with the project and government (DAIL), while at the end of the construction period water users (through the IAs) will sign hand-over agreements with the project and government (DAIL). This will engender sustainable irrigation management and transfer. **(Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded);** (ii) establish and strengthen the capacity of up to four IAs to operate and manage irrigation infrastructure thus improving sustainability, as well as ensuring more equitable distribution of water, increasing yields and cropping intensity, particularly in lower canal reaches, and thus reducing conflict over water use **(Sub-component 2: IAs established and strengthened);** and (iii) improve water use efficiency at the farm level by improved on-farm water management and agronomic techniques (such as land levelling, bed and furrow irrigation, intercropping...etc) with at least 100 farmers having improved knowledge from a demonstration plot **(Sub-component 3: Efficiency of agricultural water use enhanced).**

9. **Output 3: Watersheds properly managed and protected.** This output provides the capacity and resources for DAIL to improve community-based watershed management. This will result in the restoration and protection of at least 500 hectares of watershed (forestry/rangeland) around the scheme. This output includes the creation of a community forestry/rangeland association and preparation and implementation of a natural resource management plan. To ensure that works constructed under plan implementation are maintained post-project, construction will be subject to watershed users (through the catchment management association) signing up beforehand to O&M agreements with the project and government (DAIL), while at the end of the construction period watershed users (through the catchment management association) will sign hand-over agreements with the project and government (DAIL). This will engender sustainable management and transfer of works.

C. Cost and Financing Plan

10. **Capital Costs.** The Seyaab Canal subproject would require a financial capital outlay of \$570,495.1 (equivalent to Afg37.8 million) to cover the expenses on the following items: civil works, agricultural extension support³, subproject implementation, physical and price contingencies, and all required taxes and duties (Table C.9 in SD5). The economic subproject cost is \$347,663 (equivalent to Afg23.6 million), calculated based on the estimated total financial cost and was duly adjusted for market distortions. The derivation of the economic cost is shown in Table C.10 in SD5. Refer to cost estimates and the financing plan in the Project Administration Manual (PAM) for details.

11. **Operation and Maintenance Costs.** The annual incremental operation and maintenance (O&M) cost of the subproject, in financial terms, is \$2,352.3 per annum (equivalent to Afg160,024.4) and \$1,728.7 per annum (equivalent to Afg117,554.3) in economic terms (Table C.11 and C.12 in SD5). The subproject's O&M cost was assumed to be incurred from year 3 of the subproject, and to increase by 10% per annum starting year 4 up to year 12, and be constant thereafter.

12. For details on estimation methods and unit prices and ratios see further in Supplementary Document 5.

D. Implementation Arrangements

13. The Kokcha Sub-basin Agency, with support from a Project Implementation Office (PIO) based in the same building (overseen by the PMO in MEW Kabul), will be responsible for the implementation of output 1. The Badakshan DAIL, with support from a Project Implementation Office (PIO) based in the same building (overseen by the PMO in MAIL Kabul), will be responsible for the implementation of outputs 2 and 3.

14. Contracting of all works and goods, except those under shopping procedures, will be done by the PMOs.

E. Subproject Impact

15. The main impact will be on increased crop yields and cropping intensities for a number of crops including winter wheat, rice (paddy), tomato, small vegetables, watermelon, peaches, and almonds as well as an increase in the irrigated area, particularly in the middle and tail reaches of the scheme. For example, the yield of winter wheat in 2016 is 3,267 kg/ha, which would grow to 3,463 kg/ha in 2022 and 3,593 kg/ha in 2026. In the tail reach, the yield of winter wheat in the baseline is 2,613 kg/ha, which could increase to 2,907 kg/ha in 2022 and 3,103 kg/ha in 2026. These increases represent 11% and 19% improvements in yields for the tail reach in 2022 and 2026, respectively. Cropping intensities will also increase. The largest improvement in cropping intensity by years 2022 and 2026 is for the subproject's tail reach, by 22% and 37%, respectively. The middle reach would have an increase in cropping intensity by roughly 14% and 23% in 2022 and 2026, respectively. Meanwhile, the head reach, being the section closest to the irrigation canal, would only have an improvement in cropping intensity in the order of about 10% and 17%, accordingly in 2022 and 2026.

³ There will be associated secondary and tertiary canal works within the sub-project command area, and watershed restoration and protection in this vicinity of the sub-project area which will be implemented according based on the overall project implementation plan.

16. These improvements will lead to an increase in household income, particularly for those at the tail end. For these households, the increase in annual income is estimated to be around Afg57,679/household (equivalent to \$848/household). In the middle reach, the subproject could lead to an increase in annual household income in the magnitude of Afg21,013/household (equivalent to \$309/household). In the head reach, the increase in annual incomes of the farming households would be Afg9,783/household (equivalent to \$144/household).

17. Due to different cropping patterns and increased crop inputs an increased amount of farm labor will be required, estimated in year 10 at 10.3 labor days per hectare per annum represents an incremental income of Afg3,100 (\$46) benefiting local workers who mostly belong to low-income and poor households, and may or may not have land within the command area. At the subproject scale, the total incremental labor requirement in year 10 is 7,998.2 labor days.

18. In addition to the quantified benefits associated with crop production which have been included in this analysis there are additional, less easily quantified, benefits associated with this subproject. Among these benefits are increased food production providing better food and health for farmer families, increased availability of water for downstream users (i.e. households, and industry and hydro-power sectors), reduced flood hazards in the downstream areas, and avoidance of system wash-aways. These benefits could arise due to watershed conservation, restoration, and protection activities in the upper catchment, for which the main intention is the control of siltation of irrigation canals to protect the subproject's capital investment. In addition, main and primary canals generally are associated with access paths along their lengths. These paths also serve as ways for people to get to their fields and to take produce out after harvest, and for some households may provide easier access to area schools and local clinics.

19. Gender will be mainstreamed into project activities to the extent possible. In the creation of the the WUA and IAs, water users will be briefed on the importance of female participation. Natural resource management (NRM) plans for the watershed will be prepared with due regard for the role of women in watershed activities, particularly income-generating activities. The project will also ease women's water-fetching and laundry chores as it will install at least four water points along canals for household use (in addition to at least two livestock access point).

20. The subproject's EIRR is 24.1% and its ENPV is Afg31.5 million. These estimates suggest the economic feasibility of the subproject in view of the economic viability criteria that the EIRR should be greater than 12% (the opportunity cost rate) and that the ENPV should be greater than zero.

21. The sensitivity analysis indicates that the economic viability of the subproject is most sensitive to the decrease in subproject benefits. This suggests that it is essential for the subproject to be implemented as scheduled and its agricultural extension support activities be implemented in parallel with civil works. In addition, the overall project management should ensure that capital expenditures are kept at a minimum so that the economic viability of the subproject would be preserved.

F. Critical Risk

22. The single biggest risk is insecurity delaying or suspending field activities. This will be mitigated by basing international experts (who are kidnap targets) in Kabul which is relatively safer; adopting a participatory community-based approach— community elders and others will be empowered to keep staff safe in their areas and to liaise with insurgents as necessary to ensure that work can continue – and adopting a low-profile approach to security (but with appropriate SOPs). The other critical risk is the lack of infrastructure maintenance. This will be mitigated through support to the adoption by water users of an irrigation service fee sufficient for on-going O&M.

II. Subproject Rationale

A. Need and Justification for the Investment

23. Badakshan province, and Keshim district, are heavily reliant on agricultural production for economic growth and employment. Badakshan province is the sixth largest producer of wheat in the country, and the majority of the population are reliant on agricultural production. However, yields are low, and food insecurity levels still high at 72.7%, significantly higher than the national average of 33%⁴. Increasing agricultural productivity will therefore have a huge impact, which can best be achieved through improving access to water for irrigation.

24. This will be achieved in Seyaab irrigation scheme sub-project through improvements to irrigation structures, as requested by water users, the establishment of a WUA and IAs, training on improved on-farm water management (OFWM) and improved agricultural techniques, and watershed protection and management.

25. Seyaab irrigation scheme's main canal covers a length of approximately 20km in Keshim district located on both sides of the Keshim Faizabad road up to the end of Gumbaz village. It has a command area of 400ha and is home to approximately 376 farming households, most of whom are poor with a median land holding size of less than 1 jerib, and household incomes (not per capita⁵) of approximately \$1,615.10 in the head reach, \$1,351.10 in the middle reach and \$905.60 in the tail reach. Wheat is the main winter crop and paddy rice the main summer crop. In the summer, no land is fallow at the head, while approximately 10% is fallow in the middle reaches and 40% of land in the tail end. Subproject interventions of improving water distribution, through irrigation rehabilitation and upgrading (R&U) and the set-up of up of a WUA and IAs, will increase the irrigated area, particularly at the tail end, which will have significant benefits allowing more crops, including rice, to be grown. The irrigation system is often damaged from flash flooding both from the main river and in particular from washes. Subproject interventions of improved watershed protection and management (e.g. through the terracing or the construction of check dams) will help solve this.

26. The sub-project supports the goals of the Afghanistan National Development Strategy (ANDS) – specifically the National Water and Natural Resources Development Program which targets improved access to irrigation for 300,000 hectares, strengthening water-related institutions such as RBAs, SBAs, RBCs, SBCs, WUAs and IAs, and restoring 28,000 ha of rangeland through community-based management. The sub-project also supports the draft National Irrigation Program (NIP) which aims to achieve self-sufficiency in wheat with specific objectives including: improving irrigation services for 900,000ha through rehabilitated irrigation schemes; providing irrigation agronomic support (land preparation, in particular land levelling, etc) and extension service delivery (farmer field schools, FFS, exposure visits etc); and to establish WUAs and IAs in schemes for improved water management, operation and maintenance, with Departments of Agriculture, Irrigation and Livestock (DAILs) and Commune Development Councils (CDCs) having a support role.

27. The sub-project is not included in provincial development plans but provincial authorities have expressed their strong support, and the objective of the project to improve agricultural productivity is in line with provincial and district objectives.

⁴ Source: World Food Programme.

⁵ Noting that there are approximately 7 people per household.

B. Subproject Objectives

28. The objective (outcome) of the sub-project is increased agricultural productivity in Seyaab canal irrigation scheme (through higher crop yields, cropping intensity and cropped areas). See further details in the Design and Monitoring Framework in Annex 1.

C. Related Development Initiatives

29. The major development partners active in the irrigated agriculture sector are the Asian Development Bank (ADB), European Union (EU), United States Agency for International Development (USAID), and the World Bank. All have implemented projects in Badakshan province. The EU has funded similar work throughout the province since 2004, through the Panj-Amu River Basin Programme (2009-2016) and its predecessor programmes. This project is a follow-on to this programme. The World Bank has on-going irrigation R&U work in the province through the Irrigation Rehabilitation Development Project. The World Bank On-Farm Water Management Project (OFWM) which is concentrating on setting-up and strengthening irrigation associations (IAs), undertaking R&U work in secondary and tertiary canals, and promoting improved on-farm water management and agronomic techniques, may undertake work in the province in the future.

30. SDC is about to start a project focusing on watershed protection – the Green Initiative for Afghanistan's Agriculture (GIAA) and USAID has an upcoming project supporting irrigated agriculture and watershed protection - Strengthening Watershed and Irrigation Management (SWIM) – which will concentrate activities in the North.

31. It will be an important to ensure that there is no overlap of activities with these projects in the scheme.

III. Subproject Design

A. Subproject Context

1. Natural Features

32. **Location and Size.** Seyaab canal covers a length of over 16 km across Keshim district of Badakhshan province. The command area is 400 ha.

33. **Topography and soils.** From the headworks at Keshim Bazar to Hairatan wash, the subproject area is agricultural fields and settlement areas on either side of the canal. Below Hairatan wash, the area is agricultural fields and settlement on the left hand side, and hills on the right. The command area is a fairly level agricultural zone with some interspersed small low hills. Cultivated soils are typical of an alluvial floodplain.

34. **Air quality and noise.** Air quality is generally good and noise is low, typical of rural areas (all construction sites are in agriculture fields in rural areas). Temporary large increases in dust can occur during dust storms and large livestock migrations.

35. **Rivers and water bodies.** The waterways of the subproject area are the main canal and its secondary branch and higher-order canals. The tail area, in a normal water year, is dry from mid-May to mid-Oct (Jawzan to Mizan). There are no natural or man-made lentic water bodies in the area, other than community cisterns.

36. **Groundwater.** In the tail areas, water table depth has prevented well development. In the head and middle areas, wells are found in about half of villages.

37. **Protected areas.** There are no protected areas in or near the subproject.

38. **Terrestrial habitats and vegetation.** The main habitat is agricultural fields and settlement areas. Trees are found along canals, typically willow and some fruit trees, and within the walls of household compounds.

39. **Wetland habitats and vegetation.** The subproject area has efficient drainage and, other than the canals themselves, there are no wetlands. Canals are biologically depauperate.

40. **Terrestrial and aquatic wildlife.** Local people have reported occurrence of the following larger mammals: jackal (Eurasian Golden Jackal *Canis aureus*), fox (either red fox *Vulpes vulpes* or Blanford's fox *Vulpes cana*), tiger (Caspian tiger *Panthera tigris virgate*, last confirmed in the wild lower Amu Darya 1968, now extinct), and polecat (*Vormela peregusna*). Locally reported birds include partridge (Chukar Partridge *Alectoris chukar*), hoopoe (*Upupa epops*), eagles (*Aquila* spp.), doves (*Streptopelia* spp.), and sparrows (*Passer* spp.). The aquatic environment of the irrigation canals has few/no fish, few/no amphibians etc.

41. For further details see the Initial Environmental Examination in **Annex 6**.

2. Social-economic and Cultural Conditions

42. According to the CSO statistical yearbook, the number of people living in the district of Keshim is 81,200 (41,500 males and 39,700 females). These figures are estimates, since the last census was held in 1979. According to the project survey, the majority of the population in villages in the vicinity of the canal are Tajik (and speak Dari as the first language). There are approximately nine villages in the vicinity of the scheme.

43. For households in the sub-project area the main source of income is from agricultural production. Average (median) landholding is less than 1 jerib per household, with 91% of farmers owning their land and 9% renting. Total household farm income (the main source of livelihoods for the majority of households) ranges from \$1,615/yr in the head reaches to \$1,351 in the tail reaches. This is due to higher agricultural output in the head reach due to greater access to water for irrigation. Project intervention will improve access to water in the middle and tail reaches leading to increase in income in these areas in particular.

44. The road accessibility is good all-round the year. A few sections of the road causes difficulties during the winter season due to its narrowness and lack of drainage systems. It has been noted that the main road of the district and the total distance to Faizabad and Taloqan is asphalted which gives easy access for transporting agricultural inputs, produces and other movements that are crucial for the livelihoods of the people in the area.

45. The highest proportion of food insecure people is reported in the North-eastern region (46 percent) (i.e. the target area). In Keshim district, 71% are food insecure.

46. In Keshim district there seems to be no source of protected water and the river/irrigation canal is the major source of drinking water. There are no places along the river where water can be fetched or laundry being done. As part of P-ARBP domestic water access points will be introduced where water can be fetched in a safe manner.

47. The concerns expressed by men and women have been taken into account in project design, except the request to construct foot/vehicle bridges (a type of “community structure”), as this type of civil work is outside the scope of Project financing. The concerns expressed by women who attended meetings in each of the three representative sub-projects (RSPs) focused on domestic water issues. Consistent across all the meetings, women stated that canal water is an important domestic water source, and therefore they face domestic water supply shortages when there is less water in the canal, typically during the May to Aug/Sep/Oct period. They expect the RSPs will result in more water in the canal during this period, which will benefit them. They expressed a need for domestic water supply physical works – wells or feeder canals to bring water from the irrigation canal to the settlement areas. RSP designs will include water access points for domestic water collection, laundry, and livestock watering. Water access point locations will be identified early in the Project implementation period in consultation with local stakeholders.

48. For further details see **Annex 2**.

3. Engineering Conditions and Requirements

a) Description of the Irrigation Scheme

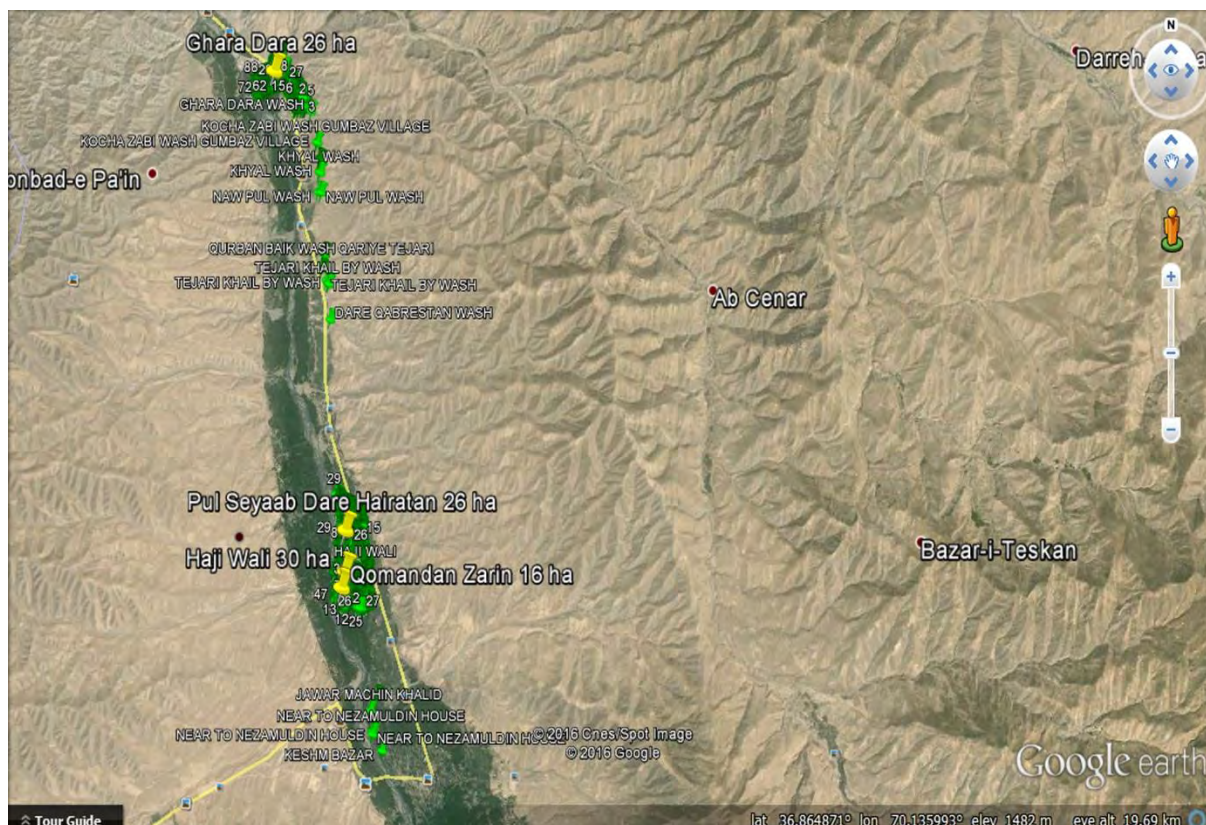
49. Seyaab Canal is located in Keshim district, which lies in Badakhshan province. Keshim district is located 102.13 Km northwest from the capital Faizabad city and 63 km away from Taloqan city. The main canal irrigates about 400 ha of fertile land of Keshim district located on both sides of the Keshim Faizabad road up to the end of the village Gumbaz.

50. The original age of the Seyaab irrigation scheme is unknown but according to local people the canal is about 70 years old. The canal was originally designed for 2 m³/sec. After taking water from the river the canal is aligned in the north direction passing through the villages and along the river and road bank. There is no exit/gated structure to divert the water into the river during flood season. The main canal is unlined and irregular in shape and silted up in places.

51. The irrigation system flows along the riverbeds conveying irrigation water to the flat lands giving the farmers opportunity to have irrigated agriculture for single and double cropping pattern. The command area of Seyaab canal has very fertile lands.

52. The command area of Seyaab canal is 400 ha, as shown in the below figure.

Figure 1: Command Area of Seyaab canal



53. The list of hydraulic structures for Seyaab sub-project as requested by the beneficiaries following consultation with SBA is given in the following table.

Table 1: Hydraulic Structures for R&U requested by water users for Seyaab sub-project

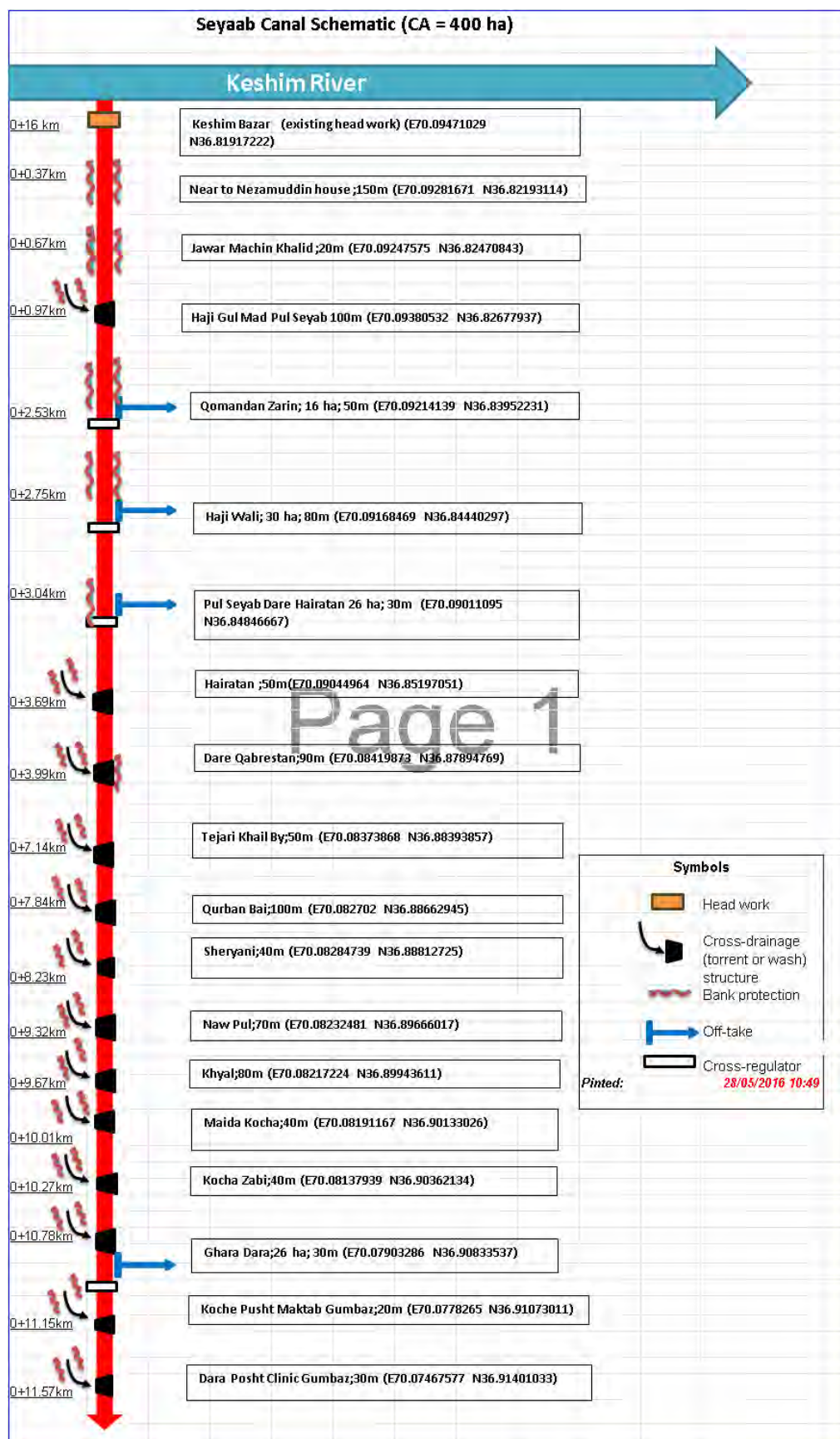
Seyaab sub-project						
1	Keshim Bazar	Existing head work; 2 new gates	36.81917222	70.09471029	0	
2	Nezamuddin house	Bank protection	36.82193114	70.09281671	0.37	
3	Jawar Machin K.	Bank protection	36.82470843	70.09247575	0	
4	Haji Gul Mad Pul S.	Cross-drainage	36.82677937	70.09380532	67	
5	Qomandan Zarin	Off-take & CR, Bank protection 50m	36.83952231	70.09214139	0.97	
6	Haji Wali	Off-take & CR, Bank protection	36.84440297	70.09168469	2.53	
7	Pul Seyab Dare Haira	Off-take & CR, Bank protection	36.84846667	70.09011095	2.75	
8	Hairatan	Cross-drainage	36.85197051	70.09044964	3.04	
9	Dare Qabrestan	Cross-drainage	36.87894769	70.08419873	3.69	
10	Tejari Khail By	Cross-drainage	36.88393857	70.08373868	3.99	
11	Qurban Bai	Cross-drainage	36.88662945	70.082702	7.14	
12	Sheryani	Cross-drainage	36.88812725	70.08284739	7.84	
13	Naw Pul	Cross-drainage	36.89666017	70.08232481	8.23	
14	Khyal	Cross-drainage	36.89943611	70.08217224	9.32	
15	Maida Kocha	Cross-drainage	36.90133026	70.08191167	9.67	
16	Kocha Zabi	Cross-drainage	36.90362134	70.08137939	10.01	
17	Ghara Dara	Cross-drainage	36.90833537	70.07903286	10.27	
18	Koche Pusht Maktab	Cross-drainage	36.91073011	70.0778265	10.78	
19	Dara Posht Clinic Gu	Cross-drainage	36.91401033	70.07467577	11.57	

b) Scheme inventory

54. There is no full inventory of irrigation infrastructures of Seyaab Canal. The inventory of irrigation infrastructures of Seyaab Canal is limited to the priority works proposed by the community following consultation with the SBA.

55. The different structures requested by the beneficiaries following consultation with SBA are summarized in the below schematic of Seyaab canal. This schematic shows the different type of structures and the location, indicating the command area for main off-takes, cross-drainage structures, bank protection and length etc.

Figure 2: Schematic of structures requested for R&U by water users



c) Main constraints

56. The main constraints are described below:

- Seyaab approach channel is adjacent to Keshim river and vulnerable to flood with frequent destruction of the left bank. Approach channel embankment breaching is common.
- The head work of Seyaab canals lies in the right bank of Keshim river just 200m downstream of Keshim bazar. There is no structure in the approach channel upstream of the headwork. The intake of the canal is made of concrete but is currently ungated as the two gates were destroyed by floods.
- The first 50% of the main canal flows in the flat lands of Keshim while the remaining part flows along the foot of soil laden hills. This way the canal passes through many torrents or washes destroying the canal during flood season. During flood season the canal capacity is overloaded thus inundating the nearby houses and land as its capacity has decreased due to siltation. In present condition, at some places in the main canal, the embankment levels are low and need heightening to avoid overtopping during flood and inundation of nearby agriculture lands and property.
- There are no water access points along the canal.
- There are many traditional off-takes without a proper structure in the feeder canal to raise the water level. Farmers put sand bags and brush woods to raise the water level to feed the off-take canal with required flow during low flow period.
- The secondary and tertiary canal network has only traditional structures. Most of the secondary canals take their water from the main canal through a free channel. The water at the intake of the secondary canal is controlled through sand bags to raise the water level in the main canal and feed the secondary canal. During flood season the sand bags are washed away and an uncontrolled amount of discharge enters into the secondary canal, causing inundation in the surrounding fields and also the secondary canal is silted up. There are no water access points in the secondary network.
- There is no drainage network as such. At the end of the canal, the surplus water (if any) goes back to the river.
- No WUA or IA are managing the canal. SBA is planning to establish a water users' association in Seyaab canal. There is one Mirab having two assistants (Kokbashi). The Mirab is responsible for the operation and maintenance (O&M) of main canal and the Kokbashis are responsible for the operation and maintenance of secondary and tertiary canals. There is no O&M record. The Mirab collects 50 Afghani per Jirib (250 AFS per hectare) in case of need for rehabilitation otherwise there is no fund and no normal collection mechanism in place.
- The O&M is still very basic and lacks proper tools such as staff gauges for a transparent and equitable water allocation and distribution between the secondary or branching canals. Consequently, there is no relation between the quantities of water diverted from the main to each secondary canal and the corresponding command area. The farmers know only about cleaning of the canal and some bank protection work. In case of canal repair and cleaning, the farmers collect 1000 Afghani per Jirib (5000 AFS/ha) per year. Normally the Mirab and his assistants receive 17.5 Kg of wheat per Jirib (87.5Kg/ha) from farmers once a year.

d) General description of the irrigation network

57. The general conditions of the existing infrastructure are described below.

1. Head work of Seyaab Canal

58. The main canal is about 20 km in length and it has the capacity to carry up to 4 m³/sec. It is silted up in many places and crosses a great number of torrents.

59. The headwork of the canal gets its water through an approach channel from Keshim River. There is no structure in the approach channel. The headwork of the canal is made of concrete. Previously, two gates were installed there but they were broken by flood.

60. Currently, an uncontrolled amount of water enters the canal and, during high flow, causes destruction to the canal banks especially in the middle part of the main canal causing water loss.



61. To control the flow at the intake, it is necessary to provide two gates and rehabilitate the existing two side walls and divide wall of the existing structure.

62. With the provision of 2 new gates, the controlled flow will be 1.96 m³/s (orifice flow).

2. Bank Protection near Nizamuddin House

63. At this point, the main canal passes through willow trees. The right bank of the main canal is destroyed and breaches are formed. So, during high flow, water spills over the bank. Most of the time main canal supply is cutoff.



64. Bank protection is the appropriate solution and are considered in the rehabilitation of the canal.

3. Jawar Machin Khalid

65. At this point, the left bank of the main canal is destroyed and breaches are formed. So, during higher flow, water spills over the banks. Most of the time main canal supply is cutoff.



66. Bank protection is the appropriate solution.

4. Haji Gul Mad Pull e Seyaab Wash

67. At this part, there is an existing torrent (wash) culvert and the canal is passing under the torrent (wash). The capacity of the structure is low. Most of the time during full discharge water spills over the banks of the canal at the wash culvert inlet.



68. A new cross-drainage structure should be provided with an increased capacity for the canal and torrent flow.

5. Qomandan Zarin Off-take

69. This off-take receives water from Seyaab main canal. The off-take is ungated and has no control over flow. Farmers used to put sand bags in the Seyaab canal to get the required amount of water. Furthermore, the canal bank is partly washed away.



70. To avoid water losses and to have a better control of the canal discharge, an off-take and cross-regulator and bank protection work are needed. Due to the small size of the structure, no sluice gate is provided.

6. Haji Wali Off-take

71. At this part of the canal, one off-take is present. This off-take receives water from Seyaab main canal. The off-take is ungated and has no control over flow. Farmers used to put sand bags in the Seyaab canal to get a sufficient amount of water. Due to spillage of water, the banks are partly washed away.



72. To avoid water losses and bank erosion and to get a better control of the water, an gated off-take and cross regulator are needed.

7. Pull Seyaab Dare Hairatan Off-take

73. This off-take is located at Baloch Olya village and receives water from Seyaab main canal. The off-take is ungated and has no control over flow. Farmers used to put sand bags to get the required amount of water. Due to spillage of water, the banks are partly washed away.



74. To avoid water losses and bank erosion and to get a better control of the water, an gated off-take and cross regulator are needed.

8. Wash Hairatan

75. This torrent is falling into the Seyaab canal with steep slope and causes high destruction to the canal and the nearby land. The bed difference between the canal and washes is less as the canal flows in the bed of the torrent (wash). The torrent (wash) intersects the canal perpendicularly. This torrent destroys the canal banks and causes siltation.



76. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

9. Dara e Qabristan Wash

77. This is a small torrent crossing Seyaab canal with steep slope and causes destruction to the canal and the nearby land. The bed difference between the canal and torrent is marginal; however, the canal flows below the bed of the torrent. The torrent intersects the canal perpendicularly and then passes through a culver under the main Faizabad road.



78. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

10. Tejary Kail Bai Wash

79. This torrent is one of the biggest in Seyaab canal. Seyaab canal passes in the form of a curve in the bed with the torrent (wash) crossing perpendicularly. When it floods, the wash destroys the canal flowing in its bed.



80. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

11. Qurban Bai Wash

81. This is a medium size torrent (wash). The torrent (wash) falls into the canal with moderate slope. The material here is mostly sand and gravel so a small flood washes the canal away.



82. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

12. Sheryani Wash

83. The canal passes straight in the bed of the torrent (wash) crossing perpendicularly. Actually people have made the canal in the torrent (wash) bed. The material here is mostly sand and gravel so a small flood washes the canal banks away.

84. The whole flow downstream the torrent passes under the main road through a culvert and ultimately reaches the river.



85. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

13. Naw Pull Wash

86. The canal passes in the form of a curve in the bed of the wash crossing perpendicularly. When it floods the torrent (wash) destroys the canal flowing in its bed.



87. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

14. Khyal Wash

88. This is a small torrent present in Seyaab canal. The canal passes in the form of curve in the bed of the torrent crossing perpendicularly. When it floods, the wash destroys the canal flowing in its bed.



89. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

15. Maida Kocha Wash

90. This is a small torrent present in Seyaab canal. The canal passes in the form of curve in the bed of the torrent crossing perpendicularly. When it floods, the wash destroys the canal flowing in its bed.



91. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

16. Kocha Zabi Wash

92. This is a small torrent. The canal passes in the form of curve in the bed of the wash.



93. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

17. Ghara Dara Wash

94. This is one of the biggest washes present in Seyaab canal. The canal flows straight in the bed of the torrent crossing perpendicularly. The material here is mostly sand and gravel so a small flood washes the canal away. At present the canal is completely washed away and the canal water is going in the torrent downward crossing the road through a culvert and ultimately reaches to the river.



95. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

18. Ghara Dara Off-take

96. This is a secondary canal. Its off-take receives water from Seyaab main canal. The off-take is ungated and has no control over flow. Farmers used to put sand bags to get the required amount of water. Due to spillage of water, the banks are partly washed away.



97. To avoid water losses and and to get a better control of the water, an gated off-take and cross regulator are needed.

19. Kocha Poshte Maktab Gumbaz Wash

98. This is a small torrent (wash) present in Seyaab canal. The canal passes straight in the bed of the torrent (wash) crossing perpendicularly. The material here is mostly sand and gravel so a small flood can wash the canal away. At present the canal is partially washed away.



99. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

20. Dara Pashte Clinic Gumbaz Wash

100. This is a small torrent (wash) present in the tail end of Seyaab canal. The canal passes curved in the bed of the torrent (wash) crossing perpendicularly. The material here is mostly sand and gravel so a small flood washes the canal away. At present the canal is partially washed away.



101. The most appropriate solution to protect Seyaab canal is the construction of a cross-drainage structure.

e) Selection of structures and proposed solutions

102. Following a review of the structures to be rehabilitated and upgraded, as requested by the water users, and as identified in the above canal schematic, costs were prepared for each structure (see chapter B, design methodology) to assess what structures could be included, based on priority and economic viability. Priorities for this and other sub-projects have been decided as follows:

- Gated headworks (if not currently existing) to control water entering the canal to protect it from flood damage and to improve water distribution between schemes along the river so that equitable water distribution can be achieved, benefitting downstream users who may currently have an inequitable share during the dry season. This will increase net benefits for downstream users due to improved water availability, resulting in reduced conflict between downstream and upstream users in river systems;
- Off-takes to improve water distribution and measurement among the branching (secondary) canals, resulting in improved water distribution, benefitting water users in the tail (and middle) reaches, in particular.
- Main canal cross-drainage structures and bank protection to control bank erosion and improve water conveyance. Cross-drainage structures will protect canal infrastructure from torrent (wash) damage. Effort should be made to construct robust overpasses by raising (if needed) the immediate u/s torrent (wash) channel bed profile and protecting the d/s works to prevent erosion working backwards to the d/s overpass abutment.
- Canal lining to decrease seepage losses improving water availability throughout the scheme.
- Structures along the secondary and tertiary canals.

103. Water access points (for domestic and livestock use) will also be considered for all schemes included in the project works.

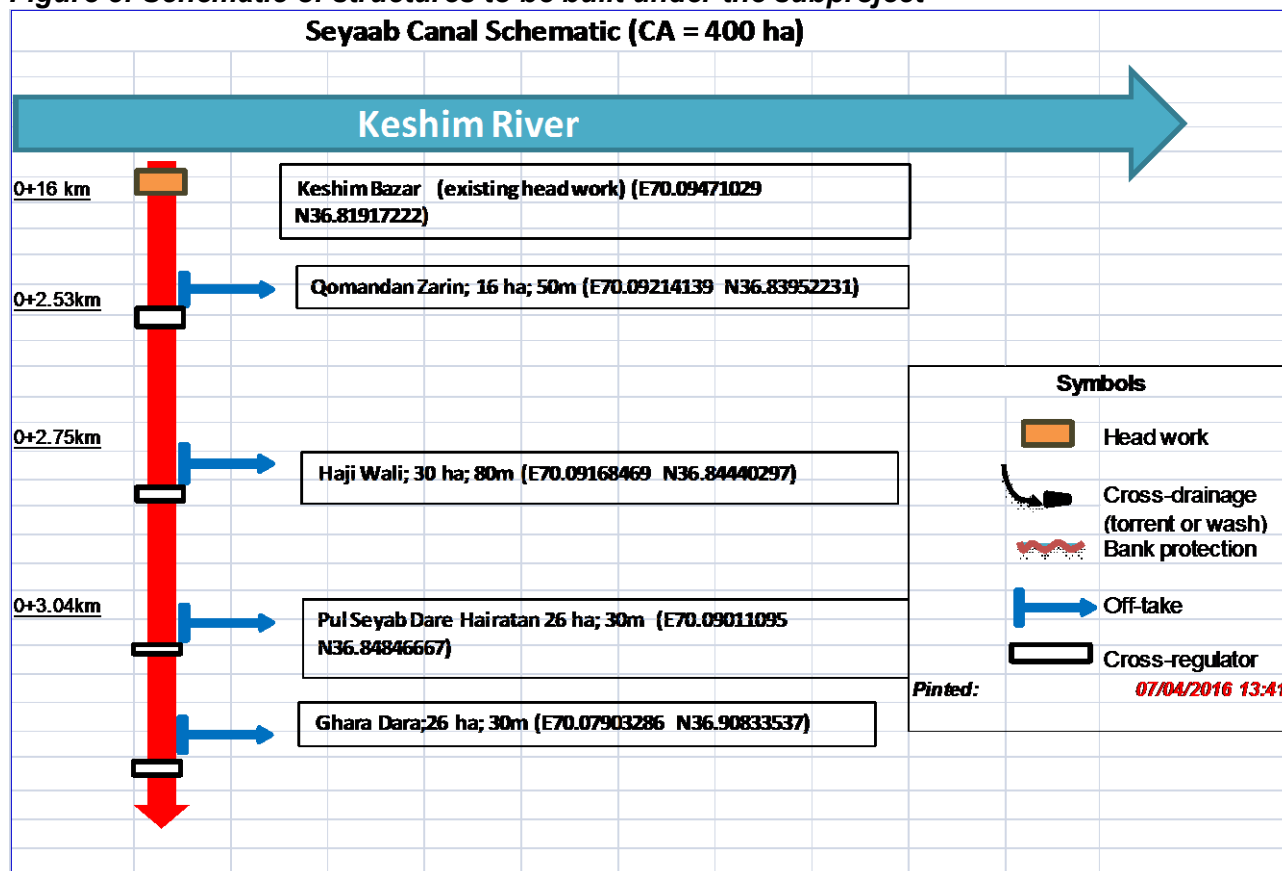
104. This has resulted in an updated list of structures to be implemented, as shown in the revised canal schematic below.

105. Specific engineering solutions have been considered in the P-ARBP FS for solving the major problems described above. They are as follows:

1. Repair of head work (2 new gates)
2. Construction of 4 new off-takes and cross-regulators with spill weir at required level considering Q_{min} flow and scour sluice for desilting purpose and maintaining the smooth flow zone for off-take area. To achieve rationale distribution of irrigation water through measurement of discharge measuring devices for each secondary or branch canal are provide - a calibrated staff gauge at each gated off-take and cross-regulator. This fixed gauge will be located sufficiently far upstream of the gate or the weir to avoid the area of surface draw-down, yet it should be close enough for the energy loss between the gauge and the gate to be negligible. In general, the staff gauge location will be at a distance equivalent to two times the depth of flow above the crest of cross regulating and off-take structure
3. Construction of four domestic water access points
4. Construction of two livestock water access points

106. The schematic diagram for Seyaab canal system shows the updated list of hydraulic structures to be built, including the cumulated distance and the command area of off-takes. This canal schematic is shown below.

Figure 3: Schematic of structures to be built under the subproject



Note: water access points not shown in the schematic

f) Impacts and benefits

107. The following positive impacts and benefits are envisaged after the completion of the project:

- Better control and distribution of the irrigation water throughout the different seasons for the 400 ha
- Hydraulic structures along the canal more efficient and protected
- Water management along the canal become easier and controllable thanks to measuring devices and rating curves
- Flood damages will be reduced

4. Associated Investments

108. While rehabilitation and upgrading of structures along the main canal is the primary goal of the sub-project, and will have the greatest impact on increased agricultural productivity, the long-term benefits of this investment will only be realised if institutional structures are in place to ensure long-term operation and maintenance (O&M). As such it is proposed to set-up a Water Users Association (WUA).

109. Further benefits will be realised by (i) rehabilitating and upgrading (R&U) secondary and tertiary infrastructure, and setting up institutional structures – irrigation associations (IAs) which have not yet been established - for O&M, at least in the command areas serviced by the structures constructed under output 1 i.e. at last one but possibly up to four); (ii) provision of training to farmers on improved on-farm water management and agricultural techniques to ensure optimum yields are produced through the efficient use of water.

110. Finally, the canal suffers from torrents (washes) flowing from the hills near the head of the canal. Similarly, in the section from Hadji Musa to Abil Ariq, the canal flows along hilly areas situated mainly on the right side. Torrents (washes) are flowing from the hills through the canal into the CA, causing siltation and destruction/damages of canal sections. This situation is shown in the list of structures requested by the beneficiaries during the topographical survey and the corresponding canal schematic (see Figure 2). Watershed protection work (e.g. check dams, terracing, reforestation) will greatly improve this situation by dissipating the energy from washes. If additional resources are available for the contractor for the main canal works R&U (e.g. if the contract budget is less than the BOQ budget, or through use of contingencies) then construction of cross-drainage structures (as proposed in the list above) should be a priority to further prevent the canal banks being breached by wash floods and silt dumping during flood seasons.

111. Finally, Seyaab canal, from middle down to tail, flows beside the hills along Takhar-Faizabd highway (right site of the canal). Washes were seen and observed under survey work as shown in the canal schematic. According to the Keshim WMD director, hills besides the canal are all rain-fed areas, with no villages nearby. Land owners of this rainfed area are living in villages along the canal. Besides the rainfed area, pistachios trees are naturally grown in the area which are the property of the government, but used by the community living at the foot of the hill along the Seeyab canal. Watershed protection work (e.g. check dams, terracing, reforestation) will greatly improve this situation by dissipating the energy from washes. Reforestation could include the planting of more pistachio trees. If additional resources are available for the contractor for the main canal works R&U (e.g. if the contract budget is less than the BOQ budget, or through use of contingencies) then construction of cross-drainage structures (as proposed in the list above) should be a priority to further prevent the canal banks being breached by wash floods and silt dumping during flood seasons.

B. Subproject Design Methodology

1. Subprojects Selection Process

112. To identify the irrigation schemes to be rehabilitated / upgraded, a list of projects was prepared in July 2015 by the RBA staff in collaboration with the six sub-basins.

113. In November 2015, a long list of sub-projects was prepared by the feasibility study (FS) team using the RBA list and, in addition, MEW and other prioritized projects from other donors (FAO, USAID etc.). This list includes 408 sub-projects covering all six sub-basins with an estimated total budget of USD 164m. Data on each scheme was scarce and not considered as accurate.

114. The MEW, RBA and SBAs were then asked to identify the priority projects for construction /rehabilitation on this list. This resulted in a list of 62 sub-projects. This list was then evaluated against eligibility and prioritisation criteria by the FS team. Seven projects were considered ineligible leaving 55 eligible sub-projects. The RBA and SBAs were then asked to identify three priority sub-projects as representative projects for which feasibility designs would be undertaken. The RBA and SBAs were asked to select projects that were of high priority (as these would be the

first to be rehabilitated under the new Project) and in relatively secure and accessible areas. The three chosen were the Laqi, Seyaab and Sharawan-Takhar schemes.

2. Topographical Surveys

115. A rapid survey has been undertaken of the eligible 55 sub-projects to identify the head work of the canal (GPS coordinates), the total command area (GPS points) and the hydraulic structures to be built, as requested by the beneficiaries. This has allowed a better estimate of the cost of the selected sub-projects.

116. A more detailed topographical survey was carried out in the representative sub-projects for the characterization of the irrigated area, the selection of the location and choice of the type of structures (a ToR of the survey is included in **Annex 8**). During this field survey, the structure types were agreed with the beneficiaries, the IA and the sub-basin agency representative. Each structure's axis and location were selected, considering in-situ alternative locations along the river or canal, topographical, hydraulic and geomorphologic factors.

117. At the same time, interviews with a number of local people and members of the IA were conducted to get some estimates of the variability of historical maximum and minimum river flows.

3. Hydrology and Flood Level

118. The alternatives taken into account in the flood return period in Keshim River near the Seyaab canal intake are:

1. Design flood recurrence period of 100 years
2. Design flood recurrence period of 50 years
3. Design flood recurrence period of 25 years

119. For the different flood recurrence periods, the maximum water level near the head work of the selected canal was calculated with Manning's formula.

120. To take into account the climate change findings, the design flood recurrence period of 100 years has been considered. The findings of the climate change analysis on river flows were completed during the field survey with interviews of a number of local people to get some estimate of the variability of historical maximum and minimum river flows and anticipated land use changes. The different water levels of the Keshim river are summarized in the following table (return period of 1 in 100):

Figure 4: Discharges and water levels of the Keshim rivers (return period of 1 in 100)

	Unit	Keshim river (Seyaab canal)
Width of river	m	38.00
Qmean	m ³ /s	134.00
hmean	m	0.88
Qmax	m ³ /s	451.00
hmax	m	1.73
Qmin	m ³ /s	23.00
hmin	m	0.40

4. Crop Water Requirements and Canal Capacity

121. The crop water requirements analysis in the lower parts of the Panj-Amu river basin indicates a maximum requirement of around 2.7 l/s/ha when all losses of conveyance, distribution and field application have been taken into account (total efficiency assumed at 50%) (Irrigation Design Manual). This irrigation modulus represents the continuous supply of water (24 hrs per day, 7 days a week) that needs to be supplied for the considered crops. However, in agreement with RBA, the monthly crop water requirements data used is 2.51 l/s/ha based on a more precise calculation for Khanabad irrigation system (Taloqan sub-basin).

122. When applied to the main canal, it allows the estimation of the total flow required and the canal capacity. This amount of water will also permit some flexibility for the future rotation irrigation over secondary canals and off-takes. Traditionally, with uncontrolled flow in the canal, flood flows well over the 2.51 l/s/ha rate are taken into the canals, whose capacity has to be accommodated in the design (freeboard). Remodelling of canals are usually avoided.

123. One factor that has not been included, as such, in the main canal flow calculation is the water demand of the water mills and small hydropower plants. They usually return water directly to the river/canal and the water may be used for agriculture by communities downstream. It is believed at this stage that agreements will be prepared between the irrigators and the water mills and hydropower plants for their operation during the time of highest crop water demand.

5. Design of the Hydraulic Structures

124. Detailed designs and typical drawings have been prepared for the hydraulic structures to be built/rehabilitated in the selected sub-project based on the topographic survey data. See **annex 3**.

125. The main types of hydraulic structures considered in the Seyaab sub-project during the topographical survey are:

1. Cross-regulator structure
2. Gated off-take structure

126. **Risk-based design.** The approach considers a risk-based design limited to the inherent randomness of the hydrologic events for the hydraulic infrastructure. The main design parameter required is the flood level at the structure location. It is also the easiest question to ask local people about historical flood events. The secondary design parameter required is the flood velocity. Its value is very important for scour calculations of structure foundations and launching apron/ bank protection.

127. The design data such as sedimentation data, river bed material and strengths of material to be used for construction have been taken from available secondary data. Geotechnical aspects and seismic analysis could be also integrated but only for larger works such as dams (not the case in the 3 subprojects).

128. To further decrease the risk of failure, the head work is always located at least 50 m downstream of the braided river intake, assuming that this canal section leading to the head work from the braided river would be first damaged in preference to the head work itself. The risk of failure by other mechanisms such as avulsion (shift in the course of a river channel) could not be taken into consideration for a lack of relevant data.

129. **Probability of failure.** The probability of exceedance of the flow rate over the design lifetime of the hydraulic structure is of fundamental importance. The probability of failure over a certain return period is often termed "risk of failure".

130. The economic lifetime of the structures to be built is taken as 25 years. For a certain economic lifetime of a structure, the probability of one or more exceedances during the design life of the hydraulic structure (the risks or probabilities of failure in % over the proposed period) for different flood recurrence intervals is given in the following table (with $R = 1 - (1 - 1/T)^n$).

Table 2: Probability of one or more exceedances during design life of the hydraulic structure

Design life (year)	Return Period, T (year)							
	2	5	10	20	25	50	100	250
	Risk of failure, R (%)							
2	75.0%	36.0%	19.0%	9.8%	7.8%	4.0%	2.0%	0.8%
5	96.9%	67.2%	41.0%	22.6%	18.5%	9.6%	4.9%	2.0%
10	99.9%	89.3%	65.1%	40.1%	33.5%	18.3%	9.6%	3.9%
20	100%	98.8%	87.8%	64.2%	55.8%	33.2%	18.2%	7.7%
25	100%	99.6%	92.8%	72.3%	64.0%	39.7%	22.2%	9.5%
50	100%	100%	99.5%	92.3%	87.0%	63.6%	39.5%	18.2%
100	100%	100%	100%	99.4%	98.3%	86.7%	63.4%	33.0%
250	100%	100%	100%	100%	100%	99.4%	91.9%	63.3%

131. The above table shows that, with an economic life of 25 years, a structure designed for a flood with an annual exceedance probability (AEP) of 1 in 100 years has a probability of 22.2% of risk of failure which means that there is a 22% probability of one surcharge exceeding the design conditions of the structure in the lifetime of the structure.

6. Cost of Structures

132. **Effect of climate change and design of least-cost alternatives.** Based on an economic life of 25 years, the least-cost alternatives for the hydraulic structures are (a) without and with climate change and (b) alternatives in the flood return period (water depth).

133. The adopted design flood should not have a design flood average recurrence interval of less than 50 years, with a risk of the design conditions being exceeded of 40%. Tempting such a lower recurrence interval increases the risk from 22% to 40% with a decrease of construction cost of only 15% approximately (calculated for Laqi canal and Seyaab canal). With this design flood average recurrence interval of less than 50 years, the risk of the design conditions being exceeded is considered to be too high.

134. Therefore, it is considered that the selection of a 100 year design flood average recurrence period accommodates the findings of the climate change analysis, giving a theoretical risk of failure of 22% for a design life of 25 years as a reasonable compromise between cost, risk and uncertainty. Attempting a lower risk by adopting a greater average recurrence interval would be too expensive because a larger, stronger structure would be required for the larger design flood. It should be noted that for the type of structures proposed, a design taking into account a 100 year return period is considered as conservative.

135. **Cost estimate.** Estimate of the cost of the requested structures by the IA has been also drawn from the experience of the P-ARBP programme.

136. Unit prices for the cost estimates of the hydraulic infrastructure and ancillary works are based on November 2012 prices with 15% physical contingencies and assuming a 3% escalation annually in USD terms.

137. Environmental sustainability concerns, social and resettlement aspects were addressed in the study through the environmental and social impact assessment and the costs were reflected in the capital investment of the three sub-projects envisaged under the study. Costs during construction for mitigating potential negative environmental impacts and for compensating farmers for land/crop losses are included. Therefore, this cost estimate includes the full development of the proposed hydraulic infrastructure, including ancillary works and all preparatory works.

138. The cost estimates also reflects the remoteness of the sub-project site and the need for the contractors to provide security at site.

139. Benefits and costs are also captured in the design criteria for the selection of factors of safety (FoS).

140. Potential benefits from incremental downstream water supply, where existing demand cannot be met, represents a potentially important project benefit.

141. The total financial investment cost of the Seyaab sub-project is shown in the following table.

Table 3: Seyaab Canal Subproject Financial Investment Costs

Items		Total	Foreign	Local
		Amount (US\$)		
A. Civil Works				
1	General Items	--	--	--
2	Site Clearance	450.4	--	450.4
3	Concrete Works	102,426.8	71,698.8	30,728.0
4	Joints and Sealers	287.8	--	287.8
5	Earthworks	34,223.6	--	34,223.6
6	Water Control Equipment	18,866.1	18,866.1	--
7	Protection Works	24,531.0	--	24,531.0
8	Stone Masonry	40,261.0	--	40,261.0
9	Miscellaneous Works	83,857.8	--	83,857.8
10	Lump Sum Allocation	48,784.7	--	48,784.7
	Subtotal	353,689.1	90,564.8	263,124.3
11	Survey and Design (8%) \1	28,295.1	--	28,295.1
	Subtotal Civil Works	381,984.3	90,564.8	291,419.4
	B. Ag. Extension Support \2	2,600.0	--	2,600.0
	C. Project Implementation \3	66,400.0	--	66,400.0
	D. Total Base Cost	450,984.3	90,564.8	360,419.4
	E. Contingencies			
	Physical Contingencies	45,098.4	9,056.5	36,041.9
	Price Contingencies	74,412.4	14,943.2	59,469.2
	F. Total Subproject Cost	570,495.1	114,564.5	455,930.6
	Taxes and Duties (inclusive)	57,049.5	--	57,049.5
Source: Project Preparation Technical Assistance (PPTA), April 2016.				
\1	Estimated at 8 percent of civil works cost estimate.			
\2	Estimated at US\$ 6.5 per command area hectares (400ha).			
	Component 2.3: Extension training (US\$ 472,350) divided by total command area (74,498 ha).			
\3	Estimated at US\$ 166.0 per command area hectares (400ha).			
	Component 1.1 & 1.2: Investment & recurrent costs less subproject allocation divided by total command area (74,498 ha).			

142. The BoQ of the Seyaab sub-project headwork and main canal construction works is given in the following table.

Table 4: Total BoQ cost of the Seyaab sub-project

No.	Technical Specification Clause No.	Items	Unit	Total BoQ (USD)		Amount (USD)
				Total Quantity	Unit rate (USD)	
1		General Items				
1.1	1.11 and 1.20 to 1.25	Mobilisation	Ls.		1.0	0.00
1.2	1.11	Demobilisation	Ls.		1.0	0.00
1.3	2.6	Testing and analysis				
1.3.1	1.6, 5.17, 5.21	Testing and analysis of earth and protection works	Ls.		1.0	0.00
1.3.2	1.3, 3.2, 3.3, 3.4 and 3.24	Testing and analysis of materials and concrete	Ls.		1.0	0.00
1.4	1.4, 1.6, 1.11, 1.15, 1.12	As-built drawings and commissioning	Ls.		1.0	0.00
1.5		Transport for supervision	Ls.		1.0	0.00
		Sub-total of General Items		X		0.00
2		The Site				
2.1	1.16 and 1.17	Improvement and maint. of access road to the construction sites	Ls.		1.0	0.00
2.2	1.13, 1.22 to 1.25 and 1.32	Maint. of water supply at all const. sites until the completion of works	Ls.		1.0	0.00
2.3	2.6	Demolition	Ls.			0.00
2.4	2.6	Stripping	m2	357.08	1.3	450.39
		Sub-total of The Site		X		450.39
3		Concrete Works				
3.1	3.12 to 3.29	Reinf. concrete Class-B	m ³	5.91	296.2	1,751.31
3.2	3.12 to 3.29	Mass concrete Class-C	m ³	454.66	173.1	78,698.71
3.3	3.12 to 3.29	Blinding concrete Class-D	m ³	40.11	154.5	6,197.09
3.4	3.7 to 3.10	Reinforcement steel	kg	4,868.32	2.6	12,585.38
3.5	3.11	Formwork and Shuttering	m ²	377.92	6.9	2,595.97
3.6	3.2, 3.20, 3.27	Contraction/Expansion joints	m	79.84	7.5	598.33
		Sub-total of Concrete Works				102,426.80
4		Joints and Sealers				
4.1	4.1, 8.9	Water stop	m	38.40	7.5	287.78
		Sub-total of Joints and Sealers				287.78
5		Earthworks				
5.1	1.13 and 1.15	River diversion and its maintenance until the completion of the works	Ls.		1.0	
5.2	1.14	Dewatering construction pits	Ls.		1.0	
5.3	5.1 to 5.5	Excavation for structures in soil or gravel	m ³	913.43	5.4	4,951.06
5.4	5.6 to 5.9 and 5.16	Back fill and fill	m ³	81.15	14.1	1,145.79
5.5	5.10 to 5.12 and 5.20 to 5.23	Embankments	m ³	3,689.74	7.6	27,923.85
5.6	5.8	Compacted gravel	m ³	30.09	6.7	202.90
		Sub-total of Earthworks				34,223.61
6		Water control equipment				
6.1	6	Vertical lift gates- including frame, spindle and hoist	kg	2,942.00	4.9	14,415.80
6.2	4.12, 6.4, 6.21	Gauges	m	21.73	204.8	4,450.26
		Sub-total of Water control equipment				18,866.06
7		Protection Works				
7.1	7.1 to 7.3	Compacted graded filter	m ³	38.79	9.0	348.86
7.2	7.1, 7.10	Gabion box and mattresses	m ³	0.00	66.2	0.00
7.3	7.4	Non woven filter cloth	m ²	524.00	7.0	3,664.93
7.4	7.6	Concrete block protection	m ³	50.60	199.8	10,112.03
7.5	7.11	Riprap	m ³	133.65	55.0	7,350.48
7.6		Stone dumping	m ³	87.28	35.0	3,054.69
		Sub-total of Protection Works				24,530.99
8		Stone masonry				
8.1	8.1 to 8.10	Stone masonry 1:4 cement mortar	m ³	396.30	91.4	36,229.01
8.2	8.7, 8.12	Pointing with 1:2 cement mortar	m ²	635.70	4.6	2,905.74
8.3	8.9	Weep holes	m	180.37	6.2	1,126.25
		Sub-total of Stone masonry		X		40,261.00
9		Survey and design				
9.1	1.4, 1.8, 1.9, 1.12 and 10.	Surveys	Ls.		1.0	0.00
9.2	1.4, 1.5, 1.6, 1.8, 1.12, 1.13 and 1.15	Final design, preparation of BOQ and drawings	Ls.		1.0	0.00
		Sub-total of Survey and design		X		0.00
10		Miscellaneous Works				
10.1	6.1	Hardwood stop logs	m ³		663.0	0.00
10.2	1.37	Sign boards (metal 120 x 80 cm)	pcs	9.00	189.8	1,708.42
10.3	1.37	Plaque (marble stone 60 x 50 cm)	pcs	8.00	258.5	2,068.13
10.4		Compensation				
10.4.1		Mulberry	pcs		44.0	0.00
10.4.2		Big non-fruit tree	pcs	73.00	22.0	1,606.00
10.4.3		Small non-fruit tree	pcs	85.00	6.0	510.00
10.4.4		Fruit tree	pcs		29.0	0.00
10.5		Water access point	pcs			
10.5.1		Domestic water access point	pcs	4.00	5,762.0	23,048.00
10.5.2		Lifestock water access point	pcs	2.00	27,458.6	54,917.24
		Sub-total of Miscellaneous Works		X		83,857.78
TOTAL			USD	X	X	304,904.42
Total lumpsum amount 16% of Total			USD			48,784.71
Contingency 15%			USD			53,053.37
GRAND TOTAL			USD			406,742.49

7. Design Procedure

143. The design procedure takes into account the followings:
1. To distribute and measure the controlled water to branching or secondary canals (off-takes and cross-regulators), prioritising canals with the larger command areas
 2. Special structures are also considered for improving the access to water for livestock and domestic purposes.
144. Typical drawings are provided.
145. The methodology adopted for the design of main structures such as the cross-regulators and gated off-takes is based on the User's Manual for the Design of a Cross-Regulator and Off-Take Structures on Permeable Foundations Using a MS Excel Spreadsheet and is summarized below:
1. The weir crest level is fixed according to the flood water level and the minimum discharge expected in the main canal. The sharp or broad crested weir formula is used for this calculation, depending on the length and height of the weir
 2. For a given minimum water level in the main canal, the corresponding number of gates and the water level in the branching canal is fixed so that the required irrigation discharge amount passes through
 3. For discharge calculation for free flow below the vertical gate (function of the upstream water depth and gate opening), the orifice formula is used for flow calculation with regulated flow. The design will be carried to reach free flow for discharge measuring purposes
 4. With the known crest height and maximum discharge in the main canal, calculate the apron length, end sill height and the protection works upstream and downstream of the structure
 5. With maximum discharge (water level) in the main and branching canal, calculate the stilling basin parameters
 6. Design the floor thickness based on uplift pressure computation due to seepage pressure (buoyancy) (Khosla's method of independent variables)
 7. Design upstream and downstream cut-off walls on the basis of Lacey's regime scour depth formula, including safety parameters
146. Seyaab canal has a controlled flow of 1 m³/s and a Q_{max} of 1.97 m³/s (see **annex 7**). To take into account the possibility of poor management of the gates of the head work, all the cross-regulators in the main canal have been designed with Q_{max} of 1.97 m³/s.

8. Detailed Drawings and As Built Drawings

147. At the start of the implementation of the contract, the contractor will be responsible to provide the final design and detailed drawings and carry out detailed topographic surveys, based on the detailed design provided for each structure type as well as the typical drawings. The contractor's detailed drawings will be approved by the TA designers before construction proceeds.
148. In addition, changed field conditions, changes requested by the community or new data becoming available will need to be taken into consideration. It is the contractor's responsibility to verify the designs in the field and he will be required to do the necessary surveys and hydraulic calculations to ensure functional properties of the designed structures. Based on a better understanding of the local conditions, some designs might be simplified.
149. At the end of the contract, the contractor will provided the As Built Drawings for all the hydraulic structures of the contract.

IV. Proposed Subproject

A. Project Outcome and Impact

150. The impact of the sub-project is aligned with the overall project impact of *“increased per-capita income and reduced poverty among rural and pastoral communities”* (Afghanistan National Development Strategy - Agriculture and Rural Development Cluster ⁶).

151. The project outcome is *“Increased agricultural productivity in Seyaab canal irrigation scheme”*.

B. Project Outputs

152. In order to achieve the project outcome the following outputs are proposed. These are aligned with the design logic for the overall project.

153. **Output 1: Water allocation and availability improved.** This output provides the capacity and resources for the Kokcha Sub-Basin Agency (SBA) to: (i) improve the conveyance and allocation of water to the irrigated farm system through rehabilitating and upgrading of water conveyance infrastructure (main canals). This will include the repair of head works (two new gates), construction of four new off-takes (with measuring staff gauges) and cross-regulators with spill weirs, and the construction of four domestic and two livestock water access points. This will improve the availability of water, particularly for the tail end of schemes, increasing yields, cropping intensity and irrigated areas. To ensure structures are maintained post-project, construction will be subject to water users (through a WUA) signing up beforehand to O&M agreements with the project and government (SBA), while at the end of the construction period water users (through the WUA) will sign hand-over agreements with the project and government (SBA). This will engender sustainable irrigation management and transfer. **(Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded).** A WUA will be established and strengthened to operate and maintain (O&M) conveyance infrastructure in the scheme thus improving sustainability, to distribute water between the head, middle and tail end of the canal more equitably; and to work with RBA/SBA to facilitate water sharing between schemes along the river. **(Sub-component 2: WUA established and strengthened).**

154. **Output 2: On-farm water management enhanced.** This output provides the capacity and resources for Badakshan DAIL to: (i) improve irrigation infrastructure (at the secondary and tertiary canal level) in the secondary canals supported by improved offtakes under Output 1, in order to have an integrated approach. To ensure structures are maintained post-project, construction will be subject to water users (through the IAs) signing up beforehand to O&M agreements with the project and government (DAIL), while at the end of the construction period water users (through the IAs) will sign hand-over agreements with the project and government (DAIL). This will engender sustainable irrigation management and transfer. **(Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded);** (ii) establish and strengthen the capacity of up to four IAs to operate and manage irrigation infrastructure thus improving sustainability, as well as ensuring more equitable distribution of water, increasing yields and cropping intensity, particularly in lower canal reaches, and thus reducing conflict over water use **(Sub-component 2:**

⁶ Islamic Republic of Afghanistan. July 2010. *Afghanistan National Development Strategy, Prioritisation and Implementation Plan, Mid 2010-2013, Volume 1.* Kabul, Afghanistan.

IAs established and strengthened); and (iii) improve water use efficiency at the farm level by improved on-farm water management and agronomic techniques (such as land levelling, bed and furrow irrigation, intercropping...etc) with at least 100 farmers having improved knowledge from a demonstration plot (**Sub-component 3: Efficiency of agricultural water use enhanced**).

155. **Output 3: Watersheds properly managed and protected.** This output provides the capacity and resources for DAIL to improve community-based watershed management. This will result in the restoration and protection of at least 500 hectares of watershed (forestry/rangeland) around the scheme. This output includes the creation of a community forestry/rangeland association and preparation and implementation of a natural resource management plan. To ensure that works constructed under plan implementation are maintained post-project, construction will be subject to watershed users (through the catchment management association) signing up beforehand to O&M agreements with the project and government (DAIL), while at the end of the construction period watershed users (through the catchment management association) will sign hand-over agreements with the project and government (DAIL). This will engender sustainable management and transfer of works.

C. Economic Analysis

1. Benefits

156. **Quantified Benefits.** The main quantified benefits generated by the subproject are the incremental net returns from the production of the following representative crops: winter wheat, rice (paddy), tomato, small vegetables, watermelon, peaches, and almonds. Net incremental benefits could arise as a result of higher cropping intensities and crop yields. Table 5 shows a summary of cropping intensities and crop yields for each of the subproject's reach for the "with-" and "without-project" scenarios.

157. Across the three reaches, the weighted average improvement in cropping intensity is 14.5% in 2022 and 24.2% in 2026. Specifically, the subproject could raise the cropping intensities from that of the baseline year in 2016 by about 10-22% in 2022, which is the target year when the implementation of the subproject is expected to end. Meanwhile, by 2026, the assumed year of full development, the subproject could increase the cropping intensity by roughly 17-37% from the baseline in year 2016.

158. The largest improvement in cropping intensity by years 2022 and 2026 is for the subproject's tail reach, by 22% and 37%, respectively. The middle reach would have an increase in cropping intensity by roughly 14% and 23% in 2022 and 2026, respectively. Meanwhile, the head reach, being the section closest to the irrigation canal, would only have an improvement in cropping intensity in the order of about 10% and 17%, accordingly in 2022 and 2026.

159. The subproject could also increase crop yields. Although it could not result to an increase in yield in its head reach, it could, however, lead to around 6% and 10% increases in yields in 2022 and 2026 for the middle reach, respectively, from its baseline yield in 2016. For instance, the yield of winter wheat in 2016 is 3,267 kg/ha, which would grow to 3,463 kg/ha in 2022 and 3,593 kg/ha in 2026. In the tail reach, the yield of winter wheat in the baseline is 2,613 kg/ha, which could increase to 2,907 kg/ha in 2022 and 3,103 kg/ha in 2026. These increases represent 11% and 19% improvements in yields for the tail reach in 2022 and 2026, respectively.

160. The estimates of the subproject's stream of incremental net benefits from the production of selected agricultural products are shown in Table C.12 in Supplementary Document (SD) 5. These figures were calculated based on crop budget, which were specifically designed to account for the aforementioned potential improvements in cropping intensities and crop yields.

Table 5: Cropping intensities and crop yields by reach at the assumed end-of-project implementation in year 2022 and full development in year 2026, Seyaab Canal Subproject

Total Area: 400ha	Baseline (2016)	At end of project (2022)		At full development (2026)	
		Value	Increments	Value	Increments
Head Reach (ha)	144				
Cropping Intensity (%)	175%	185%	10%	192%	17%
Crop Yields (kg/ha)					
Winter Wheat	3,593	3,593	0%	3,593	0%
Rice (paddy)	3,871	3,871	0%	3,871	0%
Tomato	29,249	29,249	0%	29,249	0%
Small Vegetables	24,475	24,475	0%	24,475	0%
Watermelon	22,000	22,000	0%	22,000	0%
Peach	18,644	18,644	0%	18,644	0%
Almond	1,617	1,617	0%	1,617	0%
Middle Reach (ha)	160				
Cropping Intensity (%)	160%	174%	14%	183%	23%
Crop Yields (kg/ha)					
Winter Wheat	3,267	3,463	6%	3,593	10%
Rice (paddy)	3,519	3,731	6%	3,871	10%
Tomato	26,590	28,186	6%	29,249	10%
Small Vegetables	22,250	23,585	6%	24,475	10%
Watermelon	20,000	21,200	6%	22,000	10%
Peach	16,949	17,966	6%	18,644	10%
Almond	1,470	1,559	6%	1,617	10%
Tail Reach (ha)	96				
Cropping Intensity (%)	131%	154%	22%	168%	37%
Crop Yields (kg/ha)					
Winter Wheat	2,613	2,907	11%	3,103	19%
Rice (paddy)	2,816	3,132	11%	3,343	19%
Tomato	21,272	23,665	11%	25,261	19%
Small Vegetables	17,800	19,803	11%	21,138	19%
Watermelon	16,000	17,800	11%	19,000	19%
Peach	13,559	15,084	11%	16,101	19%
Almond	1,176	1,309	11%	1,397	19%
Weighted intensities	158.7%	173.2%	14.5%	182.8%	24.2%
Weighted wheat yield (kg/ha)	3,227	3,376	5.1%	3,475	8.5%
Weighted rice yield (kg/ha)	3,477	3,637	5.1%	3,744	8.5%
Source: ADB Estimates					

161. **Unquantified Benefits.** In addition to the quantified benefits associated with crop production which have been included in this analysis there are additional, less easily quantified, benefits associated with this subproject. Among these benefits are increased food production providing better food and health for farmer families, increased availability of water for downstream users (i.e. households, and industry and hydro-power sectors), reduced flood hazards in the downstream areas, and avoidance of system wash-aways. These benefits could arise due to watershed conservation, restoration, and protection activities in the upper catchment, for which the main intention is the control of siltation of irrigation canals to protect the subproject's capital

investment. In addition, main and primary canals generally are associated with access paths along their lengths. These paths also serve as ways for people to get to their fields and to take produce out after harvest, and for some households may provide easier access to area schools and local clinics.

162. Gender will be mainstreamed into project activities to the extent possible. In the creation of the WUA and IAs, water users will be briefed on the importance of female participation. Natural resource management (NRM) plans for the watershed will be prepared with due regard for the role of women in watershed activities, particularly income-generating activities. The project will also ease women's water-fetching and laundry chores as it will install at least four water points along canals for household use (in addition to at least two livestock access points).

2. Economic Returns and Sensitivity Analysis

163. The table below shows that the subproject's EIRR is 24.1% and its ENPV is around Afg31.5 million. These estimates suggest the economic feasibility of the subproject in view of the economic viability criteria that the EIRR should be greater than 12% (the opportunity cost rate) and that the ENPV should be greater than zero.

Table 6: Results of Economic Analysis and Sensitivity Analysis

Results of Evaluation	Change	ENPV (Afg'000)	EIRR (%)	Sensitivity Indicator (SI)	Switching Value (SV)
Base Case		31,511.3	24.1		
Sensitivity Scenarios					
Case 1 - Increase in Capital Costs (%)	+10%	29,457.0	22.6	0.65	153%
Case 2 - Increase in O&M Costs (%)	+10%	31,398.7	24.0	0.04	2,798%
Case 3 - Combined Case 1 and 2	as above	29,344.4	22.6	0.69	145%
Case 4 - Decrease in Benefit (%)	-10%	26,193.3	22.5	1.69	59%
Case 5 - Benefit Delay (years)	-2 years	17,897.2	18.5	n.a	6 years
Case 6 - Combination of Cases 3 and 4	as above	24,026.4	21.1	n.a	n.a

EIRR = economic internal rate of return; ENPV = economic net present value; SI = sensitivity indicator, the ratio that compares percentage change in ENPV with percentage change in a variable; SV = switching value, the percentage change in a variable sufficient to reduce ENPV to zero.

Source: ADB estimates

164. The economic feasibility of the subproject is attributed to its significant impacts on the cropping intensities and crop yields of the agricultural products considered in its design. These farm-level improvements, along with the prudent design of the irrigation facility rehabilitation will generate benefits that have relatively large magnitudes (Table C.12 in SD5). However, the estimated cost estimates and assumed improvements in cropping intensities and crop yields, prices, and the subproject implementation schedule may vary during actual implementation of the subproject. Therefore, it is useful to examine the effects of subproject implementation risks on the economic viability of the subproject. The effects of some of these risks are shown in detail in Table C.13 in SD5. A summary is explained below.

165. **Case 1-Increase in Capital Costs** - To see how vulnerable the economic returns may be to higher construction costs, a 10% increase in capital costs has been considered in the sensitivity analysis. This cost increase causes the EIRR to fall to 22.6%. The level of increase in capital cost at which the EIRR would be equal to the hurdle rate of 12% is 153%. **Case 2-Increase in O&M Costs** - A 10% increase in O&M costs will cause the EIRR to decrease to 24%. The level of increase in total O&M cost at which the EIRR would be equal to the hurdle is 2,798%. **Case 3-**

Combination of Cases 1 and 2 - Combination of Cases 1 and 2 will cause the EIRR to fall to 22.6%. The percentage joint increases in the capital and O&M costs at which the EIRR would be equal to the hurdle rate is 145%. **Case 4-Decrease in Benefit** - A 10% decrease in benefits will cause the EIRR to fall to 22.5%. The percentage decrease in the subproject benefit at which the EIRR would be equal to the hurdle rate is 59%. **Case 5 - Two-year Benefit Delay** - A two-year delay in the realization of subproject benefits will cause the EIRR to fall to 18.5%. The length of delay at which the EIRR would be equal to the hurdle rate is 6 years. **Case 6 - Combination of Cases 3 and 4** - Combination of Cases 3 and 4 will cause the EIRR to decrease to 21.1%.

166. The sensitivity analysis indicates that the economic viability of the subproject is most sensitive to the decrease in subproject benefits. This suggests that it is essential that the subproject be implemented as scheduled and its agricultural extension support activities be implemented in parallel with civil works. In addition, the project management should ensure that capital expenditures are kept at a minimum so that the economic viability of the subproject would be preserved.

3. Subproject Benefit Distribution and Poverty Impact

167. The distribution of economic benefits and costs over and above financial revenues and expenses are estimated to determine the extent to which public investment policy can affect the share that the various sectors derive from the subproject. Table C.14 in SD5 presents the result of the benefit distribution analysis. The table suggests that farmers are the major beneficiaries of the subproject; receiving around Afg52.6 million worth of net economic benefits. The country's economic sector would have economic gains amounting to roughly Afg9.5 million. Meanwhile, the economic gain for the labor sector is estimated to be around Afg4.1 million (for discussion on financial labor income, see section 5 below). Based on these calculated economic gains for the three social sectors, it was estimated that subproject has a poverty impact ratio of 42.6% (Table C.15 in SD5).

168. During construction of water conveyance and irrigation infrastructure, over 20,000 person days of labour will be generated. Most of these temporary jobs will be sourced from the local market.

4. Household Financial Returns

169. The impact of the subproject could manifest as improvements in annual household incomes. The largest increase in annual household income could be expected from the households in the tail reach. For these households, the increase in annual income is estimated to be around Afg26,468/household (equivalent to \$389/household) as shown in Table C.18 in SD5. In the middle reach, as presented in Table C.17 in SD5, the subproject could lead to an increase in annual household income in the magnitude of Afg21,013/household (equivalent to \$309/household). In the head reach, the increase in annual incomes of the farming households would be Afg9,783/household (equivalent to \$144/household), as shown in Table C.16 in SD5.

170. The incremental net crop income for farm households noted above assumes all labor inputs are a cost (valued at the going rate for farm labor in the subproject area i.e., Afg300 or \$4.4 per labor day). "With" the project, however, different cropping patterns and increased crop inputs will be applied compared to the "without" project situation. These differences will call for an increased amount of farm labor. For the part of the incremental labor that is drawn from the farm household itself, these (wages) comprise part of incremental household income (in addition to incremental net crop revenue) - although the additional time commitment to on-farm work may partly have an opportunity cost of work and income off the farm. For the "average" household, the incremental

labor requirement in year 10 comes to 9.7 labor days a year - or Afg2,898 (\$43). That part of this figure that is not hired labor and is not off-set by lost employment opportunities off the farm represents an increase in household income. Besides family labor, incremental hired labor requirement in year 10 estimated at 10.3 labor days per hectare per annum represents an incremental income of Afg3,100 (\$46) benefiting local workers who mostly belong to low-income and poor households, and may or may not have land within the command area.

171. At the subproject scale, the total incremental labor requirement in year 10 is 7,998.2 labor days, of which family labor is 3,864.5 labor days and hired labor 4,133.7 labor days (see table C.19 in SD5). At the going rate for farm labor in the subproject area of Afg300 per day (\$4.4), the total incremental value of labor is Afg2.4 million (\$35,286), of which family labor is Afg1.16 million (\$17,049) and hired labor Afg1.24 million (\$18,237).

D. Safeguards

1. Environment

172. An Initial Environmental Examination (IEE) has been conducted, The sub-project is classified as Category B.

a) Anticipated Impacts and Management Measures

173. The anticipated impacts of the subproject and the corresponding management measures are:

- *Impact: Tree removal at construction sites.*

Management: (i) the adverse impact on tree owners will be compensated per the RSP LARP; (ii) the adverse impact on landscape, biodiversity, and community values will be mitigated and as appropriate these values enhanced, through community tree plantation arrangements.

- *Impact: Temporary disruption or blockage of water, vehicle, pedestrian and livestock movement at construction sites.*

Management: Provision of temporary irrigation channels and roads/paths.

- *Impact: Routine construction-phase impacts (dust, noise, air pollution, liquid and solid waste generation, occupational health and safety).*

Management: Tenders require contractors to prepare and submit at part of their bids site environmental management plans (SEMPs). Construction supervisors monitor and ensure SEMP implementation during construction.

- *Impact: Hydrologic changes - changes in magnitude and timing of water abstraction, irrigation flows, flooding, drainage. These changes include the intended hydrologic benefits of the subproject as well as unintended (adverse) impacts.*

Management: Project management systems to ensure irrigation works are well-designed and constructed to deliver intended impacts and avoid/mitigate/manage any adverse impacts; support to irrigation and water user associations and sub-basin / basin water management institutions, to achieve intended benefits while mitigating adverse impacts

- *Impact: Knock-on impacts of hydrologic changes - on , erosion, sedimentation, soils, agriculture (cropping, agrochemical use, yields) and socioeconomic conditions (labor demand, agricultural production, incomes, poverty).*

Management: Project management systems to ensure irrigation works are well-designed and constructed to deliver intended impacts and avoid/mitigate/manage any adverse impacts; support to irrigation and water user associations and sub-basin / basin water management institutions, to achieve intended benefits while mitigating adverse impacts

- *Impact: Changed water and environment management practices.*

Management: support to irrigation and water user associations and sub-basin / basin water management institutions to achieve positive changes in management practices and avoid/mitigate/manage any adverse impacts

- *Impact: Environment-on-project (EOP) impacts: of erosion, sedimentation, flooding, drought, and climate variability on irrigation infrastructure, farmer behavior, and benefit realization.*

Management: Project management systems to ensure irrigation works are well-designed and constructed; support to irrigation and water user associations and sub-basin / basin water management institutions to reduce EOP impacts and increase resiliency to them

b) Public Consultation and Information Disclosure

174. During the IEE study, one round of public consultation meetings was held to explain the proposed subproject to stakeholders, and to elicit and record their comments, suggestions, and concerns.

175. ADB requires MEW to disclose IEE key findings to local stakeholders in a place, form, and language(s) accessible to them – typically a Dari-language brochure distributed to WUAs, IAs, CDCs, district governors, etc – prior to ADB project appraisal.

c) Environmental Management Plan

176. The subproject IEE includes an environmental management plan (EMP), comprised of a mitigation plan, monitoring plan, and public consultation (including information disclosure and Grievance Redress Mechanism (GRM)) plan.

2. Indigenous Peoples

177. Afghanistan is inhabited by ethnic groups across its 34 provinces. None of these groups are considered indigenous peoples as defined in ADB's Safeguard Policy Statement (2009) for operational purposes. The sub-project is therefore classified as Category C.

3. Involuntary Resettlement

178. A draft sub-project land acquisition and resettlement plan (LARP) has been prepared, which will be updated once the detailed designs have been completed, and disclosed on the ADB website. The sub-project has been classified as Category B. The only resettlement issues are the removal of a limited number of trees for which a budget has been provided for compensation.

179. The budget for this LARP covers the compensation for the removal of trees and domestic and livestock access points. It is set at US\$ 88,166. The actual budget needs to be set when this LARP will be finalized. The table below gives an overview of the budget.

Table 7: LARP budget

Item	Unit	No. of Units	Affected Person	Unit price (\$)	Total
Compensation for tree removal	Big non-fruit tree	20	Amer Zarin	102 ⁷	2,040
Compensation for tree removal	Big non-fruit tree	50	Wali Agha	102	5,100
Compensation for tree removal	Big non-fruit tree	30	Mosque	102	3,060
Domestic Access Points	Access point	4		5,762	23,048
Livestock Access Points	Access point	2		27,459	54,918
					88,166

E. Monitoring, Reporting and Evaluation

1. Performance Indicators

180. Performance indicators have been set which are Specific, Measurable, Achievable, Relevant and Timebound (SMART), as well as being relatively easy and cost-effective to measure. Indicators for the outcome level – increased agricultural productivity – include an increase in crop yields and an increase in the irrigated area. The increase in the irrigated area is the most important as it has the most significant effect in agricultural productivity as it signals the conversion of fallow land into productive irrigated land which will have significant impact on net farm incomes, particularly for farmers at the tail end of the canal.

181. Simple indicators which can be monitored on an on-going basis have been set for output level indicators as shown in the Design and Monitoring Framework in **Annex 1**.

2. Evaluation Arrangements

182. Baseline figures (2016) are available from the agricultural report included in Supplementary Appendix 18. A survey will be undertaken at the end of the project (2022) to assess whether an increase in agricultural productivity has been achieved.

3. Reporting Arrangements

183. A Project Performance Monitoring System (PPMS) will be set-up to guide the collection of data on performance indicators. Such data will feed into quarterly progress reports. The River Basin Agency (PIO) working with the Sub-basin Agency (SBA) will have the primary responsibility for collecting performance data for output 1, and the Badakshan DAIL (PIO) for outputs 2 and 3. Data will also be collected by the PIOs on safeguards as per the environmental monitoring plan (overseen by the environmental safeguards officer) and to ensure compliance with the LARP (i.e.

⁷ Based on Afg7000 at an exchange rate of 1 US\$ = Afg68.86 (as of 1st June 2016).

that farmers have been compensated for the removal of trees). Grievance mechanisms will be set-up as per the EARF and LARF. An independent External Monitoring Agency (EMA) will be recruited to monitor and report on compliance.

F. Risks and Mitigating Measures

Table 8: Risks and Mitigating Measure

Risks	Action to Mitigate Risk
Lack of infrastructure maintenance	With limited public funds from public budgets, this continues as a significant risk. As interventions will primarily be for small scale irrigation works, beneficiary maintenance is the preferred option. This requires considerable support after completion of works but the resources of farmers to meet the more expensive periodic maintenance remains an issue.
Infrastructure of poor quality	The appointment of international support and oversight consultants to ensure conformity with design quality, and of impact from the investments. National staff to be recruited, trained by international staff, to ensure adherence to social and environmental safeguards. The appointment of project staff to supervise contractors in the construction process. The scrutinizing of engineering designs to ensure appropriate standards incorporated into designs.
Poor natural resource management and inadequate adaptation to climate change	Infrastructure will be climate proofed. Watershed rehabilitation and protection will protect from flash flooding and erosion. Improved water distribution mechanisms at the river and scheme level will ensure more equitable distribution of water, particularly in dry periods, reducing conflict.
MEW and MAIL unable to deliver on the Program as designed due to capacity constraint	Capacity building support to MEW and MAIL at national and field levels. Project management and support structures embedded in government.
Program implementation lagging behind or poorly executed due to lack of trained staff	Support for training of staff of PMO/PIOs
Insecurity delays or suspends field activities	The project area remains insecure and is likely to continue as such. International experts (who are kidnap targets) will be based in Kabul which is relatively safer. A participatory community-based approach will be followed – community elders and others will be empowered to keep staff safe in their areas and to liaise with insurgents as necessary to ensure that work can continue. A low-profile approach to security will be followed (but with appropriate SOPs).

V. Total Investment and Financing Plan

65. **Capital Costs.** The Seyaab Canal subproject would require a financial capital outlay of \$570,495.1 (equivalent to Afg37.8 million) to cover the expenses on the following items: civil works, agricultural extension support⁸, subproject implementation, physical and price contingencies, and all required taxes and duties (Table C.9 in SD5). The economic subproject cost is \$347,663 (equivalent to Afg23.6 million), calculated based on the estimated total financial cost and was duly adjusted for market distortions. The derivation of the economic cost is shown in Table C.10 in SD5. Refer to cost estimates and the financing plan in the Project Administration Manual (PAM) for details. Refer to cost estimates and financing plan in the Project Administration Manual (PAM) for details.

66. **Operation and Maintenance Costs.** The annual incremental operation and maintenance (O&M) cost of the subproject, in financial terms, is \$2,352.3 per annum (equivalent to Afg160,024.4) and \$1,728.7 per annum (equivalent to Afg117,554.3) in economic terms (Table C.11 and C.12 in SD5). The subproject's O&M cost was assumed to be incurred from year 3 of the subproject, and to increase by 10% per annum starting year 4 up to year 12, and be constant thereafter.

184. For details on estimation methods and unit prices and ratios see further in Supplementary Document 5.

⁸ There will be associated secondary and tertiary canal works within the sub-project command area, and watershed restoration and protection in this vicinity of the sub-project area which will be implemented according based on the overall project implementation plan.

VI. Subproject Implementation and Operating Arrangements

A. Execution and Implementation Agencies

185. MOF will be the Executing Agency (EA) for the Project, and MEW and MAIL the Implementing Agencies (IAs) supported by a Project Management Office (PMO) for each. Project Implementation Offices (PIOs) reporting to the PMOs will be established at the basin level.

186. MOF will be responsible for overall coordination and financial management of the Project. There will be no Project Steering Committee as this is felt not necessary and would be an 'artificial' structure with lack of long-term ownership – this is a lessons learnt from past ADB and EU projects. An on-going co-ordination platform exists between the two implementing agencies, MEW and MAIL, including via the Supreme Council for Land And Water (SCLW) which includes representatives from other relevant Ministries such as the Ministry of Rural Rehabilitation and Development (MRRD), and which is chaired by the First Vice-President. On-going co-ordination between MEW and MAIL will be strengthened, so that any overlaps can be avoided, synergies realized and policy gaps identified and addressed. In case of disagreement between the two IAs, the EA, MOF, will have a support role.

187. MEW will be responsible to oversee the implementation of output 1. It will set-up a PMO in Kabul in the MEW main office, building on the PMO set-up for the ADB Water Resources Development Investment Program (WRDIP). This PMO will be part of an overall ADB PMO responsible for all ADB projects and programs implemented by the Ministry to avoid duplication and minimize implementation complexity. It will set-up a PIO for basin-level activities in the River Basin Agency (RBA) in Kunduz, embedded within the RBA office to avoid setting up a parallel structure and to strengthen government institutional capacity. The PIO will coordinate with the six Sub-basin Agencies (SBAs), in which project personnel will also be based.

188. MAIL will be responsible to oversee the implementation of outputs 2 and 3. It will set-up a PMO in Kabul in the MAIL main office. This PMO will be stand-alone but in the future could be part of an overall ADB PMO responsible for all ADB projects and programs implemented by the Ministry, in line with the plan for MEW. It will set-up PIOs for basin-level activities in the five provincial DAILs, embedded within the DAIL offices to avoid setting up a parallel structure and to strengthen government institutional capacity. The DAILs will co-ordinate with Agricultural Development Officers (ADOs) at the district level.

189. The PMO for each Implementing Agency will be responsible for the following: overall management and co-ordination of the relevant outputs for the respective IA, and for co-ordination and liaison with each other, and with other relevant Ministries and agencies; guide and oversee the work of the PIOs; establishment and implementation of the project performance management system (PPMS) (consolidated by MEW PMO); hiring of project staff; procurement of goods, works and services specific to each PMO, following ADB procedures. (The MEW PMO will be responsible for recruiting and contracting the ISC firm, as well as a firm for audit of project accounts, with MAIL on the evaluation committee.); Establish and manage an imprest account, submission of withdrawal applications to ADB, retention of supporting documents, and overseeing sub-accounts of the PIOs; preparation of annual forecast of contract awards and disbursements; compilation of reports from the PIOs and preparation of project progress reports (consolidated by MEW PMO);

submission of progress reports and annual audit report and financial statements; and preparation of a project completion report (consolidated by MEW PMO).

190. The PIO(s) for each Implementing Agency will be responsible for the following: implementation of project activities at the basin level, under the management and leadership of the PMOs; co-ordination and liaison with each other, and with other relevant basin-level departments and agencies; establish and manage sub-accounts and retention of supporting documents; and procurement of small shopping contracts.

B. Subproject Implementation Management

191. Day-to-day management of implementation will be carried out by the PIOs – MEW PIO, based in the River Basin Agency, working together with the Kokcha SBA for output 1, and MAIL PIO based in Badakshan DAIL for outputs 2 and 3.

Table 9: Institutional Responsibilities by Outputs and Key Activities

Outputs and Activities	Responsible Agency(ies)
1. Output 1: Water allocation and availability improved	
1.1 Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded (headwork and main canal infrastructure)	
(i) Activity 1: Tendering and Contracting of Construction Firm	MEW (PMO) – to be done by advance procurement
(ii) Activity 2: Construction and Construction Supervision	Private firms contracted to MEW for construction. MEW (SBA/PIO) for supervision.
(iii) Activity 3: Hand-over and future O&M	MEW (SBA/PIO); WUA
1.2 Sub-component 2: WUA established and strengthened	
(i) Activity 1: Establishment of New WUA	MEW (SBA/PIO)
2. Output 2: On-farm water management enhanced	
2.1 Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded	
(i) Activity 1: Feasibility studies and detailed design of sub-project	MAIL (PMO) (with Irrigation Directorate)
(ii) Activity 2: Tendering and Contracting of Construction Firm (or through community-based work contract)	MAIL (PMO) (with Irrigation Directorate)
(iii) Activity 3: Construction and Construction Supervision	Private firms contracted to MAIL for construction. MAIL (DAIL/PIO) for supervision. Or community-based contract through MAIL-CDC/IA contract. MAIL (DAIL/PIO) for supervision.
(iv) Activity 4: Hand-over and future O&M	MAIL (DAIL/PIO); IA
2.2 Sub-component 2: IAs established and strengthened	
(i) Activity 1: Establishment of New IAs	MAIL (DAIL/PIO)
2.3 Sub-component 3: Efficiency of agricultural water use enhanced	
(i) Activity 1: OFWM and Agricultural Extension	MAIL (DAIL/PIO)
3. Output 3: Watersheds are properly managed and protected	
(i) Activity 1: Identification of Site	MAIL (DAIL/PIO)
(ii) Activity 2: Creation and strengthening of Community Association	MAIL (DAIL/PIO)

Outputs and Activities	Responsible Agency(ies)
(iii) Activity 3: Preparation of Natural Resource Management (NRM) Plan	Catchment management associations with assistance from MAIL (DAIL/PIO)
(iv) Activity 4: Implementation of NRM Plan	Catchment management associations with assistance from MAIL (DAIL/PIO). Works to be contracted by MAIL (PMO) to private firm or CDC (community-based contracting)
4. Efficient Project Management and Implementation	
(i) Project reporting (quarterly)	PIOs

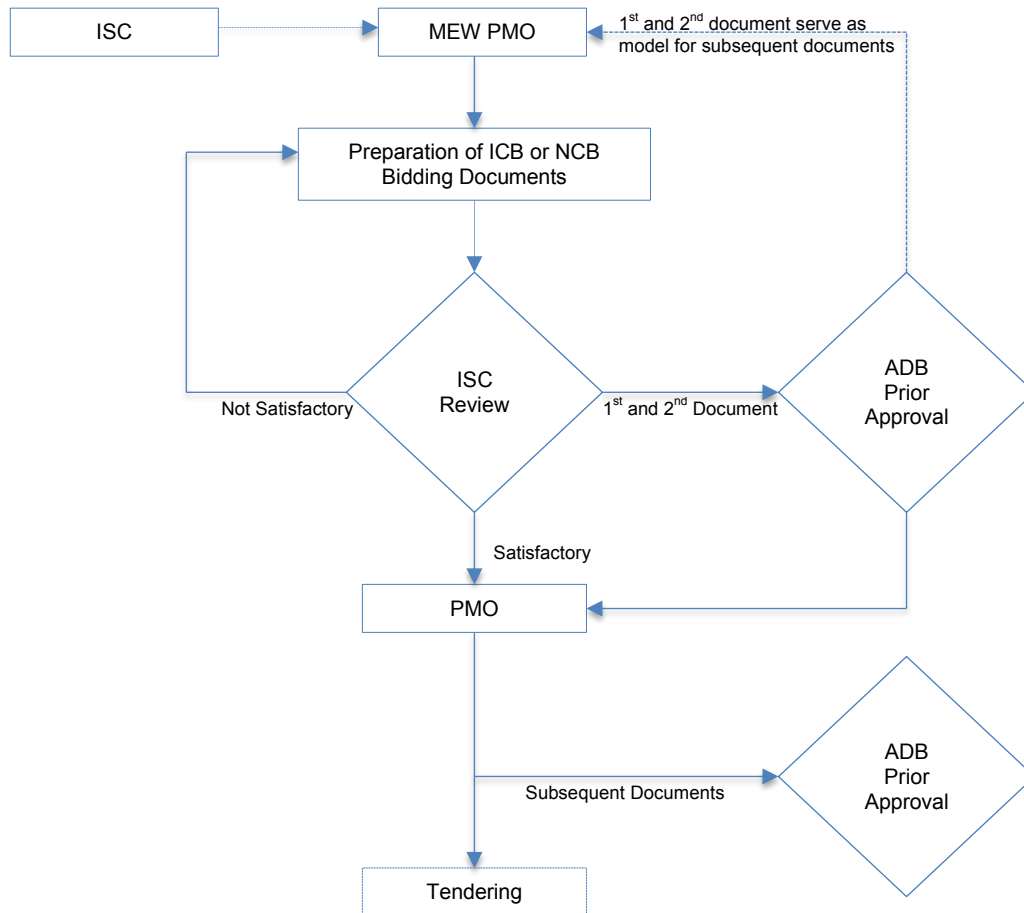
1. Output 1: Water allocation and availability improved

a) Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded (headwork and main canal infrastructure)

(i) Activity 1: Tendering and Contracting of Construction Firm

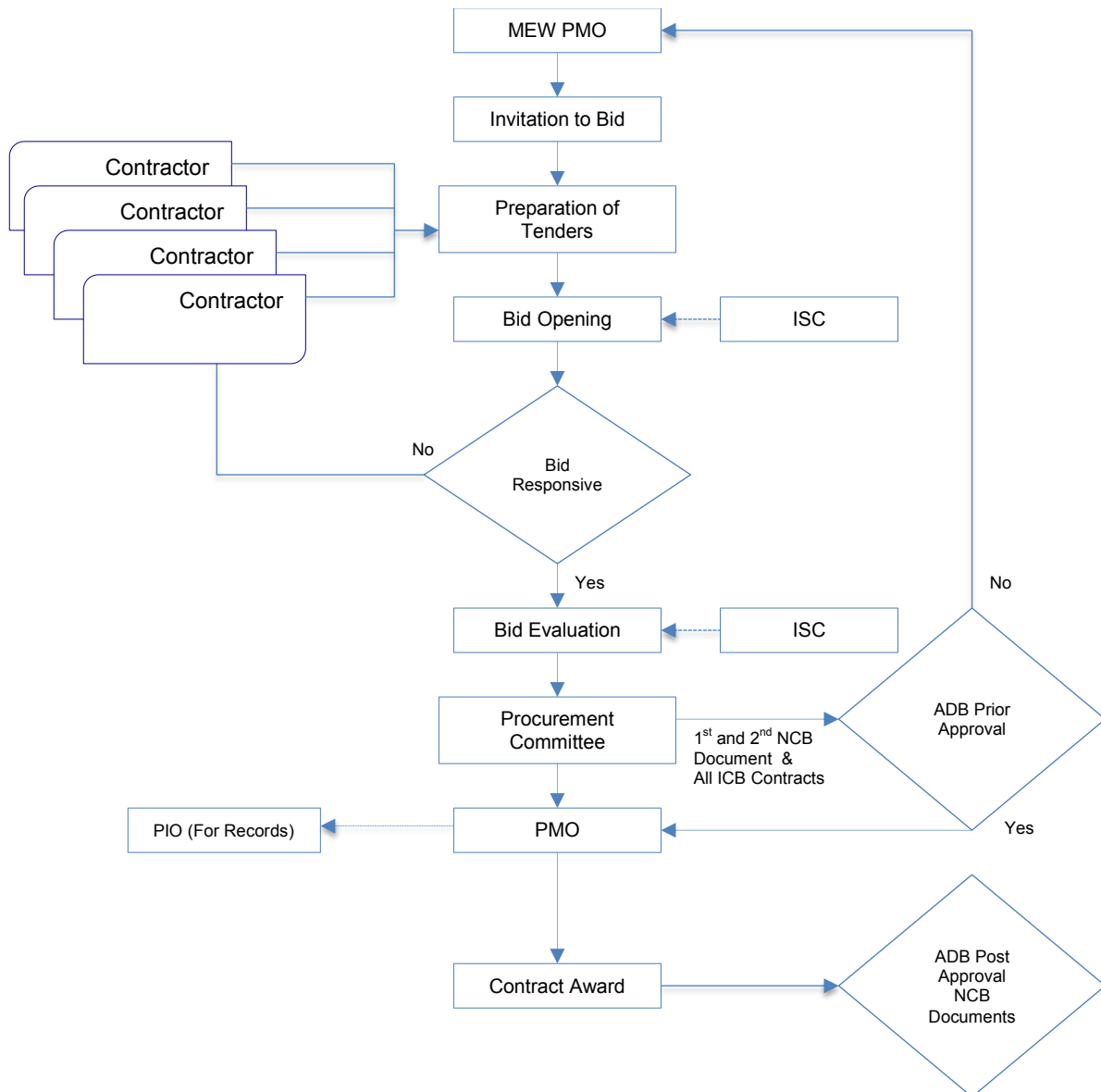
192. **Preparation of bid documents.** Bid documents will be prepared by the PMO, using advance procurement procedures, with assistance from the PPTA team. The construction of the sub-project will be packaged with the construction contract for the other two representative sub-projects. Bid documents will follow NCB procedures. Bid documents will be prepared based on ADB standard format documents. The draft English language version of the procurement documents will be submitted for ADB review and prior approval. The diagram below shows a summary work flow for the preparation and approval of bidding documents for the subproject.

Figure 5: Summary Work Flow for the preparation and approval of bidding documents



193. **Preparation of Work Contract.** Procurement of the civil works contract for the subprojects will be carried out by the MEW-PMO with the assistance of the MEW Procurement Department following NCB procedures. Award of the contract will be subject to prior approval of ADB regardless. The PPTA team and the PMO will assist the Procurement Department in the opening and evaluation of tenders. The diagram below shows a summary work flow for the tendering and contract award process:

Figure 6: Summary Work Flow for the tendering and contracting process



ADB	Asian Development Bank
ICB	International Competitive Bidding
ICS	Implementation Support Consultancy
MEW	Ministry of Energy and Water
NCB	National Competitive Bidding
PIO	Project Implementation Office
PMO	Project Management Office

(ii) Activity 2: Construction and Construction Supervision

194. Resettlement plans and provision of required compensation to project affected people will be undertaken before issuing instruction to proceed to the contractor (unless this is given as the contractors' responsibility). This will be overseen by the environmental and social safeguards officers in the PMO.

195. At the start of the implementation of the contract, the contractor will be responsible to provide the final design and detailed drawings and carry out detailed topographic surveys, based on the detailed design provided for each structure type as well as the typical drawings. The contractor's detailed drawings will be approved by the PMO before construction proceeds.

196. In addition, changes requested by the community or new data becoming available will need to be taken into consideration. It is the contractor's responsibility to verify the designs in the field and it will be required to do the necessary surveys and hydraulic calculations to ensure functional properties of the designed structures. Based on a better understanding of the local conditions, some designs might be simplified.

197. At the end of the contract, the contractor will provide the As Built Drawings for all the hydraulic structures of the contract.

198. Construction supervision will be undertaken by SBA engineers and project supervisors, with systems set-up following the P-ARBP supervision manual. These project supervisors will be contracted directly by the PMO. To ensure institutional sustainability they will be embedded in the SBA offices so can build the capacity of SBA engineers through on-the-job training. Support will be provided by a senior national engineer at PMO level and two international supervision engineers (recruited through the ISC firm), particularly to help set-up systems. Supervision will include monitoring of safeguard measures by the supervisors, with support provided by the environmental and social safeguards officers. An external monitoring agency will also be contracted by PMO.

199. A training course will also be organised for the SBA engineers, using the P-ARBP supervision manual as a basis. It is proposed that this is run by Kabul Polytechnic. A budget has been provided for up to two such training courses per year.

(iii) Activity 3: Hand-over and future O&M

200. Following a defects liability period and signing of a Final Acceptance Certificate (FAC) the structures will be handed over to WUA ownership as per the above mentioned agreement. A hand-over document will be signed between the WUA and government. The WUA will then be responsible for future O&M.

201. Such arrangements will institutionalise sustainable irrigation management and transfer arrangements.

b) Sub-component 2: WUA established and strengthened

(i) Activity 1: Establishment and strengthening of New WUA

202. A new WUAs will be established in the scheme. This task is the responsibility of the MEW, RBA and SBA.

203. They will be responsible for the following activities:

1. In coordination with the DAIL, undertake an awareness campaign in the schemes (district governors, village elders, shuras, mirabs and kokbashis) to explain the new 2009 Water Law and the advantages of forming a WUA along the main canal. Gain the authorities assistance.
2. Once all the IA representatives have been elected, the SBA staff should then start forming the WUA for the main canal and they should also take into account other water users (MHP, flour mills, domestic use, small industries etc.). In case the IAs have not yet been established, the process of setting up the WUA can still proceed.

3. The IA and other water user representatives should then elect the management board and different committees for the WUA.
4. Prepare the bylaws, charters and the documentation for the official registration of the WUA with MEW.
5. Both the SBA and DAIL staff should conduct WUA and IA (see output 2) trainings at the same time as the topics are essentially the same. Five events/WUA in yr 1-2, three in yrs 3-4, and two in yrs 5-6. Suggested training topics are:
 - The New 2009 Water Law and the River Basin setup.
 - Governance and planning.
 - Conflict resolution.
 - Equitable water distribution.
 - Canal Maintenance.
 - Budgeting.
 - Financial Management and Bookkeeping.
 - Introduction of Irrigation Service Fees.
 - Proposal writing.
6. Official registration of the WUA with MEW.

204. The SBA staff will receive intensive training on the establishment and strengthening of WUAs. They will also be provided with WUA training materials, manuals and guide books prepared by the former P-ARBP.

2. Output 2: On-farm water management enhanced

a) Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded

205. Activities proposed are as follows:

- Activity 1: Feasibility studies and detailed design of sub-projects
- Activity 2: Tendering and Contracting of Construction Firm (or through community-based work contracts)
- Activity 3: Construction and Construction Supervision
- Activity 4: Hand-over and future O&M

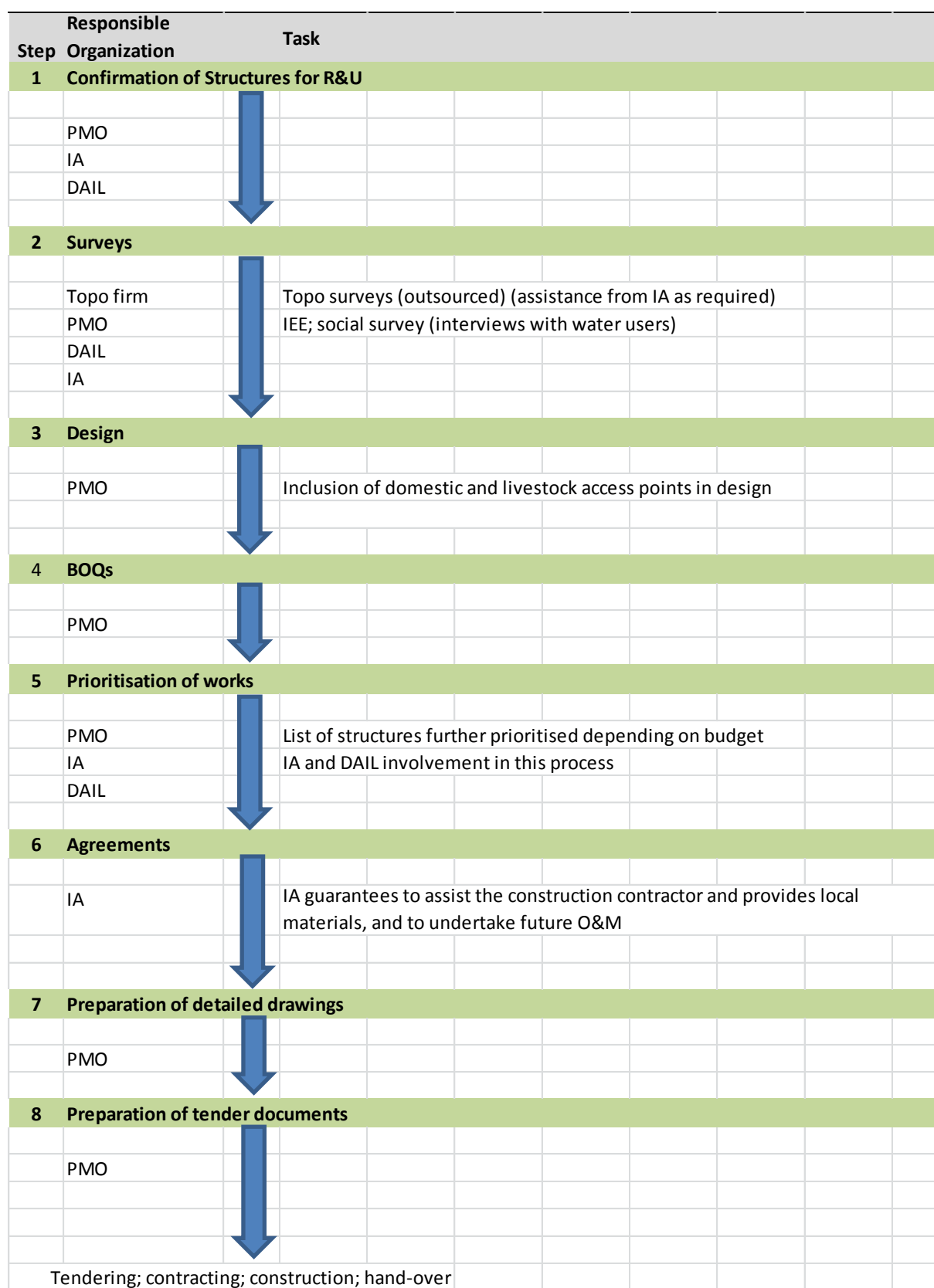
(i) Activity 1: Feasibility studies and detailed design of subprojects

206. The phasing of work in secondary and tertiary canals should follow the phasing of work on main canal level so close co-operation will be required with MEW. Since works on the main canal have already been designed though this is unlikely to happen for the representative sub-projects. The feasibility study and detailed designs will be undertaken by MAIL staff, building on experience already gained on similar works through the World Bank funded On-Farm Water Management Project, with support from an externally recruited national irrigation design engineer (full-time) (paid for by the project and recruited by MAIL PMO) and an international On-farm Water Management Specialist (hired through the ISC firm) who should have an engineering background.

207. The design of sub-project will be done in a participatory way with the involvement of water users. The IA will be a conduit for water user interaction. A participatory irrigation rehabilitation cycle is described in the flow chart below. This details who is involved at each stage, what are the roles at each stage, and what are the outputs at each stage (e.g. an agreement between the IA and government).

208. MAIL will need to determine that the sub-project is technical, environmentally, and socially feasible. For this to be determined more detailed field surveys and analysis will be undertaken to determine that the sub-project: (i) is pro-poor (i.e. benefits will mainly accrue to poor farming households); (ii) has demonstrated water availability in sufficient quantity and quality to ensure the intended benefits of the project can be achieved; (iii) works are technically feasible; (iv) has demonstrated commitment from local government authorities; and (v) has commitment from water users for the IA to operate and maintain structures post-project and to distribute water in an equitable manner.

Figure 7: Flow chart of sub-project feasibility study and detailed design tasks (for Component 2)



209. For the topographical surveys, while MAIL has its own survey staff they are often busy so a national private firm may be hired.

210. Since most works will be fairly small standard concept designs can be followed and then adjusted based on the field situation, in consultation with DAIL and water users (represented by the IA). It is recommended that concept designs and procedures from the FAO Afghanistan Design manual and FAO small hydraulic structures manual (Vol. 1 & 2) are followed to help standardise processes.

211. While negative social and environmental impacts will be minimal given the scope of works, works should still follow ADB safeguard requirements. For environmental due diligence, the Project Environmental Assessment and Review Framework (EARF) will be followed, using examples for Initial Environmental Examination (IEE) conducted for the output 1 works, in case IEEs are required. Environment management plans will then be prepared. For resettlement and land acquisition due diligence, the Project Resettlement Framework will be followed, using the LARP prepared for the output 1 works as an example. If required a resettlement plan (LARP) will then be prepared. Due regard will also be given to the Summary Poverty Reduction and Social Strategy (SPRSS). These activities will be the responsibility of the environmental and social safeguard officers, with support from international specialists.

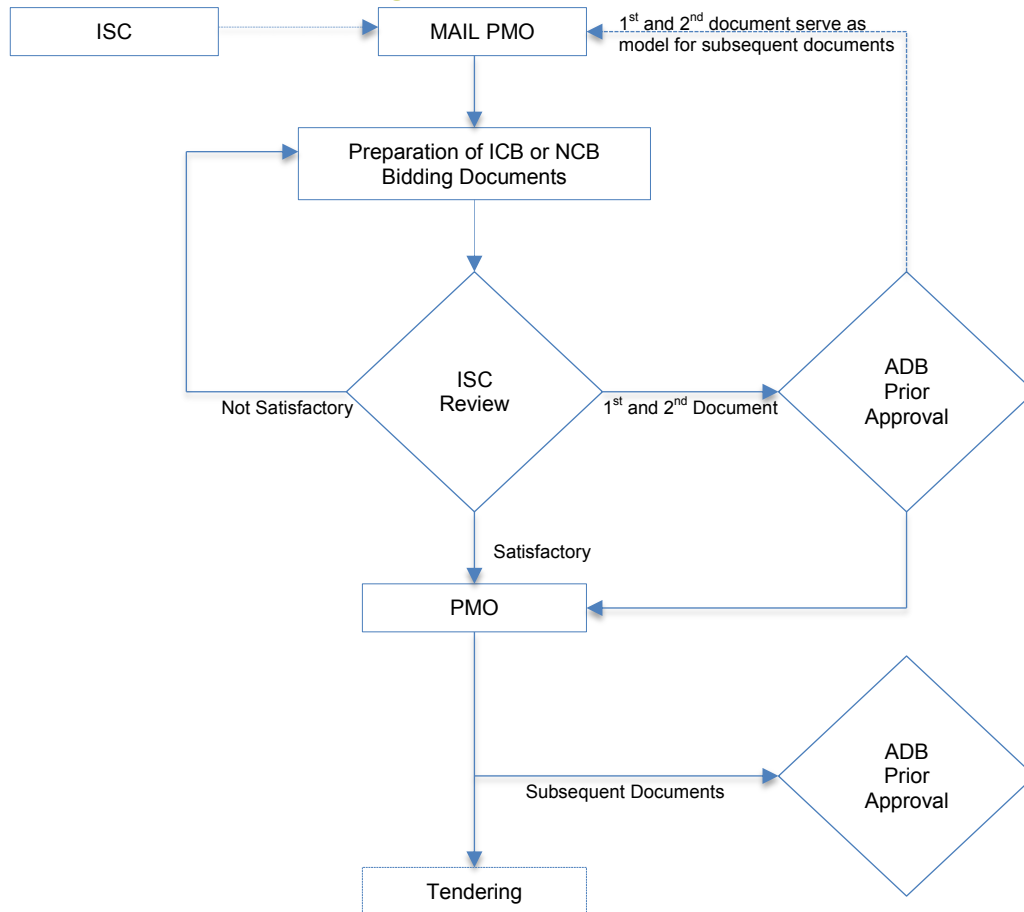
212. Tender documents should follow standard formats prepared during the PPTA.

(ii) Activity 2: Tendering and Contracting of Construction Firms (or through community-based work contracts)

213. It is recommended that the contract is packaged together with the works for the other two representative subprojects.

214. **Preparation of bid documents.** Bid documents will be prepared by the PMO. Assistance will be provided from the international procurement specialist hired by the ISC firm. Bid documents will follow ICB or NCB procedures depending on the estimated value of the contracts (almost certainly NCB). Bid documents will be prepared based on ADB standard format documents. The draft English language version of the procurement document will be submitted for ADB review and prior approval. The international procurement specialist will review the bidding documents before they are submitted to ADB for approval. The diagram below shows a summary work flow for the preparation and approval of bidding documents.

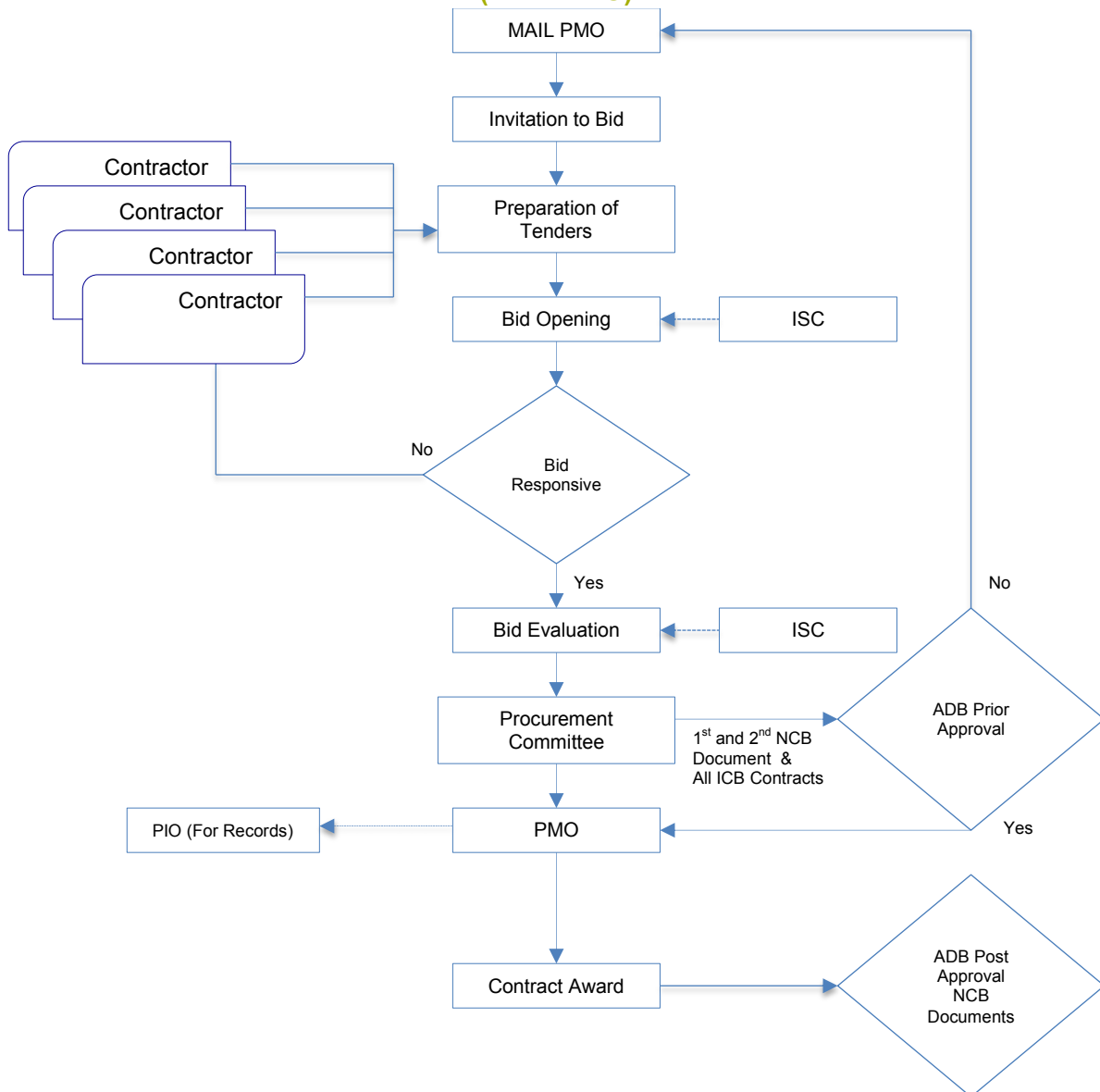
Figure 8: Summary Work Flow for the preparation and approval of bidding documents (MAIL PMO)



ADB	Asian Development Bank
ICB	International Competitive Bidding
ISC	Implementation Support Consultancy
MAIL	Ministry of Agriculture, Irrigation and Livestock
NCB	National Competitive Bidding
PIO	Project Implementation Office
PMO	Project Management Office

215. Preparation of Work Contracts. Procurement of a civil works contract for the subproject will be carried out by the MAIL-PMO with the assistance of the MAIL Procurement Department following NCB or ICB procedures depending on the estimated value. Award will be subject to prior approval of ADB. The ISC and the PMO will assist the Procurement Department in the opening and evaluation of tenders. The diagram below shows a summary work flow for the tendering and contract award process:

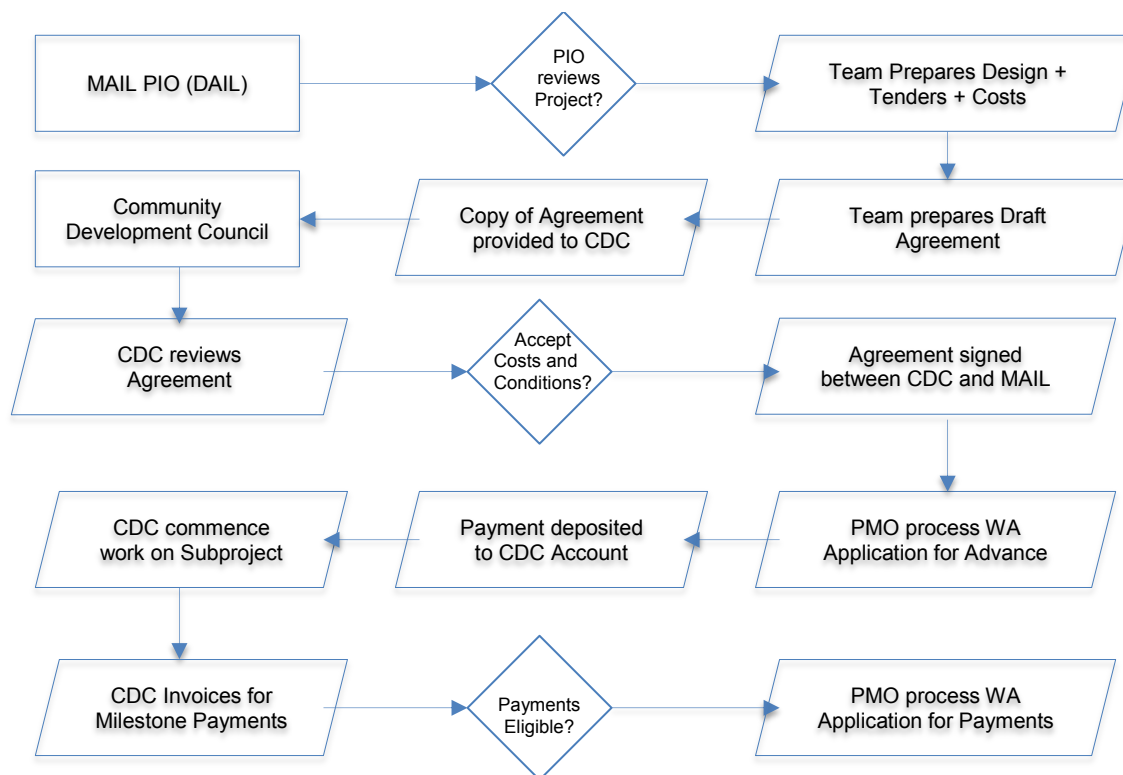
Figure 9: Summary Work Flow for the tendering and contracting award process (MAIL PMO)



ADB	Asian Development Bank
ICB	International Competitive Bidding
ICS	Implementation Support Consultants
MAIL	Ministry of Agriculture, Irrigation and Livestock
NCB	National Competitive Bidding
PIO	Project Implementation Office
PMO	Project Management Office

216. An alternative to contracting through private firms is for community-based contracting. The preferred government modality is for this to be done through CDCs. CDC sub-accounts could also be set-up as a conduit for the flow of funds to IAs. The signatories of the sub-account could be a representative from the CDC (preferably the treasurer) and a representative from the IA (preferably the treasurer). The diagram below shows the contracting process.

Figure 10: CDC contracting process



i. Activity 4: Construction and Construction Supervision

217. Resettlement plans and provision of required compensation to project affected people will be undertaken before issuing instruction to proceed to the contractors (unless this is given as the contractors' responsibility). This will be overseen by the environmental and social safeguards officers.

218. Changes requested by the community or new data becoming available will need to be taken into consideration by the contractor.

219. Construction supervision will be undertaken by DAIL irrigation engineers and project supervisors, with systems set-up following the P-ARBP supervision manual (or other such manuals). These project supervisors will be contracted directly by the PMO. To ensure institutional sustainability they will be embedded in the DAIL offices so can build the capacity of DAIL engineers through on-the-job training. Support will be provided by the international OFWM specialist (recruited through the ISC firm), particularly to help set-up systems. Supervision will include monitoring of safeguard measures by the supervisors, with support provided by the environmental and social safeguards officers. An external monitoring agency will also be contracted by PMO.

220. For community-based contracts, the CDC could also be responsible for oversight and M&E of works undertaken by the IA itself. We understand that this is the current proposal from the government.

221. In order to inform CDCs and the IA about the community-contracting model a briefing workshops will be organised.

(iii) Activity 5: Hand-over and future O&M

222. Following a defects liability period and signing of a Final Acceptance Certificate (FAC) the structures will be handed over to IA ownership as per the above mentioned agreement. A hand-over document will be signed between the IA and government. The IA will then be responsible for future O&M.

b) Sub-component 2: IAs established and strengthened

(i) Activity 1: Establishment of New IAs

174. This activity goes hand-in-hand with the setting up of a new WUA under Output 1 and therefore it should be implemented jointly by the SBA WUAs Affairs staff and the DAIL IA Affairs staff. This is because they have to follow the same procedures outlined in output , sub-component 2 above.

167. On order to undertake this task, both SBA and DAIL staff should be actively involved. MAIL is planning to recruit more staff for their DAIL offices and the WB funded OFWM program plans to spread its activities in Kunduz, Takhar and Badakhshan provinces. In this case it would be ideal for a good coordination between the upcoming P-ARBP and the WB OFWM program. MAIL should reinforce its existing staff in the P-ARBP provinces (Bamyan, Kunduz, Takhar, Baghlan and Badakhshan) up to a total of 10 staff (2 per DAIL). One of these should be responsible for the establishment of IAs and one for the planned OFWM activities. The IA staff should work closely together with the 6 SBA WUA affairs staff in order to establish IAs within the existing WUAs.

168. To implement this activity a national IA and OFWM officer with irrigation agronomy experience and many years of experience in the establishment of IAs and OFWM should be recruited (project paid and recruited by MAIL PMO). His/her main activities would be to supervise and coordinate this activity between the SBA WUA staff and the DAIL IA staff. He/she should also liaise with the DAIL directors and the RBA director. He/she will be based in the MAIL PMO or possibly RBA Kunduz or one of the DAILs (possibly Takhar). He/she will work with both the irrigation and extension departments in the DAILs. He/she will be supported by junior IA and OFWM officers based in each of the DAILs and an international OFWM specialist (recruited by the ISC firm).

169. The DAIL IA staff will undergo an intensive training of trainers course, organised by the PMO.

170. The DAIL office will be provided with a vehicle, office and IT equipment, furniture and office running costs as well as a budget for DSAs for field work. The main activities of the DAIL, with support from external staff mentioned above, will be to:

- Attend the training of trainers' course on the establishment of IAs (and OFWM).
- In coordination with the SBA WUA staff, establish IAs within the WUA (at least those corresponding to the command areas influenced by structures constructed under output 1 i.e. up to 4).
- Conduct IA establishment training, workshops and meetings.
- Prepare IA bylaws and charters.
- Prepare all the IA registration documents for official registration with MAIL.
-

c) Sub-component 3: Efficiency of agricultural water use enhanced

(i) Activity 1: OFWM and Agricultural Extension

223. This activity is the responsibility of MAIL and should be implemented by its DAIL staff. These OFWM & Agricultural Extension DAIL staff will be fully trained by at the beginning of the

program. Support will be provided by the same staff as for sub-component 2 i.e. a national IA and OFWM officer with irrigation agronomy experience and many years of experience in the establishment of IAs and OFWM (project paid and recruited by MAIL PMO). He/she will work with both the irrigation and extension departments in the DAIL. He/she will be supported by a junior IA and OFWM officer based in the DAIL and an international OFWM specialist (recruited by the ISC firm).

224. Activities should be coordinated and implemented with the IA by installing demonstration plots on OFWM and improved agronomic techniques. At least 1 demonstration plot should be established.

225. The main activities to be undertaken with this task are as follows.

1. Explain to the IA the objectives of the demo plots.
2. With the IA select the farmer/s that is/are willing to give his land for the demo plot. The plot should be accessible and easy to observe by as many farmers as possible so preferably close to a road or village.
3. Once agreed upon, the demonstration plot can be implemented. See below for the type of activities to be implemented.
4. Training and capacity building of the water users (farmers).
 - Farmers field visits and exposure tours
 - Improved crop production/cultivation techniques of the major crops grown (can be done during the winter months).
 - Dissemination of plague threats, need seed varieties etc.
 - Training on how best to respond to times of reduced water availability

226. Demonstration plots and training could be used to disseminate knowledge on the following practises:

1. Agronomic Characteristics for Soil/Land/Water Conservation. The following cultivation practices could be introduced in the OFWM activities:
 - Crop rotations e.g. Rice/wheat with leguminous pulse crops and alfalfa (for livestock feed) to increase nitrogen fixation in the soil. Pulse crops have a high market value.
 - Incorporate organic matter into the soils such as farmyard manure and leftover field stubble (instead of burning it off). This increases soil fertility and the water holding capacity of the soil.
 - The use of mulching (black plastic sheeting or straw) to conserve water in the soil and control weed growth.
 - Intercropping, such as maize with pulse crops or fruit trees with alfalfa.
 - Introduce land leveling for better irrigation water distribution on the field (see below)
 - Introduce furrow irrigation on properly leveled fields for growing maize, pulses and vegetable crops.
 - On steep slopes, the introduction of contour trenches and furrowing to control soil erosion. This especially on hilly slopes with rain fed wheat. This could be part of output 3 interventions.
 - Introduction of the appropriate and adequate application of chemical fertilizers for different crops - if this information is available from the agricultural research stations.
 - Integrated pest management.
 - Introduction of improved seed varieties for different crops.
2. System of Rice Intensification (SRI). This technique has been successful in Afghanistan and in many other countries. It has the following advantages. However, SRI requires more agricultural extension by MAIL and more time for the farmers to adopt this method. This is especially difficult to do in Afghanistan because of the security situation. Therefore, the demonstration of this technique will be decided upon local security conditions and farmers' preferences.
 - Requires less seed.

- Requires less water (recommended for downstream areas).
 - Requires less chemical fertilizer (the weeds are incorporated into the soil which increases the soils organic matter).
 - Requires less pesticide use.
 - Provides a higher yield in rice cultivation. The NGO AKF achieved 9.3 MT/ha in their P-ARBP demonstration plots which is 66% more than the traditional yields.
3. Horticultural Production. Horticultural products (e.g. vegetables) have a good market in the larger towns such as Kunduz. It is very intensive requiring a lot of labour and adequate water. Bed furrows can be introduced so that the vegetable plants are not affected by over irrigation such as is the case with basin irrigation. USAID with Chemonics International were quite successful with the introduction of drip irrigation in plastic tunnels for early vegetable production in southern Afghanistan. Early spring vegetable crops fetched a high price in the markets. The introduction of these methods are costly (over US\$ 3,000/ha with all the materials and equipment including fertigation). However, small family drip systems are available in India (about US\$ 500/ha). These could be introduced for kitchen gardens for vegetable and fruit production managed by women. Drip irrigation is worthwhile where irrigation water is scarce (e.g. downstream areas) and high value crops such as fruit, nuts, grapes and vegetables are to be grown. Drip irrigation has the following advantages:
 - 40 to 50% water saving.
 - Reduced land preparation costs.
 - Improved quality of the crop produce.
 - Reduced costs of weed control.
 - Plants can be fertigated with the system.
 - 30 to 100% yield increase.
 4. Laser Land Leveling. MAIL are working with laser land leveling in the WB funded OFWM projects and are going to import more land leveling equipment in the near future. Once farmers are convinced of this practice there will be more demand. As demand increases, private operators could take over. Land levelling has demonstrated the following advantages:
 - Up to 50% savings in irrigation water.
 - Nearly 2% increase in cropped area due to reduced numbers and lengths of field ditches.
 - Up to 25% increase in yield.
 5. Bed and Furrow Irrigation. The advantages of these methods are
 - Saves up to 40% of the irrigation water.
 - Reduced chances of plant submergence due to excessive over irrigation.
 - Reduced crusting of the soil and better seed germination.
 - Better fertilizer efficiency.
 - Yield increases of up 30%.
 6. Water Storage Tanks. These would have to be constructed if drip irrigation is to be introduced. The tanks bring flexibility in meeting the irrigation requirements which improves crop productivity.
 7. Tertiary Canal and Outlet Upgrading. See sub-component 2.1 above.

227. When undertaking demonstrations, advice should also be provided on how to rent or buy equipment. i.e. techniques need to be replicated after training/demonstrations and thus be sustainable.

228. We do not propose that any free inputs (e.g. seeds, fertilisers or equipment) are given directly to farmers free of charge as this will undermine development of sustainable private sector agri-input suppliers (or contract farming arrangement through purchasers) which are vital in the long-run.

3. Output 3: Watersheds are properly managed and protected

229. Proposed activities for output/component 3 are as follows:

- Activity 1: Identification of Site
- Activity 2: Creation and strengthening of Community Associations
- Activity 3: Preparation of Natural Resource Management (NRM) Plan
- Activity 4: Implementation of NRM Plan.

(i) Activity 1: Identification of Site

230. The watershed site will be sites adjacent (but not downstream) to the irrigation scheme so that there is a clear observed link between the work under this watershed component, and the work under components 1 and 2 to support work in irrigation command areas (essential so that water users begin to understand the importance of upper catchment work (and vice-versa) and can put a value on this, paving the way for future Payment for Ecosystem Services (PES). Hillside areas next to the irrigation scheme where there are clear problems from washes and general run-off/flash-flooding/siltation issues from the hillside have already been identified.

231. MAIL, through DAIL, and assisting agricultural district officers (ADOs), are challenged to initially start the process of determining the readiness of communities in the proposed site to get registered as an association, if they accept the challenges required of a Community Forestry Association or Community Rangeland Association. If communities are not prepared, then no activities will be undertaken.

232. In determining the readiness of communities, DAIL has to acquire a practical understanding of the community's socio-economic context, location, customary access and use of the natural resources and, finally, assess or challenge the community's readiness to be registered as a CFA or CRA in MAIL or not. Finally, they must also find the right balance between short term and long-term objectives.⁹

233. For the communities themselves, community based watershed management is essentially change management. The implications of this are: first, the use of natural resources will not be business as usual for communities, second, a community's customary access and the use of natural resources will be redefined according to the conditions set out in the registration license of the association. Communities will also have to define for themselves, through the creation of a watershed management plan, how they intend to go about doing NRM. Community organization will also lead to changes in social relations and impact traditional elites whose positioning may be threatened.

234. In light of this, MAIL, DAIL, and ADOs must be cognizant and effectively skilled to play the role of facilitator in aiding communities to manage this change.

235. The task of identifying a suitable site (and for follow-on activities mentioned below) will fall to the DAIL, through government watershed staff. Support will be provided by a Senior NRM Co-ordinator based in the NRM Directorate of MAIL, and a Senior Community based Watershed Management Officer based in the NRM Directorate or one of the DAILs (e.g. Takhar). Support will be provided by a Junior Watershed Management Officers based in the DAIL.

⁹ Agha Khan Foundation presentation in Proceedings of the Workshop on Harmonization and Strengthening of Policy and Approaches in Sustainable Community based Watershed Management in Afghanistan. March 2014, Funded by the European Delegation in Afghanistan

(ii) Activity 2: Creation and strengthening of Community Association

236. DAIL/ADOs will assist in the creation of a Community Forestry/Rangeland Association in the identified project area, with support from externally contracted staff as mentioned above. Steps to set-up an association will follow those listed in the manual and guidebook, building on P-ARBP experience. The involvement of women membership in associations and specific training for men where appropriate to raise awareness on the importance of all gender involvement in associations will be promoted.

237. DAIL will mentor the association to facilitate organizing of communities and the drafting of required documentation to register them in MAIL. The required documents are the by-laws of the association and the rehabilitation and protection management plan for their local watershed (see next activity).

238. On-going support will be provided to the association based on identified needs. A per diem and travel budget for DAIL have been provided so they can go to sites to support the association, while additional budget has been provided for specific events to help with association establishment and strengthening. This is based on three events per year for 4 years for an, at a cost of \$200 per event.

(iii) Activity 3: Preparation of Natural Resource Management (NRM)

Plan

239. DAIL will provide support to the association to develop and improve a plan, to then be implemented with project funds, with support from externally contracted staff as mentioned above, including a Senior Rural Livelihood Officer based in the NRM Directorate or one of the DAILs (e.g. Takhar). Steps to prepare plans will follow those listed in the manual and guidebook.

240. Up to \$100,000 has been budgeted for each plan. This is based on typical costs under P-ARBP.

241. Eligibility for use of project funds will be as follows:

- Who are eligible – associations in selected sites that are registered with MAIL, have signed stewardship agreement with the Ministry to manage the proposed site, and which have watershed management plans approved by the MAIL PMO;
- What are eligible activities:
 - Assisted natural regeneration activities for rangelands which should also have a rural livelihoods (income generation) aspect. The collection and selection of seed species forms a part of the technical support MAIL and DAIL provide to communities. The criteria for selecting seed species for restoring the rangeland reserve are hardiness to germinate and thrive under harsh conditions and usefulness as fodder. Lucerne and local, naturally occurring species have been used. The former was adopted due to prevailing practice and the latter because of availability in the immediate locality. The singular objective of regenerating the rangeland for fodder has to be weighed against the objective of ecologically restoring rangeland to a more natural state, which can support complex and sustainable ecological units and at the same time provide nutritional value for livestock grazing. In its capacity as facilitator, MAIL, DAIL, and ADOs can lead a conversation allowing the community to determine which to prioritize (regeneration for increased fodder production or for the maintenance of the ecosystem) given their contexts, the opportunities available to them, and the constraints they must contend with. The intention is to also inform the community that these concerns are dynamic and regardless of what they opt to prioritize they will keep having to make these decisions as they progress in their CBNRM. Should they choose, however, to prioritize the restoration of natural ecosystems, an *in-situ* germplasm of original rangeland species, either in the field at the village level or in controlled nurseries at various DAIL offices is necessary for restoring rangelands to a quasi-natural state.

- Civil works – see examples in the section above. Civil works are likely to be small-scale.
- Other activities which are in line with project objectives. Examples include bio-digesters for household heating (which would reduce the need to cut trees for firewood), solar panels, and alternative livelihood activities (particularly women-led activities) which are environmentally sustainable (bee keeping, medicinal plant production...etc).
- Training activities on implementation of the above, and specific association strengthening activities.
- Public awareness activities in line with the scope of the project, and targeted at watershed communities in the watershed of the irrigation scheme.

242. The management plan will include:

- A description of the watershed (including assets), socio-economic conditions, and the association.
- Proposed activities/tasks (with rationale of how these link to watershed rehabilitation and protection resulting in downstream benefits) including key results and outcomes;
- A description on how the association intends to ensure accomplishment – how the proposed management approach and implementation strategy will contribute to the sustainable management of the watershed. A delineation of responsibilities among stakeholders (including the association, DAIL and the community) for tasks is needed;
- Budget estimates for each component of the management plan. The plan should include a table of costs for civil works, vegetative rehabilitation works, production cost for fodder, timber, fruit trees...etc and any administration costs;
- A timeline for implementation of the plan;
- M&E plan including simple reporting;
- Proposed procurement and contracting mechanisms.
- An agreement letter signed between the association, project, and government (DAILs) stating that any works to be constructed under plan implementation will be operated and maintained post-construction by the association.

243. Apart from serving as facilitators, MAIL, DAIL and ADOs also play advisory and regulatory roles. Their tasks include the assessment and resolutions of any inter or intra community conflict in the access and use of the natural resources. MAIL, DAIL and ADOs must also advise the association on best practice in land management, agriculture, and animal husbandry to increase production while minimizing impact on natural resources. As the face of government in communities, the combined functions of MAIL, DAIL, and the ADOs serve to harmonize the engagement of communities with other agencies such as the Sub Basin Agency.

244. In line with the community's customs and traditions, MAIL, DAIL and ADOs ensure that traditional practices occur while complementing this knowledge with the science behind soil and water dynamics. In terms of soil erosion simple soil traps downstream from treated and untreated plots can be set up to measure soil loss. Trained community members can measure vegetative regrowth from sample plots taken from treated and untreated areas.

245. The government must show the villagers a method to scientifically demonstrate, measure and document the changes of the interventions. They shall also assist in establishing and operating a forest and/or rangeland-monitoring system, which can be used both for evaluating plan effectiveness and for guiding adaptation measures.

246. These responsibilities entail the active engagement of MAIL, DAIL and ADOs in all the stages of CBNRM projects. Their accessibility and readiness to engage community members elicits trust and encourages the community to participate harmoniously in an otherwise potentially volatile political atmosphere. The visibility of the government is politically and strategically important in a "post-conflict" situation in which the potential for a "shadow" government exists.

(iv) Activity 4: Implementation of NRM Plan

247. The NRM plan will be assessed and approved by an evaluation committee set-up by the MAIL PMO. Evaluation criteria will be drawn up. Approval will be based on the feasibility of the detailed management plan and reasonableness of implementation and administrative costs. The committee may reject the plan outright or ask DAIL for revisions to be made.

248. The entire plan or specific aspects of the plan (as detailed in the plan itself under the procurement section) will be contracted for implementation. These will either be contracted out to the private sector (national firms, NGOs...etc) or through community-based contracts through CDCs – see above for output 2 for these two contracting mechanisms. Contracts will preferably be performance based contracts, depending on the type of service, goods or works. In such cases a % could be paid in advance upon contract signature, a % upon satisfactory accomplishments of deliverables; and the remaining % paid upon submission by the association of the final financial and technical reports and other requirements provided in the agreement and accepted by MAIL PMO.

249. If tendered through private construction firms, it will need to be decided how the tenders are packaged and phased. The first package could be for the three representative subprojects.

250. An alternative to contracting through private firms is for community-based contracting. The preferred government modality is for this to be done through a CDC. A CDC sub-account (which apparently is possible through Azizi bank) could also be set-up as a conduit for the flow of funds to the community association. The signatories of the sub-account could be a representative from the association (preferably the treasurer) and a representative from the community organisation (preferably the treasurer).

251. DAIL will be responsible for monitoring whether the plan (contracts) is being implemented effectively. The CDC may also have a monitoring role, especially for community-based contracts. The oversight and monitoring responsibilities between DAIL and the CDC will need to be established so there is no overlap. It is recommended that a monitoring committee is set-up comprised of representatives from DAIL/MAIL, ADO, CMO, CDC and other concerned stakeholders will be formed to monitor performance against the objectives and tasks detailed in the plan.

252. For any works implemented under the plan, at the end of the construction period watershed users (through the association) will sign hand-over agreements with the project and government (DAIL). This will engender sustainable management and transfer of works.

253. The output will ensure a stable watershed downstream from irrigation schemes constructed by the project. A stable watershed supports not only the livelihood of watershed communities but also downstream agriculture. For government policy makers as well as donor agencies, the corresponding cost to undertake watershed work relative to the area of the watershed will result to a baseline of the cost effective ratio to place watershed under a management regime. Moreover, organized and licensed communities will serve as a foundation to initiate a broad based support at the grass roots level for government sponsored watershed management projects.

C. Subproject Implementation Schedule

254. The subproject implementation schedule is embedded in the overall project implementation presented in the table below.

Table 10: Implementation Schedule

Activities		2017				2018				2019				2020				2021				2022				2023	
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Grant approval																											
Project effectiveness																											
1. Output 1: Water allocation and availability improved																											
1.1 Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded																											
(i) Activity 1: Sub-project identification and selection																											
(ii) Activity 2: Tendering and contracting of a design firm																											
(iii) Activity 3: Preparation of TORs for call-down design services																											
(iv) Activity 4: Feasibility studies and detailed design of subprojects																											
FS and DD for package 2																											
FS and DD for package 3																											
FS and DD for package 4																											
FS and DD for package 5																											
FS and DD for package 6																											
FS and DD for package 7																											
FS and DD for package 8																											
(v) Activity 5: Tendering and Contracting of Construction Firms																											
Tendering and contracting of package 1 (3 rep subprojects)																											
Tendering and contracting of package 2																											
Tendering and contracting of package 3																											
Tendering and contracting of package 4																											
Tendering and contracting of package 5																											
Tendering and contracting of package 6																											
Tendering and contracting of package 7																											
Tendering and contracting of package 8																											
(vi) Activity 6: Construction and Construction Supervision																											
Construction of package 1 (3 rep subprojects)																											
Construction of package 2																											
Construction of package 3																											
Construction of package 4																											
Construction of package 5																											
Construction of package 6																											
Construction of package 7																											
Construction of package 8																											
(vii) Activity 7: Hand-over and future O&M																											
1.2 Sub-component 2: WUAs established and strengthened																											
(i) Activity 1: Continued support, capacity building and mentoring of existing WUAs																											
(ii) Activity 2: Establishment of new WUAs																											
1.3 Sub-component 3: Water resources planning and management strengthened																											
(i) Activity 1: Strengthening the water resources planning system;																											
(ii) Activity 2: Strengthened central-level inter-agency co-ordination;																											
(iii) Activity 3: Strengthening co-ordination between (S)RBA, DAIL and DRRD in river basin planning and management;																											
(iv) Activity 4: Support to Afghan members of the Afghan/Tajik transboundary technical working group to prepare for WG meetings.																											

Table 10 (continued)

Activities	2017												2018				2019				2020				2021				2022				2023	
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2			
2. Output 2: On-farm water management enhanced																																		
2.1 Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded																																		
(i) Activity 1: Sub-project identification and selection																																		
(ii) Activity 2: Feasibility studies and detailed design of subprojects																																		
FS and DD for package 1																																		
FS and DD for package 2																																		
FS and DD for package 3																																		
FS and DD for package 4																																		
FS and DD for package 5																																		
(iii) Activity 3: Tendering and Contracting of Construction Firms (or through community-based work contracts)																																		
Tendering and contracting of package 1																																		
Tendering and contracting of package 2																																		
Tendering and contracting of package 3																																		
Tendering and contracting of package 4																																		
Tendering and contracting of package 5																																		
(iv) Activity 4: Construction and Construction Supervision																																		
Construction of package 1																																		
Construction of package 2																																		
Construction of package 3																																		
Construction of package 4																																		
Construction of package 5																																		
(v) Activity 5: Hand-over and future O&M																																		
2.2 Sub-component 2: IAs established and strengthened																																		
(i) Activity 1: Establishment of IAs within the existing WUAs																																		
(ii) Activity 2: Establishment of new IAs																																		
2.3 Sub-component 3: Efficiency of agricultural water use enhanced																																		
(i) Activity 1: OFWM and agricultural extension																																		
3. Output 3: Watersheds are properly managed and protected																																		
(i) Activity 1: Preparation of a Community-based NRM Technical Manual and Guidebook																																		
(ii) Activity 2: Identification of Sites (approx. 21)																																		
(iii) Activity 3: Training of DAILs who can train communities																																		
(iv) Activity 4: Creation and strengthening of community associations																																		
(v) Activity 5: Preparation of natural resource management (NRM) plans																																		
(vi) Activity 6: Implementation of NRM Plans (including one PES pilot).																																		
4. Project management and implementation																																		
(i) Establishing and operationalizing PMO and PIOs																																		
(ii) Recruiting and mobilizing staff																																		
(iii) ISC firm recruited and mobilized																																		
(iv) Office equipment and vehicles procured																																		
(v) PPMS established and functioning																																		
(vi) Project reporting (quarterly, project completion)																																		
(vii) Annual audits																																		
(viii) ADB Project reviews																																		
Inception																																		
Annual Reviews																																		
Mid-term Review																																		
Project Completion Report																																		
Grant Closing																																		

DAIL = Department of Agriculture, Irrigation and Livestock; FS = feasibility study; DD = detailed design; DRRD = Department of Rural Rehabilitation and Development; IA = irrigation association; ISC = implementation support consultancy; NRM = natural resources management; O&M = operations and maintenance; PES = payment for ecosystem service; PMO = project management office; PPMS = project performance monitoring system; RBA = river basin agency; TOR = terms of reference; WG = working group; WUA = water user association.

Source: Asian Development Bank.

D. Subproject Financial Management

255. A Financial Management Assessment (FMA) was conducted on the role of the Ministry of Energy and Water (MEW) and the Ministry of Agriculture, Irrigation and Livestock (MAIL) as implementing agencies for the project. Risks have been assessed and mitigation measures proposed. The overall risk associated with the subprojects is considered medium.

256. Financial obligations of the government are minimised and amount to provision of office space. External staff will be recruited by the project to staff the PMO and PIO. Beneficiary payment of operation and maintenance (O&M) costs is planned, thus minimising government costs.

257. For further details see the Project Administration Manual (PAM).

1. Preparation of Financial Plan

258. The PIOs will prepare annual and quarterly work plans and budget estimates for consideration by the PMOs. These will be assessed in relation to the overall budget and work plan. The PIOs will establish and manage sub-accounts and retain supporting documents. Such expenditure will mainly be for items procured under small shopping contracts.

2. Accounting, Financial Reporting and Audit Arrangements

259. MAIL and MEW, through their respective PMOs, will prepare and maintain separate accounts for project-related disbursements, which are acceptable to ADB, and in accordance with the provisions of the Financing Agreement. Each PMO will consolidate their respective accounts and prepare separate project financial statements to be reviewed and audited by external auditors. These accounts should be synchronized with records available with each respective Finance Department. After audit, the documents will be submitted to the Ministry of Finance and ADB. An audit review process will be established and commission financial and performance audits of the PMOs by an audit agency in accordance with auditing standards acceptable to ADB. The audit report will include, among others, a separate opinion on the proper use of the imprest account and the statement of expenditure procedures. Project Accounts of P-ARBP, together with disbursement documents, will be audited annually by independent auditors acceptable to ADB, and will be submitted to ADB in English within three months of the end of each fiscal year. MAIL and MEW will be advised of ADB's requirement for timely submission of audited project accounts and financial statements, and the suspension of disbursements of the ADB grant in case of non-compliance.

260. The Government, EA/IAs, PMOs, and PIOs have been made aware of ADB's approach to delayed submission, and the requirements for satisfactory and acceptable quality of the audited project financial statements. ADB reserves the right to require a change in the auditor, or for additional support to be provided to the auditor, if the audits required are not conducted in a manner satisfactory to ADB, or if the audits are substantially delayed. ADB reserves the right to verify the project's financial accounts to confirm that the share of ADB's financing is used in accordance with ADB's policies and procedures.

261. ADB shall disclose the annual audited financial statements for the Project and the opinion of the auditors on the financial statements no later than 14 calendar days of ADB's confirmation of their acceptability by posting them on ADB's website. The management letter will not be disclosed.

E. Subproject Procurement

1. Procurement Plan

262. All procurement of goods and works will be undertaken in accordance with ADB's Procurement Guidelines. The procurement plan indicates review procedures, goods, works and consulting service contract packages and national competitive bidding (NCB) guidelines. National competitive bidding (NCB) procedures will be used for civil works contracts estimated to cost more than \$100,000 and International competitive bidding (ICB) for those that cost more than \$5,000,000. Similarly, NCB procedure will also be used for goods contracts estimated to cost \$200,000 or more. Shopping procedures will be used for contracts for procurement of small works and equipment worth less than \$200,000. Consultants will be recruited according to ADB's Guidelines on the Use of Consultants.

263. The contracts that will be required specifically for the implementation of the sub-project are shown in the table below. Other contracts will be undertaken as part of the overall project but will also be relevant to the sub-contract (e.g. the contracting of the Implementation Support Consultancy (ISC)). Further details on procurement procedures are included in the PAM.

Table 11: Procurement Plan

Package Number	General Description	Estimated Value (US \$ '000)	Procurement Method	Review (Prior/ Post)	Bidding Procedure	Advertisement Date (Quarter/ Year)
MEW/P-ARBP/ NCB/01	Rehabilitation and Upgrade of P-ARBP Package 1 (Laqi Canal , Sharawan Takhar Canal; Seyaab Canal)	2,838	NCB	Prior	1S1E	Q4 / 2016
MAIL/P-ARBP/ NCB/ Contracts	On Farm Irrigation Subprojects	TBD	NCB	Prior	1S1E	Q1/2018
Or						
MAIL/P-ARBP/ CDC/ Contracts	Community Subprojects	TBD	CDC	Prior	Direct	Q1/2018
MAIL/P-ARBP/ CDC/ Contracts	NRM plan implementation	TBD	CDC	Prior	Direct	Q1/2018

2. Contract Management

264. See subproject implementation management section above.

Annex 1 – Subproject Design and Monitoring Framework

Impact(s) the Project is Aligned with			
Increased per-capita income and reduced poverty among rural and pastoral communities (Afghanistan National Development Strategy - Agriculture and Rural Development Cluster ¹⁰)			
Results Chain	Performance Indicators with Targets and Baselines	Data Sources and Reporting	Risks
Outcome			
Increased agricultural productivity in Seyaab canal irrigation scheme (higher crop yields, cropping intensity and cropped areas)	<ul style="list-style-type: none"> • Increase in crop yields on 400ha (Wheat: Baseline (2016) 3.267t/ha in the middle reach; Target (2022) 3.463t/ha; Baseline (2016) 2.613t/ha in the tail reach; Target (2022) 2.907/ha. • Increase in cropping intensity in the tail reach by 22% by 2022 (2016 baseline: 131%); in middle reach by 14% by 2022 (2016 baseline: 160%); and in the head reach by 10% by 2022 (2016 baseline: 175%). 	Crop production survey at end of project (as compared to baseline)	<ul style="list-style-type: none"> • Security deteriorates further • Change in government policy and approach with regard to the agriculture and water sector • Natural disasters (droughts or flooding)
Outputs			
Output 1: Water allocation and availability enhanced	1.1a. Repair of head works (two new gates), construction of four new off-takes (with measuring staff gauges) and cross-regulators with spill weirs, and the construction of four domestic and two livestock water access points within 18 months of construction start.	PPMS	<ul style="list-style-type: none"> • National contractor not able to undertake works on-time and to the required quality
	1.1b. All completed works will have signed WUA O&M agreements	PPMS; signed O&M agreements	
	1.2a. WUA established and officially registered with MEW by 2019	PPMS; MEW registrar	<ul style="list-style-type: none"> • Delays in MEW registration process
	1.2b. WUA charging water users an ISF for O&M by 2019, and implementing equitable water sharing protocols between head, middle and tail secondary canals	PPMS	<ul style="list-style-type: none"> • Indirect costs to farmers (e.g. official and unofficial taxes) increase lowering their ability to pay

¹⁰ Islamic Republic of Afghanistan. July 2010. *Afghanistan National Development Strategy, Prioritisation and Implementation Plan, Mid 2010-2013, Volume 1*. Kabul, Afghanistan.

Output 2: On-farm water management enhanced	2.1a. Eligible water resource infrastructure built along the 4 secondary and tertiary canals including at least 1 domestic and 1 livestock access point on each canal, within 18 months of construction start	PPMS	<ul style="list-style-type: none"> National contractors not able to undertake works on-time and to the required quality Community-contracting not possible due to political interference from CDCs
	2.1b. All completed works have signed IA O&M agreements	PPMS; signed O&M agreements	
	2.3a. At least 100 farmers have sufficient knowledge on improved OFWM by 2022	PPMS	
Output 3: Watersheds are properly managed and protected	3a. At least 1 catchment management association, adjacent to the scheme, established and registered with the government (either under the water law, forestry law or a new rangelands law) by 2019.	PPMS; MAIL registrar	<ul style="list-style-type: none"> Suitable sites are not identified Associations cannot be registered under a specific law
	3b. 1 NRM plan prepared and implemented by 2020	PPMS; NRM plans	<ul style="list-style-type: none"> Community-contracting not possible due to political interference from CDCs
	3c. At least 500 hectares of forestry/rangeland restored/protected by 2022	PPMS	
	3d. DAIL staff independently able to support the set-up, registration and management of CBNRM organisations by 2022	PPMS	<ul style="list-style-type: none"> Government does not provide the necessary financial and human resources for SBAs

Key Activities with Milestones

1. Output 1: Water allocation and availability enhanced

1.1. Sub-component 1: Water conveyance infrastructure rehabilitated and upgraded

- (i) Construction contract started by end of month 9 (tendered by end month 3). Or earlier if advance procurement approved by ADB.
- (ii) Works implemented on schedule as per the project implementation plan
- (iii) All works completed and handed over to WUA at end of construction

1.2. Sub-component 2: WUA established and strengthened

- (i) Number of events for the WUA per year (Five events in yr 1-2, three in yrs 3-4, and two in yrs 5-6)

2. Output 2: On-farm water management enhanced

2.1. Sub-component 1: On-farm Irrigation infrastructure rehabilitated and upgraded

- (i) Works designed, tendered and implemented on schedule as per the project implementation plan
- (ii) All works completed and handed over to IAs at end of construction

2.2. Sub-component 2: IAs established and strengthened

(i) Number of events per IA (estimated at one event per IA per year (over a period of 5 years))
2.3. Sub-component 3: Efficiency of agricultural water use enhanced
(i) At least 1 demonstration set-up
3. Output 3: Watersheds are properly managed and protected
(i) Association established by 2018
(ii) Three events per year for the association for 4 years
(iii) NRM plan prepared and approved by 2018
(iv) Implementation of plans tendered and implemented on schedule
Inputs
Main Canal Works: \$353,689.10 (\$406,742 with contingencies) (ADB: ADF grant)
Secondary and tertiary canal works (TBD): To be decided (EU grant)
Demonstrations: To be decided (EU grant)
Watershed plan: to be decided (EU grant)
Implementation support: \$66,400 (EU grant)
Assumptions for Partner Financing
Not Applicable

Annex 2 – Subproject Socio Economic Survey and Analysis

A. Introduction

The socio-economic analysis draws on social surveys and public consultation meetings held in the subproject site, and secondary data from MAIL, ALCS, and the Central Statistics Organization (CSO).

Due to the insecurity situation in large parts of the country it is difficult for surveyors and enumerators to collect reliable primary data so secondary data was used to a large extent. It must be noted however that the various statistics available in Afghanistan are sometimes unreliable and contradictory. For statistical data the Consultant has made use of data provided by the Central Statistics Organization (CSO). These data have been supplemented by the results from the National Risk and Vulnerability Assessment (NRVA). In its latest round (2013-14) NRVA has been renamed into the Afghanistan Living Conditions Survey (ALCS).

The social survey was intended to establish the number of displaced persons along the alignment of the subproject especially in those areas where project intervention is foreseen. Consultation meetings have been held at the head, middle and tail sections. It must be noted that due to security concerns these meetings were held at PARB offices and not on-site. Also focus group and individual interviews were held with women to get a gender balanced view on P-ARBP. A total of 16 meetings across the three representative sub-project (RSP) areas were held during 11-18 Feb 2016, six with women (two per RSP), and ten with men (in head, mid-canal, and tail areas of each RSP).

The meetings in the district area were conducted by PPTA staff, a woman for the women's meetings and a man for the men's meetings. Details of meetings are included in the attachments to this annex at the end.

The socio-economic analysis also draws on data from the agricultural report (Supplementary Document 18) which itself draws on primary data collected at the site of the three sub-projects during the period January 25 – February 3, 2016, as well as secondary data.

Men's meetings. The concerns expressed by men who attended meetings at the head, mid-canal, and tail areas of each RSP are shown in the attachment at the end. All of these expressed concerns are incorporated in the RSP designs, with one exception –foot/vehicle bridges (a type of "community structure") will not be provided, as this type of civil work is outside the scope of Project financing.

Women's meetings. The concerns expressed by women who attended meetings in each of the three RSPs focused on domestic water issues. Consistent across all the meetings, women stated that canal water is an important domestic water source, and therefore they face domestic water supply shortages when there is less water in the canal, typically during the May to Aug/Sep/Oct period. They expect the RSPs will result in more water in the canal during this period, which will benefit them. They expressed a need for domestic water supply physical works – wells or feeder canals to bring water from the irrigation canal to the settlement areas. RSP designs will include water access points for domestic water collection, laundry, and livestock watering. Water access

point locations will be identified early in the Project implementation period in consultation with local stakeholders.

B. Population

The last national census in Afghanistan was conducted in 1979. Due to the war and political instability a new census could be undertaken. Preparations for a new census have been under way to be conducted in the 2007/8 timeframe, but this has been postponed. There is no census to be held in the near future. Therefore, all statistical data from CSO are derived from the 1979 census and of a household count in 2003 undertaken by CSO. Also figures from the National Risk and Vulnerability Assessment (NRVA) and its successor the Afghanistan Living Conditions Survey (ALCS) on household size have been included by the CSO to come up with more or less reliable population figures.

According to the most recent CSO population estimates¹¹ the settled population of Afghanistan is estimated to be about 26.6 million people including returnees. The position of the nomadic pastoralists – Kuchi – is established at 1.5 million people. This figure of 1.5 million remains constant since it is assumed that any growth of the Kuchi population will be offset by a similar number that will settle. This means that the total population of Afghanistan is about 28.1 million people. This population figure is well in line with ADB's¹² figure (28.0), but differs greatly from the population estimate of the World Bank¹³ (WB): 31. million, or 32.5 million from the Central Intelligence Agency (CIA) World Factbook¹⁴.

The population of rural areas represent 76% of the total population. Although Afghanistan is predominantly a rural society, the level of urbanization is increasing. The population growth rate is stated to be 2.03 % per annum. 48.85 % of the total population is female. The sex ratio (number of females per 1,000 males) of Afghanistan is 955. The high fertility rate of 6.3 (rate of live births per woman) is linked to a socio-cultural and religious context. Since children are considered to be a source of family wealth there is a traditional preference for large families. The population density in Afghanistan amounts to 36 people per km² is in the figure below.

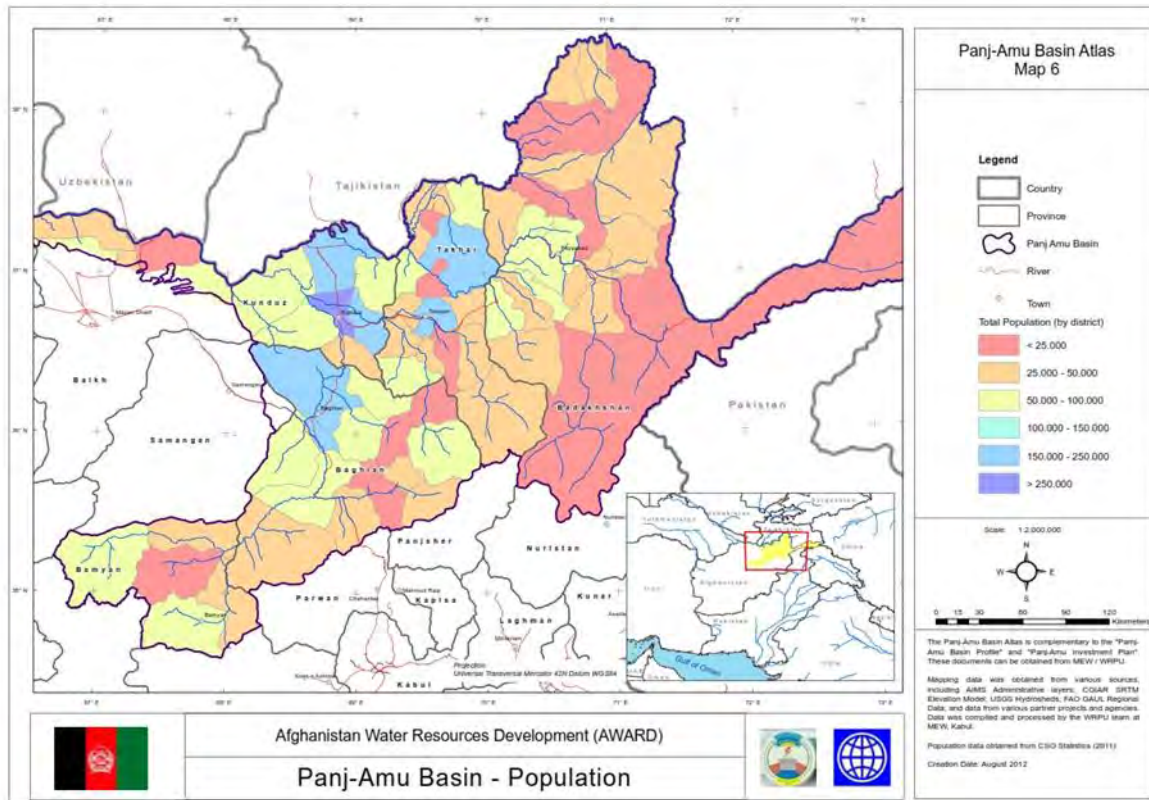
¹¹ CSO Yearbook 2014-5

¹² ADB's Basic Statistics 2015

¹³ <http://data.worldbank.org/country/afghanistan>

¹⁴ <https://www.cia.gov/library/publications/the-world-factbook/geos/af.html>

Figure 11: Population density in Afghanistan



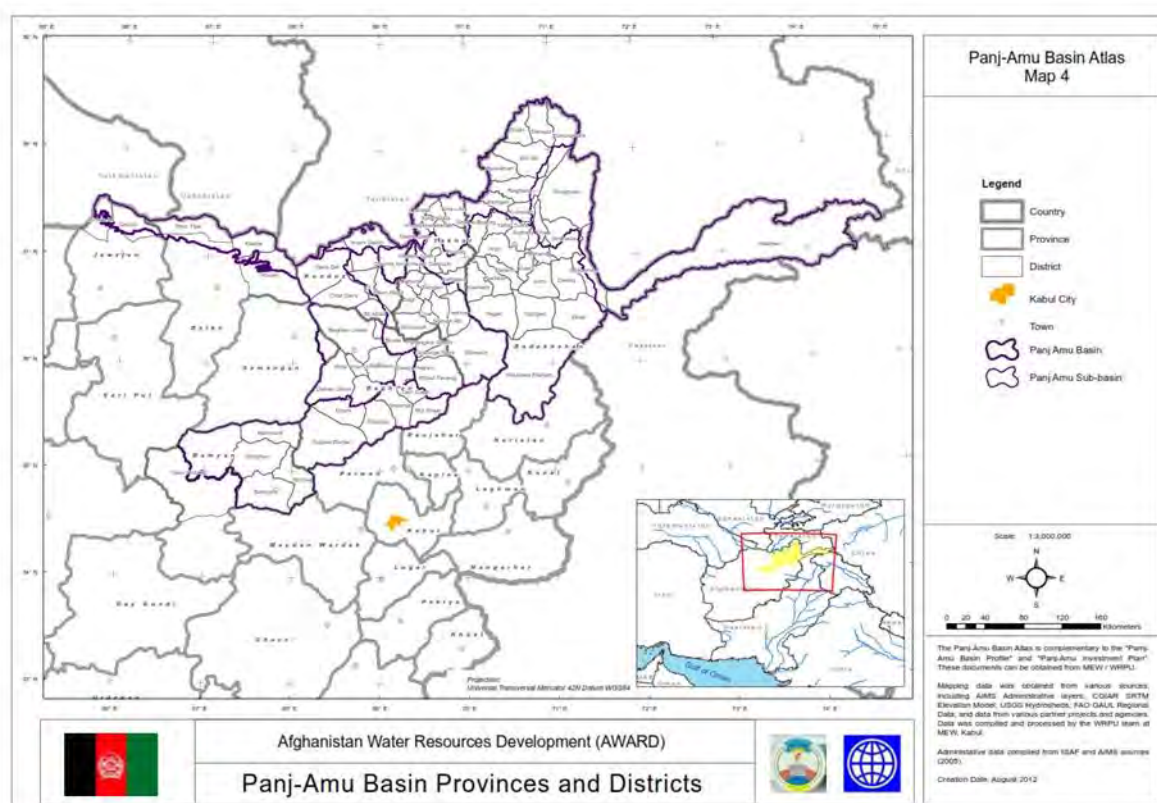
There can be no doubt that high fertility and mortality, and large-scale international migration – including consecutive massive waves of refugees and, more recently, returnees – made a significant impact on the overall size and structure of the population. In addition, geographic differentiation in fertility and mortality, as well as internal migration and movements of internally displaced persons (IDPs) have had major effects on the internal distribution of the population.

The most striking feature of the Afghan population is its very young age structure. Some 48.4 percent (13 million) is under 15 years of age, whereas elderly of 65 and over represent only 2.5 percent of the total population. The proportion under 15 would figure the second highest in the world in the 2010 UN population estimates (UN Population Division 2011). This means that the number of beneficiaries might be higher after the completion of the project.

The young age composition contributes to a very high dependency ratio: for every 100 persons in the working age 15-64, there are 104 persons in the less productive ages of under-fifteen and 65 and over, who are dependent for income and subsistence. This figure implies a significant burden for the prime working-age population and the economy at large, as large economic and social investments in terms of education and health care are concentrated in the youngest age categories.

The Panj-Amu River Basin (PARB) is spread out over the provinces Bamiyan, Baghlan, Kunduz, Takhar and Badkhash as is presented in the figure below.

Figure 12: Pani-Amu River Basin, provinces and districts



Going to more detail regarding the population by province and district, CSO comes to the following figures, as shown in the tables below.

Table 12: Population figures in PARB provinces

Province	Urban (,000)	Rural (,000)	Total (,000)
Bamyan	12.6	427.3	439.9
Baghlan	180.8	714.1	894.9
Kunduz	250.4	740.6	991.0
Takhar	127.3	839.3	966.6
Badakhshan	36.7	898.6	935.3
Total	607.8	3,619.9	4,227.7

Source: CSO, Population estimate 2014-5

Table 13: Population figures by districts in PARB provinces

Province	District	Urban ('000)	Rural ('000)	Total ('000)
Badakhshan				
	Argo		78.8	78.8
	Baharak		28.9	28.9
	Darayem		61.9	61.9
	Faizabad	33.0	34.2	67.2
	Ishkashim		13.9	13.9

	Jurm	3.7	34.1	37.8
	Keshim		81.2	81.2
	Shaghnan		28.0	28.0
	Shohada		34.7	34.7
	Teshkan		30.0	30.0
	Wakhan		15.0	15.0
	Yaftel		53.0	53.0
	Zibak		7.9	7.9
Takhar				
	Baharak -Takhar		31.1	31.1
	Bangi		35.3	35.3
	ChaAb	23.6	55.5	79.1
	Darqad		27.0	27.0
	Dashtqala		32.1	32.1
	Farkhar	2.7	44.4	47.1
	Kalafgan		35.4	35.4
	Khojabahauddin		23.4	23.4
	Taloqan center	155.4	71.8	227.2
Kunduz				
	Aliabad		47.3	47.3
	Chardara		73.8	73.8
	Khanabad	40.8	121.3	162.1
	Kunduz Center	152.8	166.1	318.9
	Qalazal	18.6	51.4	70.0
Baghlan				
	Firing		16.6	16.6
	Jelga		24.0	24.0
	Pul-e-Chumri	180.8	714.1	894.9
Bamyan				
	Bamyan centre	12.6	71.2	83.8
	Kahmard		36.5	36.5
	Saighan		24.1	24.1

Source: CSO, Population estimate 2014-5.

According to the CSO statistical yearbook, the number of people living in the district of Keshim is 81,200 (41,500 males and 39,700 females). These figures are estimates, since the last census was held in 1979.

Villages/hamlets along the vicinity of the canal include the following:

- Saripul
- Kohna Qala/Chwani
- Baloch Ulya
- Baloch Markazi (e-Bala)
- Taijari
- Nawabad Gumbaz
- Gumbaz
- Puli Dara Nahrin
- Clinic Gumbaz

In the Seyaab sub-project the estimated population is as follows:

Table 14: Estimated no. households (hh) in representative subproject area

Scheme	Command area (ha)	Head reach (hh)	Middle Reach (hh)	Tail reach (hh)	Total hh
Seyaab (Badakshan, Keshim district)	400	175	129	72	376

C. Ethnicity and Gender

1. Ethnicity

The population of Afghanistan is divided into a wide variety of ethnic groups with differences regarding their socio-economic development.

In the figure below the distribution of ethno-linguistic groups is shown. Considering the area, it is not surprising that the area is mainly Uzbek and Tajik oriented. The figure shows some patches of Pashtun in this area. This is the result of resettlement initiated by the – then – King Amanullah some 100 years ago. Although no real conflicts between groups have been recorded recently, it must be noted that Afghanistan is mainly a tribal society based on kinship. At the moment of writing, the influence of the Central Government is weak; one sees the growing power of the Taliban and local commanders, which makes the area insecure.

Figure 13: Lingual-ethnic groups



In the sub-project area, Dari is spoken by 77% of the population and 80% of the villages. The second most frequent language is Uzbeki, spoken by the majority in villages representing 12% of the population. Other languages such as Pashto, Turkmeni and Nuristani are spoken by less than

1% of the population each. Badakhshan also has a population of Kuchi who migrate to the province in the summer season.

2. Gender

According to statistics, in Afghanistan boys outnumber girls at birth (with around 105 to 100), although whether this variance from the expected 100:100 split is simply a short-term anomaly or to do with data collection techniques is unknown. This male pre-dominance in early childhood, to gradually converge with the number of women at later ages. Around age 50 the male surplus usually turns into a shortfall, which increases at older ages, resulting in an overall sex ratio generally close to 100. This pattern results from the usually small excess of boys at birth and the commonly higher mortality of males over females. Genuine deviations from this pattern can be caused by variations in the sex ratio at birth and by sex-specific mortality and migration. However, sex-specific age-misreporting and under-counting or over-counting can also lead to unexpected sex ratios.

The overall sex distribution in the Afghan population is tilted toward males, as indicated by the sex ratio – the number of males per 100 females in the population. The NRVA 2011-12 found a relatively high overall sex ratio of 106 males per 100 females, corresponding to 48.5 percent females and 51.5 percent males. It is likely that a combination of female under-enumeration – related to cultural norms of female seclusion – and excess female mortality – especially related to maternal mortality – are important factors to the high sex ratio in the Afghan population. The especially large underrepresentation of teenage (0-14) and older (55 and over) females in the survey results supports this supposition.

Various field assessments indicate that gender roles are specified by tradition with women engaged only in some selected including house-keeping, handicrafts, kitchen gardening and small livestock raising. While not relevant to the sub-project area, women are also involved in the manufacturing sector including carpet and cashmere production and food processing, as well as the education sector (as teachers).

Women have several concerns such as lack of food, income, work opportunities, lack of health facilities and potable water shortage.

Women in general are concerned about not enjoying the freedom to work on income generation projects due mainly to cultural reasons. In the meantime, they can see options available for them outside their homes. Several changes under the National Solidarity Program (NSP), implemented by MRRD, are already leading to women empowerment throughout the country as well as in project villages. The NSP led women empowerment process has resulted in the formation of Women Shura who work together with their Men Shura in the same community, which are involved in planning and implementing community development programs. The recently approved Women Action Plan is geared to establish gender units in the center and provinces. The above initiatives have already begun to unfold a new chapter on women's roles, to address their concerns and a difference in the way women are treated in public life. The women capacity development program of MRRD is expected to bring about necessary changes with regard to gender empowerment, roles and to correct on-going differences. While the project is not expected to have an impact on the activities that women undertake or ongoing cultural norms, it will have a number of interventions to mainstream gender into project activities, plus some specific actions aimed at women, such as the construction of domestic water access points.

D. Accessibility

The road accessibility is good all-round the year. A few sections of the road cause difficulties during the winter season due to its narrowness and lack of drainage systems. It has been noted that the main road of the district and the total distance to Faizabad and Taloqan is asphalted which gives easy access for transporting agricultural inputs, produces and other movements that are crucial for the livelihoods of the people in the area.

E. Education

Education is one of the most important aspects of human development. The Convention on the Rights of the Child – the most widely ratified human rights treaty – enshrines the right of all children to a primary education that will give them the skills they need to continue learning throughout life. Yet, a large majority of Afghan people have been denied this right, most of them women and girls. Consequently, they are bereft of many opportunities for personal development and contributions to society.

Afghanistan is faced with a huge challenge to recover from thirty years of conflict and political unrest that resulted in the destruction of the Afghan education system in terms of staffing, premises, curricula and student attendance. During the Taliban rule girls were even prohibited from attending schools. Since 2001, a nationwide reconstruction process is being implemented with large support from the international community. This has resulted in an increase in the enrolment and literacy rates of children (both girls and boys).

The net attendance rate according to ALCS throughout Afghanistan is 54.5% (boys 62.4%, girls 45.5%) and it may safely be assumed that these figures for the PARB (and subproject) area (which is predominantly rural) are considerably lower. Although the Consultant has assessed some statistics regarding the attendance by province and region, it was decided not to use these figures, as these seemed highly unreliable. For instance in one area it would have meant that half the population would have been enrolled in one form of education.

ALCS found that the national figure for the literacy rate is 51.7% (male 66.3%, female 36.7%) and these figures are assumed to be lower in the PARB (and subproject) area (which is predominantly rural).

When it comes to an establishment of the actual number of schools there is a lot of uncertainty. Various sources claim a various number of schools with a various number of enrolled students.

Table 15: Number of schools in PARB

Province	Primary	Lower Secondary	Higher Secondary
Bamyan	74	147	122
Baghlan	112	168	168
Kunduz	156	138	146
Takhar	236	136	175
Badakhshan	145	240	299

Source: MRRD-NABDP.

Coverage of educational facilities in Keshim district is relatively high as compared to other districts in the province. The main reason for this wide coverage is attributed to the geograph of the district and proximity to the capital city Faizabad and Taloqan in Takhar province and easy access and

follow up by different agencies like MoE, UNICEF and others agencies. The table below gives an overview of the schools in Keshim district.

Table 16: Schools in Keshim district

Preliminary school	11- (6 Boys', 5 Girls)
Secondary school	8 -(4 Boy's, 4 Girls)
High school	15 -(12 Boys , Girls)

Source: MRRD-NABDP.

F. Health

The health system of Afghanistan is recovering from its collapse in the recent decades of conflict, especially after the adoption of new health policies and a strategy of delivering a basic package of health services since 2005. Although remaining low in international terms, many of Afghanistan's main health indicators are rapidly improving. Whereas the food security situation in the country remains fragile and adequate sanitation remains poorly available, significant advance has been achieved with respect to access to safe drinking water. Other progress has been made with regard to the availability, access and quality of health care services. NRVA 2011-12 provides information about several of these health components, as well as actual health-care use.

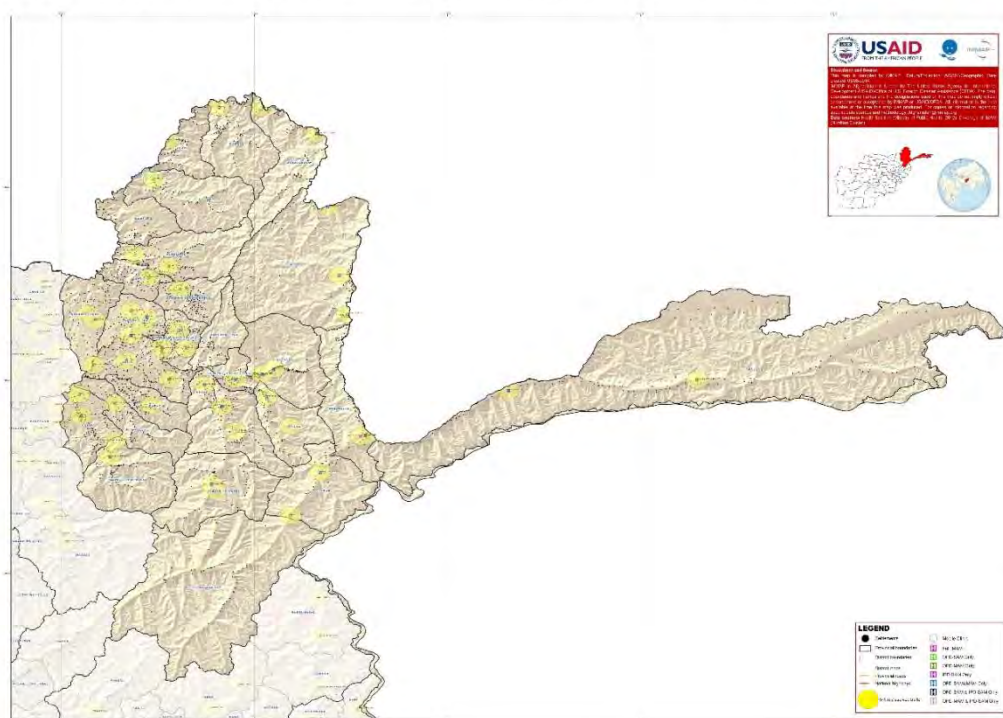
Access to health services is a multi-dimensional concept. It not only relates to the physical distance to health facilities or the travel time involved, but also involves the costs of travel and services, as well as opportunity costs, cultural responsiveness to clients' needs, mobility of women, and even the 'value' attached to the health and survival of specific household members, such as children and women. The NRVA 2011-12 provides information about travel time and travel costs required to reach health facilities, as well as information about gender-specific availability of health care staff, out of-pocket expenditure on health and actual use of health care providers.

Distance and costs to reach a health facility can be primary reasons for low use of health care, especially in remote areas. Thus, the 2006 Afghanistan Health Survey (AHS) suggested that – after the absence of urgency for seeking health care – the most important reason for not seeking care was distance (27 percent) and the fourth-most important reason mentioned was transport costs (11 percent). In line with this, male and female Shuras responses to the successive rounds of NRVA invariably mentioned improved access to health facilities among the top priorities (see section 11.4 of this report). It should be expected that given the expansion of Afghanistan's health care system the importance of these reasons will have been reduced.

Distribution and quality of health services are vital for the livelihoods of a community. As per the preliminary survey conducted in the area the coverage of health facilities in the district is poor. There are two comprehensive health centers in Keshim district that give primary health care to the people. In the figure below the locations can be found.

Figure 14: Health facilities in Badakhshan province

AFGHANISTAN BADAKHSAN Province - Regional coverage of health facilities reported – Nutrition Cluster – Provincial Coordination August 2014



Source: www.reliefweb.int.

G. Employment

In Afghanistan, some 6.6 million people are employed of whom 5.5 million (83 percent) are men and 1.1 million are women. An indicator that provides information on the ability of the economy to create employment – and which is more insightful than unemployment rate – is the employment to-population ratio, the proportion of the working-age population that is employed. The summary table below presents information about the employment-to-population ratio, besides other labour force indicators. The relatively low national ratio of 46 percent is strongly tempered by the very low female involvement in market-related activities (15 percent only), because women are either unemployed or, more importantly, out of the labour force altogether.

The economy of Afghanistan is dominated by the agricultural sector. According to the ALCS survey around 40 percent of the employed population is engaged in work in the farming or livestock sub-sectors. This figure seems on the low side however when compared to other secondary data. The CIA Fact Book 2014 estimates that 79% of the current work force are employed in agricultural production. According to the ALCS male employment is relatively varied with considerable employment of between 10 and 15 percent in construction, trade and various services, besides agriculture including farming and livestock (37 percent). Female employment is much more concentrated in a few sectors: various services, manufacturing including carpet and cashmere production and food processing, and, particularly, livestock tending. In the latter two sectors the share of women is also in absolute numbers larger than the male share. Women are well also well represented in the education sector (as teachers).

In the PARB provinces the main source of income is presented in the table below. This shows that the agricultural sector is the main source of income for 30% of the population in Baghlan, 47% in Bاميان, 39% in Kunduz, 35% in Takhar and 26% in Badakhshan. This includes those in urban areas so the figure for rural areas will be much higher.

Table 17: Main source of income by province

Source of income	Baghlan (%)	Bاميان (%)	Kunduz (%)	Takhar (%)	Badakhshan (%)
Production and sale field crops (non-opium)	14	26	32	23	4
Production and sale of opium					-
Production and sale of orchard products	1	2		1	-
Agricultural wage labour (non opium)	2	1	1	6	1
Opium wage labour	-			-	
Production & sale of livestock	11	17	5	3	19
Sheparding wage labor	-	1		1	1
Carpet weaving		-		1	
Sewing, emboidery etc		-	1	2	-
Other handicraft work	-	1	1		1
Food production and processing (bakers, butchers etc)	2	-	1	1	1
Mechanics work	1	-	2		1
Road/building construction	1	-	1	-	-
Other production work	5	-	2	-	1
Teacher	-	5	3	4	3
Doctor/nurse/medical worker	-	1	2	-	1
Military service	4	3	2	6	7
Police	8	2	2	2	5
Office work, government	4	1	2	1	2
Office work, non-government	2	2	2	1	2
Other government/NGO/UN work	1	-	-		-
Taxi/transport	6	3	6	4	2
Security		1	-	1	-
Other service work	4	1	4	3	1
Shop keeping/small business	7	3	10	6	2
Street/market sales	2	-	1	1	
Other trade	1	2		4	1
Other work, wage labour	13	12	12	4	13
Other work, day labor	6	4	8	17	1
Borrowing	1	8			27
Rental income	1	-	1	-	1
Remittances from migrants	4	1	1	1-	1
Zakat	1	1	1	1	-
Retirement/pension	-	1	1		

Source: ALCS (2013-14)

In the sub-project area the main source of income is from agricultural production. Average landholding is 5.4 jeribs per household, with 91% of farmers owning their land and 9% renting.

Table 18: Average Farm Size & Farm Size Distribution

FARM SIZE*	SEYAAB				
	Head	Middle	Tail	Total	
< 1 jerib	70	49	27	146	39%
1 to 5 jerib	58	31	16	105	28%
6 to 10 jerib	35	24	11	70	19%
>10 jerib	12	24	16	52	14%
Total Farmers	174	128	71	374	100%
Est. Total Area	144	160	96	400	
Est. Average Size (ha.)	0.8	1.2	1.3	1.1	
Av. Size (jeribs)	4.1	6.2	6.7	5.4	

Basic source: P-ARBP field questionnaires, January 26-February 4, 2016.
5 jeribs = 1ha

H. Income & Food Insecurity

By nature, reliable (cash-) income figures are hard to come by in any country. People in general are not willing to share information on their income, and Afghanistan is no exception to this rule. According to the most recent ALCS data the income derived from the main source of income is about AFN 120,000/year, which is about USD 5.-/day. It must be noted that these figures have a high standard deviation and there is a huge difference between the lowest reported income (AFN 2,00/year) and the highest (7,000,000/year).

The figures for PARB are presented in the table below, and are in line with national figures.

Table 19: PARB income figures (from main source of income) (AFN/Year)

Province	Mean	Mean (\$/year)	Std. Deviation	Minimum	Maximum
Baghlan	73,261.68	1,069.67	88576.825	8,000	1,670,000
Bamyan	77,436.94	1,130.631	72325.879	4,000	617,000
Badakhshan	102,498.35	1,496.545	85977.993	9,000	800,000
Takhar	93,832.55	1,370.018	93192.667	12,000	1,500,000
Kunduz	110,091.19	1,607.405	91088.221	8,000	1,440,000
Average	91,967.07	1,069.67	87968.377	4,000	1,670,000

Source: Analysis of ALCS data 2013/14

In the sub-project area total household farm income (the main source of livelihoods for the majority of households) ranges from \$1,615/yr in the head reaches to \$1,351 in the tail reaches. The most important point of this analysis is to show that incomes of those in the head reaches are higher than those in the middle and tail reaches of canals due to higher agricultural output in the head reach due to greater access to water for irrigation. Project intervention will improve access to water in the middle and tail reaches leading to increase in income in these areas in particular.

It must be concluded that income data from ALCS figures are not very reliable as these are based on income figures that have been provided by the respondents themselves. The World Bank has used 2011/12 NRVA data to come up with a figure on poverty. This study has been published in 2015, one year after the latest round of NRVA/ALCS. However, as with any survey regarding income data the ALCS survey is very unreliable. The Consultant has therefore decided to use food insecurity figures based on ALCS figures as a proxy for poverty. This analysis has been based on the calorie food intake per day, where the intake of 2100 calories is the threshold for food insecurity. The food insecurity is therefore a proxy for the poverty analysis, and are more readily available. Since its origin in 2003, World Food Program (WFP) has calculated the food insecurity based on NRVA data.

Food security exists when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food for a healthy and active life. In this report, households that meet a minimum of 2,100 calories per person per day are considered as food secure. In the NRVA 2011-12, data were collected on household expenditure, quantities and type of foods, and number of days certain foods are consumed over a seven-day recall period, throughout the survey period. This information allows a calculation of household food security, based on kilocalorie (Kcals) intake data. Furthermore, thresholds of calorie consumption are used to categorize the severity of food insecurity in 5 groups from very severely food insecure to food secure.

Food-insecure households are distributed across all population groups of Afghanistan. Overall, an estimated 7.6 million people or 30.1 percent of the Afghan population are very severely to moderately food insecure. Of these, 2.2 million people or 8.5 percent are very severely food insecure, as they consume on average less than 1,500 Kcal per person per day. In relative terms, more urban households, including the peri-urban population, are food-insecure than their rural and Kuchi counterparts. A total of 34.4 percent of the urban population are food insecure compared to 29.1 percent of the rural population. However, in terms of absolute numbers, there are more food-insecure people (5.2 million) living in rural areas, where 72 percent of the country's population resides.

The majority of people facing caloric deficiency are also affected by inadequate protein consumption across all population groups. In total, 4.9 million people or 19 percent of the Afghan population do not meet the daily protein requirement of at least 50 grams per person per day from the available food basket. Among them, 4.7 million are facing both calorie and protein deficiency. Inadequate protein consumption will particularly affect children under five years of age, who account for 21 percent of the surveyed population under the NRVA analysis. This means at least 1.5 million under-five children reside in food insecure households, of which more than 900 thousand children are living in households where the consumption of protein and calories are both inadequate, and hence, they are likely to be vulnerable to malnutrition.

The highest proportion of food insecure people is reported in the North-eastern region (46 percent) (i.e. the target area), followed by Central Highland region (39 percent). The largest number of food insecure population of 1.7 million people is in the North-eastern, followed by 1.6 million people in the Central and 1.1 million in the Central Highlands region

A high proportion of Afghanistan's population face chronic and transitory food insecurity. Food insecurity based on the food consumption score and food-based coping strategies is estimated at 33 percent (9.3 million people) of total population. Among them, an estimated 3.4 million (or 12 percent) are severely food insecure, and 5.9 million (or 21 percent) moderately food insecure.

The proportion of the food insecure is significantly higher in rural areas, with 36 percent of the rural population being food insecure, compared to 30 percent of the urban population.

The diet of the Afghan population is not only quantitatively inadequate, but also qualitatively poor and heavily cereal-based. Poor diet diversity is a serious problem across much of Afghanistan. Most of the food consumed is made up of staples (wheat in particular). Overall, the proportion of households with low dietary diversity accounts for 36 percent of all Afghan households (20 percent in urban, 42 percent in rural and 41 percent among the Kuchi households).

To cope with shocks, the majority of households mainly adopt short-term viable coping strategies. However, some unviable (distressed) coping strategies are also used, which negatively impacts food security in the future. Many more rural households than their urban and Kuchi counterparts adopt coping strategies, particularly unviable strategies.

Going into more detail, the food insecurity situation in PARB provinces, and in each district, is presented in the tables below.

Table 20: Food insecurity in PARB provinces

Province	Moderately Food insecure (%)	Severe Food insecure (%)	Total Food insecure (%)
Bamyan	32.7	39.1	71.8
Baghlan	10.8	42.0	52.8
Kunduz	2.5	25.0	27.5
Takhar	18.1	16.7	34.8
Badakhshan	38.2	34.5	72.7

Source: WFP, Kabul; based on ALCS data 2013/14

Table 21: Food insecurity in the districts in PARB provinces

Province	District	Severely food insecure (%)	Moderately food insecure (%)	Total food insecure (%)
Badakhshan				
	Argo	43	28	71
	Baharak	43	28	71
	Darayem	43	28	71
	Faizabad	43	28	71
	Ishkashim	38	43	81
	Jurm	43	28	71
	Keshim	43	28	71
	Shaghnan	38	43	81
	Shohada	38	43	81
	Teshkan	38	43	81
	Wakhan	38	43	81
	Yaftel	43	28	81
	Zibak	38	43	81
Takhar				
	Baharak -Takhar	21	16	37
	Bangi	21	16	37
	ChaAb	22	16	38
	Darqad	4	18	22
	Dashtqala	5	18	23
	Farkhar	22	16	38

	Kalafgan	22	16	38
	Khojabahauddin	5	18	23
	Taloqan center	22	16	38
Kunduz				
	Aliabad	3	26	29
	Chardara	3	26	29
	Khanabad	3	26	29
	Kunduz Center	3	26	29
	Qalazal	3	26	29
Baghlan				
	Firing	30	47	77
	Jelga	8	42	50
	Pul-e-Chumri	8	42	50
Bamyan				
	Bamyan centre	36	42	78
	Kahmard	36	42	78
	Saighan	36	42	78

Source: WFP based on ALCS 2013/14 data.

Looking at the district in which the sub-project is located, food insecurity figures are shown in the table below.

Table 22: Food insecurity in sub-project area

Sub-project	Moderately Food insecure (%)	Severe Food insecure (%)	Total Food insecure (%)
Seyaab (Badakshan, Kishim district)	43	28	71

Source: World Food Program (WFP) analysis on ALCS data of 2013-14

The ALCS data will form the baseline for the poverty analysis. Future ALCS surveys will serve as the impact of the P-ARBP. More efficient irrigation in the project area will result in improved agricultural output, and therefore an increased income.

I. Water Supply

The supply of water to households varies among the various provinces in the P-ARBP area. What is most interesting for P-ARBP is the open source of drinking water. This will be in many cases the river or irrigation canal. Especially in Bamyan and Baghlan a large part of the population derives its water from these sources - see the table below.

Table 23: Main source of water

Province	Piped private municipal (%)	Handpump private (%)	Handpump public (%)	Spring well protected (%)	Spring well unprotected (%)	Open source (%)	Other (%)
Bamyan	16	3	5	9	23	44	-
Baghlan	17	20	23	-	1	39	1
Kunduz	6		36	20	-	13	-
Takhar	2	4	42	22	10	20	0

Badakhshan	17	241	2	1	5	43	32
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Source: Analysis of ALCS data 2013/4

In Keshim district there seems to be no source of protected water and the river/irrigation canal is the major source of drinking water. The table below presents the main findings of the various water sources.

Table 24: Sources of water supply

Canal	District	Piped private	Handpump private	Handpump public	Other protected	Open unprotected	Other
Laqi							
	Ali Abad		13%	68%	13%	5%	
Sharawan							
	Taloqan	1%	2%	65%	6%	25%	
	Baharak			93%		7%	
	Khwaja Ghar			23%		78%	
Seya ab							
	Keshim					60%	40%

Source: Analysis based on ALCS data 2013/14

There are no places along the canal where water can be fetched or laundry being done. As part of P-ARBP domestic water access points will be introduced where water can be fetched in a safe manner.

J. Indigenous People and Refugees

Together accounting for 3.8 million people or about 12 per cent of the total Afghan population, both Uzbeks and Turkmen live in the northern part of Afghanistan. In origin, Turkmen, also called Turcoman, Turkman or Turkomen, come from the Turkic-speaking tribes that emerged from Oghuz Khan, back in the seventh and eight centuries. Turkmen are Sunni Muslim of Hanafi tradition and are closely related to the people of modern Turkey to the West and identical to the majority Muslim population of their Central Asian kin state across the border to the north. Originally a purely tribal society, they have, in the more recent years adopted a semi-nomadic lifestyle. Uzbeks come from the Altaic and are also a Turkic-speaking ethnic group. They are believed to have emerged in Central Asia in the third century B.C. and are possible descendants of Genghis Khan. They indicate Turkic Mongoloid ancestry and have a degree of an ethnic relationship with the Iranian people. The Uzbeks are, in vast majority, Sunni Muslims of the Hanafi tradition, which reflects a primarily cultural rather than religious identity. Their language is Uzbek and although it is their own Turkish dialect, it is closely related to the one spoken in the Uygur Autonomous Region of Xinjiang, in China.

Uzbeks and Turkmen have a tribal identity that still largely defines the structures within their respective societies and this is reflected both in their social as well as political life. Both groups have had an influence on the Afghan culture mainly through sport and music.

Turkmen and Uzbeks occupy the greatest share of Afghanistan's arable land in the north, and are mostly farmers by occupation, growing grain and vegetables. In addition, they produce crafts, and animal by-products that bring considerable supplementary income to their communities. Cotton production has also added significantly to the wealth of these two groups. However, a very important part of their economy and fame is based on the making of carpets, which is mainly considered women's work. Because of their relative prosperity, Uzbeks and Turkmen have not

been dependent on the central government and have not made a concerted effort to garner political influence in the past. However, the economy of northern Afghanistan was badly damaged by the Taliban conquest of 1998. The consequences of this was not only subjugation and repression, but importantly also resulted in the closure of the border with Uzbekistan by the Uzbek government resulting in significant loss of trade, and thereby reduction in the socio-economic independence of the groups.

K. Refugees

Between 1979 and 2002 over 6 million Afghans fled their homes to seek refuge, contributing to the largest, and longest lasting, refugee caseload in the world. From 2002 onwards, following the fall of the Taliban regime, over 5.7 million Afghans chose to return home, representing almost one quarter of the current population of Afghanistan. Despite both an expectation that refugees would return to their region of origin, large numbers of returnees chose instead to 'return' to urban areas to become internally displaced persons (IDPs).

Settlement patterns are related to a combination of refugees' experiences in exile, urban oriented lifestyles and skill sets, loss of connections to previous areas of origin, perceptions of greater economic potential in urban areas, and the formation of networks. Further, even for those who did return to rural areas of origin, up to two thirds later suffered secondary displacement and many ended up in cities.

According to the United Nations High Commission on Refugees (UNHCR) there are some 1 million IDPs and returned refugees in Afghanistan. Especially the influx of returning refugees from Pakistan has grown in the last year since the attack on a school in Peshawar. Most returning refugees return from refugee camps in Iran and Pakistan.

The Solutions Strategy for Afghan Refugees (SSAR) is the main policy framework for sustainable reintegration of those returning to Afghanistan. The National Steering Committee established in 2014 aims to facilitate the implementation and monitoring of the SSAR's initiatives.

While municipal authorities often regard IDPs as a temporary, transitory population, many have little or no intention of returning to their villages. The combination of massive returns and growing internal displacement has led to a high, and potentially unsustainable, rate of urbanization that poses a number of risks, as well as benefits, to the Afghan economy and society.

It is anticipated that the newly-formed national unity Government will demonstrate commitment to creating an enabling environment for sustainable returns. The withdrawal of international security forces, as well as a complex economic transition are, however, likely to affect peace, security and development in Afghanistan. Humanitarian needs are not expected to diminish in 2015. Support and assistance from the international community will be essential to ensure a transition towards more stable development.

Considering the geographical location of PARB, it is not expected that large portions of the returning refugee influx will settle in the area. Most returning refugees have settled in the eastern, southern and western parts of the country.

However, in 2015 there has been a reverse situation. Although there are no figures available, it seems there are more people fleeing from Afghanistan, rather than refugees are returning. Many Afghans are fleeing to Turkey (via Iran, Iraq and Syria). From Turkey they are trying to cross the Mediterranean to the Greek islands and then onwards to the richer countries of the European Union.

According to an article in the Washington Post¹⁵, an estimate of 180,000 Afghans applied for asylum in Europe in 2015.

In the analysis of ALCS data, less than 0.5% of the interviewed households could be identified as IDPs in PARB. In the survey that was held respondents told the interview team that in various villages people have left the village to other places in Afghanistan or outside the country. Lack of employment and the overall insecure situation in Afghanistan were the main reasons for this migration.

¹⁵ https://www.washingtonpost.com/world/asia_pacific/europe-wants-to-deport-afghan-migrants-but-kabul-is-reluctant-to-accept-them/2016/03/17/8b2d9e6a-e54e-11e5-a9ce-681055c7a05f_story.html

Attachment 1: Men's Public Consultation Meeting Agenda and Questionnaire

A. Introduction

B. Opening remarks

Dear Participants, we thank you very much for sparing your valuable time for participating in this important community consultation session, regarding the proposed project <name>. As the first step of our survey and design work, we are conducting field surveys and consultations with you people to obtain your collective views, interests and concerns regarding the design and construction of this project. Please, participate actively in this consultation session so that we clearly understand your views, interests and concerns, and possibly incorporate those in the design and construction of the project.

C. Discussion of project

1. Are you aware of the proposed project? Y/N
2. Do you approve of the construction of the project? Y/N
3. If not, why not? (give reason/s): _____
4. Do you think the construction this project is needed by you? Y/N
5. If yes, what specific difficulties do you face without this project? (for example, difficulties with: irrigation, agriculture water rotation, water losses, social conditions) _____
6. What specific benefits or positive Impacts do you expect from this project? (for example, improvements in irrigation, agriculture, water rotation, water losses, social conditions) _____
7. Approximately, how many villages and their total populations could benefit from this project?
Number of villages/towns: ____ Estimated population: ____
8. Do you think the construction of this canal could cause any negative impacts? Y/N
9. If yes, what specific negative impacts or losses to local people do you foresee? ____
10. Do you think the construction of this canal could require land acquisition or resettlement? ____

11. If yes, what assets of local people could be affected and how severe would the negative impacts be?

<i>Affected property/asset</i>	<i>Severity of negative impacts (tick)</i>
Productive land (crop, orchard, pasture)	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
Land in built-up area (house, shop, etc.)	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
Built-up structures (house, shop, etc.)	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
Standing crops and wood/fruit trees	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
Loss of income (business, employment)	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
Other (specify)	Severe <input type="checkbox"/> Moderate <input type="checkbox"/> Minor <input type="checkbox"/>
12. Do you think owners of affected assets may oppose construction of this project?
13. What might they demand in exchange for their cooperation with construction of this project?

14. What suggestions you can make to avoid or minimize land acquisition and resettlement impacts?

15. What specific suggestion you can make regarding design and construction of this project? (for example, changes in location or alignment of civil works) _____

Attachment 2: Women's Public Consultation Meeting Agenda and Questionnaire

1. Are you aware of the likely construction of the subproject?
2. What are your ideas about the construction of the subproject?
3. What are the major water-related problems for women's activities, such as washing clothes?
4. What will be the positive impact for women of the subproject?
5. What modifications to the irrigation canals would be helpful (such as water collection, laundry, and animal watering points)?
6. Is the water you use for drinking clean and healthy or not? If not what are the problems and the reasons?
7. Where does your husband get water from? The irrigation canal or a tubewell? Do they get water from different places for different uses? (drinking, washing, animals, watering the household garden)
8. Where do you wash your clothes? In the house? In the irrigation canal?
9. Are there times of the year when not enough water is available? If so, how do you manage?
10. What suggestions do you have regarding design and construction of this subproject?
11. What suggestions do you have to avoid or minimize the water problems you are facing?

Attachment 3: Concerns Expressed in RSP Public Consultation Men Meetings

Concern	Freq*	Seyaab		
		Head	Mid	Tail
Don't change canal alignment	8	X	X	X
Include community structures in the design (animal water and clothes washing points, foot & vehicle bridges)	7	X	X	
Offtake problems	5	X		
Canal erosion	5	X		
Intake/headworks problems	4	X		
Land slides into canal	4	X		
Land & water levels misaligned in some places	2			
Don't interrupt irrigation water supply during construction	2			
Compensate farmers for crop damage due to temporary construction roads	2			
Hire unskilled laborers locally	2			
Provide a spillway at the headworks for flood control	1			
Wash problems	1	X		
Water losses	1			
Contractor should work according to design	1			
Support tree plantation to compensate for tree removal at construction sites	1			

*Note that frequency refers to the frequency that the concern was raised across all three RSPs

Attachment 4: Public consultation with women

Questions Village specifications	Focus groups answers in different villages	
	Baloch Village (Seyaab Canal) 13 participants	Baloch-e-Bala village (Seyaab Canal) 13 participants
Are you aware of the likely construction of Seyaab Canal?	yes	yes
What is your ideas for construction of Seyaab Canal?	should be constructed soon and solve the residents problems	We have problems and have not enough water
What are the major problems regarding access to water for washing the clothes and other activities of women?	No access for wheel, fetching water from far away	There is not enough water in our village and we have problems of water
If Seyaab canal improve the construction what will be positives impact for women?	the construction of canal will have direct impact in agriculture production and people well easily have access for water	we will have access for water and our income will be increased and our problems will be solved
If the canal construction is here will be modifications to the irrigation canals that would be helpful (water collection points, laundry points, animal water points)?	The construction of this canal will help the community to have enough water for power and irrigation	We have problems and have not enough water and fetching water from very away for drinking and washing clothes

is the water you use for drinking clean and healthy or not? Of not what are the problems. reasons?	Yes its clean and we are using for drinking and washing cloths	we are using for drinking and other need of our families
Where does your husband get water from? The irrigation canal or the tube well? Or do they get water from different places for different purposes of drinking ? Washing? Animals? Watering the household garden?	We are using both from well and canal, but mainly from canal because there is not enough wells	we are using canal water
Where do you wash your clothes? In the house? In the irrigation canal?	washing clothes at home	We are washing our clothes at home
Are there time of the year when there is not enough water available? If so, how do you manage?	from 12 month of the year, we will have shortage of water in the month of Saratan,Asad and Mizan	from 12 month of the year, we will have shortage of water in the month of Saratan,Asad and Mizan
What specific suggestions you can make regarding design and construction of this canal from MoEW	We Suggest for ontime construction of canal and building stream from canal to our house and which will facilitate further access for water and irrigation	We Suggest for ontime construction of canal and building stream from canal to our house and which will facilitate further access for water and irrigation
what suggestion you can make to avoid or minimize water problems which you are face along the time from this canal	to minimize water problems, should have wells in house and connect to our house to canal through building stream	we need for wells

Attachment 5: Meeting Minutes

Table 1: Meeting 6 – RSP Seyaab head area, men

Meeting date & time:	20160218, 2pm
Place:	Balock village, Keshim
Topics:	See agenda and questionnaire
Attending:	<i>Proponents:</i> Zahir Nadery, PPTA national environment consultant, Mr Waditullah Wardak, PPTA national resettlement specialist. Mr. Abdullah irrigation Director, Keshim District <i>Stakeholders:</i> per sign-in sheet below
Concerns raised by stakeholders	
<i>Intake problems</i>	1. Stakeholders stated that agricultural land has been lost to erosion in recent years because the intake has migrated laterally. The proposed RSP includes construction of a modern intake. Stakeholders request for this new intake to be located at the site of the previous, pre-erosion intake.
<i>Offtake problems</i>	2. Want reliable control of flows at offtakes
<i>Sliding problems</i>	3. Canal is undercutting higher village land on one side. Stakeholders request physical works to prevent this.
<i>Erosion problems</i>	4. Across the canal from this higher village land, the canal runs along the river, which is eroding towards the canal. Stakeholders request physical works to prevent this.
<i>Wash problems</i>	5. Washes erode the canal in places. Stakeholders request physical works to prevent this.
Actions recommended for project management	
1. A modern intake structure should be constructed. 2. Modern offtake works should be constructed at all offtakes. 3. Physical works should be constructed to prevent sliding. 4. Erosion damage to canals should be repaired and erosion control measures provided. 5. Wash structures should be provided at each wash.	
Reported by:	Zahir Nadery, PPTA consultant

Table 2: Meeting 7 – RSP Seyaab tail area, men

Meeting date & time:	20160220
Place:	Gumbaz, Keshim, Badakhshan
Topics:	See agenda and questionnaire
Attending:	<i>Proponents:</i> Zahir Nadery, PPTA national environment consultant, Mr Waditullah Wardak, PPTA national resettlement specialist, Mr. Abdullah Irrigation Director, Keshim District <i>Stakeholders:</i> per sign-in sheet below
Concerns raised by stakeholders	
<i>Don't change canal alignment</i>	1. Stated that the canal alignment is good and they don't want it to be changed. Team reassured them that the proposed RSP would not change the canal alignment.
Actions recommended for project management	
1. Keep canal alignment unchanged in RSP design	
Reported by:	Zahir Nadery, PPTA consultant

Table 3: Meeting 8 – RSP Seyaab head area, women

Meeting date & time:	20160219 (13941201), time not recorded
Place:	Baloch village, Keshim, Badakhshan
Topics:	See women's meeting questionnaire
Attending:	<i>Proponents:</i> Morsal Satarzada, PPTA consultant <i>Stakeholders:</i> 13 women, per sign-in sheet below
Discussion	
<p>Participants are aware of the subproject and believe it will benefit the community by increasing water available for power and irrigation, increasing agricultural production, and making water access easier. They mostly use canal water, and also some well water (but there are not enough wells) for drinking and washing clothes; clothes are washed at home. They find the water to be clean. The major water-related problem for women is that water collection points are far from their homes. Water is short in the months of Saratan (Jun-Jul), Asad (Jul-Aug), and Mizan (Sep-Oct) [but not Aug-Sep?]. Specific suggestions were to construct the subproject soon, and to include a feeder canal to bring water to the houses for better domestic water access and for irrigation. Wells in the house areas, or connected to them by a feeder canal, would also improve water access.</p>	
Summary	
<p>Women face domestic water supply shortages when there is less water in the canal, typically from May to Aug and Sep-Oct [?]. They expect the subproject will result in more water in the canal during this period, which will benefit them. They expressed a need for domestic water supply physical works – a feeder canal to bring water from the irrigation canal to the houses area and wells.</p>	
Actions recommended for project management	
<ol style="list-style-type: none"> 1. During subproject design / EMP design: Domestic water supply physical works are out of scope for proposed Project financing. Responsibility for development of safe rural water supplies rests with the National Rural Water Supply, Sanitation Irrigation Programme (Ru-WatSIP) of MRRD 2. During construction: Where canal water is used for domestic purposes including drinking, care should be taken to maintain domestic supplies and to safeguard drinking water quality 3. During subproject operation: None. Subproject improvements in water control and efficiency of water use are expected to improve canal water availability for domestic as well as irrigation use 	
Reported by:	Morsal Satarzada, PPTA consultant

Table 4: Meeting 9 – RSP Seyaab mid-canal area, women

Meeting date & time:	20160219 (13941201), time not recorded
Place:	Baloch-e-Bala village, Keshim, Badakhshan
Topics:	See women's meeting questionnaire
Attending:	<i>Proponents:</i> Morsal Satarzada, PPTA consultant <i>Stakeholders:</i> per sign-in sheet below
Discussion	
<p>Participants are aware of the subproject. The major water-related problem for women is not enough water in the village. They use canal water. Clothes are washed at home. Water is short in the months of Saratan (Jun-Jul), Asad (Jul-Aug), and Mizan (Sep-Oct) [but not Aug-Sep?]. Specific suggestions were to construct the subproject soon, and to include a feeder canal to bring water to the houses for better domestic water access and for irrigation. Wells in the house areas would improve water supplies.</p>	
Summary	
<p>Women face domestic water supply shortages when there is less water in the canal, typically from May to Aug and Sep-Oct [?]. They expressed a need for domestic water supply physical works – a feeder canal to bring water from the irrigation canal to the houses area and wells.</p>	
Actions recommended for project management	
<ol style="list-style-type: none">1. During subproject design / EMP design: Domestic water supply physical works are out of scope for proposed Project financing. Responsibility for development of safe rural water supplies rests with the National Rural Water Supply, Sanitation Irrigation Programme (Ru-WatSIP) of MRRD2. During construction: Since canal water is used for domestic purposes including drinking, care should be taken to maintain domestic supplies and to safeguard drinking water quality3. During subproject operation: None. Subproject improvements in water control and efficiency of water use are expected to improve canal water availability for domestic as well as irrigation use	
Reported by:	Morsal Satarzada, PPTA consultant

Table 5: Meeting 10 – RSP Seyaab head area, conducted by Governor of Keshim district, men

Meeting date & time:	20160218, time not recorded
Place:	Baloch-e-Bala, Keshim, Badakhshan
Topics:	General discussion among governor and participants
Attending:	<i>Proponents:</i> Zahir Nadery, PPTA national environment consultant, Mr Waditullah Wardak, PPTA national resettlement specialist, Mr Abdullah, Irrigation Director, Keshim District; Governor of Keshim district <i>Stakeholders:</i> per sign-in sheet below, farmers, elders, teacher, landowner, CDC member
Concerns raised by stakeholders	
<i>Don't change canal alignment</i>	1. Stated that the canal alignment is good and they don't want it to be changed. Team reassured them that the proposed RSP would not change the canal alignment.
<i>Include community structures in the design (a particular bridge)</i>	2. Stated that a community structure, a particular bridge (not named or geolocated in the notes) should be included in the design. Team stated that they would flag it up to the Project.
Outcomes & conclusions	
At the conclusion of the discussion, governor (or his representative) created a hand-written statement of agreement in Dari, that participants each signed and thumb-printed. In rough English translation it says, "During construction of RSP Seyaab, if there is some effect like damage to structures, cutting of trees, damage to house walls, a temporary road through an agriculture area, we all agree / accept that this may happen; and we agree to cooperate with the contractor."	
Actions recommended for project management	
<ol style="list-style-type: none"> 1. Keep canal alignment unchanged in RSP design 2. Consult with the community to agree upon the number, locations, and types of community structures needed and include these in the subproject design 3. Continued communication with the governor and local stakeholders. 	
Reported by:	Gul Md. Baloch, Keshim District Governor

Table 6: Meeting 11 – RSP Seyaab mid-canal area, conducted by Governor of Keshim district, men

Meeting date & time:	20160218, time not recorded (attendance sheet lost)
Place:	Baloch-e-Olia, Keshim, Badakhshan
Topics:	General discussion among governor and participants
Attending:	<i>Proponents:</i> Zahir Nadery, PPTA national environment consultant, Mr Waditullah Wardak, PPTA national resettlement specialist, Mr Abdullah Irrigation Director, Keshim District; Governor, Keshim district <i>Stakeholders:</i> per sign-in sheet below, 13 men - Men: elders, CDC members, farmers
Concerns raised by stakeholders	
<i>Don't change canal alignment</i>	1. Stated that the canal alignment is good and they don't want it to be changed. Team reassured them that the proposed RSP would not change the canal alignment.
<i>Include community structures in the design (bridges, other structures not specified in the notes)</i>	2. Stated that community structures, including bridges and other unspecified structures (not name or geolocated in the notes) should be included in the design. Team said that they would flag it up to the Project.
Outcomes & conclusions	
1. At the conclusion of the discussion, governor (or his representative) created a hand-written statement of agreement in Dari, that participants signed and thumb-printed. In rough English translation it says, "During construction of RSP Seyaab, if there is some effect like damage to structures, cutting of trees, damage to house walls, a temporary road through an agriculture area, we all agree / accept that this may happen; and we agree to cooperate with the contractor."	
Actions recommended for project management	
1. Keep canal alignment unchanged in RSP design. 2. Consult with the community to agree upon the number, locations, and types of community structures needed and include these in the subproject design 3. Continued communication with the governor and local stakeholders.	
Reported by:	Gul Md. Baloch, Keshim District Governor

Attachment 6: Participant Sign in Sheets

Figure PCM 6, RSP Seyaab head area

Minutes of the meeting

Name of Canal: Seyaab Section of Canal: Head of Canal

Date: 18-02-16

Location: Batashahi / Kesham / Batoli - village

Agenda: Conducting of public Consultation regarding Seyaab Canal

List of Participants:





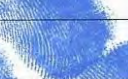








No	Name	Age	Name of Village	Occupation	Signature
1	Bashir Ahmad	23	Sar-e-pul	Student of university	
2	Hameed	30	Sar-e-pul	Land Owner	
3	M. Zuhir	45	Sar-e-pul	Senior Miralb	
4	Haji Safer	65	Chawni	Land Owner	
5	Khaled	30	Batolia	Former	
6	Lahibullah	35	Batolia	Former	
7	Abdul Rehman	23	Batolia-e-Ola	Land Owner	
8	Chahum Sarwar	60	Batolia Bala	Land Owner	
9	Said Ahmed	35	Batolia-e-Sipla	Land Owner	
10	Qasim Bai	65	Cembar	Former	
11	Muti Abdul Rehman	45	Batolia-e-Bala	Chairman of CJC	
12					
13					

Conclusion:

Minutes of the meeting

Name of Canal: Suyaab Section of Canal: Tail of CanalDate: 20-2-16Location: Badulikh Shami / Kesham DistrictAgenda: Conducting public Consultation with Combar village regarding Suyaab Canal Construction work

List of Participants:

No	Name	Age	Name of Village	Occupation	Signature
1	Mula Nimeth	45	Combar	Chairman of CDC	
2	Hui Ghoshor M	80	"	Farmer	
3	Khani	40	"	"	
4	Esa Khan	40	"	"	
5	Kunarakhan		"	"	
6	Quina	60	"	"	
7	Daxod	35	"	"	
8	Azmi	80	"	"	
9	Dador	60	"	"	
10	Shri Bory	70	"	"	
11	Bud	35	"	"	
12	Azi	45	"	"	
13	Hakim	40	"	"	

Conclusion:

PCM 8, RSP Seyaab head area, women

Minutes of the meeting

Name of Canal: Seyaab Section of Canal: head of Canal

Date: 19-02-2016

Location: Kashani/Badarshahi

Agenda: Public Consultation with women regarding Enormous and project

List of Participants: Construction work and Rules of Women in Water losses

No	Name	Age	Name of Village	Occupation	Signature
1	زلیخا	40	بلوچ		
2	آسیہ	23	بلوچ		
3	اسیل	25	بلوچ		
4	خدیجہ	25	بلوچ		
5	گدای بی بی	45	بلوچ		
6	درستہ	16	بلوچ		
7	انیرا	16	بلوچ		
8	موسیٰ	15	بلوچ		
9	ضیرہ	18	بلوچ		
10	دروازہ	17	بلوچ		
11	رابیہ	60	بلوچ		
12	غلامہ	20	بلوچ		
13	ضلعورہ	50	بلوچ		

Conclusion:

PCM 9, RSP Seyaab, women

Minutes of the meeting

Name of Canal: Sayab Section of Canal: Medium of Canal

Date: 19-02-2016

Location: Badakhshan province / Kesham District - Baboch-e-Bata village

Agenda: Conducting P.C with women

List of Participators:

No	Name	Age	Name of Village	Occupation	Signature
1	مسلمه	60	بلوچ بالا		
2	فاطمه	36	بلوچ بالا		
3	لسمه	30	بلوچ بالا		
4	زینب	60	بلوچ بالا		
5	روشن	40	بلوچ بالا		
6	عارف	38	بلوچ بالا		
7	مریقا	44	بلوچ بالا		
8	نعمه	30	بلوچ بالا		
9	کماله	28	بلوچ بالا		
10	بجوج خال	60	بلوچ بالا		
11	سرمه	22	بلوچ بالا		
12	کلیلا	20	بلوچ بالا		
13	نارینه	23	بلوچ بالا		

Conclusion:

PCM 10, RSP Seyaab head area, conducted by Keshim district governor

Minutes of the meeting

Name of Canal: Suyyeh Section of Canal: Head of Canal

Date: 18-02-16

Location: Budock-e-Baku - Pagan Medium

Agenda: public consultation with affected peoples while are with
the All India Project protect construction such as forest

Agenda: *Joint Consultation with the community*
List of Participants: *Be Affected by From project Construction Such as Forest Cutting and Resettlement*

No	Name	Age	Name of Village	Occupation	Signature
14	در فیه	۵۰	شند	ریش کوری	(3)
15	حاجی محمد نوروزی	۴۱	"	کشور کوری	
16	محمد جان	۴۵	بلوچ کوری	مزارع دهقان	
17	محمد طاهر	۴۰	بلوچ کوری	دهقان	
18	محمد طاهر	۲۸	"	دهقان	
19	غیاث الرحمن	۴۰	بلوچ کوری	مزارع کوری	
20	حاجی مادی علیا	۴۰	"	مزارع کوری	
21	محمد صالح عبد الباقی	۴۵	بلوچ اکرم خیل	کشور کوری	
22	صفی احمد	۴۰	بلوچ علیا	دهقان	
23	حاجی محمد علم	۷۰	"	مزارع کوری	
24	ملا حفیظ احمد	۵۰	دهقان	معلم	
25	حاجی محمد نوروزی	۷۰	دهقان	مستغنی	
26	عبد الحق	۴۵	"	دهقان	

Conclusion:

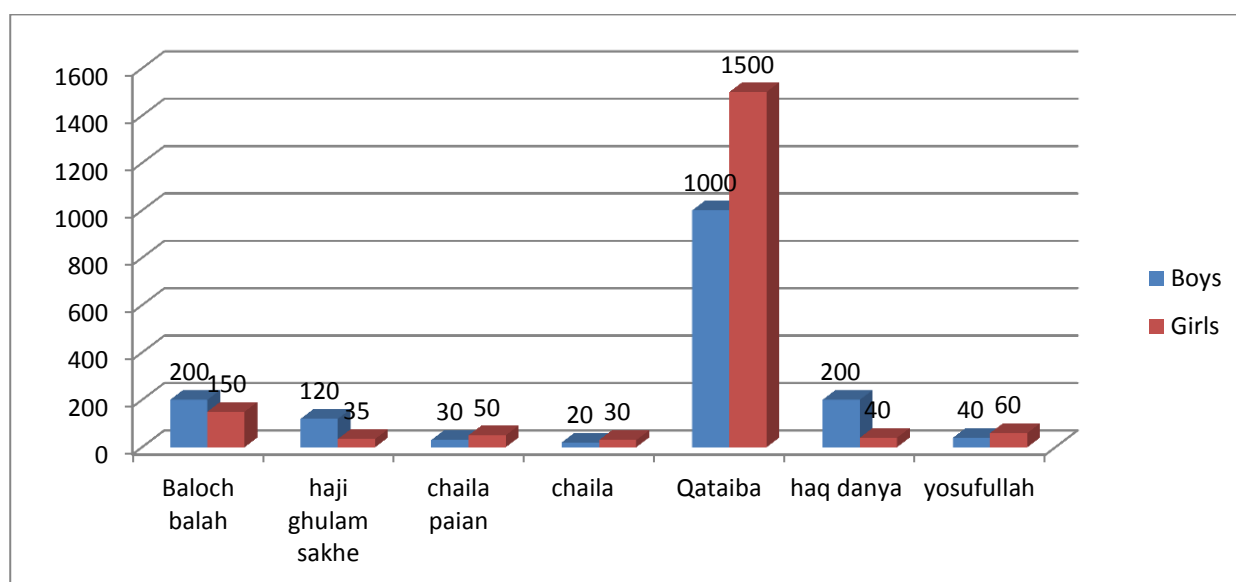
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Note: Participant numbering was continued at 14 from the sign-in sheet of the previous meeting held by the district governor, PCM 11 at Seyaab mid-canal area. Attendance sheet lost.

Attachment 7: Population and Ethnicity

Table 1: General and demographic information

General Information				Demographic Information			
Province	District	Interviewers	Interviewee	Village Name	Population	Male	Female
Badakhshan	Kisham	Masudsatarzada	Gull Bebe	Balochbalah	3000	1200	1800
Takhar	Takhartaleqan	Masudsatarzada	Kemya	Haji Ghulamsakhe	700	300	400
Takhar	Barek	Masudsatarzada	Khumar Gull	Chailapaian	300	100	200
Takhar	Barek	Masudsatarzada	Nafesa	Chaila	250	110	140
Badakhshan	Kisham	Masudsatarzada		Qataiba	5000	2000	3000
Kunduz	Ali Abad	Masudsatarzada	Khasyat	Haqdanya	700	300	400
Kunduz	Ali Abad	Masudsatarzada	Pari gull	Laqi Sufla	800	400	400



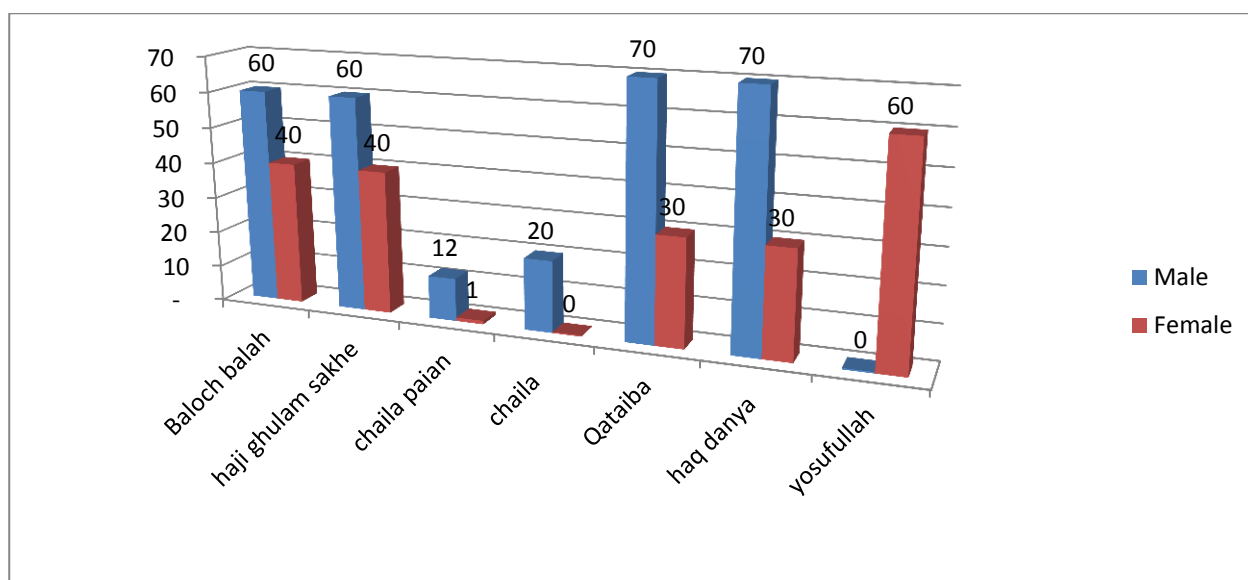


Table 2: Percentage of residents by ethnic group

Village Name	Pashton	Tajik	Hazara	Uzbek
Baloch Balan (Seyaab)		100		
Qataiba (Seyaab)		100		
Haji Ghulam Sakhi (Sharawan-Takhar)		20		80
Chaila Pain (Sharawan-Takhar)		1		99
Chaila (Sharawan-Takhar)				100
Haqdanya (Laqi)		20		80
Laqi Sufla (Laqi)	5			95

Table 3: Common language in the project areas

Village Name	Pashto	Dari	Uzbeki
Baloch Balan (Seyaab)		yes	
Qataiba (Seyaab)		yes	
Haji Ghulam Sakhi (Sharawan-Takhar)			yes
Chaila Pain (Sharawan-Takhar)			yes
Chaila (Sharawan-Takhar)			yes
Haqdanya (Laqi)			yes
Laqi Sufla (Laqi)			yes

Annex 3 – Subproject Engineering Design and Drawings Methodology

A. Design methodology

The design of the structures was carried out following the P-ARBP User's Manual for the Design of a Cross-Regulator and a Canal Off-take Structures on Permeable Foundations using an MS Excel Spreadsheet (December 2015).

The double purpose of this manual is to serve as a guide to good practices for all concerned with the design and operation of structures and to bring consistency and uniformity of approach to the design of the most common irrigation structures in the new and existing canal systems of the Panj-Amu River Basin and other river basins in Afghanistan.

This Manual presents instructions, standards and procedures for the selection and design of cross-regulator and gated off-take hydraulic structures. It is fairly self-contained although some references are made to publications listed in the references.

To practically implement the technique, the author developed a stand-alone MS Excel spreadsheet computer programme that allows one to design and compute the flow rate through a complete check structure. This spreadsheet is an interactive computer program that generates all the necessary data for the design of a cross-regulator, a gated off-take and its discharge calibration (vertical slide gates).

A weir is used for passive regulation of the water level in the river or parent canal. The structure is normally applied for free flow only. The User's Manual considers only rectangular cross-sections to facilitate the analysis.

This application provides also simple graphs to help defining dimensions and hydraulic properties of the structures.

A graph and data generated by the interactive spreadsheet are shown below for a typical cross-regulator and off-take of Seyaab canal.

Figure 15: Seyaab canal. Hadji Wali cross-regulator

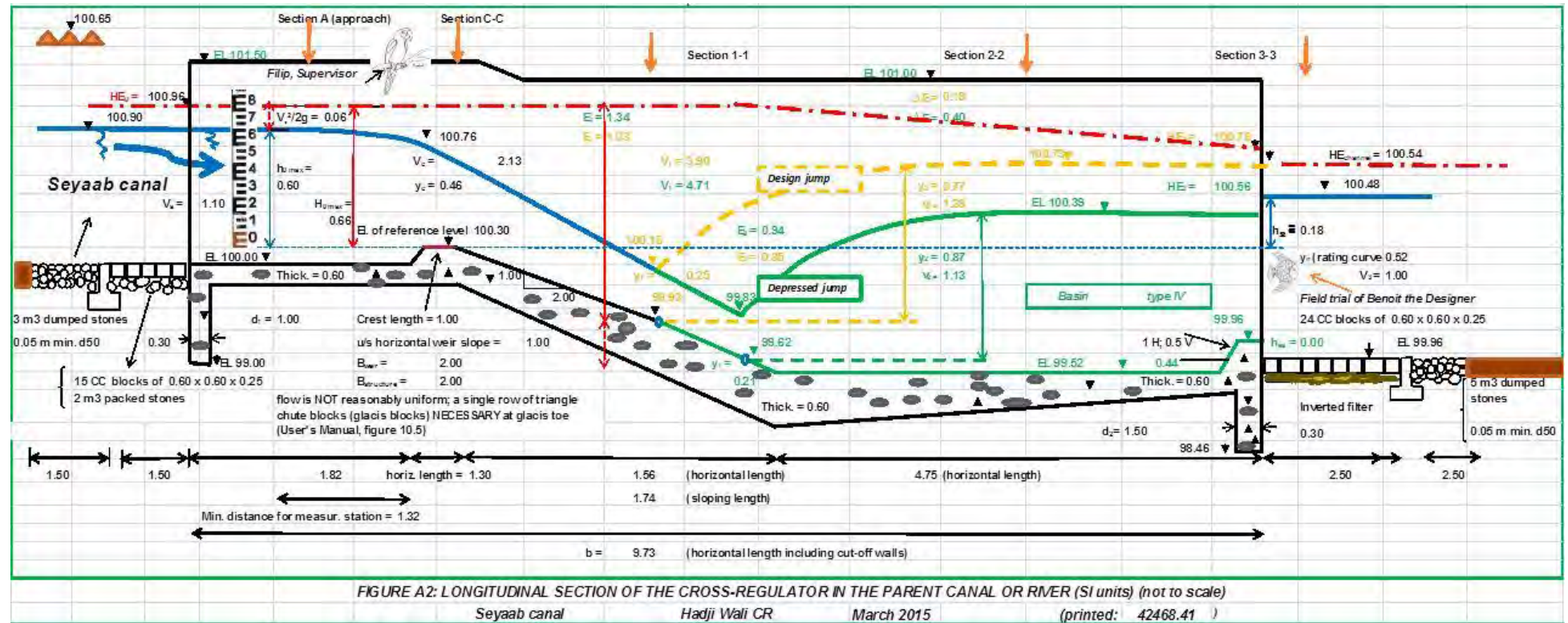
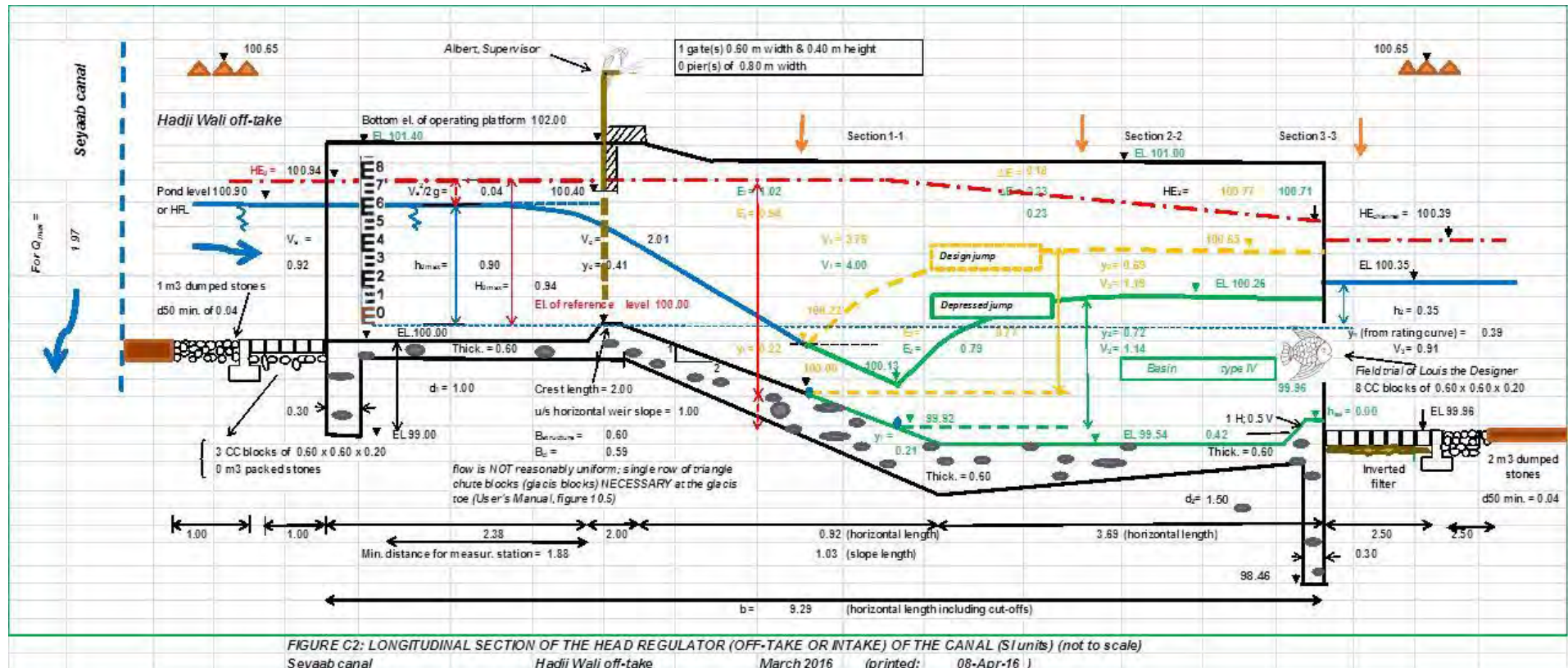


Figure 16: Seyaab canal. Hadji Wali off-take



B. Drawings methodology

Considering the short time available for P-ARBP FS, typical drawings with dimension tables have been prepared for the different structures to be constructed.

The typical drawings are provided with notes and legends. The note part is self-explanatory. All the typical drawings for the different hydraulic structures of Seyaab canal are given in the Tender Dossier.

In addition, two canal schematics of the sub-project have been prepared. The first canal schematic clearly indicates the cumulative distance and the location and the type of each structure requested by the users. The second canal schematic indicates the cumulative distance and the location and the type of structures to be constructed. These are included in the main section of the report above.

Annex 4 – Subproject Economic and Financial Analysis

See Supplementary Document 5.

Annex 5 – Subproject Resettlement Plan

See Linked Document 15.

Annex 6 – Subproject Initial Environmental Examination

The IEEs for the three representative sub-projects are included in one IEE document which is provided separately as Linked Document 11.

Annex 7 - Water Requirements and Availability

A. Crop water requirement

The crop water requirements analysis in the lower parts of the Panj-Amu river basin indicates a maximum requirement of around 2.7 l/s/ha when all losses of conveyance, distribution and field application have been taken into account (total efficiency assumed at 50%) (Irrigation Design Manual). This irrigation modulus represents the continuous supply of water (24hrs per day, 7 days a week) that needs to be supplied for the considered crops. However, in agreement with RBA, the monthly crop water requirement data used is 2.51l/s/ha based on a more précised calculation for Khanabad irrigation system (Taloqan sub-basin).

When applied to the main canal, it allows the estimation of the total flow required and the canal capacity. By diverting the required flow from the river to the main canal (controlled flow), potential benefits from incremental downstream river water supply where existing demand cannot be met represent a potentially important project benefit. This additional amount of water flowing downstream has been calculated for the 3 sub-projects.

Traditionally, flood flows well over the 2.51 l/s/ha rate are taken into the canals, which capacity has to be accommodated in design (freeboard). Remodelling of canals are usually avoided. This fact will permit some flexibility for the future rotation irrigation over secondary canals and off-takes. One factor that has not been included as such in the main canal flow calculation is the water demand of the water mills and small hydropower plants. They usually return water directly to the river/canal and the water may be used for agriculture by communities downstream. It is believed at this stage that agreements will be prepared between the irrigators and the water mills and hydropower plans for the operation during the time of highest crop water demand.

The maximum and minimum discharges (Q_{max} and Q_{min}) and water levels (h_{max} and h_{min}) of the rivers near the 3 selected sub-projects are given in the following table.

B. Water availability

To take into account the climate change findings, the design flood recurrence period of 100 years has been considered. For the 3 sub-projects with high priority, the findings of the climate change analysis on river flows were completed during the field survey with interviews of a number of local people and members of the WUA to get some estimate of the variability of historical maximum and minimum river flows and anticipated land use changes. The different water levels of the Taloqan, Baghlan and Keshem rivers are summarized in the following table for the 3 sub-projects (return period of 1 to 100):

Table 25: Discharges and water levels of the Taloqan, Baghlan and Keshem rivers for the 3 sub-projects (return period of 1 to 100)

	Unit	Baghlan river (Laqi canal)	Taloqan river (Sharawan canal)	Kesshem river (Seyaab canal)
Width of river	m	90.00	180.00	38.00
Qmean	m ³ /s	443.00	242.00	134.00
hmean	m	1.58	0.74	0.88
Qmax	m ³ /s	912.00	666.00	451.00
hmax	m	2.40	1.35	1.73
Qmin	m ³ /s	18.00	30.00	23.00
hmin	m	0.29	0.32	0.40

C. Water availability of Seyaab canal

The flood flow of 1 in 100 year return period in Keshim River is 451 m³/s with Hmax 1.73m in accordance with the hydrological studies (see table above). The 1 in 100 year flood flow with Hmax of 1.73m in approach channel corresponds to 4.17m³/s. This flood flow, if enters into Seyaab canal, it can overtop and damage embankments and agricultural lands.

The Qmin flow in Keshim River at Seyaab canal site is 23 m³/s with Hmin depth of 0.40 m. With Hmin of 0.40 m, the Seyaab canal can receive 0.40 m³/s. Considering the crop water requirement of 2.51 litres per second per ha in accordance with the crop water requirements calculated for Khanabad irrigation system (Taloqan sub-basin), the Seyaab system has a peak crop water requirement of 1 m³/s during 24 hours.

The Qmin flow in Keshim River at Seyaab canal site is 23 m³/s with Hmin depth of 0.40 m in accordance to the hydrological study (see table above). With a Hmin of 0.40 m, the Seyaab canal can only receive 0.85 m³/s. Considering the crop water requirement of 2.51 litres per second per ha during the month in accordance with the crop water requirements calculated for Khanabad irrigation system (Taloqan sub-basin), the Laqi canal has a crop water demand of 0.85 m³/s during 24 hours.

With a discharge of 18 m³/s discharge in the Baghlan River, the water depth in Laqi canal is insufficient to cover the crop demand during that period considering the peak crop water requirement of 2.51 l/s/ha. If necessary, additional flow to cover the crop water requirement will have to be diverted from the river by the beneficiaries by raising the water level near the intake, using brushwood and temporary diversion structures in the Keshim River.

Annex 8 – TOR for Topographic Survey

A topographic survey has been carried out to facilitate the detailed design of the headworks to the main canal, regulating structure and off-takes to branch canals, canal lining, bank protection, wash/river structures and flood protection works.

The terms of reference for the topographical survey work (which was under one contract for all three representative sub-projects) prepared and carried out by a private survey contractor is provided below.

A. Introduction

The Panj-Amu River Basin Project (P-ARBP II) Feasibility Study is jointly funded by the European Community (EC) and Asian Development Bank (ADB) and will be implemented by the Government of Afghanistan. The Ministry of Energy and Water (MEW) has a leading role in implementing the programme with joint role from the Ministry of Agriculture, Irrigation and Livestock (MAIL). It aims to promote Integrated Water Resources Management (IWRM) focusing on Panj-Amu River Basin Management which covers 6 sub-basins including (from East to West); Upper Panj sub-basin, Lower Panj sub-basin, Kokcha sub-basin, Taloqan sub-basin, Upper Kunduz sub-basin and Lower Kunduz sub-basin. The main objective of the future programme is to increase agricultural production by extending and improving the quality of irrigated cultivated land and sustainable management of natural resources in the Panj-Amu basin of northern Afghanistan.

The feasibility study needs to identify, design and prepare tender documents for three representative irrigation schemes. To plan and design the irrigation rehabilitation projects it is essential to carry out topographic survey of individual sites. Therefore, the P-ARBP FS needs to conduct topographic survey works for the selected three representative schemes in order to facilitate the detailed design of the main structures, rivers/canals and flood protection works. The three representative sub-projects are located in Lower Panj, Taloqan and Lower Kunduz areas and all three sites are easily approachable by jeep within 2 hours. Maps of the locations of the three representative sub-projects are shown separately.

B. Objective

The first objective of the work is to carry out detailed topographical survey of the selected sites based on reference benchmarks and to prepare detailed survey drawings including data analysis and interpretation for designing of new, or rehabilitation of, the main hydraulic structures, canals and flood protection works.

The specific objectives are:

- Establish the GPS positions of the structure sites,
- Establish primary benchmarks at each site,
- Survey topographic features of structure sites in rivers/canals and washes,
- Make cross section surveys and long section surveys of structure sites in rivers/canals and washes with reference points,
- Carry out topographic survey and identify the command area of each offtake canal and main canal for the structures as shown in the list provided.
- Take photographs of the benchmarks, and structure sites.

C. Scope of Works

To fulfill the above-mentioned objectives, the scope of survey works is based on the following activities:

1. River and Structure Sites

- In rivers, the main structure will be either a weir or dam. At each structure site the Contractor shall firstly establish a Primary Bench Mark (BM) and set out Secondary BM levels to standards specified in Table 1. All bench mark surveys shall be carried out in a closed loop and closing errors shall be rectified, as described in section 5. The BMs should be positioned with reference to existing physical features, as well as with a GPS base Station. Photographs should be taken to facilitate physical identification and confirmation of the BMs.
- Carry out topographical survey works on the weir or dam site, as specified below. During survey works P-ARBP FS social team and engineering team will liaise with WUAs and communities for structure location identification and any social issues.
- The survey shall be carried out showing existing permanent structures, river and canal layouts, trees and houses, etc. The transects of the survey must have triangulation to locate structures, cross-section locations, etc. The geographic north direction should be clearly shown in relation to the existing features.
- Carry out layout survey including longitudinal section and cross sections at and around weir and dam sites in the river, and head regulator and other structures sites in the main canal, as follows. All cross sections must be taken at right-angles to the local river or canal centre line.
 - For hydraulic structures in rivers, the river cross sections will be surveyed up to a distance of 50m in both the upstream and downstream direction along the structure centre line. Cross sections are to be taken at 10m intervals in the specified reaches. For any sudden rise and drop in levels between the 10m interval, levels should be taken and shown in the survey drawings appropriately. Beyond these 50m stretches, cross sections are to be taken for another stretch of 500m in both the upstream and downstream directions at intervals of 100m such that the total survey covers a distance of 550m on each side.
 - The river cross sections will be surveyed as stated in point a. The deepest river bed level at every cross section interval shall be precisely taken, and the distance from each bank shall be recorded and shown. Representative photographs looking upstream and downstream, and in the transverse direction as well, shall be taken at each cross section to show the local river bed materials, bank materials and bank conditions. Close-up photographs are encouraged to show bed material types and sizes with written detail. The maximum flood level marks and low water level marks, including existing flow water level marks, shall be noted and levels shall be taken at every cross section interval.
 - The river cross sections shall extend by at least 50m beyond both the right and left banks showing existing roads, agricultural land, canals, drainage ditches and any other significant features. Spot levels in cross sections shall be taken, in general, at 10m intervals. In case any abrupt rise or fall is encountered within 10m, additional spot levels should be taken to ensure proper representation of the cross section.
 - Since river structures, such as weirs and dams, need proper bank protection to avoid outflanking of the main structure, if either river bank is lower than 2-3 m height then extend the river cross section until high land is available in upstream direction. If such a situation is encountered at site, prior to commencing the additional survey, the existing situation should be informed to the P-ARBP and only after receiving approval should such additional survey be commenced and completed.
 - In the case of existing structures in the weir and dam site areas, dimensions of these structures, with key levels, shall be taken and noted in the survey level book. Photographs

shall be taken of the existing structures from upstream and downstream showing front, back and side view, and top view (if possible).

2. Canal and Structure Sites

- At each structure site the Contractor shall firstly establish a Primary Bench Mark (BM) and set out Secondary BM levels to standards specified in Table 1. All bench mark surveys shall be carried out in a closed loop and closing errors shall be rectified, as described in section 5. The BMs should be positioned with reference to existing physical features, as well as with a GPS base Station. Photographs should be taken to facilitate physical identification and confirmation of the BMs.
- Carry out topographical survey works on the irrigation asset rehabilitation sites (Headworks, Canal intakes, Offtakes, Cross Regulators, Divider structures, Drop structures and Wash crossings), as specified below. During survey works P-ARBP FS social team and engineering team will liaison with WUAs and communities for structure location identification and any social issues.
- The survey shall be carried out showing existing permanent structures, canal layouts, trees and houses, etc. The transects of the survey should have triangulation to locate structures, cross-section locations etc. The geographic north direction should be clearly shown in relation to the existing features.
- For command area survey works, all three mentioned sub-projects shall be visited to all the offtaking channels in addition to the offtakes mentioned in the list of structures provided separately. The command area survey of main canal and each offtake canal and channels have to be conducted by tracing the boundary line of the command area using GPS. However, the main canal command area survey for Sharawan-Takhar canal is not necessary although command area survey for all offtakes shall be carried out.
- Carry out main and off-taking canal and structure layout surveys, including longitudinal section and cross sections at and around proposed structure sites, as follows. All cross sections must be taken at right-angles to the local river or canal centre line.
 - For hydraulic structures in main canals, the main canal cross section will be surveyed up to a distance of 25m in both the upstream and downstream directions along the structure centre line. Cross sections to be taken at 5m intervals in the specified reaches. For any sudden rise and drop in levels between the 5m interval, levels should be taken and shown in the survey drawings appropriately. Beyond these 25m stretches, cross sections are to be taken for another stretch of 150 m in both the upstream and downstream directions at intervals of 50m such that the total survey covers a distance of 175 m on each side.
 - For canal lining work in main or secondary canals, cross sections should be taken at 25m intervals for the length of protection works, as specified. Canal cross sections in seepage portions of canal shall extend by at least 100m beyond both the right and left banks showing the groundwater table risen and drainage of water through the agricultural fields etc. There should be two cross sections taken upstream and downstream of the proposed canal lining portion in existing canal section.
 - The canal cross section should be surveyed covering the readings at top and toe of the left and right banks including a reading in canal centre line.
 - General canal cross sections shall extend by at least 25m beyond both the right and left banks showing existing roads, agricultural land, drainage ditches and any other significant features. Spot levels in cross sections shall be taken, in general, at 5m intervals. In case any abrupt rise or fall is encountered within 5m, additional spot levels should be taken to ensure proper representation of the canal section. Representative photographs shall be taken to show the effect of canal seepage flow in the agricultural land and fields.
 - Maximum irrigation level, max flood level / low water level shall be shown in the cross sections.

- In the case of existing structures in the affected area, dimensions of these structures, with key levels, shall be taken and noted in the survey level book. Necessary photographs shall be taken of the existing structure from upstream and downstream showing front, back and side view, and top view (if possible).

3. Flood Protection Works Sites

- Carry out topographical survey in the flood protection/river training sites of the project,
 - The river cross section will be surveyed at 100m intervals, including the length of the flood affected area, plus 300m upstream and downstream. The deepest river bed level at every cross section interval shall be precisely taken, and the distance from each bank shall be recorded and shown. Representative photographs shall be taken to show the local river bed materials and bank materials. Some close-up photographs are encouraged to show bed material types and sizes with written detail. The maximum flood level marks and low water level marks shall be noted and their levels shall be taken at every cross section, including existing flow water level marks.
 - The bank line topographic survey will follow the river cross section interval of 100m as stated earlier. However, the change in the bank alignment shall be precisely noted and additional river cross sections shall be taken at 10m intervals between these alignment-changed locations. The deepest river bed level will be precisely taken and the distance from each bank shall be recorded and shown. If any abrupt rise or fall is encountered within the specified interval, additional spot levels should be taken at those points. Representative photographs shall be taken to show the river's meandering situation and river bank and bed conditions.
 - It is necessary to collect information about river course and bank line shifting from local people like Mirabs and other old people. A typical hand sketch is required, showing the bank line shift in a number of years from an old time location to the current location, with the approximate distance of shifting in X m from the past noted period to the current point in Y years. The type of bed load in water during flood and normal flow periods will be indicative (for instance stone, gravel, shingle or just coarse and fine sand). Representative photographs shall be taken to show the existing situation.
 - Cross sections and a long section of the flood erosion affected area shall be taken at 50m intervals. Any abrupt change in elevation must be identified, as already mentioned above, to produce a representative profile.
 - The river cross sections shall extend by at least 50m beyond both the right and left banks showing existing roads, agricultural land, canals, drainage ditches and any other significant features. Spot levels in cross sections shall be taken, in general, at 10m intervals. In case any abrupt rise or fall is encountered within 10m, additional spot levels should be taken to ensure proper representation of the river section.
 - In the case of existing structures in the affected area, dimensions of these structures, with key levels, shall be taken and noted in the survey level book. Photographs shall be taken of the existing structures from upstream and downstream showing front, back and side view, and top view (if possible).

4. Preparation of Survey Drawings

The Contractor, after completing the survey works as stated in the sections above, will prepare the necessary survey drawings as stated below:

- Prepare the site plan showing spot levels on the cross sections and contour lines following normal standards at 0.30 m intervals, or as specified by the Supervisor.
- All topographic survey drawings shall be in AutoCAD showing all details of the site, including river and canal boundaries, cross-section lines, all spot levels, existing features, etc.

- The cross-section drawings shall, in addition to other information, show left and right banks, paddy lands, roads, drainage ditches and existing infrastructure, as well the existing water level, maximum flood level, low water level and the currently practiced maximum irrigation supply level.

D. Required Standards for Survey

The Contractor shall carry out the survey works to the following standards:

Table 26: General Standards for Survey

S.No.	Description of Works	Standard
1	Benchmark	1 Primary BM per site. Secondary BMs at an interval of 2,000 m.
2	Command area	Topographical map scale: 1:2,000 and contour interval 0.3 m
3	River and structures	Topographical map scale: 1:500 and contour interval 0.3 m
3.1	Longitudinal profile	H: 1/500 and V:1/100
3.2	Cross-sections	H: 1/50 V:1/25 Cross sections at 100 m intervals with spot levels at 10m intervals along the thalweg. Cross sections should be extended beyond the bank lines by at least 50 m on both sides.
4	River Structures	
4.1	Site plan	1:500 scale of surveyed area and contour interval of 0.3 m
4.2	Longitudinal profile	H: 1/500 V:1/100 Limit of survey should be 550m u/s and 550m d/s from the river structure-center line and 175 m d/s from the main canal offtake, or as decided by the Supervisor.
4.3	Plan and profile	H: 1/500 V:1/100
4.4	Cross-section	H: 1/50 V:1/25 Limit of survey should be 50m at 10 m intervals from the structure center line followed by another 500 m at 100m intervals completing a survey length of 550m separately in both upstream and downstream directions from the structure, as applicable, or decided by the Supervisor. Cross section lines should be extended beyond each bank line by at least 50m.
5	Canal and structure sites	
5.1	Longitudinal profile	H: 1/500 and V:1/100
5.2	Cross-section	H: 1/50 V:1/25 Cross sections at 100 m intervals with spot levels at 10 m intervals along the thalweg. Cross sections should be extended beyond the bank lines by at least 25 m on both sides.
6	Irrigation structures	
6.1	Site plan	1:500 scale of surveyed area and contour interval of 0.3m

S.No.	Description of Works	Standard
6.2	Longitudinal profile	H: 1/500 V:1/100 Limit of survey should be 175m u/s and 175m d/s from the main canal structure center line and 175m d/s from the secondary canal offtake, or as decided by the Supervisor.
6.3	Plan and profile	H: 1/500 V:1/100
6.4	Cross-section	H: 1/50 V:1/25 Limit of survey should be 25m at 5m intervals from the structure center line followed by another 150m at 50m intervals completing a survey length of 175m separately in both the upstream and downstream directions from the structure as applicable, or as decided by the Supervisor. Cross section lines should be extended beyond each bank line by at least 25m.
7	Flood Protection Sites	
7.1	Site plan	1:500 scale of surveyed area and contour interval of 0.3 m
7.2	Longitudinal profile	H: 1/500 V:1/100 Limit of survey should be the length of flood affected area plus 300m u/s and 300m d/s.
7.3	Plan and profile	H: 1/500 V:1/100
7.4	Cross-section	H: 1/50 V:1/25 Cross sections for 300m upstream and downstream from the flood affected area shall be taken at 100m intervals. The cross sections and long sections of the flood erosion affected area shall be taken at 50m intervals. Cross section lines should be extended beyond each bank line by at least 50m.
8	Special Structures/ Drainage structures	
8.1	Site plan	1:500 scale of surveyed area and contour interval of 0.3m
8.2	Longitudinal profile	H: 1/500 and V:1/100 Limit of survey should be 175m u/s and 175m d/s from the main canal structure-center line and 175m d/s of the secondary canal offtake, or as decided by the Supervisor
8.3	Plan and profile	H: 1/500 and V:1/100
8.4	Cross-section	H: 1/50 V:1/25 Limit of survey should be 25 m at 5 m intervals from the structure center line followed by another 150 m at 50 m intervals completing a survey length of 175m separately in both the upstream and downstream directions from the structure as applicable, or decided by the Supervisor. Cross section lines should be extended beyond each bank line by at least 25 m.
9	Elevation error	Must be less than $(5 \text{ mm} \times \sqrt{k})$, where k is the length of the survey loop in km
10	Digital output	Export to up-to-date AutoCAD software

E. Benchmarks

The survey shall be based on a permanent Primary Bench Mark (BM). At each site the permanent Primary BM will be constructed, as shown in the figure below, in a safe location. All permanent BMs shall be clearly marked and photographed so that they can be found in the future. The full description of each BM shall be included in the survey report.

The elevation of the Primary BM shall be determined by surveying to a national survey monument, if available in the vicinity. If not, then the elevation shall be determined using a properly calibrated GPS base station and the details written up in the survey report. The elevations of all other temporary and secondary benchmarks shall be based on the Primary BM.

The BM survey shall be double levelled, closed and checked against errors as specified $\pm 5\text{mm}$ for existing structures, and the double tertiary leveling should be carried out with an accuracy of $\pm 12\sqrt{k}\text{ mm}$, where 'k' is the length of route traversed in km. Closing errors in the BM survey loop should be distributed between the secondary benchmarks as follows.

$E_i = E_c * L_i / L$, where:

E_c = Closure error (mm).

E_i = Adjustment to level of Station i (Temporary or Secondary BM).

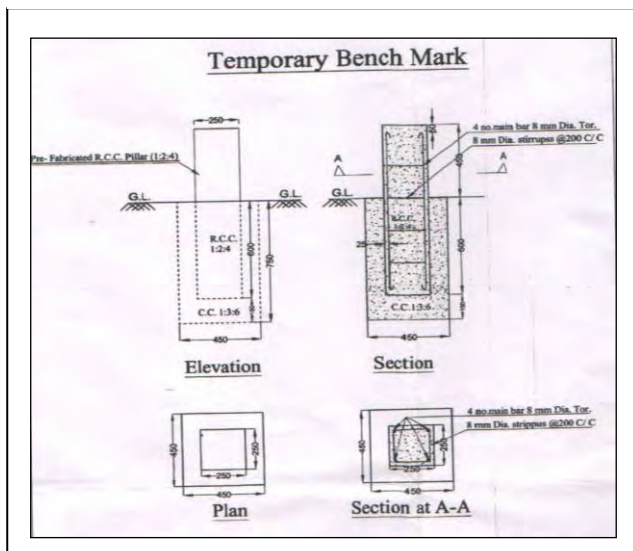
L = Total length of traverse loop from and to Primary BM.

L_i = Length of traverse from Primary BM to Station i (Temporary or Secondary BM).

This method accounts for the propagation of error with distance.

The permanent BMs should be constructed and installed in the form shown in the drawing below:

Figure 17: Details of Primary Benchmark



F. Equipment for Surveys and Drawings

A list of survey equipment with date and model name shall be submitted. The survey contractor shall own at least 4 Electronic Total Stations (ETS) and should have a GPS base Station to take the N&E coordinates of the rivers, canals and structures.

All survey digital output will be exported to up-to-date recognized AutoCAD software for plotting the topographic data with all details of the site and cross sections.

Other than the above stated equipment, the survey contractor should have the minimum following equipment to carry out the field survey work.

- Auto Level and Staff
- Magnetic Compass
- Measuring tape

G. Survey Methodology and Work Plan

The survey contractor shall submit a work plan within one week's period after mobilization to complete all works within three weeks including preparation of drawings. There should be minimum one team in each sub-project to carry out the survey works.

The contractor will first survey 1 structure chosen by P-ARBP to show the survey methodology and the quality of the drawings.

Once the methodology and the quality of drawings are finalized and approved by the supervisor, the contractor will finalize his work plan if necessary. A weekly debriefing will be organised by the contractor with the supervisor. The survey data and drawings shall be submitted to the supervisor weekly.

The contractor should carry out the survey works adopting control surveying approach as mentioned below in order to achieve higher accuracy in survey results.

1. Horizontal Control

The survey shall be conducted by using the combination of double global positioning system (DGPS) and quality Electronic Total Stations (ETS).

To carry out the DGPS survey, two set of GPS instruments shall be required. One GPS instrument will be kept on Base stations in the area and these stations will be established with greater precision taking long term observations of satellite signals. The long-term observations are taken so as to get the stabilised reading from the constellation of US satellites which are continuously moving around the earth. Base Stations will be established on existing permanent structures, as far as possible, so that these can be used during construction and post-construction activities. The other GPS unit will be moved in the area and kept on existing BMs so as to determine their exact geographic location (Latitude and Longitude). The elevation relative to first primary BM at intake point is taken arbitrary as 100m. These coordinates will also be computed in Universal Transverse Mercator (UTM) system, as this system will be required for topographic mapping of the area. The details of BMs will be shown on index maps and be given in the Inception Report, along with the detailed scheduling of activities and manpower deployment, etc.

In order to have a proper network of control points in the area, necessary permanent bench marks at each structure site will be established in river sites and along the canal using Electronic Total Station (ETS) and DGPS survey. These BMs would be required to carry out traversing work. If there are locations where GPS satellite signals are weak, such as forested areas with lots of tree cover or buildings, ETS will be used to establish the BMs. The advantage of ETS is that it can take long sights provided there is visibility between ETS and the reflecting prism. However, the main advantage of DGPS survey is that it is faster compared with Electronic Total Station survey and does not require any Prism.

The ETS shall have an angle measuring accuracy of at least 6 seconds of arc, and a distance measuring accuracy of at least 2mm+3ppm. Each ETS used on the survey shall have been calibrated by an authorized workshop. All field measurements are to be directly stored in data-loggers attached to field instruments, and downloaded remotely or directly to computer for processing. Hand recording and transcription of field data is not appropriate for this project given the time-frame available and will not be permitted.

2. Vertical Control

High precision levelling is carried out to provide the main vertical controls and for the determination of the shape and figure of the ground. Secondary and double tertiary levelling will be used for establishing the elevations of the controlling bench marks in the sub-project area for all subsequent levelling. Tertiary levelling will be used for providing a dense network of vertical control points in the sub-project area. The double tertiary leveling will be carried out with an accuracy of $\pm 12\sqrt{k}$ mm (where 'k' is the length of route traversed in km). Auto Levels will be used for leveling work.

The Permanent Bench Mark established at each site shall be used as reference datum for all vertical control. Automatic or Digital levelling equipment with >28X magnification in excellent condition, along with compatible levelling staves shall be used. The levelling staff shall be held at quality steel change plates at change points. The levelling staff bubble shall be used to keep the staff upright during levelling.

3. Survey Accuracy

In general survey accuracies are to be fit for purpose. In the case of control points, traverse work and benchmarks, this will be taken as better than 1:500 in plan and 15 mm per kilometre vertically. All angles are to be measured to the nearest 1 second of arc and all distances and levels to the nearest millimetre.

4. Longitudinal and Cross section Survey

Detailed topographic survey shall be done using Electronic Total Station. Topographic survey is required to understand the topography of the ground, study the various features present and assess the land required for redesigning the canal system. The elevation contours will be used to generate a Digital Elevation Model (DEM) of the area. Slope will be computed from the DEM which is a very important parameter in the canal system. Land boundaries will be superimposed on the DEM so as to study the exact area involved. DEM will also be used to create longitudinal and cross-sectional profiles of the ground.

Necessary spot levels for X-sections will be taken for river, main and branch canals using Auto Levels. The salient points, upstream and downstream of the structures, will be mapped to generate

a complete topographic map of the structure. Digital Elevation Model (DEM) of corridor area, longitudinal -sections and cross sections of canals and escape channels along with the details of all existing structures will be generated using AutoCAD or Survey software. A report will be prepared to show all the details and their drawings.

The cross section data, in digital form, shall be converted into Excel spread sheets as per the approved format. Both hard and soft copies of the cross sections shall be submitted progressively to the supervisor.

Necessary photographs shall be taken to show upstream, downstream and side views of the river, main and branch canals, drains at structure sites and protection works.

H. Experience of Survey Contractor

The Contractor's company profile with organogram shall be submitted. Previous experience of the Contractor shall be submitted in the proposal with photos and certificates from clients.

A list of personnel including engineers, surveyors and AutoCAD specialists, with CVs, shall be submitted with the proposal.

I. Tender Cost

The list of structures to be surveyed is provided separately.

The Survey Contractor shall quote rates based on structures. The cost will include BM construction and fixation, topographic survey, long section and cross section survey.

The costing shall include a layout plan in AutoCAD showing existing structures, rivers, canals, homesteads, etc. Long section and cross section of each site shall be included for each structure.

J. Default

In case of default by the Survey Contractor such as wrong survey data and drawings, the Contractor shall re-do the works without any additional cost to P-ARBP.

K. Deliverables

1. General

The main deliverables shall include survey drawings in hardcopy and soft copy format and ASCII text files in soft copy only of features used to derive the DTM. In addition, the Contractor shall provide a report giving the relative closure errors between his survey and the existing survey benchmarks. The report shall incorporate station descriptions and corresponding values for all benchmarks and control points used or established.

The Contractor shall provide one draft copy of all documents and drawings on paper, clearly marked "Draft" for comment and approval. Upon receipt of comments, the Contractor shall make

all necessary corrections and amendments and shall produce five final sets of reports on paper and three final sets of drawings on drawing film, clearly marked "FINAL". In addition he shall provide five copies of the drawings and reports on CD.

2. Drawings (Plan and Sections)

Survey work shall be presented on drawings in Auto CAD format;

- Drawings shall be prepared at the various scales specified in Section 4, including a map location legend and scale bar;
- Drawings shall be on A1 sheets, with a 20 mm border on all sides. The title block shall be in the bottom right hand corner of the page and the title block and area above it shall be 100 mm wide. No part of the model-space drawing shall extend into the title block or the margin above it. All notes, scale bars and legends shall be located in the margin above the title block;
- All survey data shall be presented in model space (within Auto CAD) and all other non-special data and constructions (title block, legend, frame etc) shall be located in paper space;
- Each drawing shall include a grid with clearly referenced co-ordinates along the drawing border;
- Each drawing shall show the location of benchmarks and control points used during the survey. Each shall be fully referenced and its details included in the close-out report;
- The Contractor shall ensure that sufficient approved control points are located within the areas surveyed, to enable a third party to re-establish the survey at some later date;
- In the case of a river weir/dam and wash, it is necessary to sketch river/wash direction and river/wash channels (there may be a number of river/wash channels in the terrain). River/ Wash damages to agricultural land and valuable lands shall also be shown in the sketch. Survey sections should cover full length, including the agricultural land and other valuable lands.
- The survey team shall take at least 5 photos of each site (u/s river/canal, d/s river/canal, structure site (3 photos from different directions). For river/wash photos, maybe more will be required. The survey team should refer to the details about photos to be taken as stated in the Scope of Works.
- The Traverse and BM data and Summaries, and Description Sheets shall be in soft and hard form;
- Cross sections in digital ASCII format shall be in soft and hard form;
- A survey report containing the following items shall be prepared and delivered in digital AutoCAD file plus PDF-format in CD and on paper:
 - Method statement and equipment used for the field survey,
 - Method statement of the digital map production,
 - Results and deliverables.
- Two copies of Inception report with workplan in hard and soft copy within a week of mobilisation.
- Two copies of Draft report within the 3rd week in hard and soft copy.
- Final report within the 4th week after incorporating comments from supervisor in five hard copies and five soft copies.

L. Payment Plan

The contract will be a lumpsum contract with payment made as follows:

- 20% upon approval of the inception report with workplan
- 30% upon delivery of the draft survey report (including all mentioned deliverables)
- 50% on approval of the final survey report incorporating any comments

Annex 9 – Bills of Quantities Methodology

A. General

The Bill of Quantities is the document containing an itemized breakdown of the works to be carried out in a unit price contract, indicating a quantity for each item and the corresponding unit price. The quantities set out in the Bill of quantities are estimated quantities.

The amounts due are determined through the measurement of the actual quantities of the works executed and by applying the unit rates to the quantities actually executed for the respective items. The BoQs consider contingencies that amount to 15% of the total value of the BoQ. The lump sum items are summed up as 16% of the total value of the BoQ.

B. Prices and Detail in Bill of Quantities

- The prices inserted in the Bill of Quantities are to be the full inclusive values of the works described under the items, including all costs and expenses which may be required in and for the construction of the works described, together with any temporary works and installations which may be necessary and all general risks, liabilities and obligations set forth or implied in the documents on which the tender is based. It will be assumed that establishment charges, profit and allowances for all obligations are spread evenly over all the unit rates.
- Unless where the technical specifications or the Bill of Quantities and the Price Schedule specifically and expressly state otherwise, only permanent works are to be measured.
- No allowances are made for loss of materials or volume thereof during transport or compaction.
- The prices covered in the Bill of Quantities do not include the taxes and fiscal duties, for which the Contractor will be responsible as per the relevant section of Technical Specification and Contract Document.
- The units of measurement used in the Bill of Quantities are those of the International System of Units (SI). No other units are used for measurements, pricing, detail drawings etc. (Any units not mentioned in the technical documentation must also be expressed in terms of the SI.).

The general BoQ is shown in the following table. The numbers of the technical specification clauses refer to the VOL. 3, contract document.

Table 27: General BOQ Table

S.N	Technical Specification Clause No.	Description of Works	Unit	Quantity	Unit Rate	Amount (USD)
1		General Items				
1.1	1.11 and 1.20 to 1.25	Mobilisation	L.s.			0.00
1.2	1.11	Demobilisation	L.s.			0.00
1.3.1	1.6, 5.17, 5.21	Testing and analysis of earth and protection of works	L.s.			0.00
1.3.2	1.3, 3.2, 3.3, 3.4 and 3.24	Testing and analysis of materials and concrete	L.s.			0.00

1.4	1.4, 1.6, 1.11, 1.15,1.12	As-built drawings and commissioning	L.s.			0.00
		Sub-total of General Items				0.00
2		Detailed Design				
2.1	1.4, 1.8, 1.9, 1.12 and 10.	Surveys	L.s.			0.00
2.2	1.4, 1.5, 1.6, 1.8, 1.12,1.13 and 1.15	Detailed design, preparation of BOQ and construction drawings	L.s.			0.00
		Sub-total of Detailed Design				0.00
3		Services				
3.1	1.16 and 1.17	Improvement and maintenance of access road to the construction sites	L.s.			0.00
3.2	1.13, 1.22 to 1.25 and 1.32	Maintenance of water supply at all construction sites until the completion of works	L.s.			0.00
		Sub-total of Services				0.00
4		Clearing and Grubbing				
4.1	2.6	Stripping	m ²			0.00
		Sub-total of Clearing and Grubbing				0.00
5		Demolition				
5.1	2.6	Demolition	L.s.			0.00
		Sub-total of Demolition				0.00
6		Earthworks				
6.1	1.13 and 1.15	River diversion and maintenance until completion of the works	L.s.			0.00
6.2	1.14	Dewatering construction pits	L.s.			0.00
6.3.4	5.1 to 5.5	Excavation for structures in soil or gravel	m ³			0.00
6.4.1	5.6 to 5.9 and 5.16	Backfilling for structures	m ³			0.00
6.4.2	5.10 to 5.12 and 5.20 to 5.23	Embankments	m ³			0.00
6.4.3	5.8	Compacted gravel	m ³			0.00
		Sub-total of Earthworks				0.00
7		Concrete Works				
7.1.2	3.12 to 3.29	Reinforced concrete Class-B	m ³			0.00
7.1.5	3.12 to 3.29	Mass concrete Class-C	m ³			0.00
7.1.6	3.12 to 3.29	Blinding concrete Class-D	m ³			0.00
7.2	3.7 to 3.10	Reinforcement steel	kg			0.00
7.3	3.11	Formwork and Shuttering	m ²			0.00
7.4	3.2, 3.20, 3.27	Contraction/Expansion joints	m			0.00

7.5	4.1; 8.9	Water stop	m			0.00
		Sub-total of Concrete Works				0.00
8		Masonry Works				
8.1	8.1 to 8.10	Stone masonry 1:4 cement mortar	m ³			0.00
8.4	8.7, 8.12	Pointing with 1:2 cement mortar	m ²			0.00
8.6	8.9	Weep holes	m			0.00
						0.00
9		Protection Works				
9.1.2	7.1 to 7.3	Compacted graded filter	m ³			0.00
9.2.2	7.1. 7.10	Gabion box	m ³			0.00
9.3.1	7.4	Non woven filter cloth	m ²			0.00
9.6	7.6	Concrete block (0.3m,0.5m,1m etc.) protection	m ³			0.00
9.7	7.11	Riprap	m ³			0.00
9.8		Stone dumping	m ³			0.00
		Sub-total of Protection Works				0.00
10		Water control equipment				
10.1.1	6	Vertical lift gates- size including frame, spindle and hoist	kg			0.00
		Sub-total of Steel Works				0.00
11		Miscellaneous Works				
11.1	4.12, 6.4, 6.21	Gauges	m			0.00
11.2	6.1	Hardwood stop logs	m ³			0.00
11.3	1.37	Sign boards (metal 120 x 80 cm)	pcs			0.00
11.4	1.37	Plaque (marble stone 60 x 50 cm)	pcs			0.00
		Sub-total of Miscellaneous Works				0.00
TOTAL						0.00
Contingencies @15%						0.00
GRAND TOTAL						0.00