ROOTS OF PEACE

Paktya Watershed Study

Dawlatzi Watershed Report and Project Proposal

11/7/2011

ADT Paktya; CERP Project # 20110423-083025; Initial Requisition # CERPRCE1K733ZZ

Paktya Watershed Study

Funded by US Department of Defense,
Agriculture Development Team (ADT) Paktya
Implemented by Roots of Peace

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Brief

The US Army ADT based in FOB Gardez, working in conjunction with USDA, would like to focus their development activities in Paktya Province on a watershed-based approach. This more holistic approach is strongly supported by Roots of Peace, who is currently implementing development programs in forestry, orchard and vineyard development, and gender based agriculture programs in Paktya Province. This strategic approach will provide a framework for development activities in the watershed and will ultimately build to a more sustainable environment for agriculture and improved living conditions. The implementation of this approach will leverage information gained from the USACE Southeast Afghanistan Water resources Assessment, US Army, USDA, ROP and GPFA experience in this province.

CERP Project #	2011 0423-083025
Contract Recipient	Roots of Peace
Period of Contract	July 25 – December 22, 2011
Agreement Officer	LTC James B. Arnold
ROP Chief of Party	Ferenc “Francisco” Sandor, Francisco@rootsofpeace.org
ROP Executive Director	Gary Kuhn, gary@rootsofpeace.org
ROP Founder & CEO	Heidi Kuhn, heidi@rootsofpeace.org

Table of Contents

1 Acronyms

ADT	US Military Agriculture Development Team
ANA	Afghan National Army
ANP	Afghan National Police
COIN	Counter-insurgency Strategy
COP	Chief of Party
CDC	Community Development Council
DDA	District Development Assemblies
DAIL	Directorate of Agriculture, Irrigation and Livestock
DST	District Stabilization Teams
GIRoA	Government of the Islamic Republic of Afghanistan
IED	Improvised Explosive Device
IPM	Integrated Pest Management
ISAF	International Security Assistance Forces
LOE	Level of Effort
MAIL	Ministry of Agriculture, Irrigation and Livestock
M&E	Monitoring and Evaluation
MOE	Ministry of Economics
MOU	Memorandum of Understanding
MRRD	Ministry of Rural Rehabilitation and Development
P2K	The provinces of Paktika, Paktya and Khost
PRT	Provincial Reconstruction Team
ROP	Roots of Peace

2 Background

Afghanistan's climate is unique. There are a limited number of regions in the world where you can grow perennial crops with such positive results in yields, flavor and plant health. The region is an epicenter for origin for many fruits and nuts. You can find native stands of pistachio, walnut and pine nuts in the mountains. There are 62 varieties of grapes, 30 varieties of pomegranate and dozens of almond varieties. Afghanistan is not blessed with many riches in resources, but perennial crops and the hard working Afghan farmers are a superior resource that can compete internationally and win. Afghanistan's agriculture is the employment engine of the country. Some 84% of the country's population is either directly involved in or related to farming. There are around 275,000 grape farmers; but it is almonds that are Afghanistan's top horticultural crop.

In Afghanistan the main source for income comes from the agriculture and livestock sector. Therefore, the use of the natural water sources plays a primary role in the household economy. This has an important effect on the country water source development. The most common irrigation scheme in the country consists of a diversion structure in a watercourse with canals and laterals leading water to field's downslope.

Diversion structures are typically made from rock, soil and wooden pilings and placed nearly parallel to the current flow offering minimum resistance to the main channel flow. Seasonal floods often wash them away. Cross-stream diversion structures are built after spring flood crests have passed and must be completely reconstructed annually. Canals are hand-dug and exhibit various cross-sections. The high gradients often cause scouring and bank erosion. Ditches are following a serpentine path through the terrain from the river to cropland and sections that are crossing gullies and rills are swept away during the rainy season.

ROP wholeheartedly supports and will continue to implement the U.S. Agriculture Assistance Strategy for Afghanistan to mobilize support for the Afghan government and the Ministry of Agriculture, Irrigation, and Livestock (MAIL) and the private sector to revitalize Afghanistan's agricultural economy and increase income and jobs. The goal of our project is to focus the development activities in Paktya Province on a watershed and natural resources based approach. The achievement of this goal will result in the creation of short-term jobs as the rural population respond to the short-term stimulus provided the project and the creation of long-term jobs in response to the long-term demand from the established and expanding natural resource management enterprises impacted by the project.
Collaboration, Capacity Building and Support Mobilization for MAIL

In past and current projects, ROP has followed a procedure designed to assure that we have MAIL support for our activities and, to the extent possible within our contractual obligations to the project funding agency, that we follow MAIL advice and directions for project implementation. This procedure includes the development of a Memorandum of Understanding guiding the implementation of the project, the development and involvement of a Project Steering Committee. Project implementation in the field is begun through a letter of introduction from MAIL to the Directors of MAIL (DAIL) in the

project areas, followed by discussions between the DAIL and ROP on methods and means for cooperation. ROP has generally made arrangements with the DAIL to provide on-the-job training to DAIL extension agents by providing them with per diem support that allows them to serve as full-time members of our extension staff. This activity and our standard procedure of having DAIL officials present our work to the local population (for example, in public meetings relating to the project) support the USAID strategy of mobilizing Afghan support for the MAIL and the GIRoA.

Program scope

The program will consist of two major components, (1) upgrade and/or establish physical measurements in order to protect water-ways and land, (2) develop agroforestry in order to protect the soil and decrease erosion.

3 Introduction

The climate of Afghanistan is arid or semiarid continental climate. The daily temperature range is wide. Precipitation usually occurs in the winter and spring seasons. Because of its continental climate and seasonal clear skies, Afghanistan receives a large share of solar radiation. This fact has important implication for its hydrological system. Most of the precipitation accumulate as snow caps in the highland areas and is released during the spring and summer. Additional precipitation occurs during the monsoon period in summer, but as the amount of these rainfalls are quite unpredictable and variable in amounts. Snowmelt and monsoon precipitation are the two main factors causing seasonal fluctuations simultaneously throughout the province.

The natural water resource development of the country is typically characterized by its water balance. A simplified water balance formula is described below:

$W_P+W_I+W_{CW}+W_{RI} = W_E+W_{TR}+W_D+W_{RO}\pm\Delta W$;
Where:

W_P = Volume of precipitation
W_I = Volume of irrigation water
W_{CW} = Volume of capillary water lifted up in the soil
W_{RI} = Volume of run in water received from neighboring areas
W_E = Volume of evaporation
W_{TR} = Volume of transpiration
W_D = Volume of drainage water
W_{RO} = Volume of run off
ΔW = Fluctuation in the volume of the area's water resource

In Afghanistan, according to the results of the water balance, there are two classes of water balances, which are dominant throughout the country:

- Run off type water balance, this characterized by huge amount of water loss through run off accompanied with high soil erosion activities.
- Evaporation type water balance. In this case the water is located near to the surface and the water movement in the soil dominantly point to upward.

In Afghanistan the main source for income is from the agriculture and livestock sector. Therefore, the use of the natural water sources plays a primary role in the household economy. The most common irrigation scheme in the country consists of a diversion structure in a watercourse with canals and laterals leading water to field's downslope. When the water reaches the fields, almost always the practice is basin irrigation. Distribution is gravity powered from the gradients built into the ditches. The overly steep ditches result in substantial amounts of potentially irrigable land being left above the ditch and lost to cultivation.

Diversion structures are typically made from rock, soil and wooden pilings and placed nearly parallel to the current flow offering minimum resistance to the main channel flow. Seasonal floods often wash them away. Cross-stream diversion structures are built after spring flood crests have passed and must

be completely reconstructed annually. Canals are hand-dug and exhibit various cross-sections. The high gradients are often causes scouring and bank erosion. Ditches are following a serpentine path through the terrain from the river to cropland, and sections, which are crossing gullies and rills, are swept away during the rainy season.

Seepage losses are a significant factor reducing the quantity of available water. The seepage losses of the canals are around 25% and approximately 15% for laterals. Evaporation losses are also high, particularly in the longer canals and from impounded bodies of water. These losses are approximately 2,400-3,000mm per year. The reasons for this high evaporation rate may be found in the high solar energy inputs mentioned earlier, the extremely low prevailing humidity and the strong, steady winds which blow across large sections of the province, (locally named the “120 days wind”). The problem of high evaporation rates and the perhaps more serious problem of siltation are serious deterrents to the construction of water storage facilities in many parts of the country. High stream gradients and the absence of vegetative cover on hilly watersheds add large silt loads to the runoff that rapidly fill impoundment structures.

The focus point of this study is focused on three watersheds in Paktya Province: Dawlatzi, Ghunday and Dam watershed. The hydrologic system is comprised of 9 (earlier 10) river systems flowing into five basins. From the nine river systems only the Kabul river system ends into the sea. The rest are entirely inland systems. Many rivers in the country debauch into desert wastes or swampy areas or dry up entirely during the summer months. Their typical characteristics are the steep gradients except the lower reaches, and transport of large silt loads during heavy runoff from rain and snowmelt. The five main river basins in Afghanistan are:

- Northern River Basin
- North Eastern River Basin
- Eastern River Basin (Kabul)
- Helmand River Basin
- Western River Basin

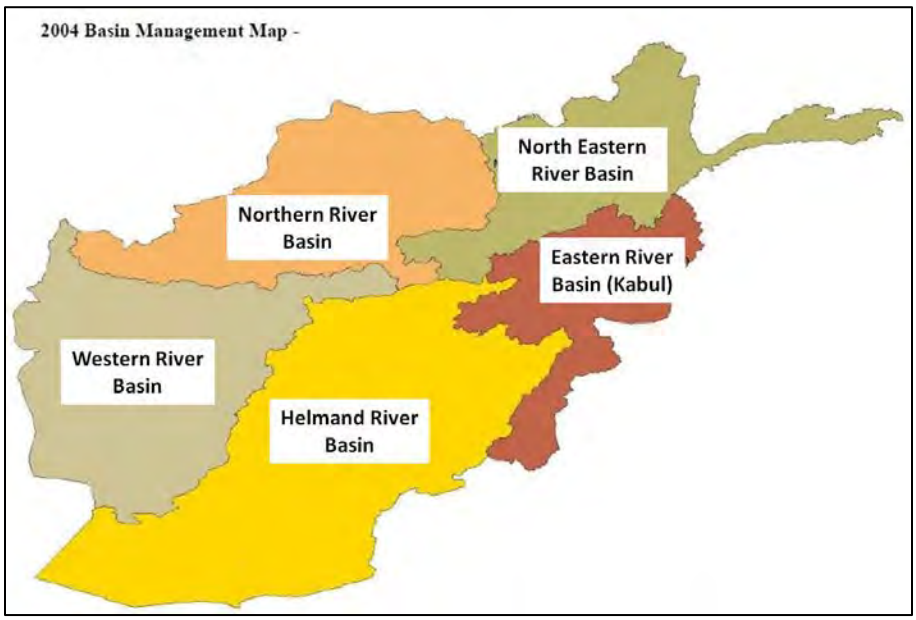


Figure 1: River basin system in Afghanistan

Each of these basins is divided into sub-basins or main watershed. Paktya Province belongs to the Upper Ghazni Sub-basin (Sardih wa Ghazni Rod) that is part of the Helmand River Basin.

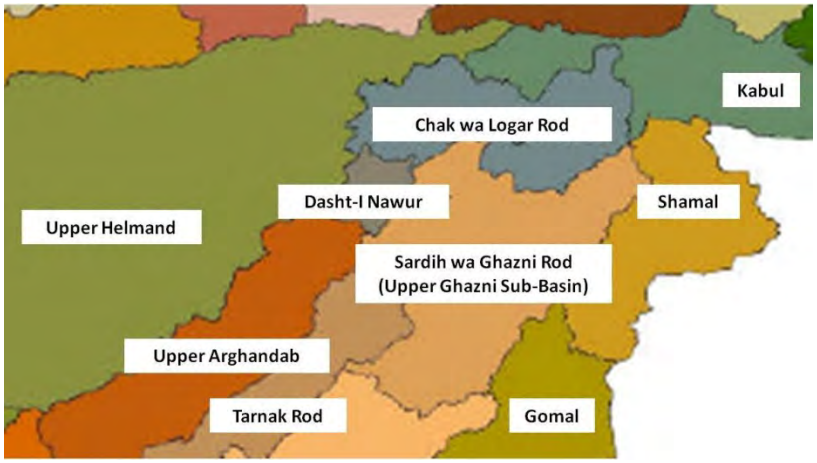


Figure 2: The location of the Upper Ghazni Sub-basin

The Helmand River Basin contains 15 sub-basins or watersheds and its extent is around 262,341 Km^2. It contributes 40.62% of the country's hydrologic system. From this amount the Upper Ghazni Sub-basin occupies 17,252 Km^2, which is 2.67% of the Helmand River Basin.

River Basin	Watershed	Main River Name	Area (Ha)	Area (km^2)	%
Helmand	Upper Helmand	Helmand	4,688,198	46,882	7.26
Helmand	Farah Rod	Farah Rod	3,280,911	32,809	5.08
Helmand	Khash Rod	Khash Rod	2,183,992	21,840	3.38
Helmand	Sistan-Helmand	Helmand	2,157,453	21,575	3.34
Helmand	Adraskan Rod	Adraskan Rod	2,126,571	21,266	3.29
Helmand	Arghistan Rod	Arghistan	2,021,861	20,219	3.13
Helmand	**Sardih wa Ghazni Rod**	**Sardih wa Ghazni Rod**	**1,725,200**	**17,252**	**2.67**
Helmand	Middle Helmand	Musa Qula Rod	1,644,127	16,441	2.55
Helmand	Lower Helmand	Helmand	1,414,679	14,147	2.19
Helmand	Upper Arghandab	Arghandab	1,316,972	13,170	2.04
Helmand	Khuspa Rod	Khuspa Rod	942,802	9,428	1.46
Helmand	Chagay	Chagay	931,885	9,319	1.44
Helmand	Tarnak Rod	Tarnak Rod	907,639	9,076	1.41
Helmand	Lower Arghandab	Arghandab	730,017	7,300	1.13
Helmand	Dasht-i Nawur	Nawur Lake	161,830	1,618	0.25
		Helmand Total	**26,234,136**	**262,341**	**40.62**

Table 1: Sub-basin system of Helmand River Basin

Figure 3: Hydrological map of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin drains water from Paktya Province, Gardez River and several districts of Ghazni province and Ghazni Rod River. It is divided into two watersheds at the Sardeh Dam. The Sardeh River drains water from numerous torrents originating from the extension of the Spin Ghar Mountains in the district of Sayid Karam in Paktya and flows through Gardez and Zurmat districts before filling the Band-i Sardeh dam. The Ghazni Rod and Sardeh Rod meet in Giro district and flows into the Ab-i Istada salty lake. Another small river, the Nahara Rod has its sources in Omna and Zarghun Shahr districts of Ghazni (in spring) the water drains into the Lora Rod River (Arghistan watershed) that contributes to the Helmand River, which is the reason because the Upper Ghazni Sub-basin is part of the Helmand River Basin. The Gardez River (referred to in some publications as the Jilga River) at Mechalghu gauge has an annual discharge of 0.66 m^3/s with a flow of 0.4 m^3/s in September. The stream gage at Gardez city has a flow of 0.12 m^3/s during the same time period. The Gardez city gage has a mean annual discharge of 1.25 m^3/s with an annual water budget of 39.6 M-m^3.

River Basin	Watershed	Area (km^2)	Settlements (No.)	%	Settled Population	%	Population Density (km^2)
Helmand	Upper Ghazni Sub-basin	17,252	1,922	6.15	1,868,342	9.03	108.3

Year: 2004

River Basin	Watershed	Area (km^2)	Snow Cover (km^2)	%	Water Bodies (km^2)	%	Marsh-lands (km^2)	%
Helmand	Upper Ghazni Sub-basin	17,252	0.00	0.00	146.2	5.89	30.0	0.72

River Basin	Watershed	Irrigated land (km^2)	%	Intermittently Cultivated (km^2)	%	Rainfed Land (km^2)	%	Rangeland (km^2)	%	Forest Cover (km^2)	%
Helmand	Upper Ghazni Sub-basin	1,065	6.83	1,196	7.25	337	0.75	11,791	4.04	35	0.27

Table 2: Principal data of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin is characterized by rangeland and bare soil. Irrigated land represents 6.83% of the watershed surface and 7.25% is intermittently cultivated. The sub-basin contains large areas of shrub/grassland interrupted by large areas of barren rock surrounded and areas of extensive irrigated agriculture.

LANDCOVER	Area (Ha)	Area (km^2)	% Watershed
Rangeland (grassland/forbs/low shrubs)	1,179,059	11,790.6	68.34
Rock Outcrop / Bare Soil	263,893	2,638.9	15.30
Irrigated			
Irrigated: Intermittently Cultivated	119,575	1,195.8	6.93
Irrigated: Intensively Cultivated (1 Crop/Year)	105,835	1,058.3	6.13
Irrigated: Intensively Cultivated (2 Crops/year)	665	6.7	0.04
Rain-fed Crops			
Rain-fed Crops (flat lying areas)	31,299	313.0	1.81
Rain-fed Crops (sloping areas)	2,362	23.6	0.14
Water Bodies	14,619	146.2	0.85
Marshland Permanently inundated	2,999	30.0	0.17
Natural Forest			
Natural Forest (open cover)	2,510	25.1	0.15
Natural Forest (closed cover)	3	0.0	0.00
Degenerate Forest/High Shrubs	960	9.6	0.06
Fruit Trees	927	9.3	0.05
Settlements	495	5.0	0.03
Total	**1,725,200**	**17,252.0**	**100.00**

Table 3: Land cover data of the Upper Ghazni Sub-basin

Geologically, it is largely unconsolidated sediments ranging from gravel to loess, with some weathered sandstone, siltstone, and some acid intrusive rocks. Slopes are generally low (less than 10%) with hills on either side of the watershed ranging above 30%. The unconsolidated deposits from the Quaternary and Neocene Age can be found in the areas along the river valleys. The consolidated bedrock units are built up from sedimentary rocks and partially from crystalline and igneous rocks during the Paleocene Age.

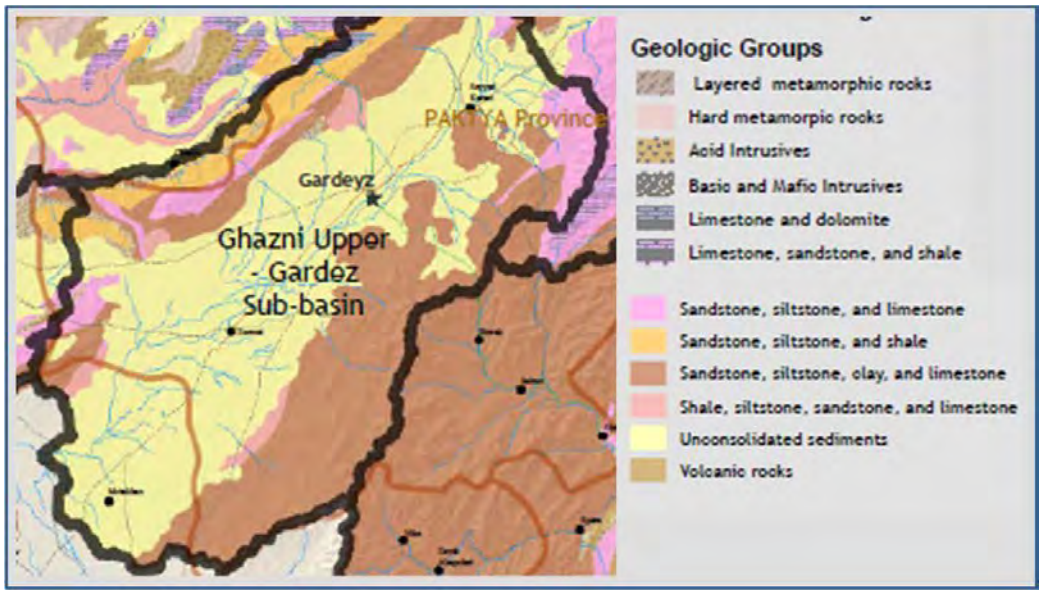


Figure 4: Geological features of the Upper Ghazni Sub-basin

The Upper Ghazni Sub-basin also includes the Gardez Valley. A complex network of canals and diversions along the Gardez River heavily irrigates the Gardez Valley. The irrigated area of approximately 10,500 Ha from groundwater sources create a demand of 80Mm^3/year water annually.

Springs	4,680 Ha
Karezes	5,860 Ha
Shallow wells	70 Ha
Total:	**10,610 Ha**

Table 4: Irrigated areas from groundwater sources in the Upper Ghazni Sub-basin

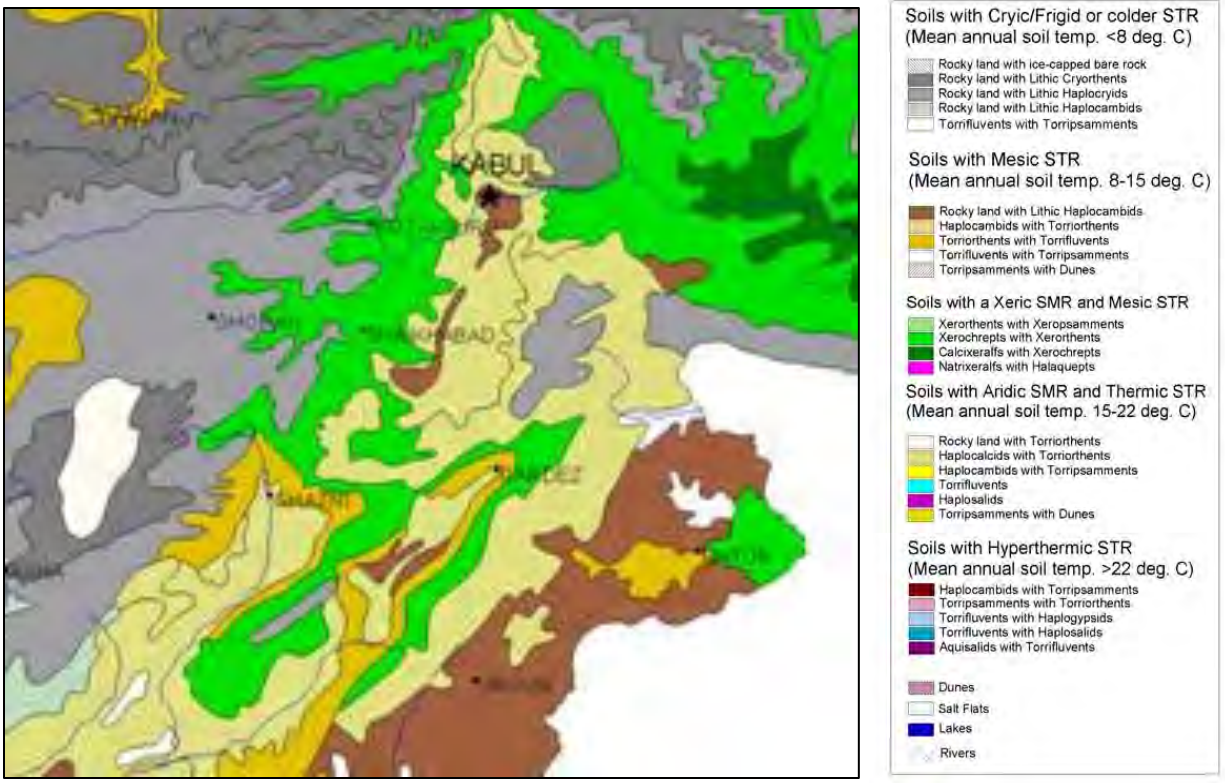
Considering an average annual precipitation range between 300 mm and 400 mm and a recharge rate of 10% for unconsolidated plus 5% for consolidated aquifer, the potential water resource for withdrawals is almost double than the existing demand, around 140Mm^3/year. This recharge capacity represents a major potential for irrigated agriculture development in Paktya Province.

Geologic Unit	Area (km2)	Precipitation	Annual Recharge (Mm^3/year)
Consolidated	15,000	5% of 350mm	260
Unconsolidated	4,000	10% of 350mm	140
Total	**19,000**		**400**

Table 5: Recharge capacity of the Upper Ghazni Sub-basin (Vincent V. UHL, 2003)

However, the average annual precipitation shows a wide range of fluctuation, which can vary between 141.0 mm and 521.0 mm per year. Another three climatic factors also contribute significantly into the potential water loss and/or water deficit. The average wind speed in Paktya Province shows a range between 1.7 and 3.1 m/s. The evapotranspiration varies around 3.35 and 3.78 mm per day. Finally, the radiation rate fluctuates between 15.6 and 18.1 MJ/m^2/day.

Figure 5: Soil characteristics of the Upper Ghazni Sub-basin



4 Dawlatzi Watershed

4.1 Introduction

The Dawlatzi Watershed received its name after the Dawlatzi Village. The village is about 7 km from south to Gardez City, which is the capital of Paktya Province. The village is managed by a council assembly constituted by eight elders, each one of them representing one major sub-village from the area. These sub-villages are the following:

- Halim Kala
- Ghunday
- Laghar
- Habib Khel
- Drai Plarani
- Ali Jan Khel
- Gajan Khel
- Wali Khel

Around 1,850 families live in these sub-villages, but it is a difficult task to establish an exact number because the continuous immigration rate in the area is high. Complete families move back and forth to Pakistan depending upon economic opportunities and the damage caused by frequent water floods.

The location of Dawlatzi village in Gardez district, Paktya Province

More than seventy percent of the population is dedicated to agriculture and livestock production using the plain areas surrounded by high mountains and hills on the south-east part of the region, where most of the annual precipitation is accumulated in the form of snow cups. During spring and summer time the

snow melts and floods over the plain areas. The melted snow mainly follow five principal water washes through the Dawlatzi plain. These are:

- Darbal wash
- Zour wash
- Sargand wash
- Rodak wash
- Lagarou Kanda gully

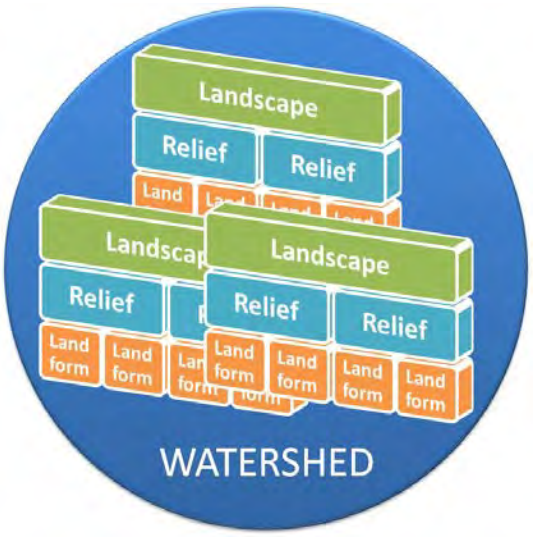
The five main water washes are fed with water from Chekan, Banozu Muntains, Bad Asib, Tura Ghundai and Band Hills. The flood frequently causes damage in the farming areas and in the villages almost every year. However, it is also the main source to recharge the watershed and to provide irrigation water for 67% of the farmland. The remaining 33% farming area is supplied with water by traditional Karezs, springs and deep wells.

This study focuses on three watershed of Paktya Province:

- Dawlatzi watershed
- Ghunday watershed
- Dam watershed

These watersheds had been recommended for rehabilitation by the USACE Southeast Afghanistan Water Resources Assessment in October 2009. The Dawlatzi Watershed is the largest from the three watersheds surveyed by Roots of Peace survey team and it is located in Gardez district, Paktya province. It provides the main water source for most of the agriculture land in the province including partially Zormat district too. This fact can be explained by the topographic conditions of the Province. The largest plain areas, which are suitable for agriculture, are located in the area of Dawlatzi watershed and Zormat district. The rest of the province mainly contains hills and mountains.

The surveying approach used by the team was to identify and divide the watershed into landscapes, reliefs and landforms, such as illustrated in the schematics below:



4.2 Schematics for Survey Approach

Three main categories may be distinguished:

- LANDSCAPE

  First order terrain class, represents the biggest hierarchical unit: The Landscape, or first-order terrain class, is defined as a large area characterized either by a repetition of similar relief-types or an association of dissimilar types. Landscapes are greatly influenced by distribution of the main geological units and tectonics.

- RELIEF

  Second order terrain class, represents the middle hierarchical unit: The Relief, or second-order terrain class, represents the morphology of the Earths' surface as determined by a combination of geological structure (lithology and tectonics), morphogenetic processes and specific morpho-climatic conditions.

- LANDFORM

  Third order terrain class represents the smallest hierarchical unit: The Landform, or third-order terrain class, represents features of the Earth's surface determined more by morphogenetic and climatic processes than geology. They are the smallest landscape unit/s and examples might include the different parts of a slope (summit, shoulder, back slope, foot slope, toe-slope), or erosional/depositional features such as rills, gullies, back swamps and coastal dunes.

4.3 Summary Results of the Survey

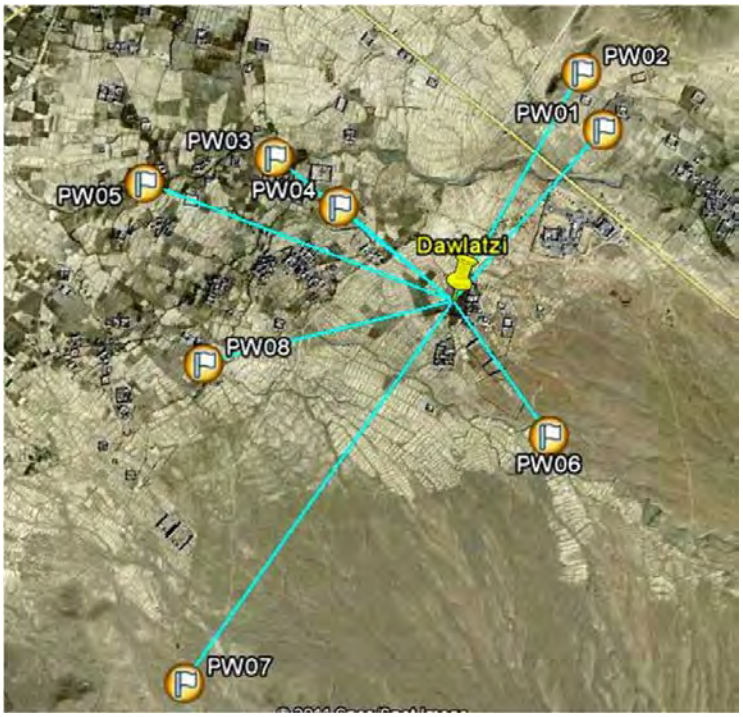
Topography

According to the selection approach for survey the team identified eight landscapes in the Dawlatzi watershed for further survey study:

Code	Location
PW01	From Banozi village to Halim village
PW02	From Quli Urdu Road to Mailan Road
PW03	From Khost Road up to Haabib Khel village
PW04	From Quli Urdu Road to Awal Din village
PW05	From Habib Khel village to Saidan village
PW06	From Petala Khel village to Swat Beg village
PW07	From Chekan Mountains to Derbal Wash
PW08	From Chekan Mountains to Swalan Beg village

Code	Latitude	Longitude
PW01	33.57734	69.25023
PW02	33.57977	69.24913
PW03	33.5762	69.23344
PW04	33.57409	69.23675
PW05	33.57511	69.22678
PW06	33.56433	69.24746
PW07	33.55381	69.22888
PW08	33.5674	69.22982

The GPS coordinates for the identified landscapes of Dawlatzi watershed



Surveyed landscapes of the Dawlatzi watershed

The elevation of the studied areas varies between 2,200m and 2,370m over sea level. The dominant landscape class is Plain, an extensive, generally broad tract of land, flat or gently sloping, unconfined, low-lying with low relief intensity (varying up to 10 m) and gentle slopes (generally <3%). They are located around the mountain/hill bases and primary river valleys.

The second order terrain classes include three categories. The most common is the Planation Surface. This means a flattish plain resulting from erosion. The areas have a gently sloping surface, which incised by rivers, streams and fractures. Five of the twelve studied landscapes contained reliefs with this characteristic. Three reliefs from two landscapes showed characteristics of Dissected Ridge, an elongated, narrow, steep-sided elevation of the earth's surface. The crest and slopes had been cut by water running in channels and they contained a number of slope faces and peaks. Other reliefs from two

landscapes are dominated by Denudational Surface, an almost flat surface on which there is clear evidence of erosional processes through active canals with running water, or through landslides, creep, etc.

During the survey, the team observed a series of different features, which belong to the third-order terrain classes. The watershed characterized by relatively flat alluvial landforms, constructed generally by a river flow regime and subject to flooding. They commonly flank a clearly defined river channel, but also in valleys without channels while others form downstream of channels. These found features belong to the Floodplain third order class. Rill and gully development are common in three major landscape units:

- PW05 - From Habib Khel village to Saidan village area
- PW06 - From Petala Khel village to Swat Beg village area
- PW08 - From Chekan Mountains to Swalan Beg village area

The observed rills, caused by the run-off events, are small ephemeral channels, forming in parallel sets on sloping agricultural land, steep and unprotected surfaces. Their length in some places reached over 60-70m. The rill areas frequently contained gullies as well, a deeper and longer feature than a rill. These steep-sided trench and channels were incised into sediment and soil. They were found also in bare rock areas incised into the bedrock. Two landscapes (From Petala Khel village to Swat Beg village area and from Chekan Mountains to Darbal Wash area) contained landforms of depression. They formed an elliptical shape, as their surfaces are lower than the surroundings, clearly caused by fluvial erosion. They characterized by well-developed drainage network.

All studied landform areas, except some “Plain Valley” were found as “Plateau” or “Wide Plain” Sub-plain type. The sloping angle of the landforms, generally, varied between “Level” (0-2%), “Very Gently Sloping” (2-4%) and “Gently Sloping” (4-8%), mean while the sloping aspect were found as “Flat or almost flat” and “Variable”.

Photo 1: Wide plain of the Dawlatzi watershed

5 Hydrological Conditions

Landscape PW01: The landscape includes the Darbal wash area and recharged with water from Banozi Mountain. During the rain and flood period the erosion and sedimentation are significant and the water flow rate may go over 40-50 m^3 per second. The survey team found some existing structures, already built, in response to control flood. The Shahid intake was established by CARE. Unfortunately it has been almost totally destroyed by floods. There are also two check dams (Kaki) and the Shahid canal.

Photo 2: Darbal wash

Landscape PW02: It receives water from the Banozi Mountain. The water flow rate in the river reaches the 15-20 m^3 per second during early summer time. Sedimentation makes unstable the riverbank. The infrastructures, which were found in this area are:

- Zabet aqueduct
- Sarwar protection wall
- Ghondi intake

Photo 3: PW02 landscape unit

Landscape PW03: This area contains the section where the Darbal wash and Zour wash join each other. The maximum annual water flow rate is around 50-60m^3/sec. There several infrastructure destroyed by the annual flood (Intakes, aqueducts, canal, etc.).

Photo 4: The joint point of the Darbal and Zour wash

Landscape PW04: In this landscape the team found a 90m long Asadullah Karez built by the village people at earlier time. At this time the Karez is not functional, because the flood destroyed it.

Photo 5: One of the wells of the Asadullah karez

Landscape PW05: The Darbal and Zargal wash cross the area up to the join point where the two water wash become one. The heavy annual flood (60-70m^3/sec) destroyed every existing infrastructure (intakes, protection walls, canal, etc.).

Photo 6: The Zargal wash

Landscape PW06: The main water source of the river comes from Chakan Mountain when the runoffs from snow melt flood the area. It is a highly eroded area. During peak time the water flow rate in the river is around 15-20m^3/sec. In this landscape the survey team identified the following existing structures:

- Petal Khel 2 aqueducts
- Quazim Wash culvert
- Haji Mohammad protection wall
- Hassan protection wall

Photo 7: The Quazim wash

Landscape PW07: The area receives water from the Chakan Mountains and Rodak wash, where the flow rate can reach the 15-20m^3/sec. Several improvements had been found in this area:

- Timoor Karez
- Landi Karez
- Bouri Karez
- Khudaidad pool
- Two culverts
- Ahtar protection wall
- Mehraban intake
- Chapoli intake
- Ghani protection wall

Photo 8: The Rodak wash

Landscape PW08: The conditions are similar to the conditions of landscape PW07. The annual flood comes from the Chakan Mountain and has caused damage to the existing check dams. The following infrastructures were observed:

- Pass canal intake
- Lallo canal
- Mohammad Amin check dam
- Gujar aqueduct
- Khalan check dam
- Majid check dam
- Sailani check dam

Photo 9: Flood plain

- Nasar check dam
- Gujar check dam
- Gul karim check dam
- Morad Khan check dam
- Ghani check dam
- Rozi Khan check dam

6 Land Cover

Most of the studied areas have both, consolidated and unconsolidated land areas. The consolidated areas contain around 53% of the total area covered by gravels and boulders and 46% bare rock. The unconsolidated areas are characterized by equal proportion of bare soil, loose sand and stony areas.

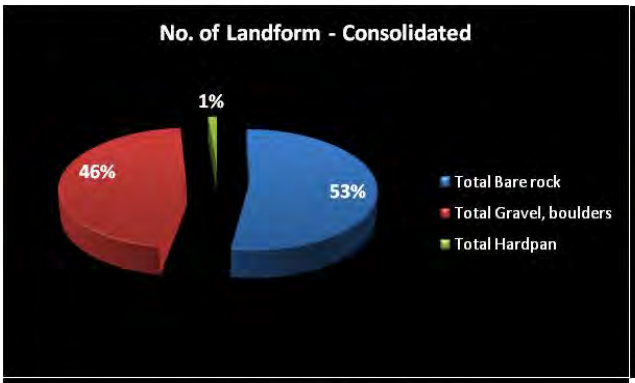
No. of Landform - Consolidated		No. of Landform - Unconsolidated		No. of Landform - Coverage	
Total bare rock	41	Total bare soil	42	Total bare rock	41
Total gravel, boulders	36	Total loose sand	42	Total gravel, boulders	36
Total hardpan	1	Total stony	42	Total hardpan	1
				Total bare soil	42
				Total loose sand	42
				Total stony	42

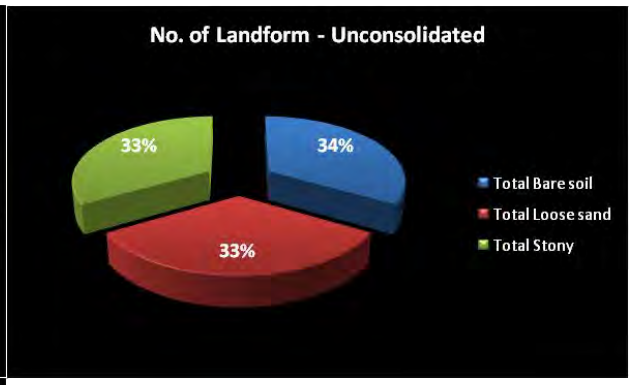
Landform cover in Dawlatzi plain

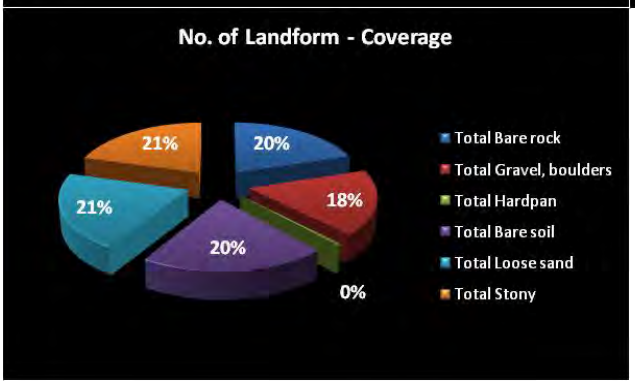
The non-vegetated area of Dawlatzi watershed is around 32% of the total area. Of the vegetated area, agriculture crops and structures cover 33%. The high percentage of non-vegetated area indicates severe erosion problems in the Dawlatzi plain. This is primarily caused by water erosion and followed by additional secondary wind erosion in the bare soil areas.

Number of Landforms							
Cover	Bigger area	Cover	Smaller area	Cover	Smallest area	Cover	Total
Total Agri/Infrastructure	17	Total Agri/Infrastructure	8	Total Agri/Infrastructure	17	Total Agri/Infrastructure	42
Total Aquatic	0	Total Aquatic	0	Total Aquatic	0	Total Aquatic	0
Total Natural	1	Total Natural	1	Total Natural	0	Total Natural	2
Total Non vegetated	15	Total Non vegetated	20	Total Non vegetated	5	Total Non vegetated	40
Total Terrestrial	0	Total Terrestrial	0	Total Terrestrial	0	Total Terrestrial	0
Total Vegetated	9	Total Vegetated	13	Total Vegetated	20	Total Vegetated	42

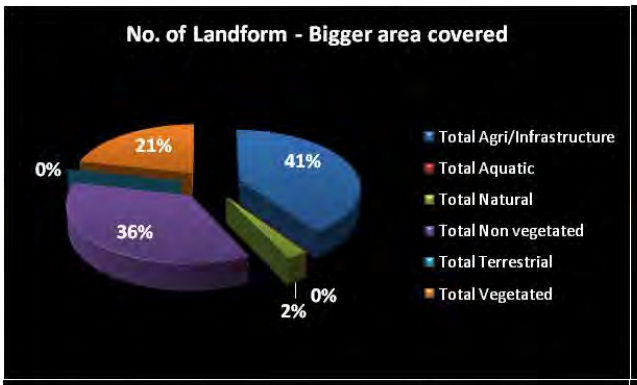
Vegetated areas in Dawlatzi plain

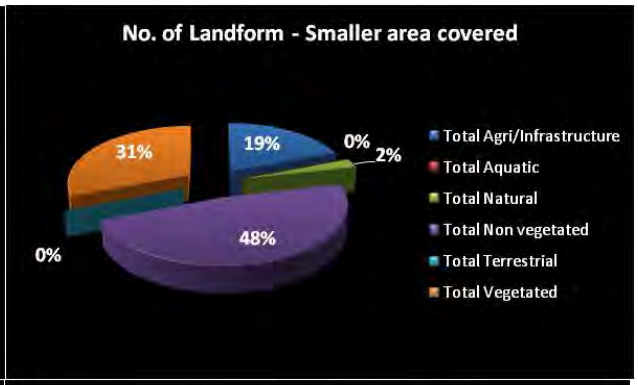


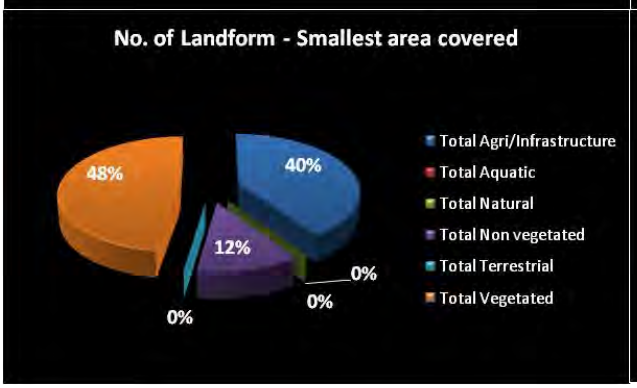


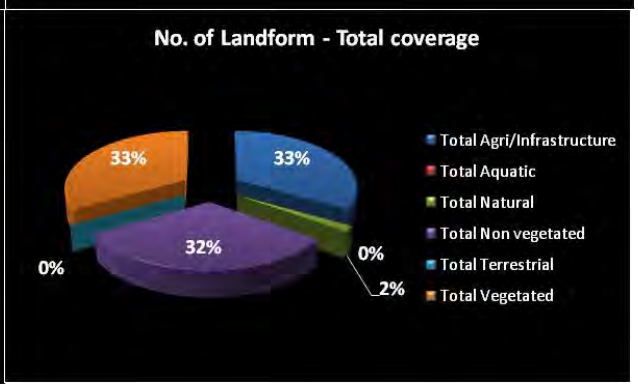


Landform cover in Dawlatzi plain









Vegetated areas in Dawlatzi plain

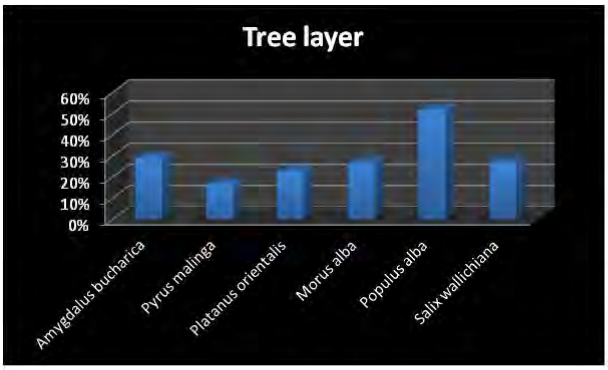
7 Vegetation

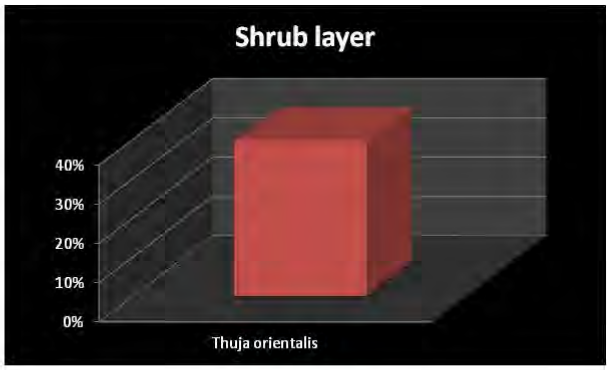
During the survey of the Dawlatzi plain the team classified the existing vegetation into five classes:

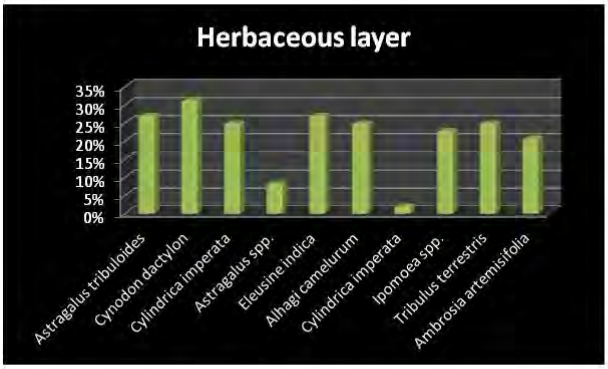
- Tree layer: 6 species
- Shrub layer: 1 species
- Herbaceous layer: 10 species
- Graminoid layer: 4 species
- Forbs layer: 5 species

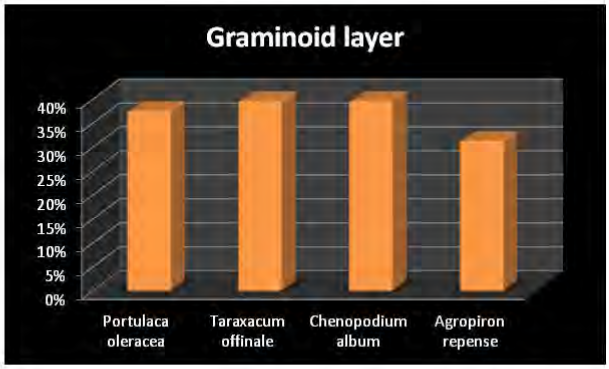
Vegetation	Common name	Scientific name	Classification	Present in No. of landform
Tree layer	Almond	Amygdalus bucharica	Frequent	14
	Apple	Pyrus malinga	Frequent	8
	Button wood	Platanus orientalis	Frequent	11
	Mulberry	Morus alba	Common	13
	Poplar	Populus alba	Very dominant	25
	Willow	Salix wallichiana	Frequent	13
Shrub layer	Morpan	Thuja orientalis	Frequent	19
Herbaceous layer	Astralagus	Astragalus tribuloides	Frequent	13
	Bermuda grass	Cynodon dactylon	Common	15
	Cogongrass	Cylindrica imperata	Frequent	12
	Cord grass	Astragalus spp.	Rare	4
	Goose grass	Eleusine indica	Frequent	13
	Leucopoa	Alhagi camelurum	Frequent	12
	Logongrass	Cylindrica imperata	Very rare	1
	Morning glory	Ipomoea spp.	Frequent	11
	Punchure vine	Tribulus terrestris	Frequent	12
	Ragweed	Ambrosia artemisifolia	Rare	10
Graminoid layer	Common parslane	Portulaca oleracea	Common	18
	Dandelion	Taraxacum offinale	Sub-dominant	19
	Lambsquarter	Chenopodium album	Dominant	19
	Quack grass	Agropiron repense	Common	15
Forbs layer	Johnson grass	Sorghum halepense	Very dominant	22
	Jungle rice	Echinochloa colonum	Sub-dominant	20
	Pig weed	Echinochloa crus-galli	Very dominant	26
	Platian	Plantago major	Very dominant	23
	Yellow nutsedge	Cyperus esculentus	Very rare	2

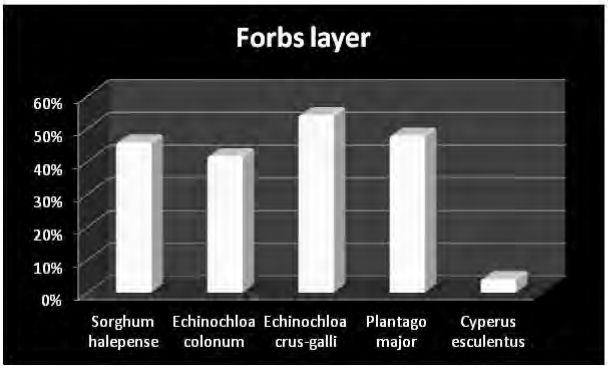
Vegetation cover in the area of Dawlatzi watershed











Appearance of the species in the Dawlatzi plain

From these species according to the appearance in the different landscape the following species are qualified as dominant species of each vegetation layer:

- Tree layer: Poplar tree (Populus alba)
- Shrub layer: Morpan (Thuja orientalis)
- Herbaceous layer: Bermuda grass (Cynodon dactylon)
- Graminoid layer: Lambsquarter (Chenopodium album); Dandelion (Taraxacum offinale)
- Forbs layer: Johnson grass (Sorghum halepense); Jungle rice (Echinochloa colonum); Pig weed (Echinochloa crus-galli); Platian (Plantago major)

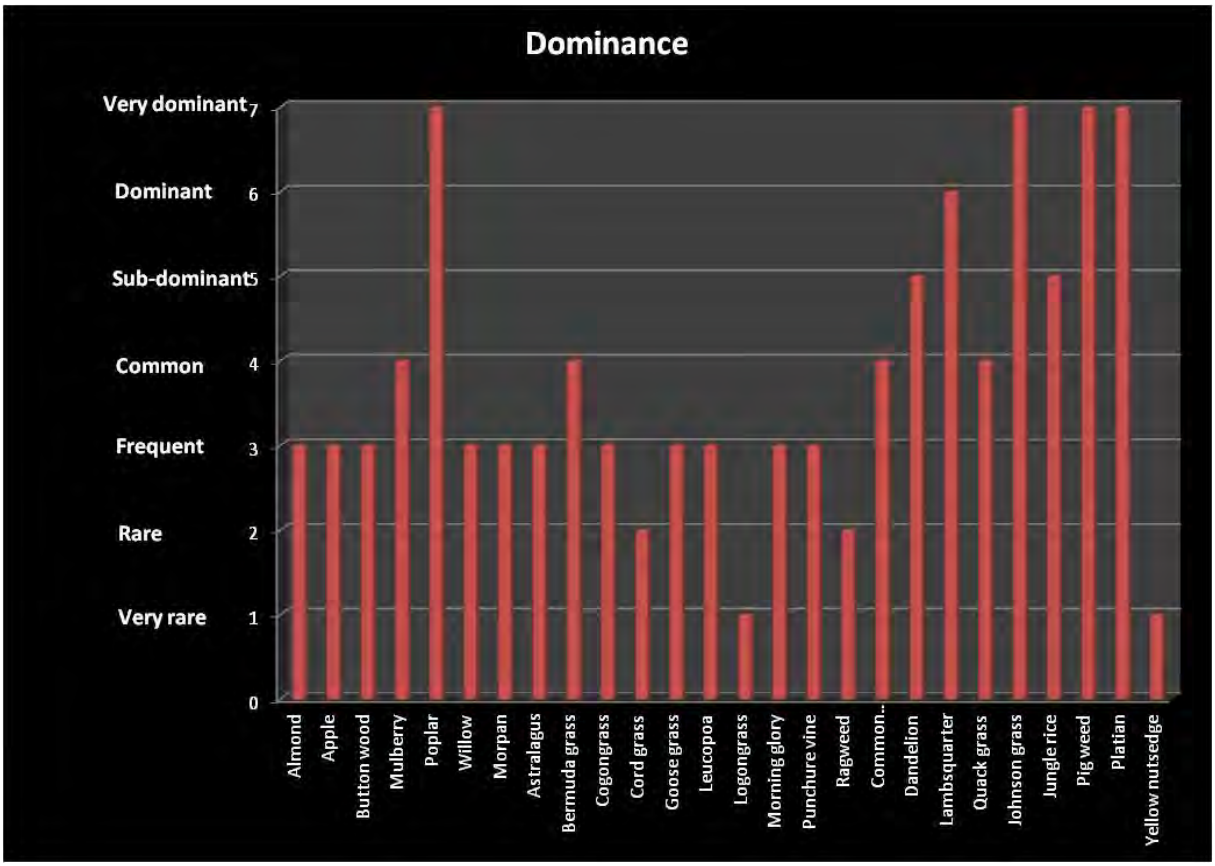


Photo 10: Orchard in the Dawlatzi area

8 Land Use

Photo 11: Basin irrigated area

The most frequently found farming practice in the area is irrigated agriculture complemented with grazing and wood collection practices. Nomadic pastoralist activities occupied a low percentage in the survey (6%), but this data does not really reflect the reality, because the survey had been conducted among the settled population in the rural areas. The nomadic pastoralist mainly practiced by the kuchis whom appearance is unpredictable, but significant. Therefore, nomadic pastoralist may have a major role in land use.

irrigation improvement in the farmland areas consist of construction of bore holes and deep wells. Most of the farmers protect the productive land with both, graded and contour bands. The constructed bands are also necessary for the traditional surface irrigation practices.

The production is characterized by low input level, mainly reduced to two basic fertilizers use and occasionally the application of some chemicals for disease and pest management. The machinery use includes the basic tractor use with plough and cultivator for land preparation. The equipment, in most of the cases, are rented by the farmer.

The main crops are wheat and corn and some limited area include rice production. These crops are complemented with some secondary crops such as tomato, potato, beans and onion. Farmers typically grew alfalfa and clover as cover crops for their perennial crops. The main fruit crops are apple, mulberry and almond. The farmers are typical smallholder farmers with an average of 1-2 Jeribs land. The main water source for irrigation is bore holes/wells and river/stream. The harvest is used mainly for home consumption and partially for sales on the local/domestic market.

Photo 12: Annual crop cultivated in ridges

The high value crops, such as fruits, are usually sold through intermediary traders directly to Pakistan. The livestock includes sheep, goat and in some area cattle. At the household level the team frequently found some chicken. Sheep and goat are generally overgrazing the land, which may contribute into the increasing erosion in the area.

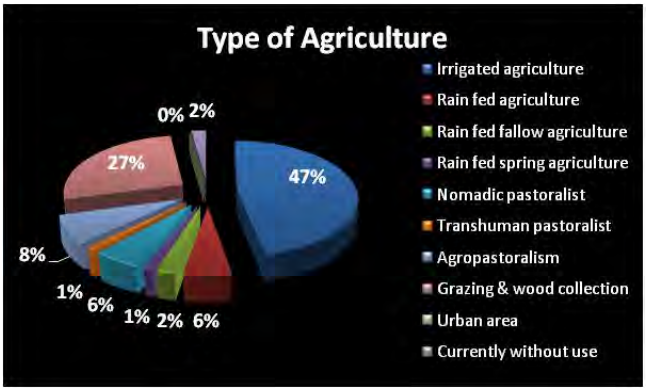
Crop	Dawlatzi Watershed - Crop Calendar											
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Main annual crop												
Wheat			3	3	3	6			1,2	3,5	3	
Rice					1,2	3,5	3,5	3	3	6		
Maize					1,2	3	3	3	5	6		
Other crop												
Tomato					1,2	3	3	6				
Onion				1	2,3	3	3	6				
Potato					1,2	3	3,5	6				
Bean				1,2	3	3,5	3	6				
Perennial crop												
Clover			3	3	1,2	3	3	6	3	3	3	
Alfalfa			3	3	1,2	3	3	6	3	6	3	

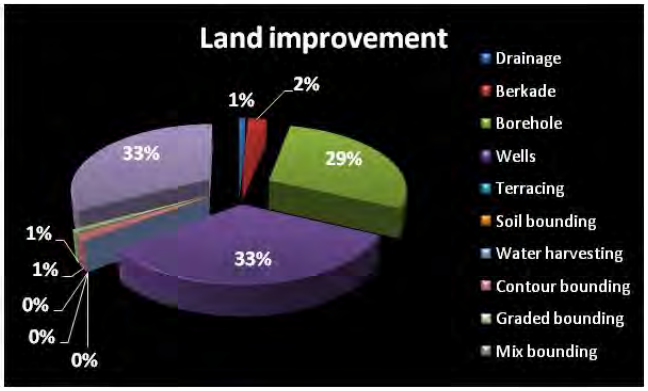
Land preparation: 1 **Planting: 2** **Growing period: 3**

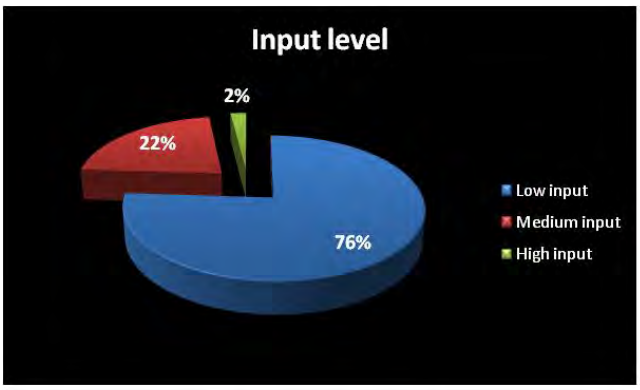
Pruning: 4 **Fertilizer application: 5** **Harvesting: 6**

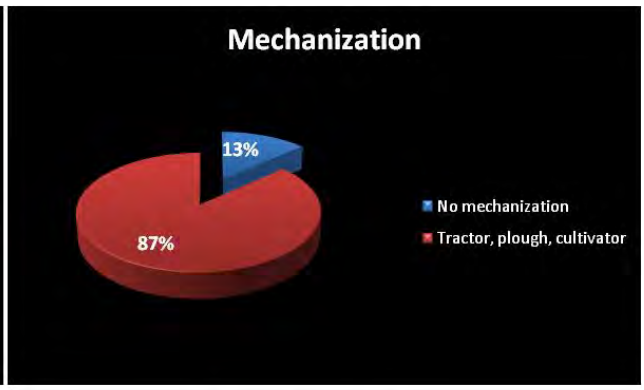
Crop calendar used by farmers in Dawlatzi plain

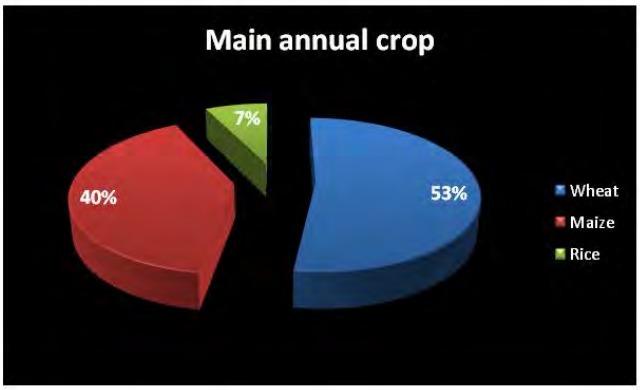
Deforestation has reached an alarming level in the region. Everywhere the population practices wood collection on regular bases. The wood is used for construction and/or as firewood. Only a small percentage of the people collect wood from dead trees. The commonly used practice is to cut down medium size live trees. Reforestation activities and forestry management is nonexistent in the area.

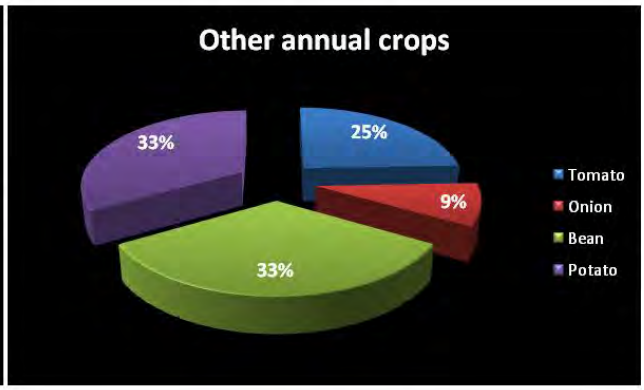


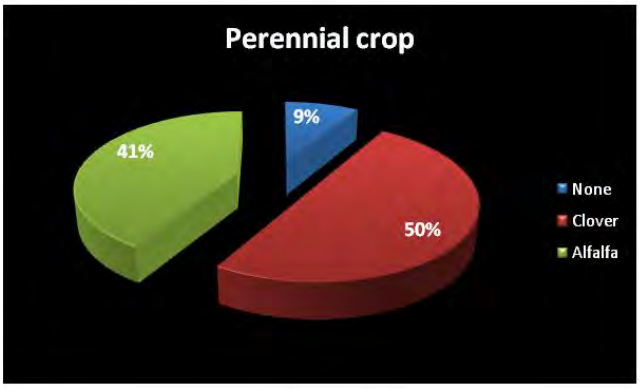


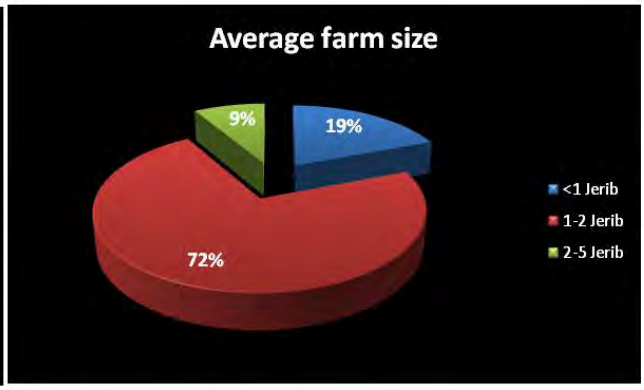

Input level
2%
22%
76%
Low input
Medium input
High input

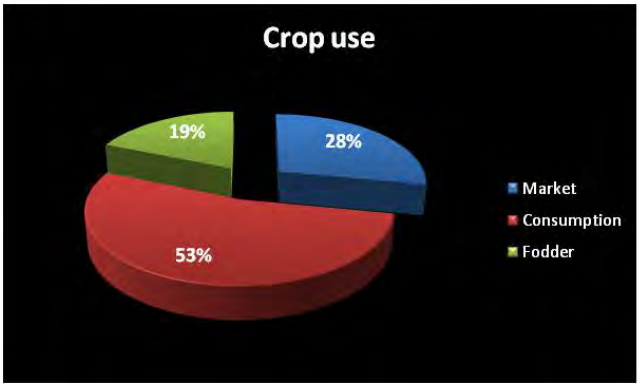

Mechanization
13%
87%
No mechanization
Tractor, plough, cultivator

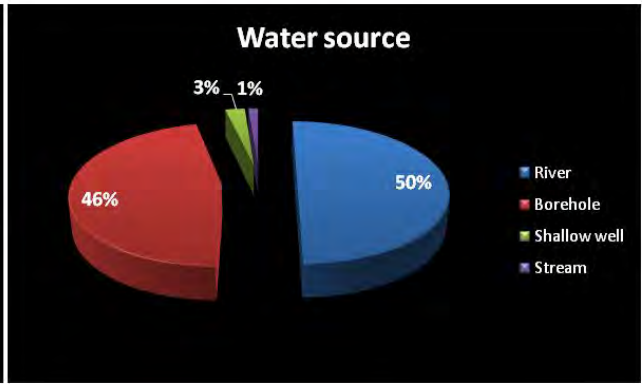

Main annual crop
7%
40%
53%
Wheat
Maize
Rice

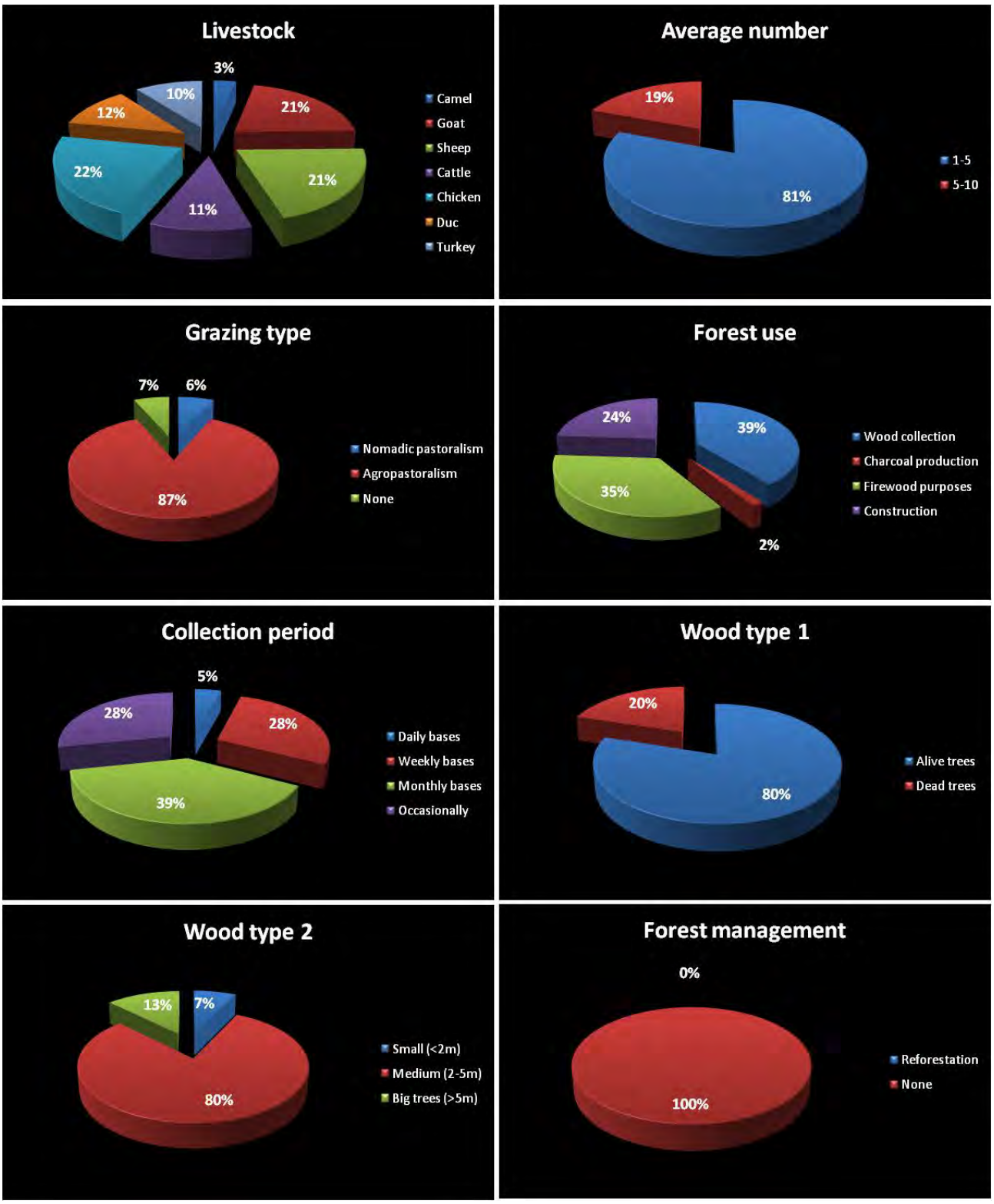

Other annual crops
33%
25%
9%
33%
Tomato
Onion
Bean
Potato


Perennial crop
9%
41%
50%
None
Clover
Alfalfa


Average farm size
9%
19%
72%
<1 Jerib
1-2 Jerib
2-5 Jerib


Crop use
19%
28%
53%
Market
Consumption
Fodder

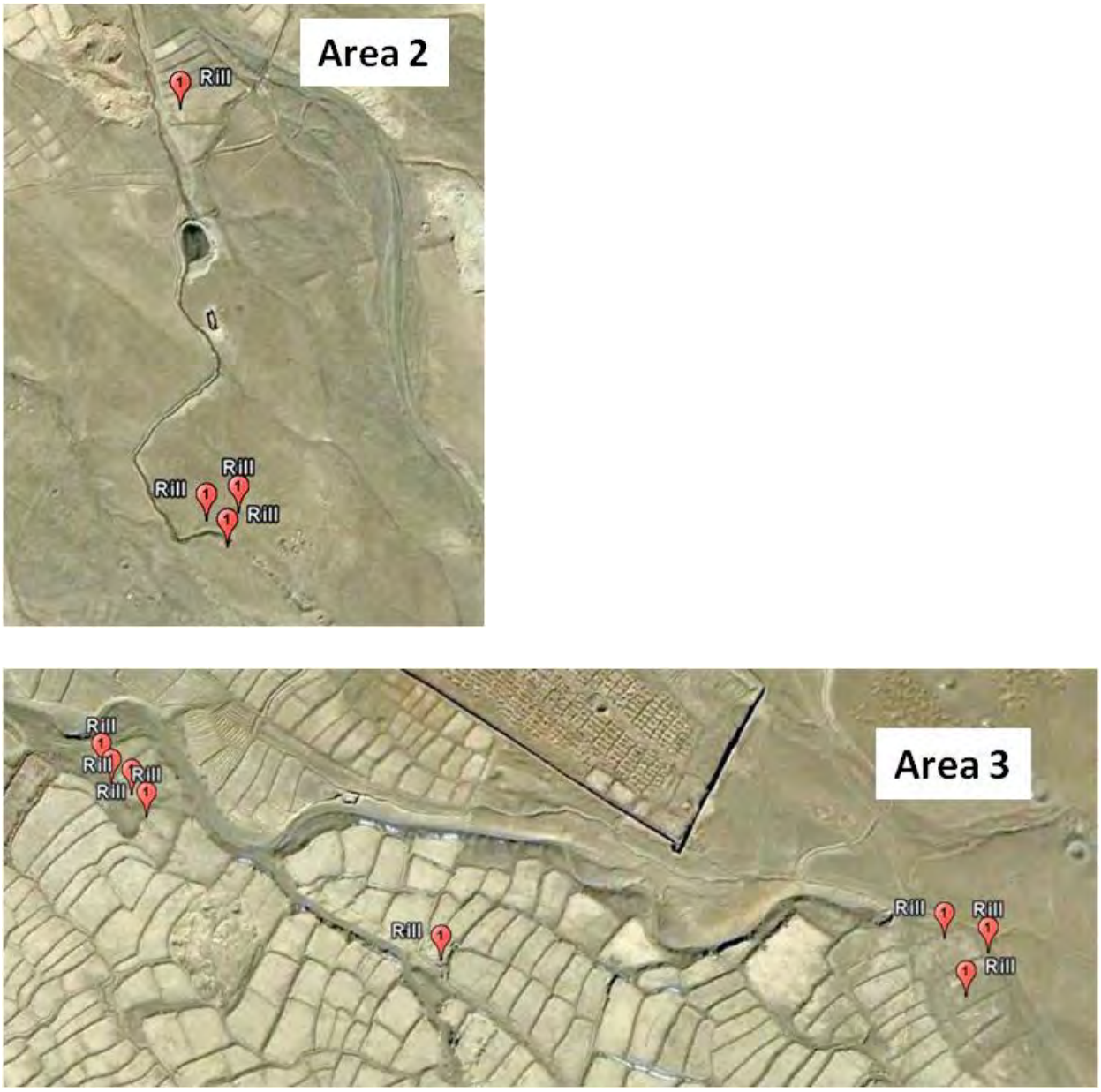

Water source
3%
1%
46%
50%
River
Borehole
Shallow well
Stream



Land use characteristics of the Dawlatzi plain

9 Summary Qualification of the Dawlatzi Watershed

The area of Dawlatzi watershed is characterized by flattish plain caused by erosion. The area is surrounded by mountains, which are receiving the major share of the annual precipitation in the form of snow. During summer, the snow melts and during a short period of time floods the plains below. The flood causes severe erosion problem in the region resulting in denuding of surface vegetation an alternating with dissected ridges. Pedestals, armor layers, rills and gullies frequently develop on the surface. The pale color of the soil indicates a well or excessively drained type of soil. However, the large volume of water during the time of flood for a short period saturates the soil, which is a typical characteristic of the soils from imperfectly drained soil drainage class.



Major erosion problems in the Dawlatzi plain

The primary cause of soil degradation is water and gully type erosion. There is evidence of the partial and/or complete removal of surface horizons. The original biotic functions are partly or largely destroyed. These facts qualify the degree of erosion as severe with an extent rate of 5-10%. The gully type erosion reached the level of 10-25%. The loss of soil is clearly shows the destructive effect of the erosion. The measurement on the field resulted into an amount of soil loss; depend of the area, from 500MT/Ha to 1,200MT/Ha.

Landform	Pedestal					Armour layer					
	Latitude	Longitude	Height	Ave. Height	Soil loss	Latitude	Longitude	Depth	Ave. Depth	Coarse material	Soil loss
			(mm)	(mm)	(Mt/Ha)			(m)	(m)	(%)	(Mt/Ha)
PW05/R01/F01	33.57695	69.23334	70	71.0	923.0	33.57702	69.23335	0.005	0.01	10%	585.00
	33.57697	69.2332	72			33.57708	69.23316	0.006			
	33.57696	69.23299	65			33.57709	69.23299	0.006			
	33.57693	69.23275	68			33.5772	69.23286	0.004			
	33.57677	69.23245	80			33.57687	69.23255	0.005			
PW05/R02/F01	33.57459	69.22157	60	65.0	845.0	33.57437	69.22174	0.004	0.01	20%	377.00
	33.5746	69.22459	50			33.57448	69.22448	0.009			
	33.57463	69.22463	80			33.57441	69.22444	0.008			
	33.57483	69.22483	70			33.57462	69.22462	0.008			

Dawlatzi Watershed - Soil Loss										
Landform	Rill									
	Latitude	Longitude	Width	Ave. Width	Depth	Ave. Depth	Length	Cross section	Catchment area	Soil loss
			(m)	(m)	(m)	(m)	(m)	(m^2)	(m^2)	(Mt/Ha)
PW05/R01/F01	33.57587	69.23061	0.15	0.248	0.12	0.143	30.0	0.035	90.00	5.094
	33.5757	69.23042	0.24		0.15					
	33.57547	69.23048	0.26		0.20					
	33.57526	69.23009	0.39		0.25					
	33.57539	69.22905	0.20		0.12					
	33.57518	69.2288	0.11		0.11					
	33.57514	69.22885	0.28		0.09					
	33.5753	69.2288	0.35		0.10					
PW05/R02/F01	33.5742	69.22139	0.20	0.31	0.10	0.14	20.0	0.045	60.00	9.648
	33.57436	69.22119	0.30		0.20					
	33.57431	69.22079	0.35		0.15					
	33.57463	69.2295	0.40		0.12					
PW06/R01/F01	33.56433	69.24746	0.80	0.76	0.15	0.14	30.000	0.105	90.00	15.144
	33.56454	69.24759	0.90		0.20					
	33.5645	69.24443	0.75		0.10					
	33.56461	69.24734	0.60		0.10					
PW07/R01/F01	33.55361	69.2288	0.30	0.26	0.20	0.16	30.000	0.041	90.00	5.972
	33.55381	69.22888	0.20		0.15					
	33.55376	69.22865	0.25		0.17					
	33.55622	69.22846	0.30		0.11					

Dawlatzi Watershed - Soil Loss										
Landform	Gully									
	Latitude	Longitude	Width at lip	Ave. Width at lip	Width at base	Ave. Width at base	Depth	Ave. Depth	Length	Soil loss
			(m)	(m)	(m)	(m)	(m)	(m)	(m)	(Mt/Ha)
PW05/R01/F04	33.57405	69.22447	1.50	1.567	2.10	2.167	1.10	1.733	29.00	12.198
	33.57384	69.22343	1.90		2.00		2.00			
	33.57365	69.22334	1.30		2.40		2.10			

Water loss caused by erosion

There is no data on how severe the erosion caused by wind, but the exposed and uncovered surface is vulnerable for wind erosion during the dry season. This is a secondary effect, which develops after the surface horizon removal by the water erosion. Deforestation by the village people and overgrazing the land also contributes into the wind erosion development.

Another major effect of the flood is the sedimentation. Both, erosion and sedimentation prevent the stabilization of the riverbanks, streams and waterways and causes the large overflow of the water on the land surface. This is the reason because the floodplain of the rivers is so large comparing to the riverbank. Therefore, the riverbanks are continuously eroding resulting from flood and sedimentation. Most of the rivers/streams dry up after the flood. The water travel and drain from the area through five major water wash during early summer time with a flow rate from 15m^3/sec up to 60-70m^3/sec. The resulting soil degradation occurs in three levels:

- Physical degradation: Soil and water erosion; soil compaction; sedimentation
- Chemical degradation: Soil fertility declination
- Biological degradation: Vegetation cover loss; biodiversity loss

Dawlatzi Watershed - Soil Degradation Type											
Landform	Physical						Chemical			Biological	
	Soil & Water erosion	Wind	Soil compaction	Soil crusting	Sedimentation	Urbanization	Fertility declination	Soil salinity	Soil toxicity	Vegetation cover loss	Biodiversity loss
PW05/R01/F01	■		■		■		■			■	
PW05/R01/F04	■						■			■	■
PW05/R02/F01	■		■		■		■			■	
PW06/R01/F01	■		■				■			■	■
PW07/R01/F01	■		■				■			■	■

Soil degradation types in the Dawlatzi plain

The unconsolidated sediment is the dominant soil surface layer. In the surrounding mountain area consists from sandstone, siltstone, clay and limestone. The estimated stoniness of the plain area is around 20-25%. It contains different size of materials from fine gravel (0.2-0.6cm) up to large boulders (60-200cm). The grouping criteria for this type of soil are “Soils influenced by water” and according to that, the soil of the Dawlatzi plain belongs to the Fluvisols (FAO-UNESCO soil taxonomy system) reference soil group. They are young alluvium, developed on sediments and weakly divided into layers. The Fluvisols are the equivalent groups of the Regosoils (Canadian classification system) and the Entisols (US soil taxonomy system).

Soil sampling location in the Dawlatzi plain

Fluvisols have no profile development except a shallow marginal A horizon. Many recent river floodplains, volcanic ash deposits, unconsolidated deposits with horizons eroded away, and sands are Entisols. The little difference between the horizons and the absence of E horizon also indicates the young age and poorly structured soil. The high content of fine size sand particles with silt and clay content makes the soil compact and poorly ventilated. The water penetration is also limited into the soil. The dominant soil color category is white to grey, light grey A-horizon and brownish B-horizon. The subdominant color is light brown. There is little visible difference between horizons. The light, pale color indicates low organic matter content, which also reflected in the soil structure. The whiter A layer indicates upward movement of water and soluble salts in the soil, which caused by the high evapotranspiration rate and low precipitation. The thin A-horizon is possible characterized by the eluviation of clay, iron, aluminum, or organic matter alone or in combination. The brown B-horizon slightly altered by hydrolysis or solution, or all two together giving a change in color, structure or both. These types of soils are originally developed under forest area. The topography of the area (valley and riverside) together with the characteristics of the parent material (C horizon) indicates that the soil developed on classic sedimentary type of bedrock (R). The layer between 60cm and 90cm seems to re-enforce this. The soil profile shows up a weekly-developed soil in early stage of weathering. Very little differences are visible between the horizons. There is no visible sign of a well-developed E horizon. The 60-90 cm layer appears to contain over 30% of accumulated clay minerals. It is highly compacted, hard layer.

The value of cation exchange capacity and base saturation closely related to the measured pH value (CEC is always shows a higher value in alkaline soil). Therefore the soil free Calcium Carbonate and Exchangeable Sodium content are pH dependent. The test result indicates high Calcium Carbonate (free lime) content. The low sodium cation contents indicated that the soil is not sodic at all. The CEC value also indicated that the dominant clay minerals in the samples are 2:1 type Montmorrillonit and Smektit. The presence of Allofan type clay minerals is excluded, because the CEC-S value (AL^{3+} and H_2O^+ content) is very low.

hy1	$CaCO_3$ %	So %	pH_{KCl}	pH_{H2O}	Hu % 0.25mm	K_{Hu} (quality)	Color 10YR	
							Dry	Wet
1.771	8.23	0.75	7.11	7.62	1.47	0.1141	4/1	3/1
Sand %		Silt %				Clay %	Hu % 2mm	i.v. % 2mm
0.25-2.0 mm	0.05-0.25 mm	0.02-0.05 mm	0.01-0.02 mm	0.005-0.01 mm	0.002-0.005 mm	>0,002 mm		
30.2	63.5	0.3	1.7	0.3	1.7	2.3	5.10	6.03
NH_4 extract mgee/100g					S%			
K	Na	Ca	Mg	ΣS	K	Na	Ca	Mg
4.70	1.90	45.46	11.67	63.73	7.37	2.98	71.33	18.31
HNO3s extract mg/kg				Acidity		NH_4-N mg/kg	NO_3-N mg/kg	Total N %
Cu	Fe	Mn	Zn	y1	y2			
6.50	494.50	53.50	14.40	2.10	0.60	1.0	13.8	0.08
Al-P_2O_5 mg/kg	Al-K2O mg/kg	CEC (T)						
418	652	85.00						

Soil test results (Average)

Combined vertical and horizontal slope curvatures (slope shapes) predict soil drainage classes. Thus, material and soil solution through flow vary with both profile (downslope) and plan (across-slope) curvature. The areas of Dawlatzi plain can be classified as “Plateau” or “Wide Plain” Sub-plain type. The sloping angle of the landforms, generally, varied between “Level” (0-2%), “Very Gently Sloping” (2-4%) and “Gently Sloping” (4-8%), mean while the sloping aspect were found as “Flat or almost flat” and “Variable”. As result of the sloping areas the water flux contains dissolved and suspended materials, which it moves from the upper reaches of the hills/mountains basin to lower parts. This movement result in eluviation in the upper zone of the basin and illuviation along the lower reaches. The non-vegetated area had been found in 40 studied landforms and it constituted 48% of area. This is an important fact, because topographic attributes and vegetation cover affect soil moisture by governing the proportions of surface runoff to infiltration. The soil, which developed on the slopes, shows appreciable lateral sub-surface flow.

In term of the physiognomic aspect, using the criteria of uppermost canopy layer, the dominant layers are the graminoid and forbs layers (The two sub-classes of the Herbaceous layer). The cultivated fields

are classified in special distribution as “Scattered clustered” (Percentage of fields is between 20-50%). The vegetation coverage was evaluated as “sparse” (The distance between two canopies are more than double of their diameter). The estimated cover varies between 5% and 15%. The main layer for cultivated land is HCI (Herbaceous Crops Irrigated) and for natural vegetation layer is CH (Closed Herbaceous, where the total surface is about 25%). The overall qualification for vegetation coverage, based on the analysis above, is the following: Open trees with closed to open herbaceous layer. The remaining 32% of the area is bare soil and rock. This qualification definitely indicates large volume and water loss in the Dawlatzi plain. Soil fertility and biodiversity decrease, while deforestation and soil degradation increase.

The low input farming system is the dominant type of agriculture in the area. The farmland is located mainly on both side of the rivers and wash ways. All farms are built up in the traditional way using graded or contour bounds to close around the field where they use surface irrigation, mainly furrow or basin irrigations. The average farm size is 1-2 Jeribs (around 0.2 Ha). Most of the farmers produce annual crops such as wheat corn and where the conditions allow rice. These main annual crops are completed in the crop rotation cycle with the production of tomato, potato, bean and onion. Around 20-25% of the farmers are orchard owners producing mainly apple, mulberry and some almond. Basic machinery use, such as tractor, plough and cultivator, is common during land preparation. The used surface irrigation is inefficient. Average irrigation efficiency is around 27-38%. This data indicates continuous nutrient leaching and soil degradation process of the farmland. The water quality tests show moderately high hardness and alkalinity rate in the irrigation water, which tends to increase free lime content and pH in the soil. Alkaline soils inhibit the uptake of some important nutrients such as iron for example resulting from the low solubility under high value pH.

Water Quality Data - Gardez, Dawlatzai						
S/N	Landscape	Total Chlorine (ppm)	Free Chlorine (ppm)	Total Hardness (ppm)	Total Alkalinity (ppm)	pH
1	PW01	0	0	425	240	8.4
2	PW02	0	0	425	240	8.4
3	PW03	0	0	425	240	7.8
4	PW04	0	0	250	180	7.2
5	PW05	0	0	425	240	8.4
6	PW06	0	0	250	180	8.4
7	PW07	0	0	120	120	7.8
8	PW08	0	0	250	120	7.8

Water samples test result of the Dawlatzi plain

Water sampling location in the Dawlatzi plain

The traditional annual crop farms are exposed to erosion. These comes from the fact that the fields are open and there are little physical measurements and tree strips are available to control erosion processes. The inefficient irrigation system also supports increasing erosion.

Almost every household has some 5-10 livestock, mainly sheep, goats and cattle. They are overgrazing the available pastureland and expose the soil to rill, gully and sheet erosion during the period of annual flood. This situation is even more serious if includes the nomad Kuchi population, which also uses the same land for grazing and other natural resources without any control.

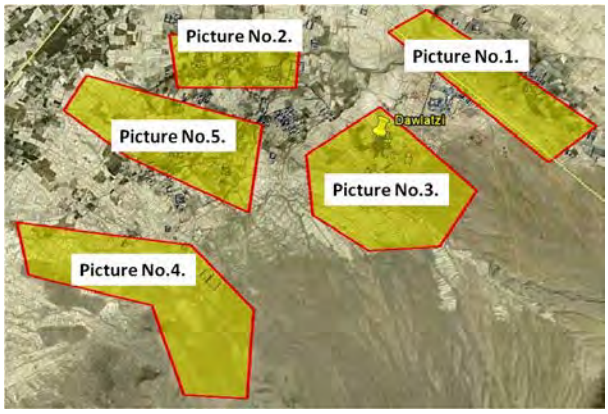
Deforestation is a very serious issue in the region. Basically the whole rural population used to collect wood for firewood and construction purposes. Even more serious issue is that 80% of the population collects wood from live, relatively young trees. Wood collection is a regular activity. 56% of the people collect wood on weekly or monthly bases, meanwhile there is no reforestation practices found during the survey. Therefore, even if the most common tree is the poplar tree, the dominant vegetation cover is belonging to the herbaceous plant, mainly graminoids and forbs. The deforestation also explains the reason for the high percentage of area with bare soil and rocks found by the survey team.

Limited level of land improvement had been found in the survey area. These land improvement measurements are rather related to water availability and irrigation than soil and water source protection. Farmers are bounding their fields to facilitate surface irrigation. Around half of the population obtains water from deep wells/boreholes and shallow wells. Another half of them utilize water diversions from canals, rivers/streams and Karezes.

Karez is a traditional practice to catch water in Afghanistan. It consists of a series of wells connected underground by a tunnel that gently leads the water from the uppermost well in the series to a point down slope where it can be reached by a ditch dug downward from the surface. The gravity-powered water is then led onto the fields. The wells provide access during construction and cleaning operations to the tunnel that serve as an infiltration gallery. The first well, which may be quite deep, is usually placed into the hill side where the land slopes away to the fields below. Water is brought down slope at a shallower gradient naturally reaching the land surface above. This sometimes requires long distances to accomplish. In practice, construction of a single Karez may require two or three years to complete. The tunnel and wells are seldom lined and cave-ins are frequent. In addition the cave-ins often block the tunnel resulting in the need for periodic cleaning or, in extreme cases, abandonment.

Water scarcity problems due to varying precipitation are frequent, but severe distress is confined to those areas in which cultivation depends completely on the rainfall production. As more marginally irrigated land is brought into production to meet the demands of a rapidly increasing population, the impact of low precipitation years becomes more severe. Recharge capacity of the watershed can provide sufficient volume of water annually. The lack of water catchments and retaining physical measurements does not allow a reserve or recharge. The main volume of annual water supply for recharge is available only for a short time period of the year and in many places it causes more erosion in the area than good.

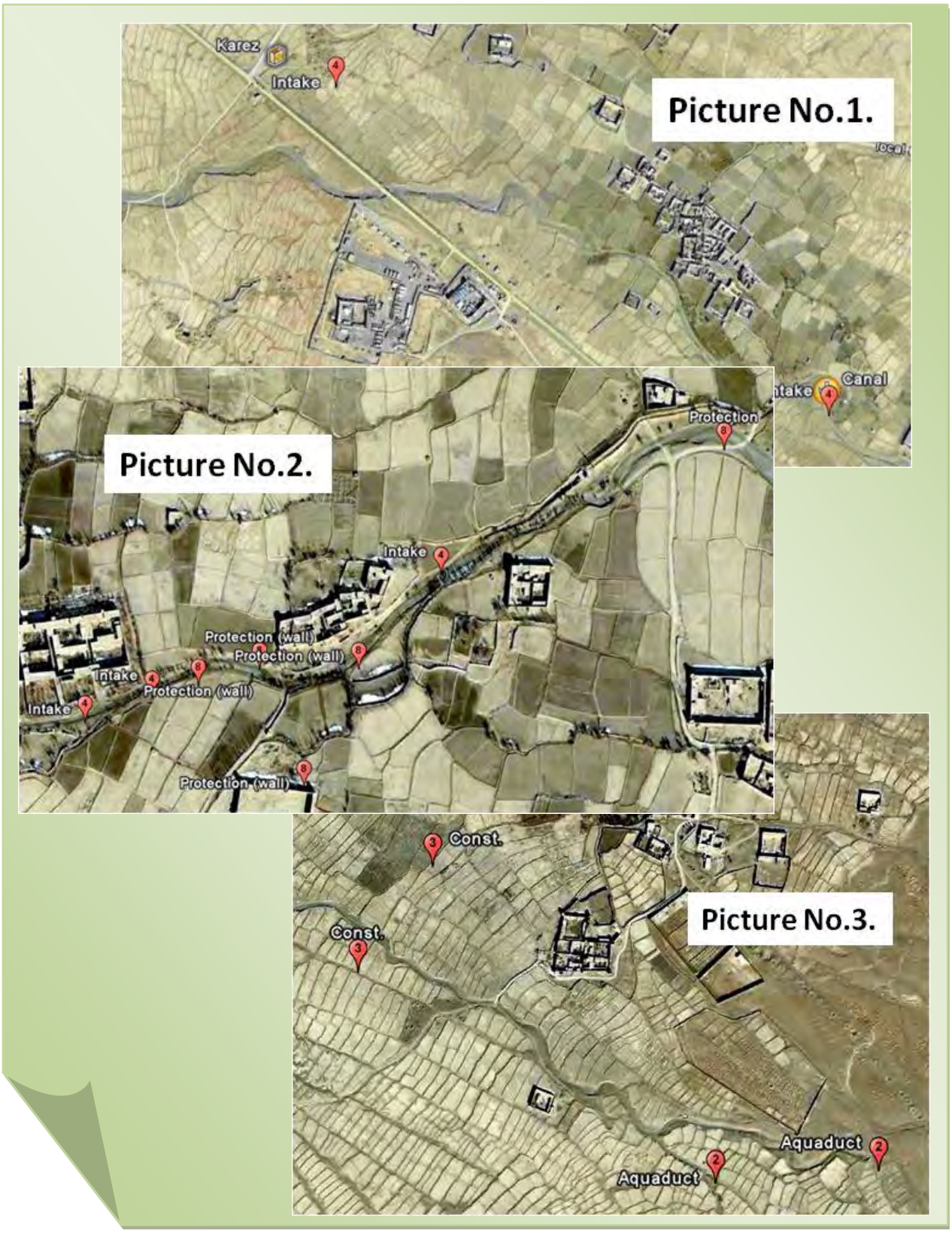
By far the most common irrigation scheme in the area consists of a diversion structure in a watercourse with canals and laterals heading water to fields down slope. Distribution is gravity powered with ditch gradients. This results in substantial amounts of potentially irrigable land being left above the ditch and lost to cultivation.

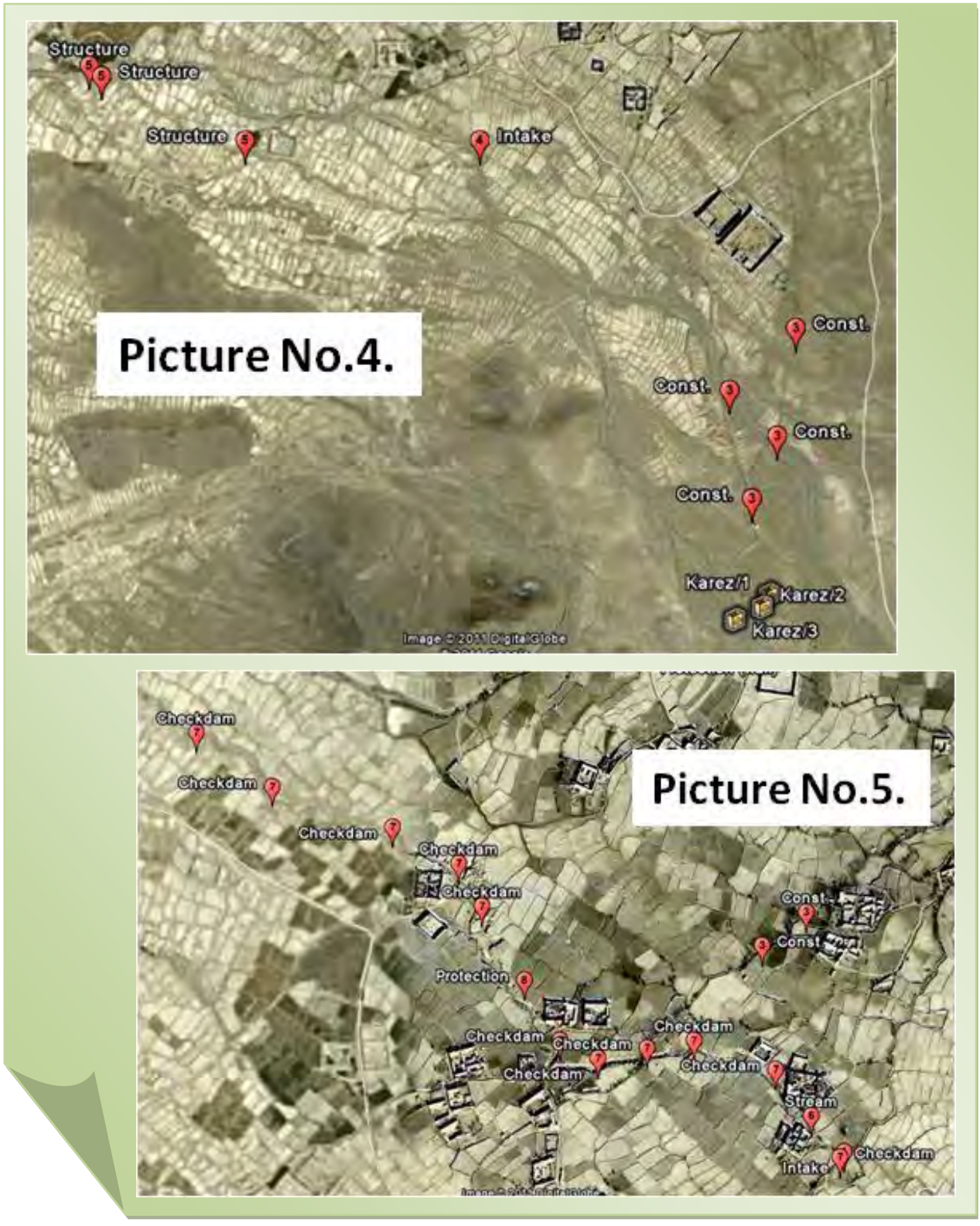


Areas where existing infrastructures were found in the Dawlatzi plain

Diversion structures are typically made from rock, soil and wooden pilings and placed nearly parallel to the current flow so as to offer minimum resistance to the main channel flow. However the annual floods often wash them away. Cross-stream diversion structures are built after the flood crests have passed and must be completely reconstructed annually. Canals are usually made by hand digging and show an uneven cross section pattern. The high gradients often cause bank erosion. Ditches leading through hilly

terrain follow a serpentine path from the river to cropland, and sections crossing and washes are swept away each spring during the rainy season.





Existing Infrastructures in the Dawlatzi plain

10 Constraints and Assumptions

The problems and risks found in the area of Dawlatzi watershed can be classified under the following categories:

- Unstable waterways, catchment areas and flood
- Increased degree of water erosion complemented with secondary wind erosion
- Incorrect use of natural resources, especially in regards to deforestation and grazing practices
- Inadequate land husbandry practices in agricultural and livestock production
- Temporary water scarcity in the productive areas

10.1 Unstable Waterways, Catchment Areas and Floods

The main cause of this problem is the sedimentation. The heavy seasonal rains wash down the slope in the mountain areas. The force of the runoff carries the surface soil layer from these areas toward the plains below. On the plain the water flow slows down and deposit the sediments in gullies and alluvial fans. The existing irregularly shaped catchment areas and waterways are not able to cope with the large volume of water between the hydrologic plain, therefore the water invades large areas of the topographic plain. As consequence, the banks of the hydrologic plain are continuously eroding and changing shape. Meanwhile the topographic plain is affected by both sedimentation and erosion. Between these two effects the topographic conditions of the area change annually (depth, with, slope angle and grade, etc.).

10.2 Increased Degree of Water Erosion Complemented with Secondary Wind Erosion

Soil depletion and degradation that caused by erosion is a complex problem in the Dawlatzi plain. The fact is that the erosion process is increasing in the Dawlatzi watershed area. Obviously one of the main contributing factors is the annual flood, which causes the primary water erosion from the mountain side. This erosion is increased by the deforestation and over-grazing that is widespread. Though, sheet erosion happens, the two principal forms of soil degradation in the Dawlatzi watershed area are:

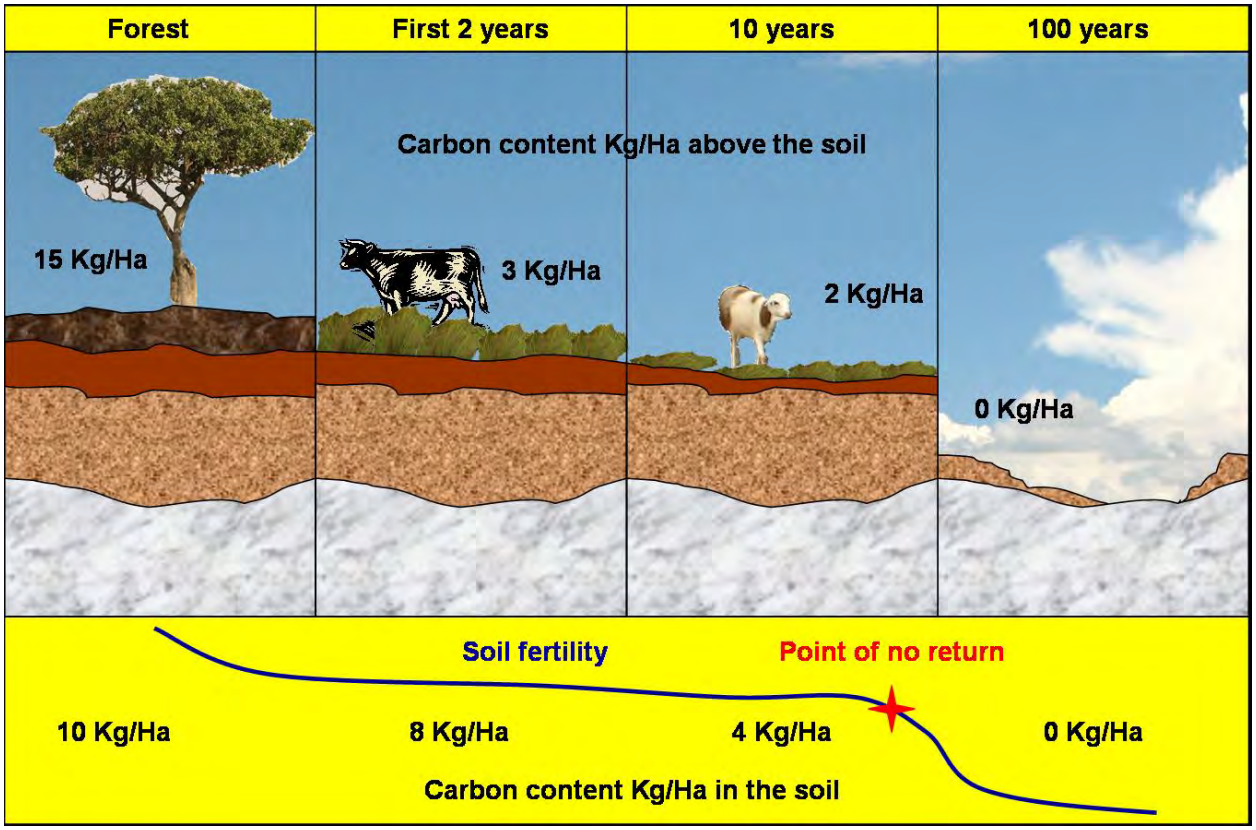
- Rill formation: Detachment and transport of soil by a concentrated flow of water
- Gully formation: Advanced stage of rill erosion. Deep depression, channels or ravine in the landscape.

In the plain areas of the watershed two types of soil degradation processes are commonly found. One of them is the formation of pedestals, where the rain-splash erosion dislodging soil particles surrounding the pedestal but not under the resistant capping layer. The pedestal is result of the grazing and deforestation practices. As the people in the area remove the uppermost canopy layer, the herbaceous layer became the dominant vegetation cover. This process followed by nomadic and agro-pastoralism overgrazing the area. Especially, animals like sheep and goat tends to cut foliage near the roots. The

plants cannot recover and they die. At first small spots develop where the bare soil surface has been exposed. Those soils are removed later on by the water creating the pedestal. As biodiversity and the quality of the soil physical properties are decreasing, the primary water erosion gives place to the secondary wind erosion.

The second type of soil degradation occurs commonly in the large and extended topographic and hydrological plain areas around the unstable waterways and water catchment areas. This form of soil degradation, called armour layer, is a concentration of coarse soil particles at the soil surface that would ordinarily be randomly distributed throughout the topsoil. This is the result from the removal of fine soil particles by water (flood, raindrops) and wind. The annual flood continuously changes the surface of the plains removing the top surface soil and deposits it in other places down stream. The depleted, structure-less surface layer will be exposed to the wind and rain forming the armour layer.

The landscape changes by natural processes of geological erosion. In normal conditions the landscape evolves extremely slowly. The process of soil formation balances the loss of soil. However, when soil quality declines the erosion process accelerates, increasing the rate of damage to the soil considerably and depleting it. Accelerated soil erosion removes more soil from the land than the soil-forming process is capable of replacing. This causes a gradual decline in soil quality. This is the overall process that occurs in area of the Dawlatzi watershed and the root of the problem has originated from human interventions.



10.3 Soil Degradation Process

10.3.1 Deforestation and Poor Grazing Practices

Grazing and forest management do not exist in the Dawlatzi watershed area. The collected data indicate that a better description of resource management would be the exploitation of natural resources. It was mentioned previously that overgrazing the available land by the livestock has caused serious soil degradation problems. The dominant species for livestock are sheep and goats, which are known as damaging species for pastures. The nomadic Kuchi population does not understand their impact on the existing natural resources and they are freely exploiting and destroying them.

Deforestation through wood collection from live trees and without reforestation practices is not only a problem of the Dawlatzi area, but it is one the most serious issue for the whole country. Most of the population does not realize that deforestation will cause soil physical, chemical and biological degradation and will cause changes in the climatic conditions. Degradation of the forests more seriously affects the watershed recharge capacity and results in water scarcity in the area. Deforestation breaks the hydrological cycle. It is now a measurable effect all over in the territory of Afghanistan. When the land was originally forested (see soil description above) the rainwater is retained in the soil and re-evaporated to form clouds and rain further inland. The water recycled many times. Deforestation and farmland use caused the rainwater to drain quickly down stream and into deep aquifers. The water is no longer recycled as before, resulting in droughts and desertification further inland. The aquifers then dry up.

10.4 Inadequate Land Husbandry Practices in Agricultural and Livestock Production

There is little land improvement in the farmland areas. Agroforestry activities are an integral part of farm management. However, the team did not find or very little measurements of this kind. There are no windbreaks, tree belts, etc. Though the crop fields are bounded by graded and contour bunds the size of these bunds and the size of the fields are not coinciding with soil properties resulting from the lack of knowledge about the relationship of soil texture and recommended physical measurements. The use of deep wells and irregular shaped irrigation canals are also not balanced with their recharge capacity. Karezes and other waterway structures are poorly or not at all able to control water flow and sedimentation. In fact, their actual conditions do not allow the functionality of them.

This report previously mentioned and described the problems of the extensive, grazing based livestock production. In a short term, the main problem is the lack of grazing land management. It is also complemented with the absence of seed supply for forage production. Nomadic pastoralism aggravates this problem everywhere.

10.5 Temporary Water Scarcity in the Productive Areas

The climate of the surveyed area is arid-semiarid. Precipitation usually occurs in the winter and spring. Most of the precipitation is received as snow in the mountain areas. It is released throughout the summer in a short period of time.

Average rainfall												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Unit
69	18	57	6	0	0	9	0	3	0	3	15	mm
5	6	6	3	1	0	2	2	2	1	2	4	days

Average monthly rainfall in area of Dawlatzi watershed

The data for rainfall indicates that during a short time there is excess water in the area, meanwhile the rest of the year is characterized by water scarcity. The problem only partly caused by the climatic condition. The other reason is that little has been done to regulate water flow and retain water for future use. Check dam and intake system are insufficient in number and design. There is no capacity to slow down water flow in order to control sedimentation and as consequence the sedimentation destroys the limited number of established physical measurements.

11 Recommendations

The Dawlatzi watershed rehabilitation requires an integrated approach. Short and medium-term interventions should address the following subjects:

- Rehabilitation of the existing and destroyed physical measurements for water flow and recharge regulation and sedimentation control
- Interventions for primary water and secondary wind erosion control
- Reforestation, water availability and landscape development intervention
- Natural resource management and land husbandry system development

Rehabilitation of the existing and destroyed physical measurements for water flows and recharge regulation and sedimentation control.

The survey team identified possible 30 interventions with primary importance. From the list of 30 interventions, DAIL selected 20 that they would support for implementation in the immediate future. Here are the 20 DAIL chose to support.

N/S	Selected interventions	N/S	Planned interventions for mid-term implementation
1	Hallem Village, Shahed intake	11	Kaky Village. 1st check dam
2	Hallem Village, Shahed canal	12	Kaky Village. 2nd check dam
3	Shaga intake	13	Khanjar Village, protection wall
4	Hallem Village, Assadullah Karez	14	Habib Khel Village, Hassan Taly intake and canal
5	Babrak Village, protection wall	15	Qassim intake
6	Petla Khel Village, 2 aqueducts	16	Khadar Khel basin for three Karezs
7	Habib Khel Village, Sailani check dam	17	Khodaidad Khel 2 aqueducts
8	Gujar check dam	18	Khundaidad Khel, Klinga canal
9	Haji Gul Karem check dam	19	Gojon Village, retaining wall
10	Abdul Ghani check dam	20	Rozi Khan check dam

The recommended projects are described below.

11.1 Hallem Village, Shahed Canal

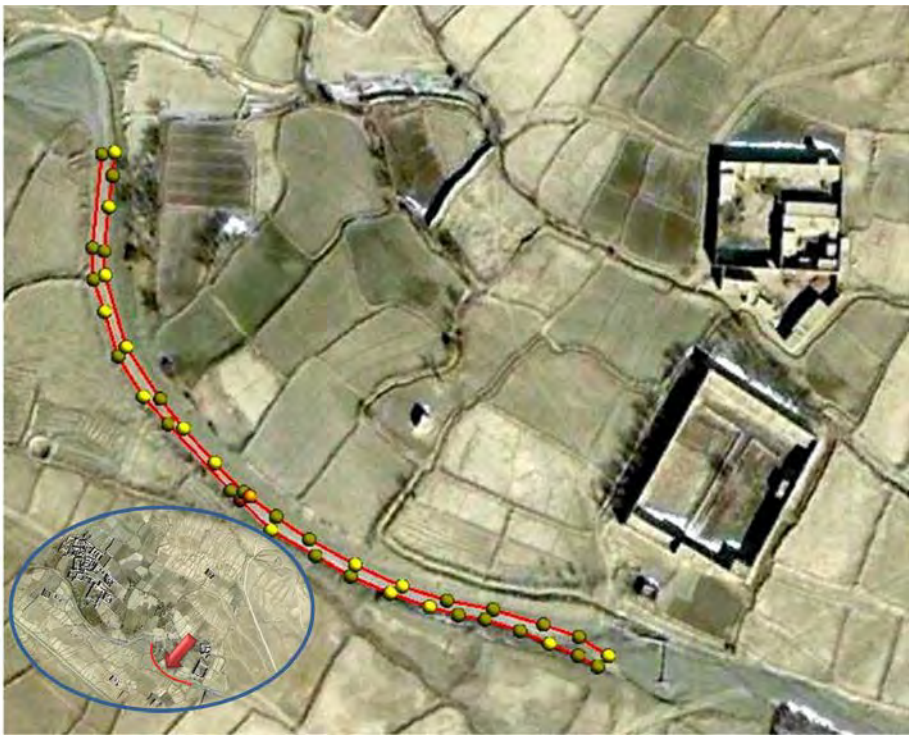
The Shahed canal located in the R01 relief of the PW01 landscape, east from Dawlatzi population center and between the Khost road and Quli Urdo road. The middle of the landscape is divided by the Darbal wash. The canal runs almost parallel to the canal. Around 90% of the area is farmland where annual crop fields alternate with fruit orchards. The annual crops vary between wheat, corn, rice, sorghum and potato. The well-developed fruit orchards include apple and apricot production.

The annual flood, which flow throughout the Darbal wash damages the canal structure and negatively impacts the crop fields. Loose soils and sediments characterize the unconsolidated area. Soil erosion, especially the stream canal erosion, destroys the infrastructure and affect crop yield. During part of the year the farmers are struggling with water scarcity and in the other part with the damage caused by the floods. The irrigation canal is essential to maintain the agriculture production and its rehabilitation will allow expanding the farmland area to increase agriculture production and productivity.

The survey team studied the most damaged parts of the canal along a length of 254m. From this section we selected 65m length where a new canal bed is urgently needed.

PW01-R01-F03- Shahid canal							
Left	**253.87 m**	**Right**	**252.34 m**				
1	33.571307	69.258903	2,357.3 m	16	33.569967	69.260702	2,363.1 m
2	33.571115	69.258925	2,357.5 m	17	33.569907	69.260545	2,362.7 m
3	33.570955	69.258952	2,356.3 m	18	33.569915	69.260392	2,361.8 m
4	33.570740	69.259020	2,355.1 m	19	33.569980	69.260192	2,363.3 m
5	33.570587	69.259030	2,355.6 m	20	33.570092	69.260010	2,362.0 m
6	33.570467	69.259197	2,352.4 m	21	33.570145	69.259820	2,361.0 m
7	33.570430	69.259230	2,351.3 m	22	33.570225	69.259665	2,359.1 m
8	33.570332	69.259407	2,348.5 m	23	33.570310	69.259522	2,358.4 m
9	33.570267	69.259575	2,349.0 m	24	33.570462	69.259357	2,357.1 m
10	33.570148	69.259787	2,352.3 m	25	33.570500	69.259318	2,357.2 m
11	33.570108	69.259855	2,353.6 m	26	33.570613	69.259167	2,357.2 m
12	33.570077	69.259960	2,356.0 m	27	33.570773	69.259055	2,357.9 m
13	33.570032	69.260117	2,358.2 m	28	33.570948	69.259007	2,358.0 m
14	33.569972	69.260305	2,359.4 m	29	33.571105	69.259000	2,358.2 m
15	33.569870	69.260527	2,358.7 m	30	33.571260	69.259010	2,359.0 m

Specific coordinates of the Shahid canal section

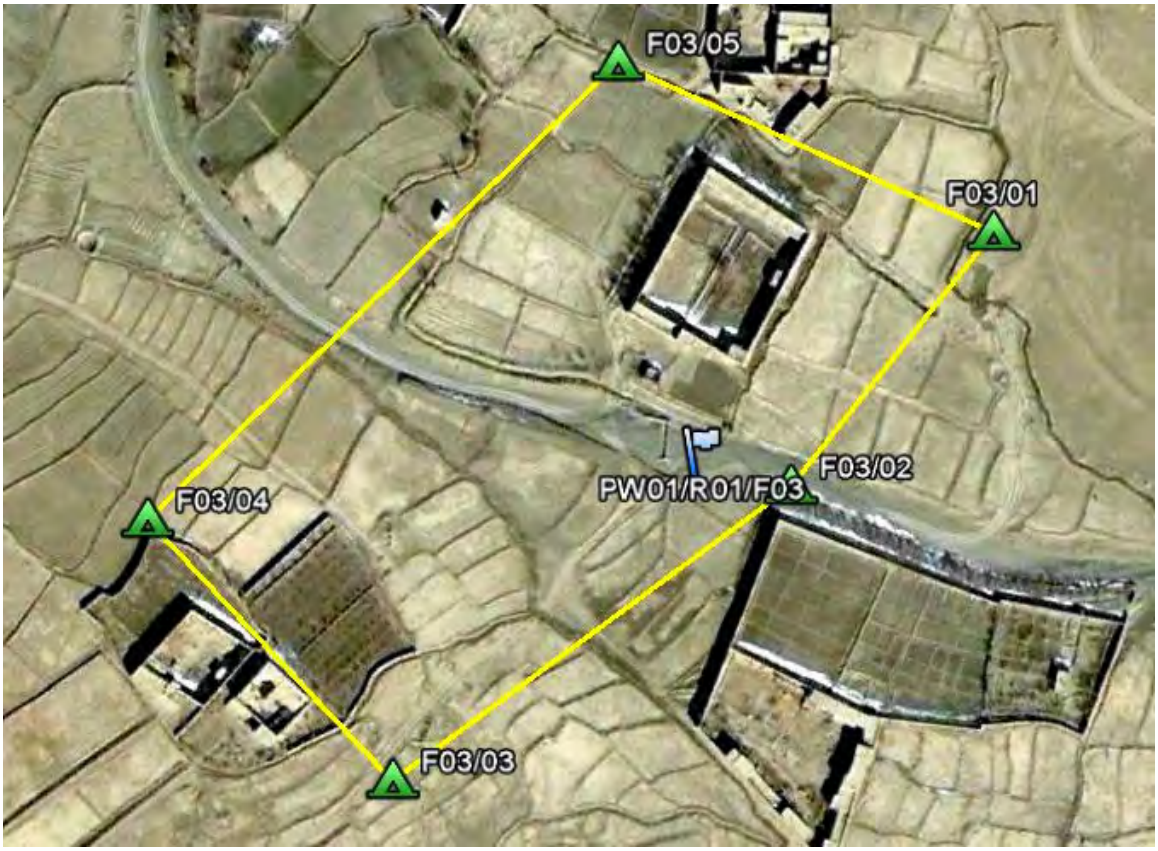


Satellite photo of the studied area of the Shahid canal

The selected length of Shahid canal is located inside the PW01/R01/F03 landform. The landform consists from an area of 33,852 m^2. The altitude of this area is around 2,358m.

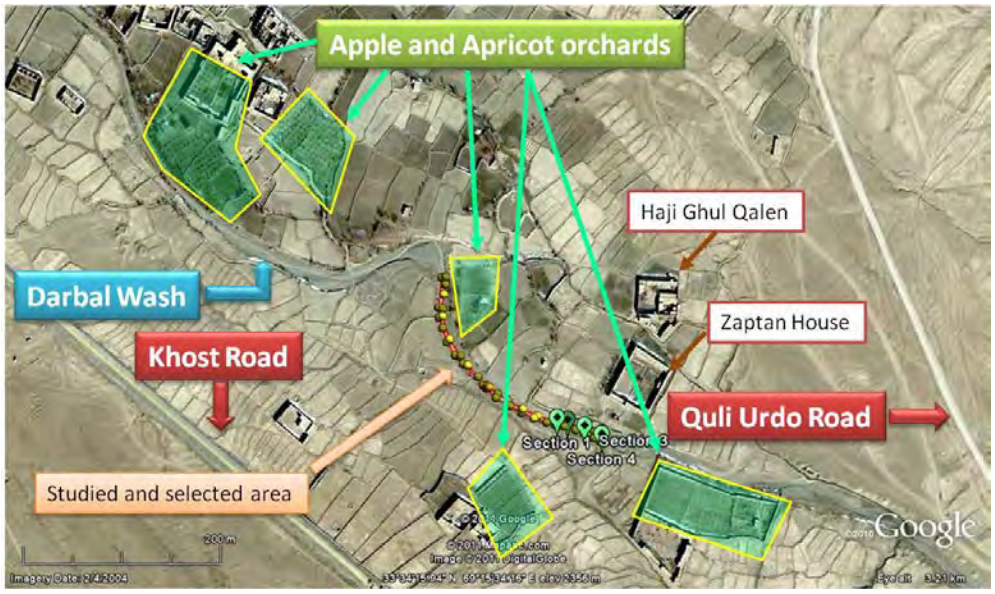
PW01-R01-F03		
Latitude	**Longitude**	**Elevation**
33.57045166	69.26201379	2,359
33.56967218	69.26126835	2,358
33.56877053	69.25980073	2,359
33.56956959	69.25889036	2,356
33.57097339	69.2606308	2,358
	Area (m^2):	**33,851.71**
	Perimeter length (m):	**768.24**

The specific coordinates of the PW01/R01/F03 landform



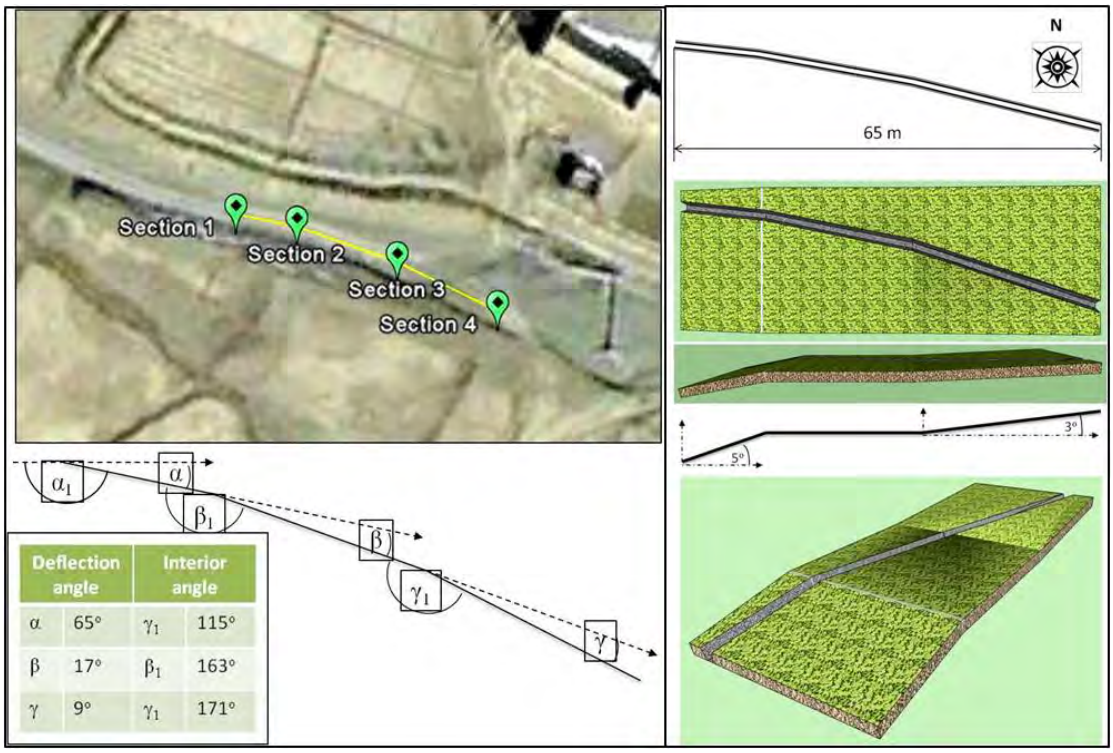
Satellite photo of the PW01/R01/F03 area

This area includes a part of Darbal wash, mud walls and houses, annual crop and perennial crop fields and the mentioned section of the canal. Detailed illustration about the existing structures can be seen in the following satellite photo:



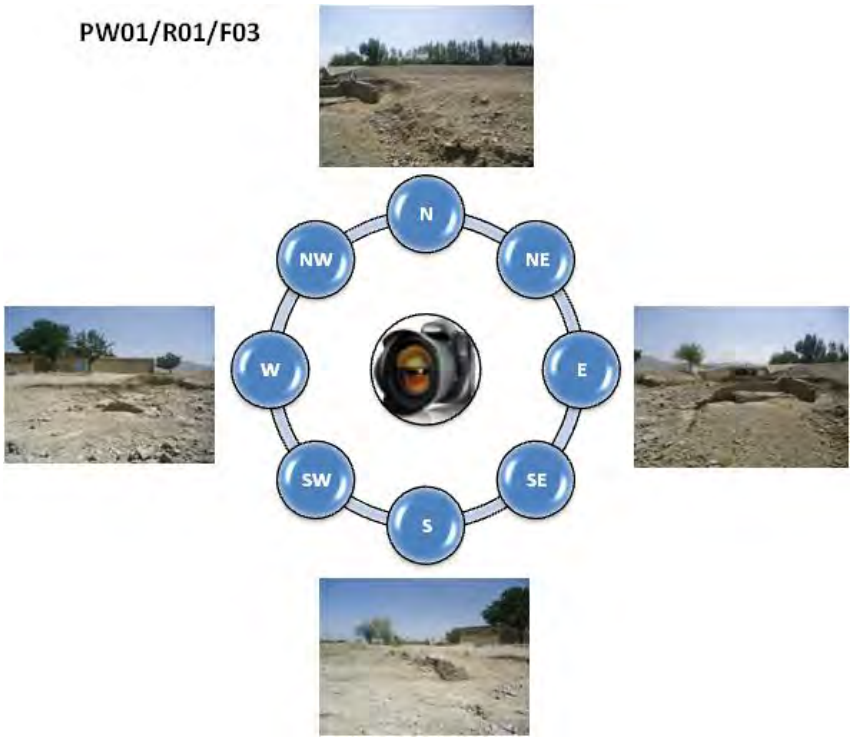
Identified objects in the PW01/R01/F03 landform

The selected section of the canal is 65m long and the slope angle varies between 3^o and 5^o. The deflection angles are 65^o, 17^o 9^o according to the measurements. This section of the canal is flowing to the northwest.

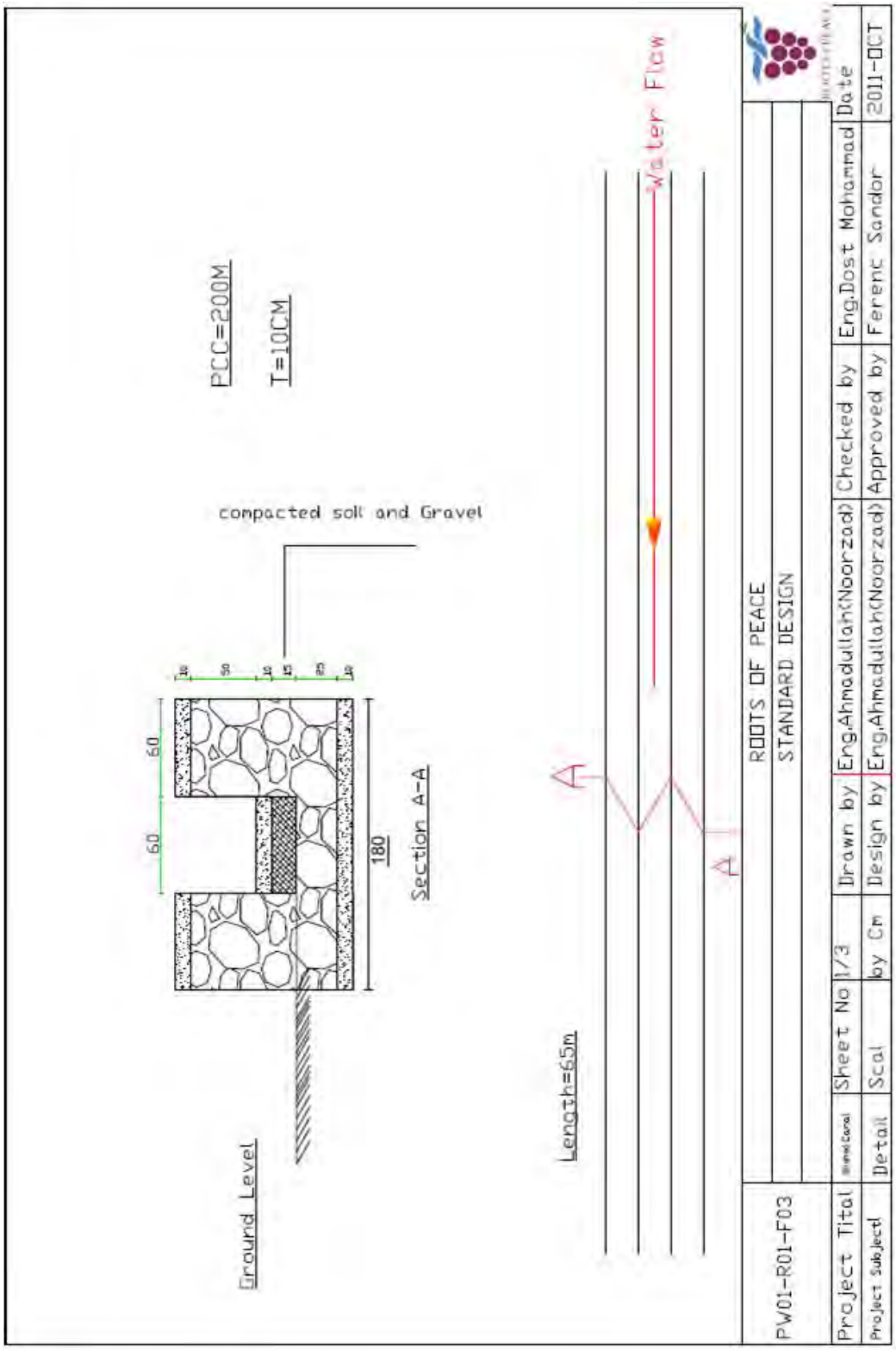


Deflection angle		Interior angle	
α	65°	γ_1	115°
β	17°	β_1	163°
γ	9°	γ_1	171°

Illustration of the selected section (Shahid canal)



11.1.1 Construction Design



11.1.2 Construction Cost

Bill of Quantity (BoQ) of Canal

Code: PW01-R01-F03
Province: Paktya
District: Gardez
Village: Hallem Qala
Project purpose: Canal Cleaning with Stone lining
Date: 2011-OCT
Length of canal: 65m

Title	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**130.00**	**m^2**		
	1.01	0.04	Site preparation, clearing site ect.	6.00	md	7.00	42.00
Preparing the project site, preparing hand tools, etc.							
A2	**2.00**		**Excavation**	**67.00**	**m^3**		
	2.01	0.50	Unskilled labor	34.00	md	7.00	238.00
The soil is Fluvial							
A3	**3.00**	3	**Stone work**	**100.55**	**m^3**		
	3.01	0.3885	Sand	39.00	m3	25.00	975.00
	3.02	77.7	cement	156.00	Bags	7.00	1,092.00
	3.03	80.5	water				
	3.05	0.5	Skilled labor	50.00	md	14.00	700.00
	3.06	1	Unskilled labor	100.55	md	7.00	703.85
Mortar mark is 1:3, under stone should be well compacted, cement should be fresh, sand should be washed							
A4	**4.00**		**Pointing**	**80.00**	**m^2**		
	3.01	0.01	Sand	0.80	m3	25.00	20.00
	3.02	200	cement	320.00	Bags	7.00	2,240.00
	3.03	2	water				
	3.04	0.17	Skilled labor	14.00	md	14.00	196.00
	3.05	0.05	Unskilled labor	4.00	md	7.00	28.00
Mortar mark is 1:3, cement should be fresh not older than 3 months, sand should be washed							
A5	**5.00**		**Personal**				
		2	Foreman	120.00	md	10.00	1,200.00
		1	Storekeeper	60.00	md	7.00	420.00
		2	Guard	120.00	md	10.00	1,200.00
It includes foreman (engineer), store keeper and guard assigned by ROP							
A6	**6.00**		Hand tools, stationary, transportation	1	Lump sum	3,200.00	3,200.00

11.1.3 Implementation Time Table

Code:	PW01-R01-F03
Province:	Paktya
District:	Gardez
Village:	Hallem Qala
Project:	Canal protection
Duration:	Two months

N/S	Description	Weeks
1	Purchacing material	
2	Site preparations	
3	Foundation, excavations	
4	Stone masonary	
5	PCC work	
6	Pointing	
7	Monitoring and evalutions	
8	Closing ceremony	
Prepeared by: Eng. Dost Mohammad and Eng. Ahmadllah Noorzad		

11.2 Hallem Village, Shahed Intake

The planned location of the Shahed intake would be in the Section 4th area of the Shahed canal. The picture below shows the area where the intake's construction would take place.

The area of the planned intake in the Shahed canal and the DPS coordinates

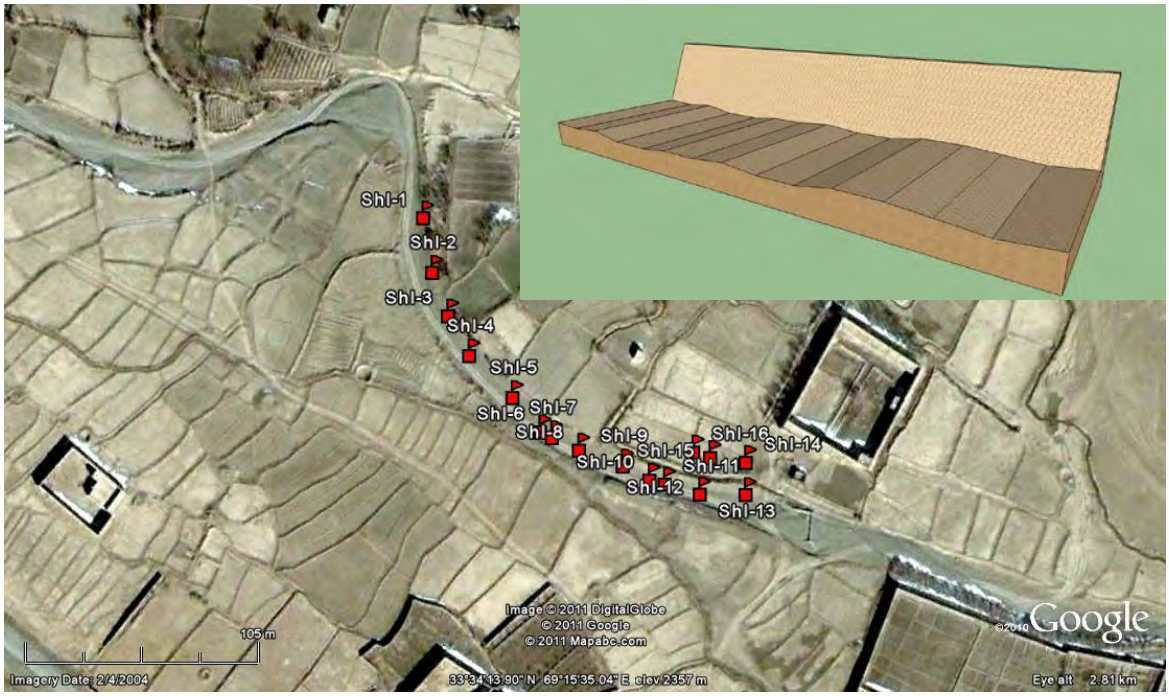
PW01-R01-F03- Shahid intake							
S/N	**Latitude**	**Longitude**	**Altitude**	**Temp**	**Course**	**GPS fix**	**Signal**
1	33.57108	69.258953	2,355.5 m	97.6°F	179	Y	4
2	33.57086	69.258998	2,354.8 m	97.8°F	164.8	Y	7
3	33.570685	69.259075	2,354.6 m	97.9°F	156.2	Y	6
4	33.570525	69.259178	2,353.5 m	97.9°F	156.1	Y	7
5	33.570357	69.259387	2,354.3 m	98.3°F	128.2	Y	7
6	33.57022	69.25952	2,355.2 m	98.3°F	140.4	Y	7
7	33.570197	69.259577	2,355.0 m	98.5°F	141.9	Y	7
8	33.570147	69.259707	2,354.4 m	98.5°F	129.8	Y	6
9	33.570085	69.259917	2,352.9 m	98.6°F	127.5	Y	7
10	33.570028	69.260045	2,352.6 m	98.6°F	107.9	Y	7
11	33.570012	69.260118	2,352.6 m	99.1°F	103.7	Y	7
12	33.569972	69.260287	2,350.5 m	99.5°F	110.6	Y	7
13	33.56997	69.260507	2,349.0 m	99.7°F	101.8	Y	7
14	33.570098	69.260508	2,348.4 m	107.6°F	289.2	Y	7
15	33.570118	69.260337	2,348.3 m	108.4°F	278.7	Y	8
20	33.57014	69.260255	2,347.8 m	108.6°F	281.7	Y	8

S/N	**Latitude**	**Longitude**	**Altitude**
1	33.56998091	69.26056332	2,357 m
2	33.56982825	69.26050479	2,358 m
3	33.56971301	69.26079898	2,358 m
4	33.56988318	69.26081962	2,358 m

The elevation differences of this section of the canal vary between -0.90m and 2.1m. The Darbal wash width at this section varies between 20m and 30m with the deepest depth of 3.0 m.

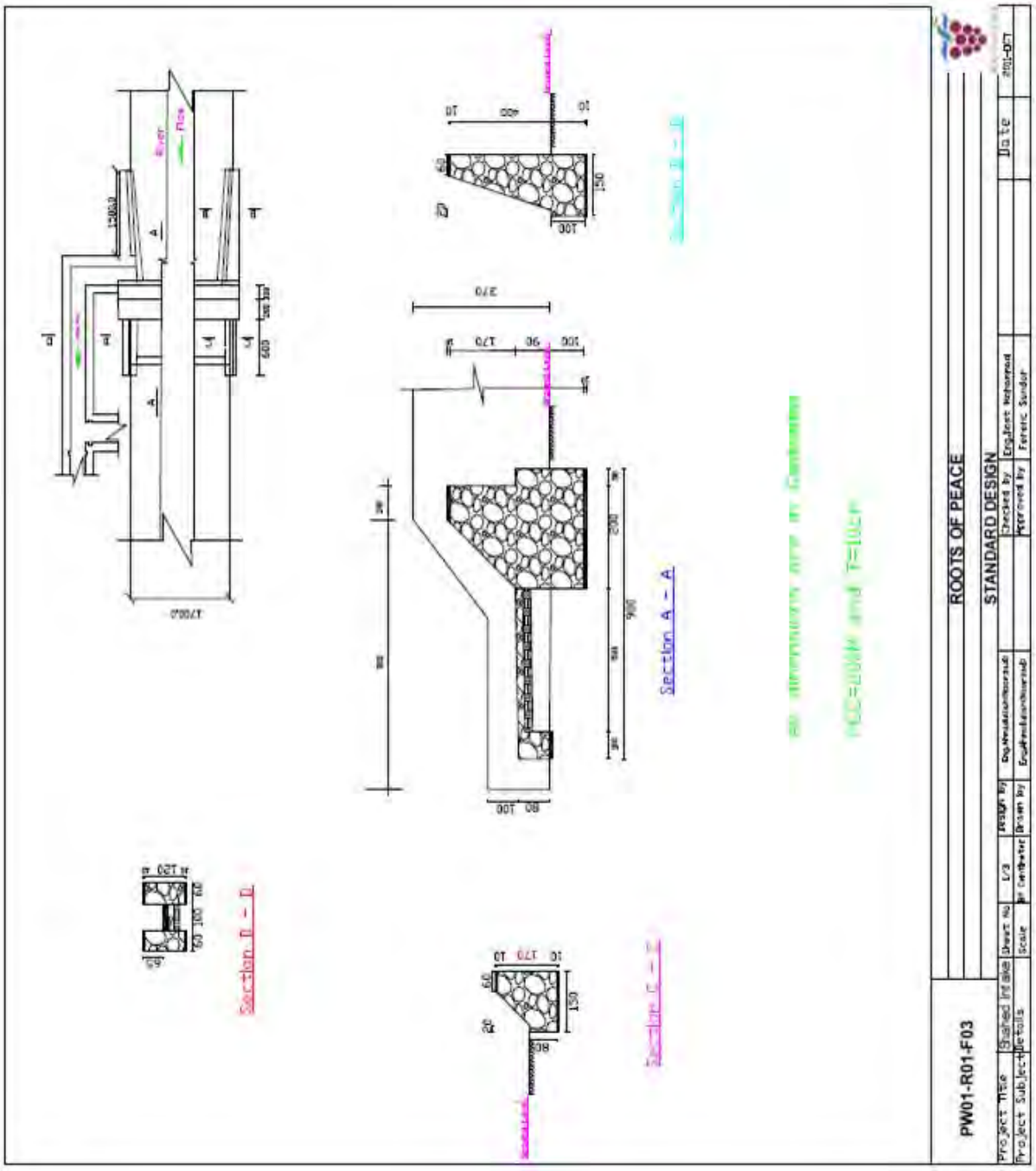
PW01-R01-F03- Shahid canal sloping aspects				
Altitude	**a**	**b**	**c**	**tan α**
2,356				
2,355	0.70	2.5	2.60	0.3
2,355	0.20	2.5	2.51	0.1
2,354	1.10	2.5	2.73	0.4
2,354	-0.80	2.5	2.62	-0.3
2,355	-0.90	2.5	2.66	-0.4
2,355	0.20	2.5	2.51	0.1
2,354	0.60	2.5	2.57	0.2
2,353	1.50	2.5	2.92	0.6
2,353	0.30	2.5	2.52	0.1
2,353	0.00	2.5	2.50	0.0
2,351	2.10	2.5	3.26	0.8
2,349	1.50	2.5	2.92	0.6
2,348	1.00	2.5	2.69	0.4
2,348	0.00	2.5	2.50	0.0
2,347	1.00	2.5	2.69	0.4

Sloping aspects of the Shahed intake area



The area of the planned intake in the Shahed canal and schematics of the sloping aspects of the canal bed

11.2.1 Construction Design



11.2.2 Construction Cost

Bill of quantity(BoQ) of Intake

Code: PW01-R01-F03
Province: Paktia
District: Gardez
Village: Hallem Qalla
Project: Intake
Date: 2011-OCT

Title	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**200.00**	**m2**		-
	1.01	0.04	Site preparation, clearing site etc.	8.00	md	7.00	56.00
A2	**2.00**		**Foundation excavation**	**115.40**	**m^3**		-
	2.01	1	Unskilled labour	115.40	md	7.00	807.80
A3	**3.00**		**Stone Masonry**	**374.18**	**m^3**		-
	3.01	1.1	Stone including transportation	411.00	m^3	20.00	8,220.00
	3.02	0.3885	Sand	142.18	m^3	25.00	3,554.50
	3.03		Unskilled labour for digging				-
	3.04	0.3885	Transportation of sand to the site				-
	3.05	77.7	Cement (M: 200, 1:3)	581.00	Bags	7.00	4,067.00
	3.06	80.5	water				-
	3.07	0.5	Skilled labour on site	187.00	md	14.00	2,618.00
	3.08	1	Unskilled labour on site	374.18	md	7.00	2,619.26
A4	**4.00**		**PCC**	**17.27**	**m^3**		
	4.01	1.055	Sandy gravel	17.27	m^3	25.00	431.75
	4.02		Unskilled labour for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	86.00	Bags	7.00	602.00
	4.05	200	water				
	4.06	0.65	Skilled labour on site	11.00	md	14.00	154.00
	4.07	3.25	Unskilled labour on site	56.00	md	7.00	392.00
A5	**5.00**		**Pointing**	**133.75**	**m^2**		
	5.01	0.01	Sand	1.34	m^3	25.00	33.43
	5.02		Unskilled labour for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	7.00	Bags	7.00	49.00
	5.05	2	water				
	5.06	0.17	Skilled labour on site	23.00	md	14.00	322.00
	5.07	0.05	Unskilled labour on site	7.00	md	7.00	49.00
A6	**6.00**		**Personal**				
	6.01	2.00	foreman	180	md	10.00	1,800.00
	6.02	1.00	storekeeper	90	md	7.00	630.00
	6.03	4.00	guard	360	md	10.00	3,600.00
A7	**7.00**		**Hand tools, stationary,transportation**	**1**	**Lump sum**	5,000.00	5,000.00
						Grand total	**35,005.74**

Produced by : Ing. Dost Mohammad andIng. Ahmadullah Noorzad

11.2.3 Implementation Time Table

Code: PW01-R01-F03
Province: Paktya
District: Gardez
Village: Hallem Qala
Project: Intake
Duration: Three months

N/S	Description	Weeks
1	Purchasing material	
2	Site preparations	
3	Foundation, excavations	
4	Stone masonry	
5	PCC work	
6	Pointing	
7	Monitoring and evaluations	
8	Closing ceremony	

Prepared by: Eng. Dost Mohammad and Eng. Ahmadullah Noorzad

11.3 Shahed Canal Forest Belt

Projection for the Shahed canal forest belt

PW01-R01-F03- Shahed canal forest belt					
Length:	**300 m**	**Width:**	**20 m**	**Area:**	**6,000 m^2**
S/N	**Latitude**	**Longitude**	**S/N**	**Latitude**	**Longitude**
1	33.57157658	69.25884037	22	33.56964268	69.26114875
2	33.57157347	69.25904693	23	33.56970734	69.2608511
3	33.57137294	69.25907852	24	33.56979271	69.26066459
4	33.57112635	69.25910306	25	33.56986431	69.26056149
5	33.57080012	69.25910242	26	33.56990639	69.26044398
6	33.57068262	69.25912172	27	33.56993379	69.2603247
7	33.57057382	69.25918355	28	33.56997176	69.26016212
8	33.57041441	69.25935731	29	33.57000249	69.26000851
9	33.57027697	69.2595571	30	33.57004478	69.25987281
10	33.57015591	69.25979378	31	33.57009109	69.25975752
11	33.57016377	69.25985307	32	33.57013278	69.2596462
12	33.57016561	69.25988923	33	33.57021182	69.25948795
13	33.57005817	69.26020423	34	33.57042178	69.25922021
14	33.57002009	69.26052129	35	33.57066528	69.25899707
15	33.56998977	69.26068633	36	33.57091903	69.25888224
20	33.56987609	69.26102613	37	33.57115755	69.25890124
21	33.5697862	69.26123934	38	33.57145283	69.25890631
			39	33.57155235	69.25886092

Specific coordinates for the Shahed canal forest belt

11.3.1 Implementation Time Table

Time table

Code: PW01-R01-F03
Province: Paktya
District: Gardez
Village: Hallem Qala
Project: Forest belt
Duration: One month

N/S	Description	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Planting sapling																														
5	Buck filling																														
6	Final report																														
7	Closing cermony																														
8	M&E																														

Prepared by Eng.M.Dawood

11.3.2 Implementation Cost

Bill of Quantity (BoQ) Wind Break

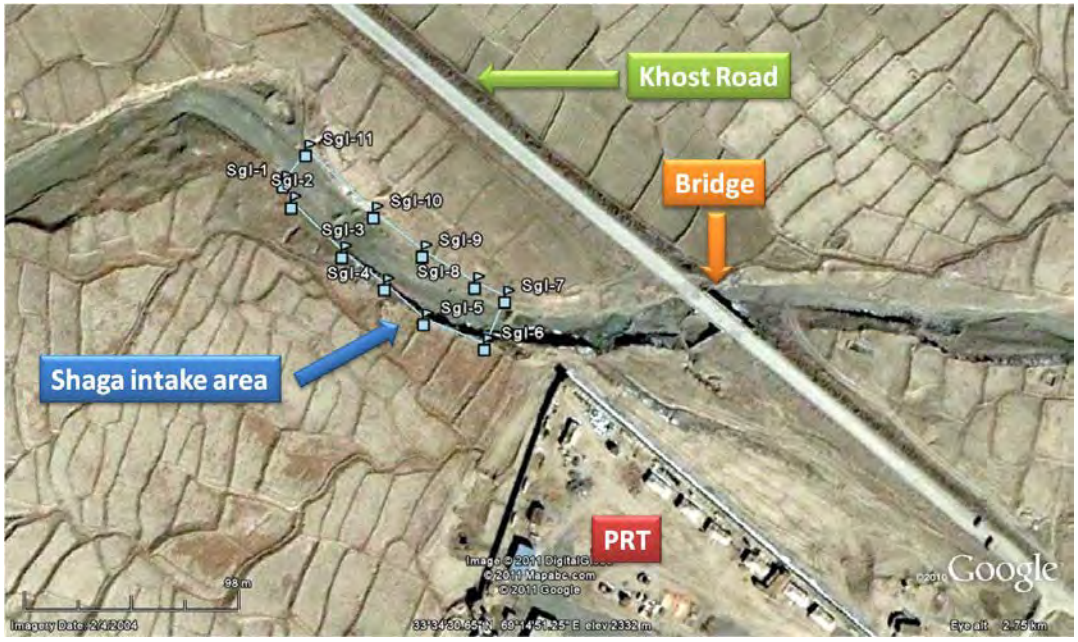
Code:	**PW01-R01-F03**
Province:	**Paktia**
District:	**Gardez**
Village:	**Halim Qala**
Project:	**Forest belt**
Total Area:	**6,000 m2**
Date:	**2011-OCT**

A1	**1.00**		**Site Preparation**	**6,000.00**	**m2**		-
	1.01	0.1	Unskilled Labor	600.00	md	7.00	4,200.00
A2	**2.00**		**Cutting and back filing**	**340.00**	**m^3**		-
	2.01	0.5	Unskilled Labor	170.00	md	7.00	1,190.00
A3	**3.00**		**Wind Break**	**6,000.00**	**m2**		-
	3.01		Willow (AUS-C)	142.00	Nos	3.00	426.00
	3.02		Poplar (NE-389)	2,000.00	Nos	3.00	6,000.00
	3.03		Morpan (Toja orientalis)	600.00	Nos	4.00	2,400.00
	3.04		Wild Rose (Rosa webbiana)	750.00	Nos	3.00	2,250.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	40.00	Nos	5.00	200.00
	4.02		Pick Axe	20.00	Nos	5.00	100.00
	4.03		Wheel Barrow	10.00	Nos	60.00	600.00
	4.04		Bucket Steel	8.00	Nos	2.00	16.00
	4.05		Axes	5.00	Nos	10.00	50.00
	4.06		Water collar	5.00	Nos	6.00	30.00
	4.07		Glasses	10.00	Nos	1.00	10.00
	4.08		I-beam for maintenance	192.00	Meter	3.00	576.00
	4.09		Wire For maintenance	640.00	Meter	0.40	256.00
	4.10		Adze	5.00	Nos	10.00	50.00
	4.11		Scissors	15.00	Nos	35.00	525.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Storekeeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Hand tools, stat., transp.**	**1**	**Lump sum**	4,500.00	4,500.00

Prepared by Eng. M. Dawood

11.4 Shaga Intake

The area's landform code is PW03/R01/F01. The area is classified as Plain. The second order terrain class is Denudational surface. Evidence of continuous erosion can be seen everywhere. Rill and gully development is common. The area is completely deforested. To stop desertification process agroforestry interventions are needed in large scale, what can be a medium, long-term development process managed by the local Shuras and DAIL.



The projected Shaga intake area

The projected construction area of Shaga intake

PW03-R01-F01- Shaga intake				
S/N	**Latitude**	**Longitude**	**Altitude (m)**	**Width (m)**
1	33.57574958	69.24632414	2,330	14.17
2	33.57566384	69.24636596	2,331	19.97
3	33.57546192	69.24661444	2,331	19.50
4	33.57533128	69.24682175	2,332	17.73
5	33.57519053	69.24701113	2,332	22.50
6	33.57508958	69.24730709	2,332	18.70
7	33.57528149	69.24740609	2,332	Right path
8	33.5753382	69.24725985	2,332	
9	33.57546534	69.24700523	2,332	
10	33.57562288	69.24676832	2,332	
11	33.57587619	69.24643614	2,331	

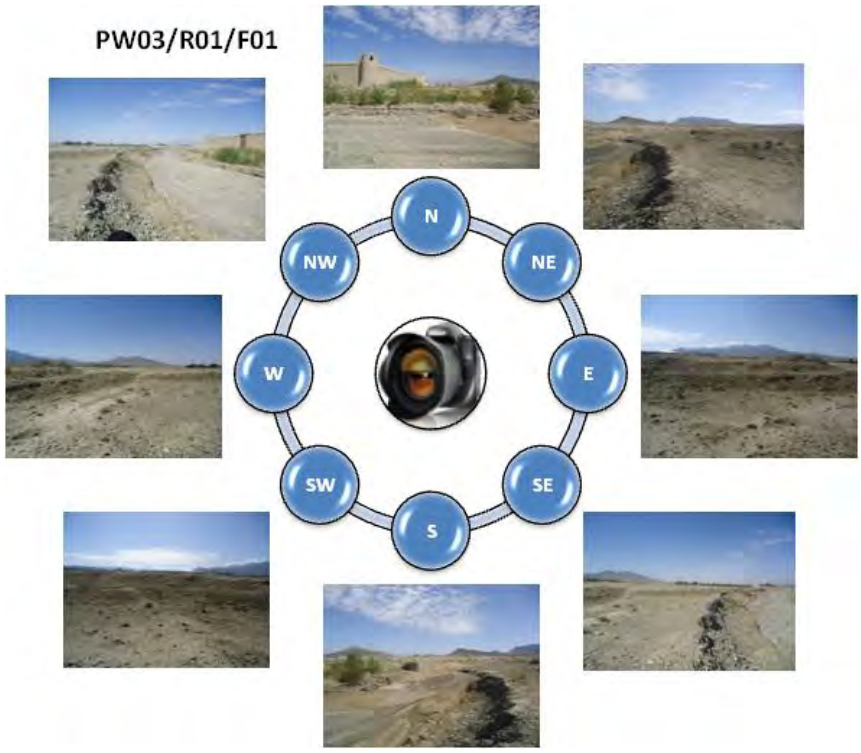
PW03-R01-F01- Shaga intake			
S/N	**Latitude**	**Longitude**	**Altitude**
1	33.57555202	69.24648043	2,331
2	33.57544643	69.24663954	2,332
3	33.57530328	69.24686829	2,332
4	33.57519069	69.24701311	2,332
5	33.57537287	69.24719568	2,332
6	33.57546721	69.24699978	2,332
7	33.57560595	69.24678652	2,332
8	33.57571782	69.24664012	2,331

Specific coordinates of the projected Shaga intake

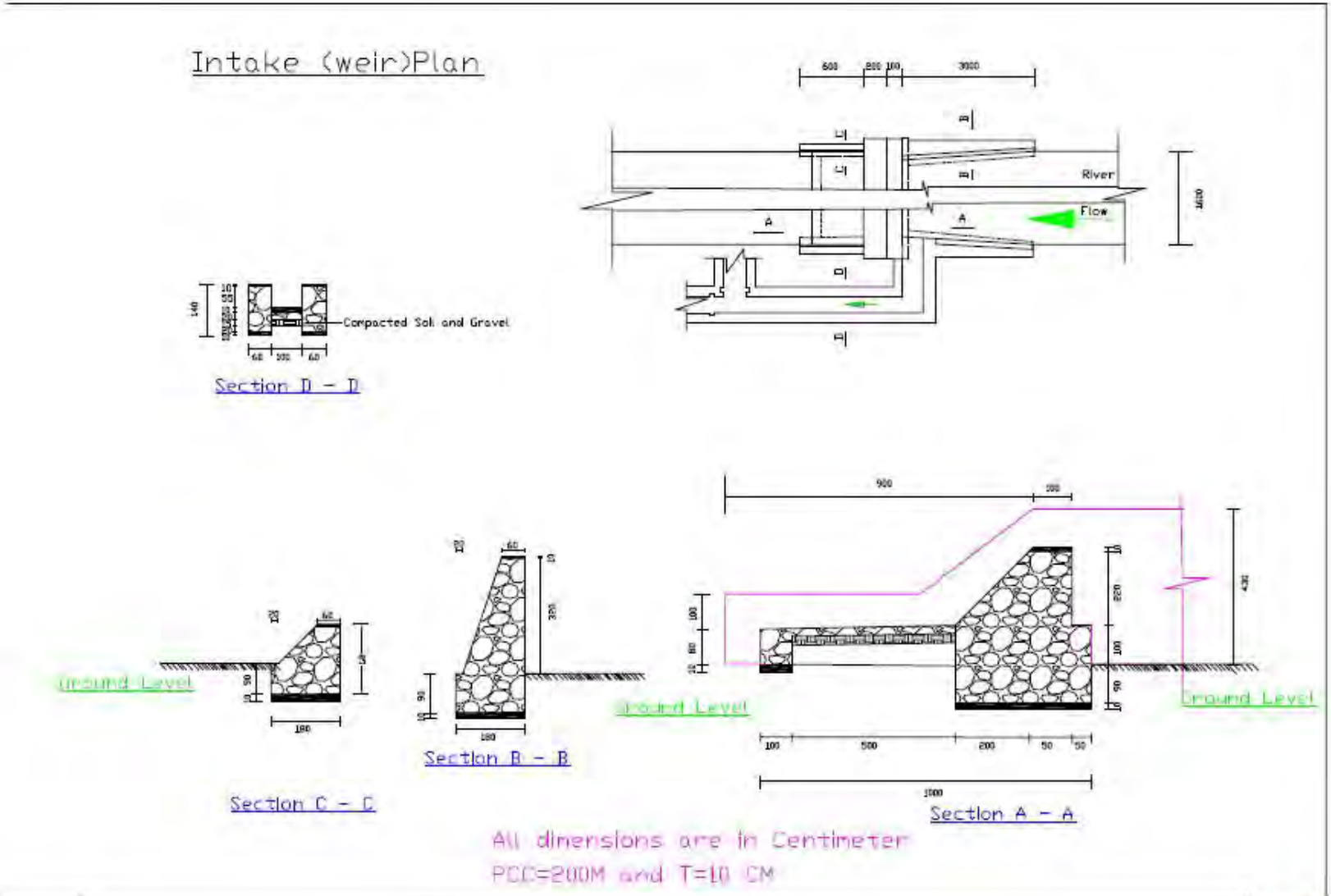
PW03-R01-F01- Shaga canal sloping aspects				
Altitude	**a**	**b**	**c**	**tan α**
2,330				
2,331	-1.00	10.59	10.64	-0.09
2,331	0.00	31.91	31.91	0.00
2,332	-1.00	24.35	24.37	-0.04
2,332	0.00	23.29	23.29	0.00
2,332	0.00	22.29	22.29	0.00
2,332	0.00	22.24	22.24	0.00
2,332	0.00	15.14	15.14	0.00
2,332	0.00	27.64	27.64	0.00
2,332	0.00	27.90	27.90	0.00
2,331	1.00	41.35	41.36	0.02

Sloping aspects of the projected Shaga intake area

Floodplain schematics of the projected Shaga intake area



11.4.1 Construction Design



PW03-R01-F01	ROOTS OF PEACE										
	STANDARD DESIGN										
Project Title	Shga Intake	Sheet No	1/3	Design by	EngAhmadullahNoorzad		Checked by	Eng.Dost Mohammad		Date	2011-OCT
Project Subject	Details	Scale	by centheter	Drawn by	EngAhmadullahNoorzad		Approved by	Ferenc Sandor			

11.4.2 Construction Cost

Bill of quantity(BoQ) of Intake

Code: PW03-R01-F01
Province: Paktia
District: Gardez
Village: Gafar Qalla
Project: Intake
Date: 2011-OCT

Title	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	**215.00**	**m2**		-
	1.01	0.04	Site preparation	9.00	md	7.00	63.00
A2	**2.00**		**Foundation excavation**	**174.60**	**m^3**		-
	2.01	1	Unskilled labour	174.60	md	7.00	1,222.20
A3	**3.00**		**Stone Masonry**	**387.19**	**m^3**		-
	3.01	1.1	Stone including transportation	425.90	m^3	20.00	8,518.00
	3.02	0.3885	Sand	150.42	m^3	25.00	3,760.50
	3.03		Unskilled labour for digging				-
	3.04	0.3885	Transportation				-
	3.05	77.7	Cement (M: 200, 1:3)	602.00	Bags	7.00	4,214.00
	3.06	80.5	water				-
	3.07	0.5	Skilled labour on site	194.00	md	14.00	2,716.00
	3.08	1	Unskilled labour on site	387.00	md	7.00	2,709.00
A4	**4.00**		**PCC**	**22.28**	**m^3**		
	4.01	1.055	Sandy gravel	23.50	m^3	25.00	587.50
	4.02		Unskilled labour for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	111.00	Bags	7.00	777.00
	4.05	200	water				
	4.06	0.65	Skilled labour on site	15.00	md	14.00	210.00
	4.07	3.25	Unskilled labour on site	73.00	md	7.00	511.00
A5	**5.00**		**Pointing**	**137.35**	**m^2**		
	5.01	0.01	Sand	1.37	m^3	25.00	34.25
	5.02		Unskilled labour for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	7.00	Bags	7.00	49.00
	5.05	2	water				
	5.06	0.17	Skilled labour on site	24.00	md	14.00	336.00
	5.07	0.05	Unskilled labour on site	7.00	md	7.00	49.00
A6	**6.00**		**Personal**				
	6.01	2.00	foreman	240	md	10.00	2,400.00
	6.02	1.00	storekeeper	120	md	7.00	840.00
	6.03	4.00	guard	480	md	10.00	4,800.00
A7	**7.00**		**Hand tools, stat., transp.**	**1**	**Lump sum**	5,200.00	5,200.00
						Grand total	**38,996.45**

Produced by : Ing. Dost Mohammad andIng. Ahmadullah Noorzad

11.4.3 Implementation Time Table

Code:		PW03-R01-F01															
Province:		Paktya															
District:		Gardez															
Village:		Gafar Qala															
Project:		Intake															
Duration:		Four months															
N/S	**Description**	**Weeks**															
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
1	Purchasing material																
2	Site preparations																
3	Foundation																
4	Stone masonry																
5	PCC work																
6	Pointing																
7	M&E																
8	Closing ceremony																
Prepared by: Ing. Dost Mohammad and Ing. Ahmadullah Noorzad																	

11.5 Asadullah Karez

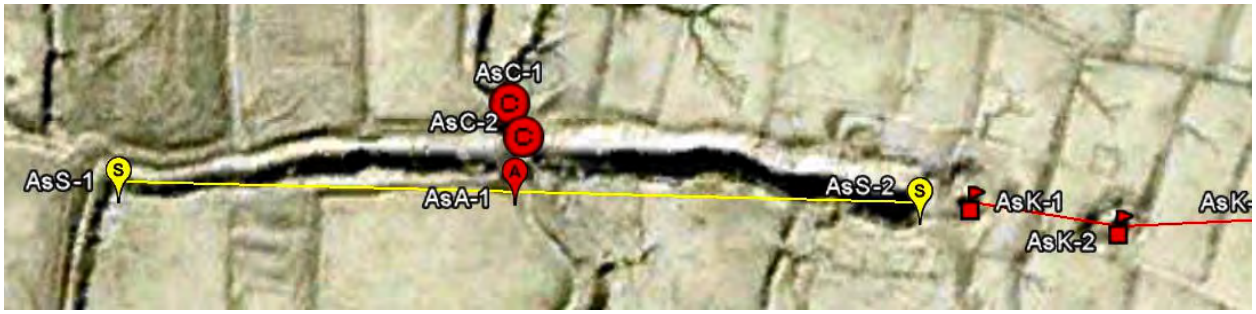
The Asadullah Karez was identified inside the landform PW04/R01/F01. The landform is part of the landscape unit, which had been categorized as Dissected Hill Land. This type of landscapes characterized by strong relief rising straight from the plains or surrounding areas and they usually do not exceed a height about 300m. The land of the hill undergoes a deep fluvial incision leaving a rougher topography than the more gently undulating land.

Most part of the landform qualifies as Hill (S29, an isolated and well-defined landform with a gently undulating summit, gently inclined to precipitous slopes. The drainage network varies from fixed, shallow erosional stream channels to very wide spaced drainage (In our case the two main drainage stream: Darbal and Zour washes). The hillside should be reforested following the contour lines. This will slow the erosion process. Probably the construction of terraces and ditches would give an even more beneficial result for the long-term.

The main permanent water source of this area is the Asadullah Karez, an over 1,500 m long system. The erosion and sedimentation partially destroyed the system and its canal also needs a major clean up. The continuity of the Karez's end is an aqueduct with a small 20m long canal to northward and a well-defined stream stone bed westward. The Karez system consists from the canal and 58 wells. The average distance between wells is 27.5m.

Landform PW04/R01/F01

Asadullah Karez system



The end section of the Karez with the aqueduct (A), small canal (C) and stream stone bed (S)

PW04-R01-F01- Asadullah Karez				PW04-R01-F01- Asadullah Karez sloping aspects				
S/N	Latitude	Longitude	Altitude (m)	Altitude	a	b	c	tan α
1	33.57821	69.24097	2,317	2,317				
2	33.57817	69.24125	2,318	2,318	-1.00	25.70	25.72	-0.04
3	33.57818	69.24157	2,319	2,319	-1.00	29.58	29.60	-0.03
4	33.57815	69.24227	2,319	2,319	0.00	65.37	65.37	0.00
5	33.57793	69.24332	2,320	2,320	-1.00	100.20	100.21	-0.01
6	33.57795	69.24368	2,322	2,322	-2.00	33.21	33.27	-0.06
7	33.57786	69.24399	2,326	2,326	-4.00	30.94	31.19	-0.13
8	33.57791	69.24622	2,325	2,325	1.00	207.11	207.11	0.00
9	33.57791	69.24660	2,326	2,326	-1.00	35.06	35.07	-0.03
10	33.57755	69.24728	2,330	2,330	-4.00	74.87	74.98	-0.05
11	33.57754	69.24763	2,331	2,331	-1.00	32.33	32.35	-0.03
12	33.57733	69.24845	2,331	2,331	0.00	79.64	79.64	0.00
13	33.57766	69.24943	2,332	2,332	-1.00	97.73	97.73	-0.01
14	33.57784	69.24985	2,334	2,334	-2.00	44.25	44.29	-0.05
15	33.57804	69.25020	2,334	2,334	0.00	38.80	38.80	0.00
16	33.57846	69.25042	2,335	2,335	-1.00	51.60	51.61	-0.02
17	33.57857	69.25079	2,336	2,336	-1.00	35.78	35.79	-0.03
18	33.57862	69.25112	2,336	2,336	0.00	31.28	31.28	0.00
19	33.57902	69.25165	2,336	2,336	0.00	66.11	66.11	0.00
20	33.57904	69.25183	2,337	2,337	-1.00	16.48	16.51	-0.06
21	33.57902	69.25237	2,338	2,338	-1.00	50.39	50.40	-0.02
22	33.57892	69.25289	2,339	2,339	-1.00	49.63	49.64	-0.02
23	33.57840	69.25433	2,342	2,342	-3.00	146.15	146.18	-0.02
24	33.57766	69.25574	2,343	2,343	-1.00	154.07	154.08	-0.01
25	33.57732	69.25632	2,344	2,344	-1.00	65.60	65.61	-0.02
26	33.57728	69.25671	2,344	2,344	0.00	36.10	36.10	0.00

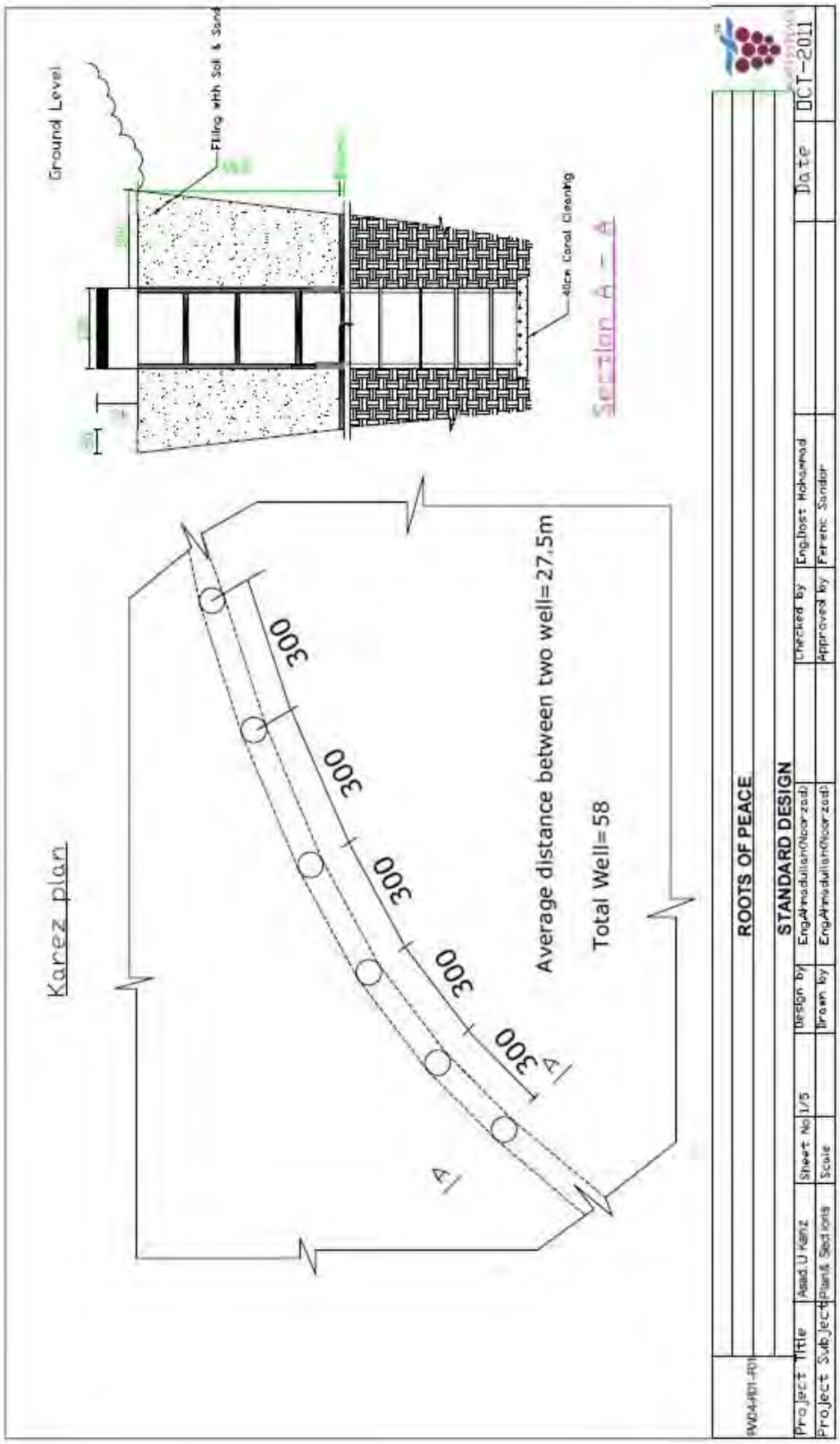
S/N	Latitude	Longitude	Altitude	Altitude	a	b	c	tan α
1	33.57836	69.24011	2,318	2,317				
2	33.57831	69.24013	2,318	2,344	-27	1,463.26	1,463.51	-0.02

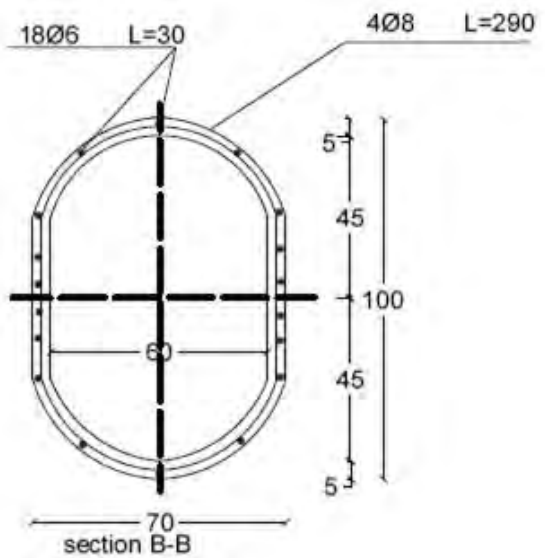
S/N	Latitude	Longitude	Altitude
1	33.57824	69.24012	2,318

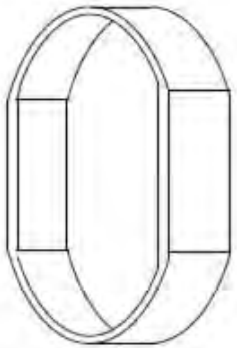
S/N	Latitude	Longitude	Altitude
1	33.57824	69.23936	2,317
2	33.57821	69.24088	2,319

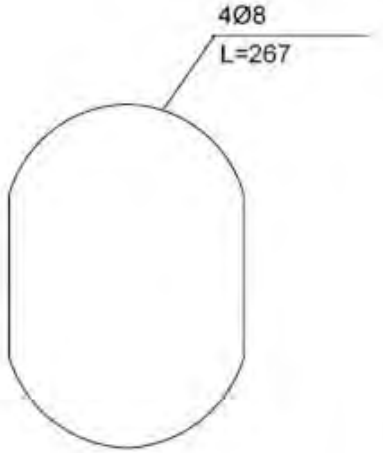
Specific coordinates and characteristics of the Asadullah Karez

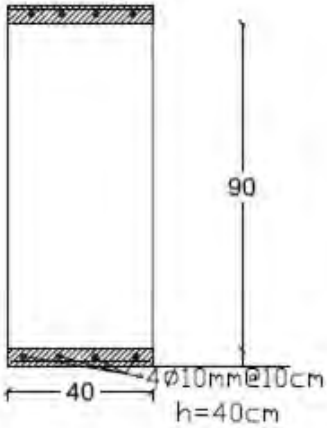
11.5.1 Construction Design











Total well Ring=464

Total Ring Cover=58

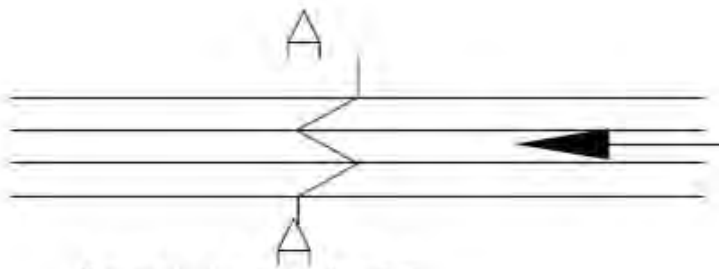
S/N	Type of work	Unit	Quantity
1	RCC	m3	0.058
2	Formwork	m2	2.3
3	Steel	kg	3.150

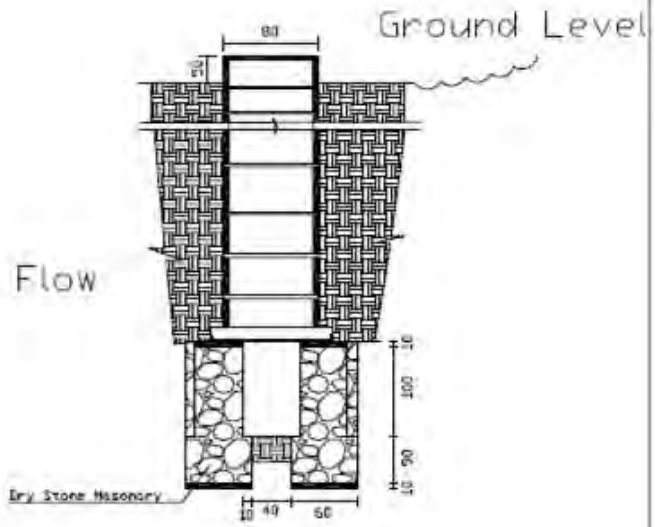
Quantity table for One Unit

ROOTS OF PEACE

STANDARD DESIGN

Project Title	Asrol UKAEZ	Sheet No	15		Eng Ahmedullah(Nicozad)		Checked by	Eng Dost mohammad		Date	2011-OCT
Project Subject		Scale	By Centimeter	Surveyed by	Eng Dost Md Eng M Dawod		Approved by	Ferenc Bandor			

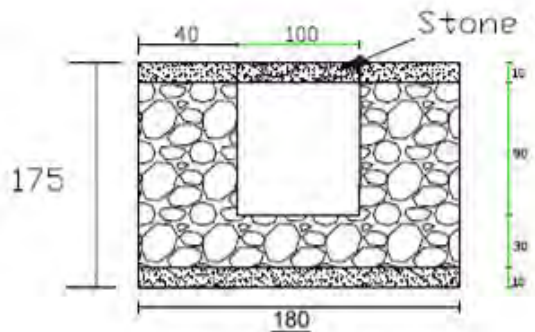




Section A - A

Note:
1: All Dimension are in Centimeter.
2: PCC=200M
3: T=10CM

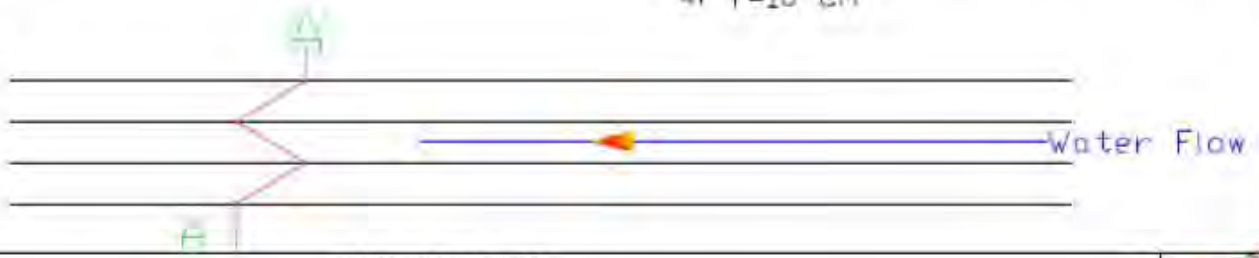
	ROOTS OF PEACE										
	STANDARD DESIGN										
Project Title	Asad U Rehman	Sheet No	1/5	Design by	Engr Ahmadullah Noorzai		Checked by	Engineer Mohammad		Date	OCT-2011
Project Subject	Sections	Scale	In Centimeter	Drawn by	Engr Ahmadullah Noorzai		Approved by	Ferenc Sandor			



Section A-A

N0te:
1: this Canal Should be Excavation up to 13 M.
2: Stone Slab Should be put above the Canal(Under Ground).
3: PCC=200M
4: T=10 CM

Length=90m



PW04-R01-F01	ROOTS OF PEACE							
	STANDARD DESIGN							
Project Tital	Acoalu Canal	Sheet No	1/5	Drawn by	Eng.Ahmadullah(Noorzad)	Checked by	Eng.Dost Mohammad	Date
Project Subject	Detail	Scal	by Cm	Design by	Eng.Ahmadullah(Noorzad)	Approved by	Ferenc Sandor	2011-OCT

11.5.2 Construction Cost

Bill of Quantity (BoQ) of Karez Cleaning

Code: **PW04-R01-F01**

Province: **Paktya**

District: **Gardez**

Village: **Dowlatzai - Hallem Qala**

Project: Karez Cleaning and Rehabilitation

Date **2011-OCT**

Title	No.	Norm/Unit	Item	Quantity	Unit	Unit cost USD$	Total cost USD$
A1	**1.00**		**Site preparation**	437.00	m2		
	1.01	0.04	Un Skilled Labor	18.00	md	7.00	126.00
A2	**2.00**		**Excavations**	12,845.70	m3		
	2.01	1.00	Un Skilled Labor	12,845.00	md	7.00	89,915.00
A3	**3.00**		**Tunnel cleaning .**	1,300.40	m3		
	2.01	1.00	Skilled labor	**1,300.00**	md	**14.00**	**18,200.00**
	2.02	1.00	Unskilled labor	**1,300.00**	md	7.00	**9,100.00**
A4	**4.00**		**Stone work**	**464.12**	**m^3**		
	3.01	1.10	Stone including transportation	510.50	m^3	20.00	10,210.00
	3.02	0.39	Sand				
	3.03		Unskilled labor for digging				
	3.04	0.39	Transportation				
	3.05	77.70	Cement (M: 200, 1:5)				
	3.06	80.50	Water				
	3.07	0.50	Skilled labor on site	233.00	md	14.00	3,262.00
	3.08	1.00	Unskilled labor on site	465.00	md	7.00	3,255.00
A5	**5.00**		**PCC**	**47.90**	**m^3**		
	7.01	1.06	Sandy gravel	50.53	m^3	25.00	1,263.25
	7.02		Unskilled labor for digging				
	7.03	1.06	Transportation of gravel				
	7.04	250.00	Cement (M:120, 1:6)	240.00	kg	7.00	1,680.00
	7.05	200.00	Water				
	7.06	0.65	Skilled labor on site	31.00	md	14.00	434.00
	7.07	3.25	Unskilled labor on site	156.00	md	7.00	1,092.00
A6	**6.00**		**Pointing**	**233.00**	**m^2**		
	8.01	0.01	Sand	2.33	m^3	25.00	58.25
	8.02		Unskilled labor for digging				
	8.03	0.01	Transportation of sand				
	8.04	250.00	Cement (M: 200, 1:6)	12.00	kg	7.00	84.00
	8.05	2.00	Water				
	8.06	0.17	Skilled labor on site	39.00	md	14.00	546.00

	8.70	0.05	Unskilled labor on site	12.00	md	7.00	84.00
A7	**7.00**		**Filling & compaction**	**45.00**	**m^3**		
	9.01	1.00	Soil	45.00	m^3	6.00	270.00
	9.02	0.33	Unskilled labor on site	15.00	md	7.00	105.00
A8	**8.00**		Spool	4.00	Nos	70.00	280.00
	8.01		Bucket	16.00	Nos	13.00	208.00
	8.02		Oil	100.00	lit	2.00	200.00
	8.03		Hand Cart	20.00	Nos	65.00	1,300.00
	8.04		Rope	500.00	meters	2.00	1,000.00
	8.05		Beams(0.12*0.16*3)	375.00	meters	20.00	7,500.00
	8.06		Spade	100.00	Nos	5.00	500.00
	8.07		Wheel Ring	464.00	Nos	20.00	9,280.00
	8.08		Ring Cover	58.00	Nos	22.00	1,276.00
	8.09		Pike axe	50.00	Nos	5.00	250.00
	8.10		Stone Slab	90.00	meters	12.00	1,080.00
A9	**9.00**		**Personal**				
	10.01	2.00	Foreman	360.00	md	10.00	3,600.00
	10.02	1.00	Store keeper	180.00	md	7.00	1,260.00
	10.03	4.00	Guard	720.00	md	10.00	7,200.00
A10	**10.00**		**Hand tools, stat., transp.**	**1.00**	**Lump sum**	**5,000.00**	5,000.00

Prepared by: Eng. Ahmadullah Noorzad

11.5.3 Implementation Time Table

Time table

Code: PW04-R01-F01
Province: Paktya
District: Gardez
Village: Hallem Qala
Project: Karez
Duration: Sixr months

N/S	Description	Weeks																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Purchacing material																								
2	Site preparations																								
3	Tunel cleaning																								
4	Foundation																								
5	Stone masonary																								
6	PCC work																								
7	Pointing																								
8	M&E																								
9	Closing ceremony																								

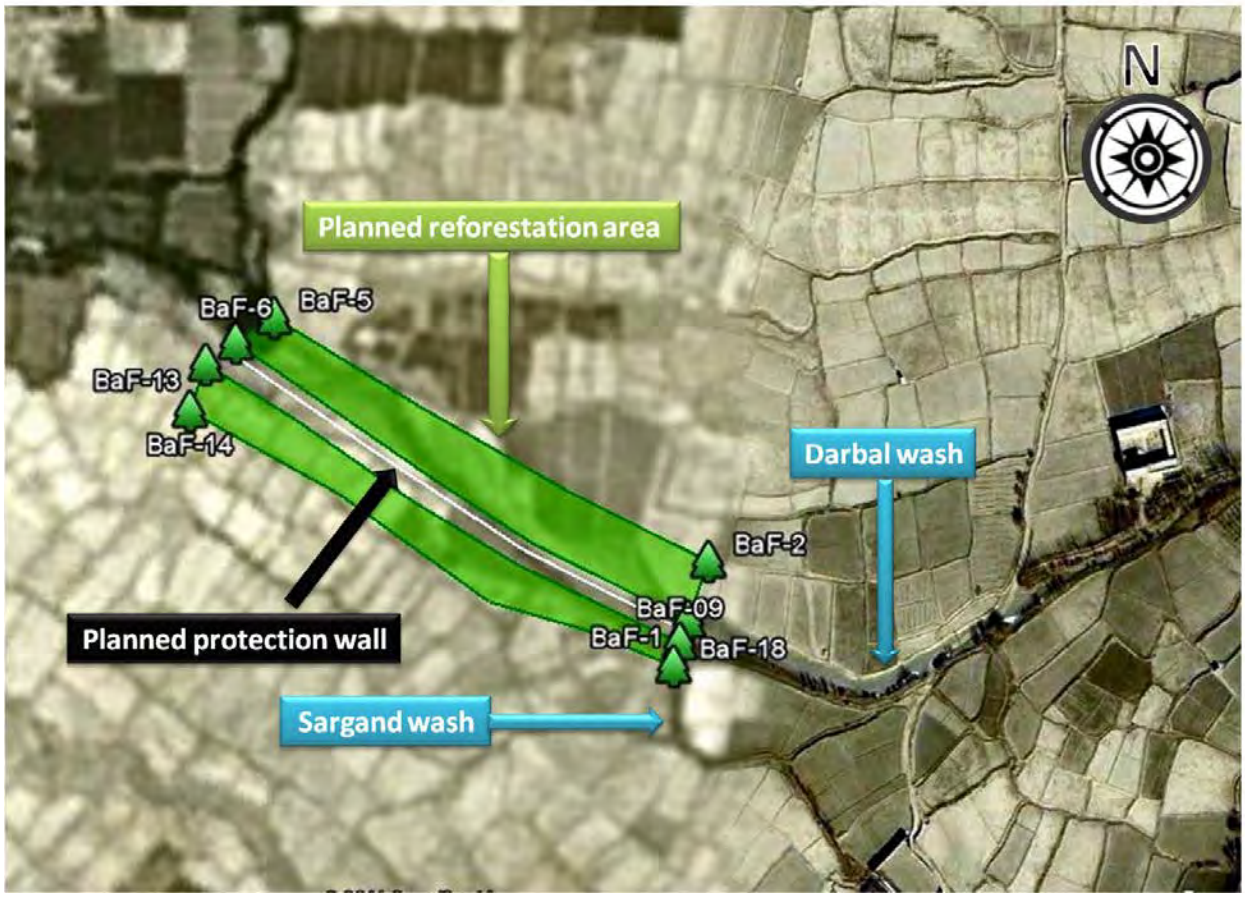
Prepeared by: Ing. Dost Mohammad and Ing. Ahmadllah Noorzad

11.6 Babrak Protection Wall

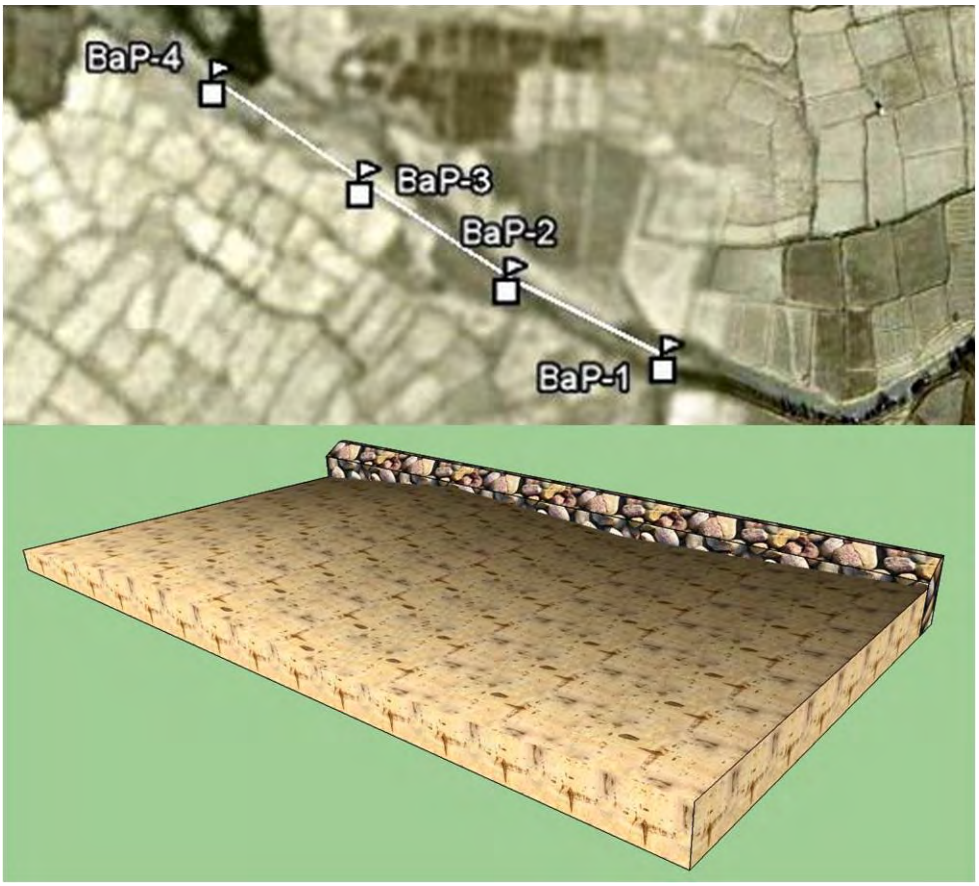
The landscape is included Babrak Village and one the more developed fruit orchard area. The extensive, broad tract of land is flat or gently sloping (<3%), unconfined, low-lying with low relief intensity. It is a typical Plain class landscape unit.

The studied relief area is a Planation Surface class land, flattish plain resulting from erosion. It is incised by the Darbal and Sargand wash. The Darbal wash characterized by intensive stream canal erosion, the reason because the survey team recommended to construct protection wall and protective tree belts in one particular section of the river bank (Landform: PW05/R02/F01).

The tree belts in both sides of the floodplain would be between 30m and 40m wide along 300m long section of the protection wall. It will begin from the joint point of the Darbal and Sargand washes and will end near to Qasim and Sayidon villages.

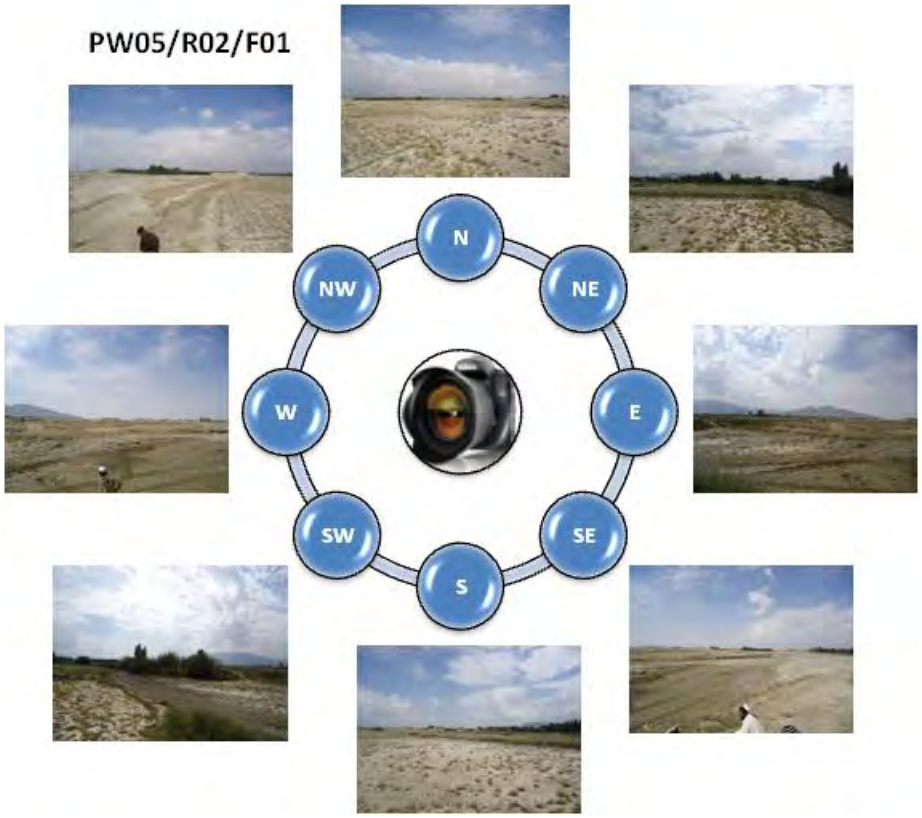


The PW05/R02/F01 landform area and the planned interventions



The location of the proposed Babrak protection wall and schematics of the Darbal wash streambed in that area

The planned tree belts in order to protect the area of intervention



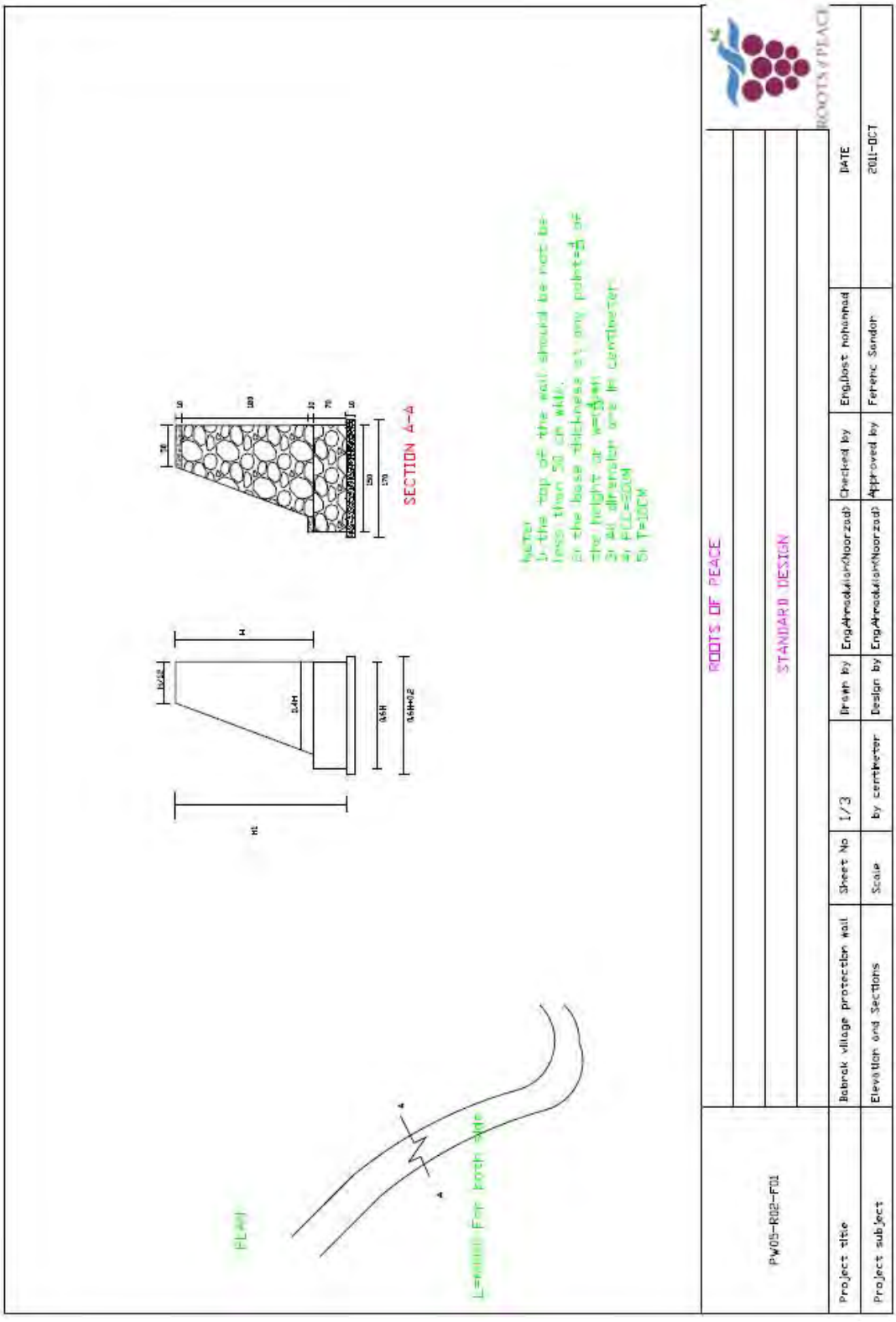
PW05-R02-F01- Babrak protection wall				
S/N	**Latitude**	**Longitude**	**Altitude (m)**	**Width (m)**
1	33.57407612	69.22186485	2,292	13.00
2	33.5744751	69.22091108	2,292	30.00
3	33.57496704	69.22001553	2,293	25.00
4	33.57548082	69.21911253	2,295	12.00

Height	a	b	c	tan α
0.000	0.000	100.00	100.00	0.00
1.825	1.825	100.00	100.02	0.02
2.672	0.847	100.00	100.00	0.01
4.214	1.54	100.00	100.01	0.02

PW05-R02-F01- Babrak Reforestation							
Left:	**6,488.51 m^2**	**Perimeter:**	**654.51 m**	**Right:**	**8,810.00 m^2**	**Perimeter:**	**634.38 m**
1	33.57401087	69.2218447	2,295	1	33.57412148	69.22189483	2,295
2	33.57440055	69.2208739	2,293	2	33.57441883	69.22201726	2,294
3	33.57471754	69.22024604	2,292	3	33.57476274	69.22118794	2,292
4	33.57512777	69.21953763	2,293	4	33.57519117	69.22028867	2,292
5	33.57540508	69.21899772	2,292	5	33.57563784	69.21940962	2,292
6	33.57517134	69.21890104	2,292	6	33.57551296	69.21917838	2,292
7	33.57475572	69.21979932	2,292	7	33.57484657	69.22033838	2,292
8	33.57421627	69.22070261	2,293	8	33.57450841	69.22096175	2,293
9	33.57407527	69.22128546	2,294				
10	33.57389689	69.22180699	2,295				

Specific coordinates for the Babrak protection wall and tree belts

11.6.1 Construction Design



11.6.2 Construction Cost

Bill Of Quantity (BoQ) Protection Wall

Code:	**PW05-R02-F01**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Babrak Qalla-Saidan Qalla**
Purpose:	**Protection Wall Typical Design by ROP {H=2.8 m & L=600m for Both side}**		
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Excavation**	816.00	m^3		-
	1.01	0.50	Unskilled labor	408.00	md	7.00	2,856.00
A2	**2.00**		**PCC M-120**	135.00	m^3		-
	2.01	1.06	Sandy gravel	143.10	m^3	25.00	3,577.50
	2.02	0.50	Unskilled labor for digging				-
	2.03	1.055	Transport				
	2.04	250	Cement	576.00	Bags	7.00	4,032.00
	2.05	200	Water				
	2.06	0.65	Skilled labor	88.00	md	14.00	1,232.00
	2.07	3.25	Unskilled labor	438.00	md	7.00	3,066.00
A3	**3.00**		**Stone masonry 1:3**	1,805.00	m^3		
	3.01	1.1	Stone & Transportation	1985.50	m^3	20.00	39,710.00
	3.02	0.3885	Sand	701.20	m^3	25.00	17,530.00
	3.03	0.50	Unskilled labor for digging				-
	3.04	0.3885	Sand transport				
	3.05	77.7	Cement	2805.00	Bags	7.00	19,635.00
	3.06	80.5	Water				
	3.07	0.5	Skilled labor	902.00	md	14.00	12,628.00
	3.08	1	Unskilled labor	1805.00	md	7.00	12,635.00
A4	**4.00**		**Pointing**	1,470.00	m^2		
	4.01	0.01	Sand	14.70	m^3	25.00	367.50
	4.02		Unskilled labor for digging				
	4.03	0.01	Transport				
	4.04	250	Cement (50Kg bag)	74.00	Bags	7.00	518.00
	4.05	2	Water				
	4.06	0.17	Skilled labor	250.00	md	14.00	3,500.00
	4.07	0.05	Unskilled labor	74.00	md	7.00	518.00
A5	**6.00**		**Personal**				
	6.01	2.00	Foreman	240.00	md	10.00	2,400.00
	6.02	1.00	Store keeper	120.00	md	7.00	840.00
	6.03	4.00	Guard	480.00	md	10.00	4,800.00
A6	**7.00**		**Tools, Stat., Transp.**	1.00	Ls	4,500.00	4,500.00

Prepared by: Eng. Ahmadullah Noorzad

11.6.3 Implementation Time Table

Time table

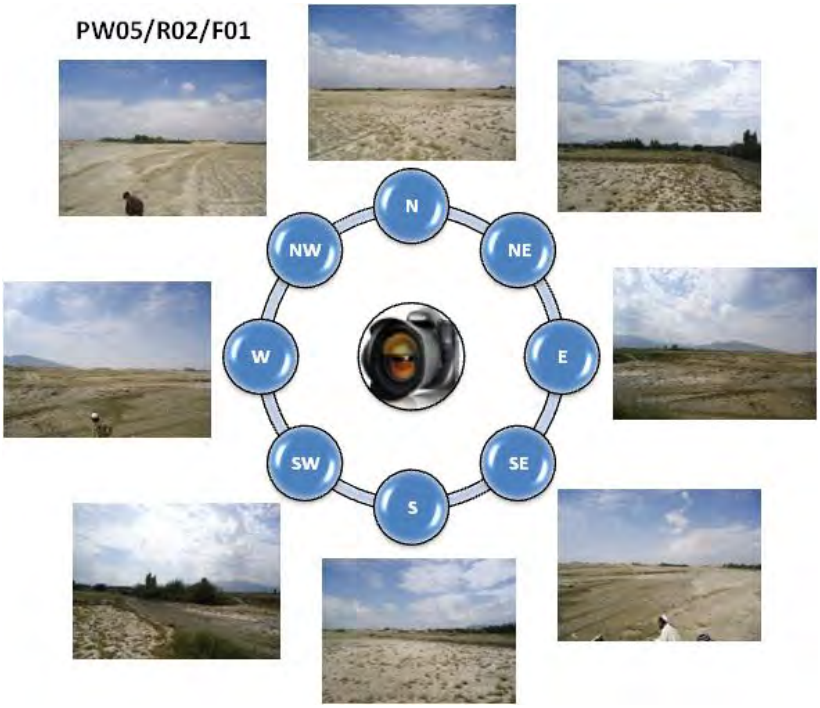
Code:	PW05-R02-F01
Province:	Paktya
District:	Gardez
Village:	Babrak Qllah to Saidan Qallah
Project:	Protection Wall
Duration:	Four Months

N/S	Description	Weeks
1	Purchasing Material	
2	Foundation Excavations	
3	Stone masonry	
4	PCC Works	
5	Pointing	
6	M&E	
7	Closing Ceremony	

Prepared by: Ing. Dost Mohammad and Ing. Ahmadllah Noorzad

11.7 Protective Tree Belts

The section where the protective tree belts will be established



11.7.1 Implementation Cost

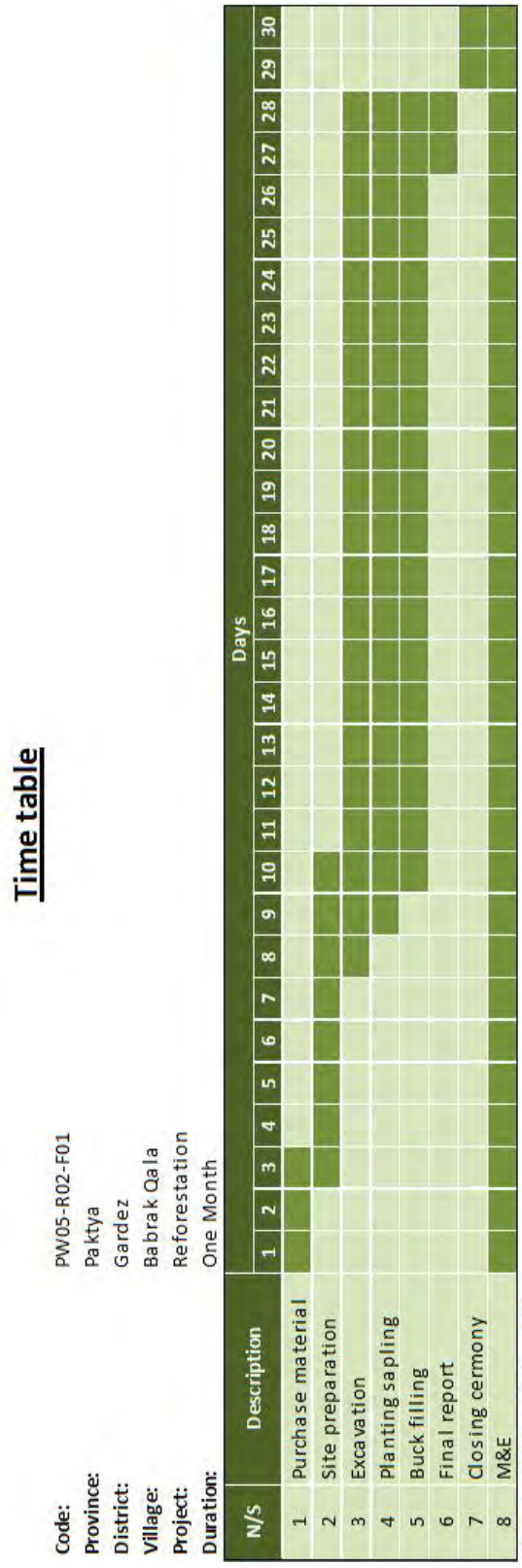
Bill of Quantity (BoQ) Reforestation

Code:	**PW05-R02-F01**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Babrak Qala**
Project:	**Reforestation**	**Total Area (m^2):**	**3,800**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**3,800.00**	**m^2**		-
	1.01	0.1	Unskilled labor	380.00	md	7.00	2,660.00
A2	**2.00**		**Cutting and Buck filling**	**300.00**	**m^3**		-
	2.01	0.5	Unskilled labor	150.00	md	7.00	1,050.00
A3	**3.00**		**Poplar**	**3,800.00**	**m^2**		-
	3.01		Simplat	1,800.00	Sapling	3.50	6,300.00
	3.02		Dn-70	1,200.00	Sapling	3.50	4,200.00
	3.03		Russian Olive (zaho)	267.00	Sapling	4.00	1,068.00
A4	**4.00**		**Purchase Material**				
	4.01		Shovel	60.00	Sapling	5.00	300.00
	4.02		Axe	30.00	Sapling	5.00	150.00
	4.03		Wheel Barrow	10.00	Sapling	60.00	600.00
	4.04		Bucket Steel	10.00	Sapling	2.00	20.00
	4.05		Axes	5.00	Sapling	10.00	50.00
	4.06		Water Collar	5.00	Sapling	6.00	30.00
	4.07		Glasses	20.00	Sapling	1.00	20.00
	4.08		I Beam for Maintenance	450.00	Meter	3.00	1,350.00
	4.09		Wire for Maintenance	1,280.00	Meter	0.40	512.00
	4.10		Adze	5.00	Sapling	10.00	50.00
	4.11		Scissors	10.00	Sapling	35.00	350.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	2.00	Guard	60	md	10.00	600.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,200.00	4,200.00
						Grand total	**24,740.00**

Prepared by Eng. M. Dawood

11.7.2 Implementation Time Table



Time table

Code: PW05-R02-F01
Province: Paktya
District: Gardez
Village: Babrak Qala
Project: Reforestation
Duration: One Month

N/S	Description	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Planting sapling																														
5	Buck filling																														
6	Final report																														
7	Closing cermony																														
8	M&E																														

Prepared by Eng.M.Dawood

11.8 Two Aqueducts of Pethakhel village

The gently undulating area characterizes the PW06 landscape by a series of rounded and elongated hills, with summits of the reticular hydrographic network. It formed by down weathering and flattening of an originally rugged land surface.

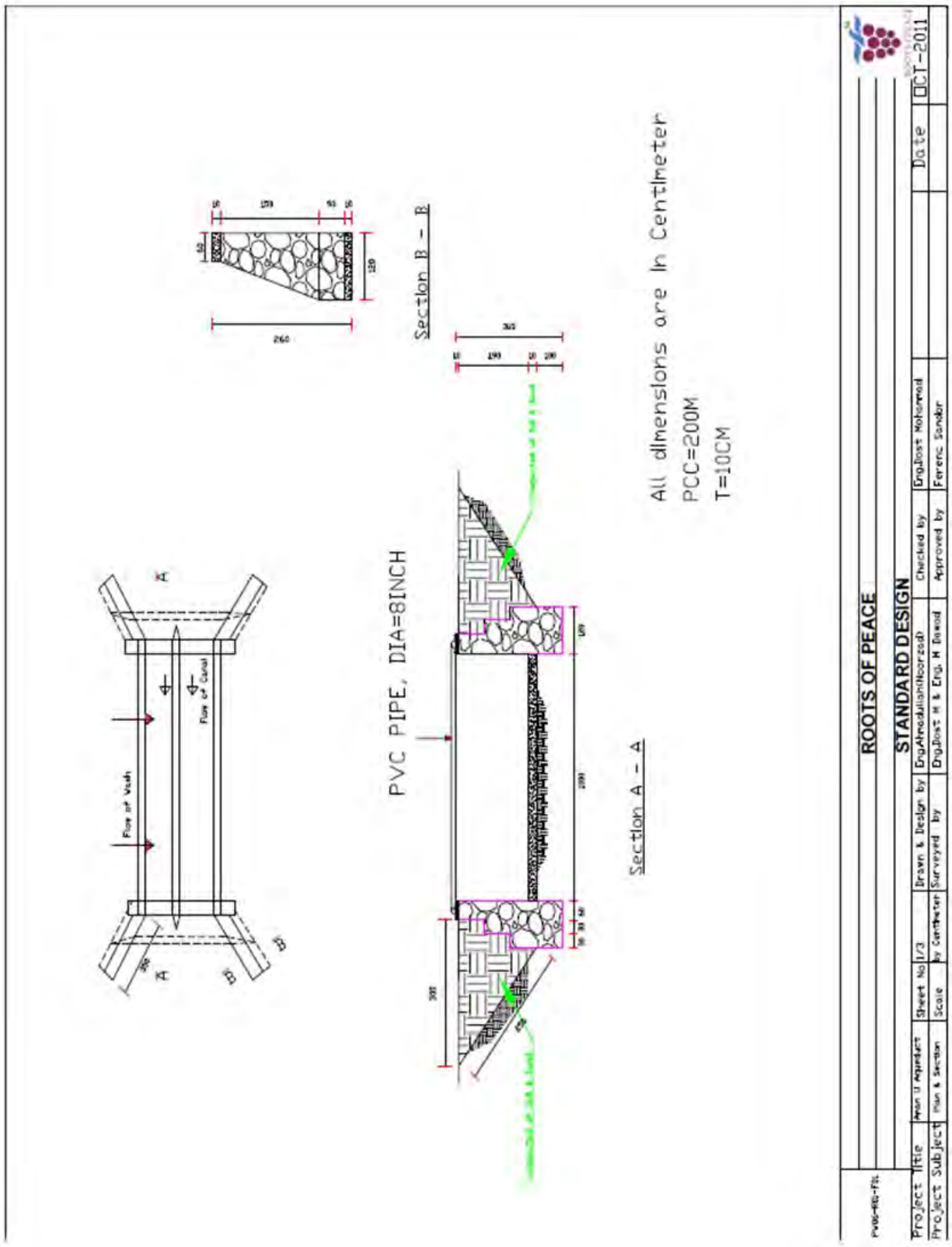
The smaller relief unit (PW06/R01) is a Denudational Surface with clear evidence of ongoing erosion through active canalized water washes and flood. Across the landscape flows the Sargand wash. In the future several protective interventions are needed for the floodplain landform PW06/R01/F01, though this survey identified two of them in order to address the main cause of the erosion. Both interventions should take place in the areas where the increasing erosion already developed extended rill areas with significant loss of soil.

The erosion affected rill areas with the proposed two aqueducts

PW06-R01-F01- Petalakhel 2 aqueducts				
S/N	Latitude	Longitude	Altitude (m)	Description
1	33.56468	69.24720	2,343	Aqueduct
2	33.5643854	69.24442303	2,339	Aqueduct
3	33,56433	69,24746	2,345	Rill area
4	33,56454	69,24759	2,339	Rill area
5	33,56450	69,24443	2,344	Rill area
6	33,56461	69,24734	2,334	Rill area
7	33,56520	69,24270	2,334	Rill area
8	33,56531	69,24261	2,333	Rill area
9	33,56536	69,24249	2,333	Rill area
10	33,56544	69,24243	2,333	Rill area

Specific coordinates of the PW06/R01/F01 landform

11.8.1 Construction Design (Aman U Qala Aqueduct)



11.8.2 Construction Cost (Aman U Qala Aqueduct)

Bill of Quantity (BoQ) Aqueduct

Code: PW06-R01-F01 **Province:** Paktya
District: Gardez **Village:** Aman U Qala
Purpose: Aman U Aqueduct
Date: 2011-OCT

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**60.00**	**m^2**		-
	1.01	0.04	Unskilled labor	3.00	md	7.00	21.00
A2	**2.00**		**Excavation**	**22.60**	**m^3**		-
	2.01	1	Unskilled labor	23.00	md	7.00	161.00
A3	**3.00**		**Stone Masonry**	**35.70**	**m^3**		-
	3.01	1.1	Stone & transportation	39.23	m^3	20.00	784.60
	3.02	0.3885	Sand	13.80	m^3	25.00	345.00
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	56.00	Bags	7.00	392.00
	3.06		PVC Pipe	12.00	meter	9.00	108.00
	3.07	80.5	Water				-
	3.08	0.5	Skilled labor on site	18.00	md	14.00	252.00
	3.09	1	Unskilled labor on site	36.00	md	7.00	252.00
A4	**4.00**		**Filling with soil & compaction**	21.11	**m3**		
	4.01	1.00	Soil	21.00	m3	6.00	126.00
	4.02	0.33	Unskilled labor on site	7.00	md	7.00	49.00
A5	**5.00**		**PCC**	**4.00**	**m^3**		
	4.01	1.055	Sandy gravel	4.22	m^3	25.00	105.50
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	20.00	Bags	7.00	140.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	3.00	md	14.00	42.00
	4.07	3.25	Unskilled labor on site	13.00	md	7.00	91.00
A6	**6.00**		**Pointing**	**32.10**	**m^2**		
	5.01	0.01	Sand	0.32	m^3	25.00	8.03
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	3.00	Bags	7.00	21.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	6.00	md	14.00	84.00
	5.07	0.05	Unskilled labor on site	2.00	md	7.00	14.00
A7	**7.00**		**Personal**				
	6.01	2.00	Foreman	120	md	10.00	1,200.00
	6.02	1.00	Store keeper	60	md	7.00	420.00
	6.03	4.00	Guard	240	md	10.00	2,400.00
A8	**8.00**		**Tools, Stat., Transp.**	**1**	**Ls**	3,500.00	3,500.00
						Grand total	**10,516.13**

Prepared by: Eng. Ahmadullah Noorzad

11.8.3 Implementation Time Table (Aman U Qala Aqueduct)

Time table

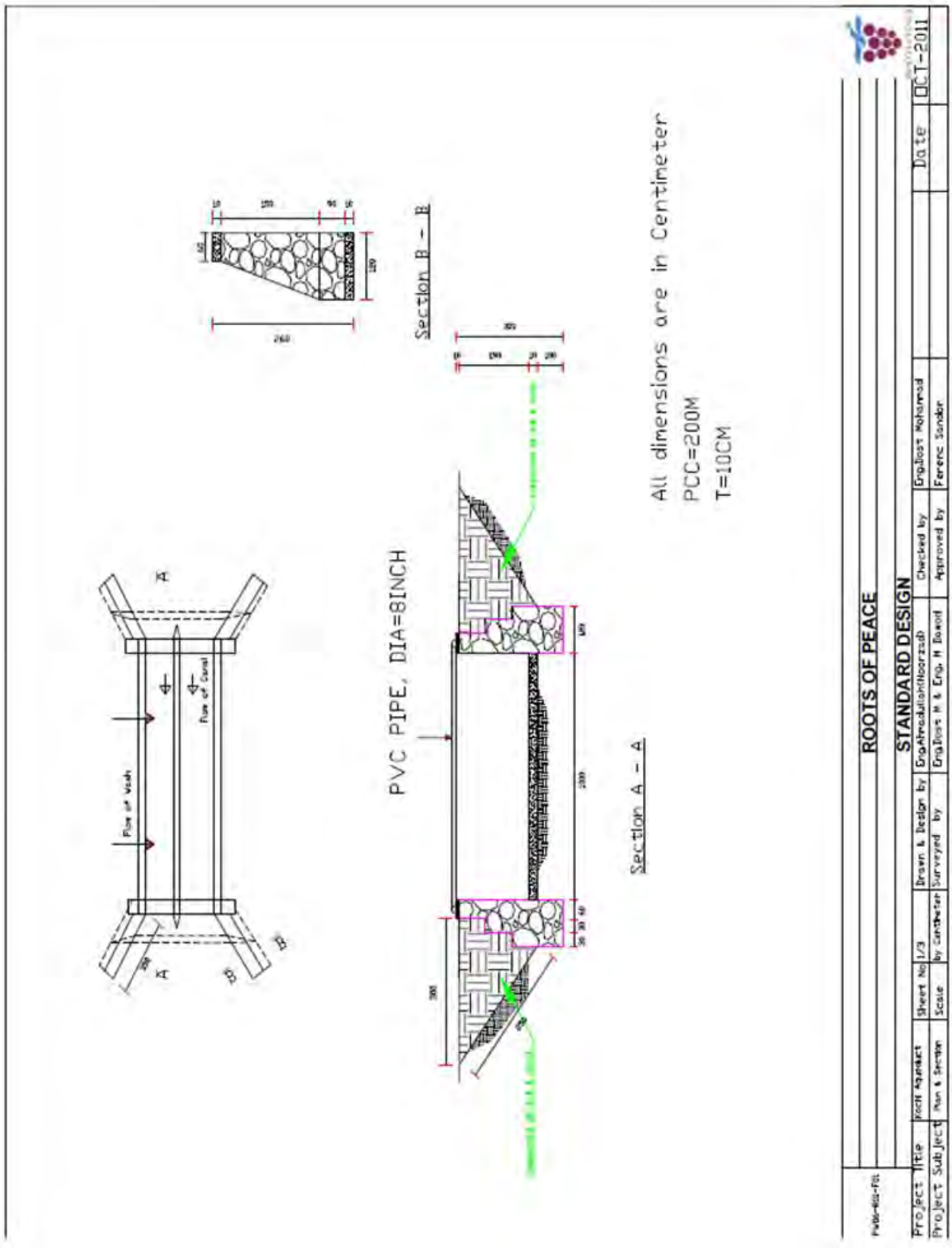
Code: PW06-R01-F01
Province: Paktya
District: Gardez
Village: Aman U Qala
Project: Aman U Aqueduct
Duration: Two months

N/S	Description	Weeks							
		1	2	3	4	5	6	7	8
1	Purchasing Material								
2	Site Preparation								
3	Excavation								
4	Stone Masonry								
5	PCC Works								
6	Pointing								
7	M&E								
8	Closing Ceremony								

Prepeared by: Ing. Dost Mohammad & Ing. Ahmadllah Noorzad

11.9 Kochi Aqueduct

11.9.1 Construction Design



11.9.2 Construction Cost

Bill of Quantity (BoQ) Aqueduct

Code: PW06-R01-F01 **Province:** Paktya
District: Gardez **Village:** Kochi Qala
Purpose: Kochi Aqueduct
Date: 2011-OCT

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**60.00**	**m^2**		-
	1.01	0.04	Unskilled labor	3.00	md	7.00	21.00
A2	**2.00**		**Excavation**	**22.60**	**m^3**		-
	2.01	1	Unskilled labor	23.00	md	7.00	161.00
A3	**3.00**		**Stone Masonry**	**35.70**	**m^3**		-
	3.01	1.1	Stone & transportation	39.23	m^3	20.00	784.60
	3.02	0.3885	Sand	13.80	m^3	25.00	345.00
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	56.00	Bags	7.00	392.00
	3.06		PVC Pipe	12.00	meter	9.00	108.00
	3.07	80.5	Water				-
	3.08	0.5	Skilled labor on site	18.00	md	14.00	252.00
	3.09	1	Unskilled labor on site	36.00	md	7.00	252.00
A4	**4.00**		**Filling with soil & compaction**	21.11	**m3**		
	4.01	1.00	Soil	21.00	m^3	6.00	126.00
	4.02	0.33	Unskilled labor on site	7.00	md	7.00	49.00
A5	**5.00**		**PCC**	**4.00**	**m^3**		
	4.01	1.055	Sandy gravel	4.22	m^3	25.00	105.50
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	20.00	Bags	7.00	140.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	3.00	md	14.00	42.00
	4.07	3.25	Unskilled labor on site	13.00	md	7.00	91.00
A6	**6.00**		**Pointing**	**32.10**	**m^2**		
	5.01	0.01	Sand	0.32	m^3	25.00	8.03
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	3.00	Bags	7.00	21.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	6.00	md	14.00	84.00
	5.07	0.05	Unskilled labor on site	2.00	md	7.00	14.00
A7	**7.00**		**Personal**				
	6.01	2.00	Foreman	120	md	10.00	1,200.00
	6.02	1.00	Store keeper	60	md	7.00	420.00
	6.03	4.00	Guard	240	md	10.00	2,400.00
A8	**8.00**		**Tools, Stat., Transp.**	**1**	**Ls**	3,500.00	3,500.00
						Grand total	**10,516.13**

Prepared by: Eng. Ahmadullah Noorzad

11.9.3 Implementation Time Table

Time table

Code: PW06-R01-F01
Province: Paktya
District: Gardez
Village: Kochi Qala
Project: Kochi Aqueduct
Duration: Two months

N/S	Description	Weeks							
		1	2	3	4	5	6	7	8
1	Purchasing Material								
2	Site Preparation								
3	Excavation								
4	Stone Masonry								
5	PCC Works								
6	Pointing								
7	M&E								
8	Closing Ceremony								

Prepared by: Ing. Dost Mohammad & Ing. Ahmadllah Noorzad

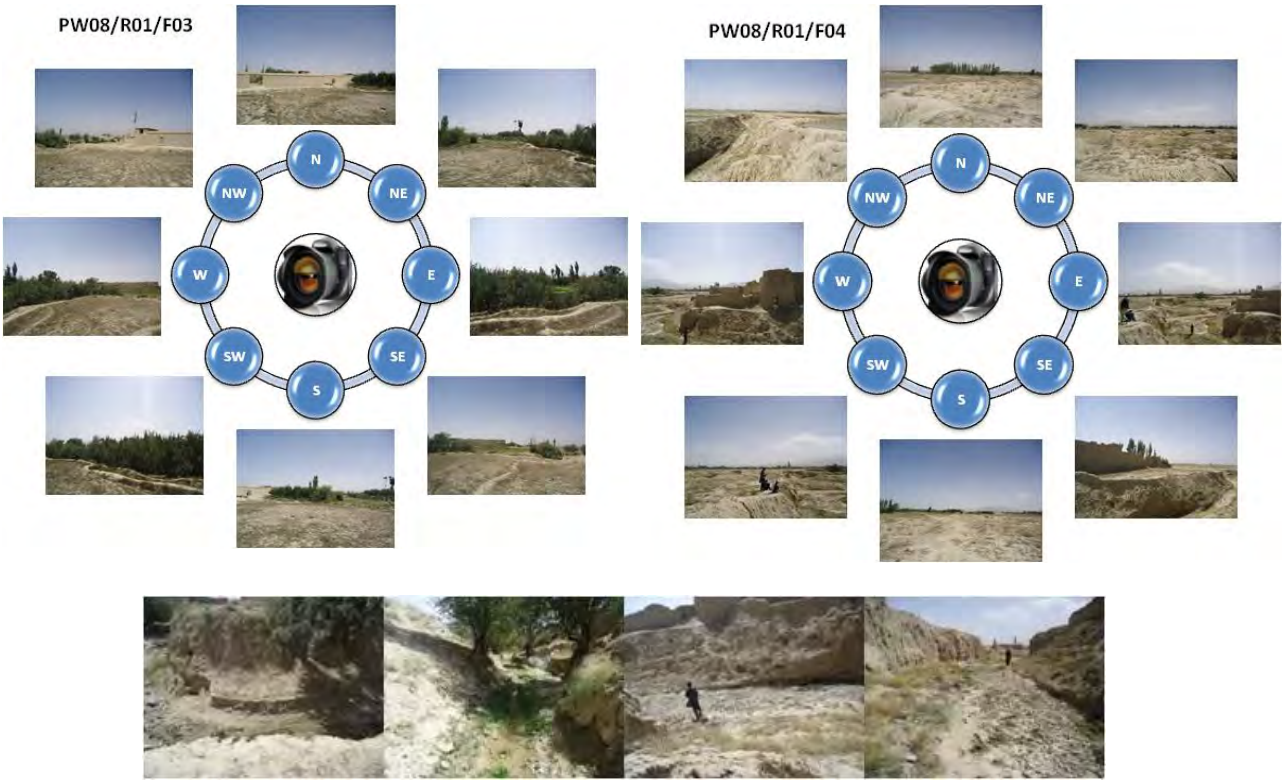
11.10 Four Check Dams Lagarou Kanda Wash

The Lagarou Kanda wash area has Denudational surface with extended rill and gully erosion. The steep-sided trench and channels were incised into sediment and soil. The extent of the gully type erosion reached the level of 10-25%. The soil loss of these gullies is varies between 500MT/Ha and 1,200MT/Ha. Sedimentation level also is very high. Both, erosion and sedimentation prevent the stabilization of the riverbanks, streams and waterways and causes the large overflow of the water on the land surface. The riverbanks are continuously eroding resulting from flood and sedimentation.

A series of check dams need to be installed the control water flow. The erosion control also requires large areas of reforested land. Some check dams are already had been constructed in the area, but they lack maintenance and several of them need complete rehabilitation. The reconstruction of four check dams is particularly important in order to control water flow. They are the following:

- Sailani check dam
- Gujar check dam
- Haji Gul Karem check dam
- Abdul Ghani check dam

These check dams are located in the PW08/R01/F03 and PW08/R01/F04 landforms. The area where the check dams are located will be protected in both sides with tree/shrub belts.



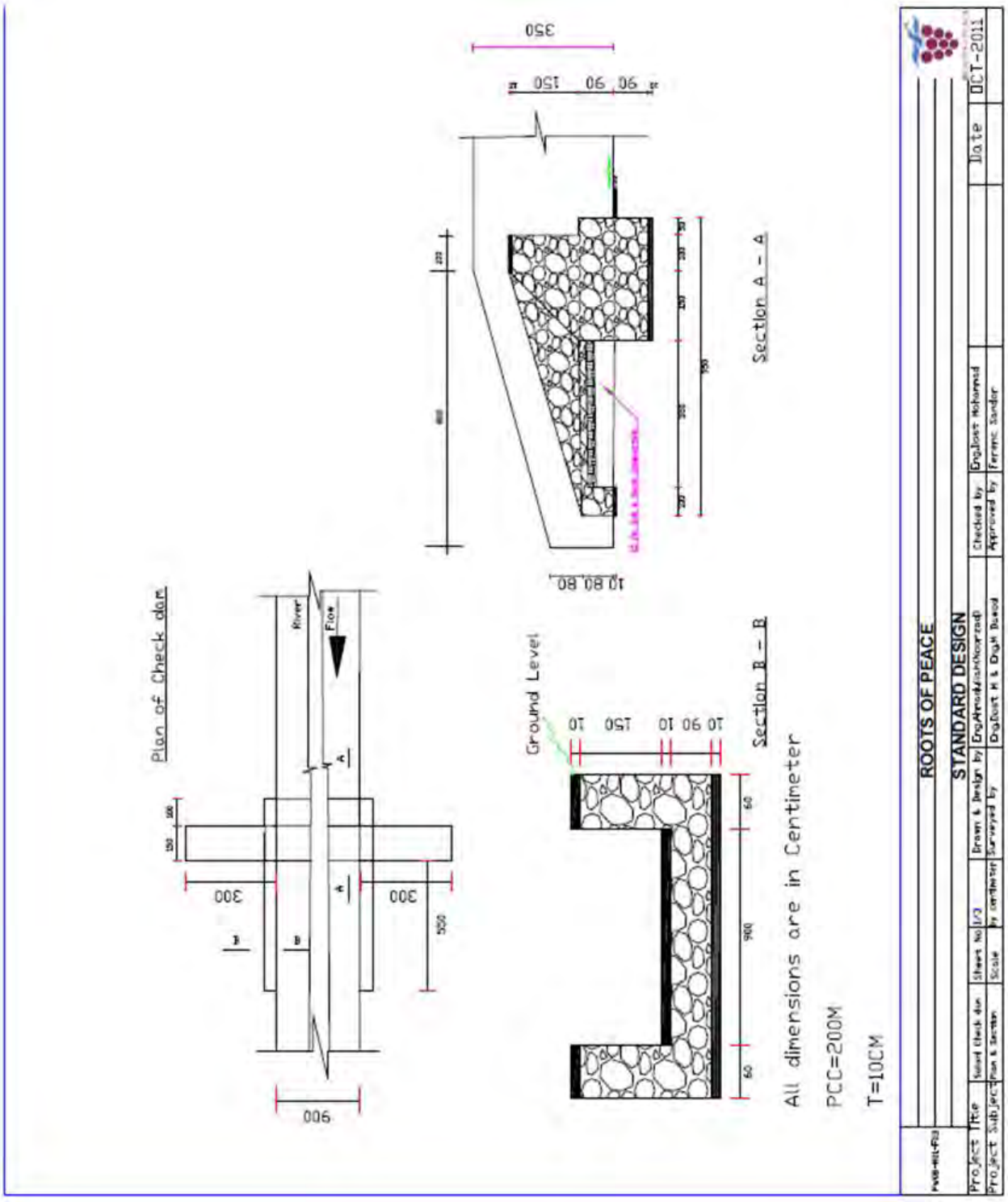
Satellite photo of the check dams area

PW08/R01/F03 - Check dams				
S/N	**Latitude**	**Longitude**	**Altitude (m)**	**Description**
1	33.56819181	69.22499836	2,304	Sailani 1
2	33.56817688	69.2256224	2,304	Sailani 2
3	33.5707805	69.22350368	2,300	Gujar 1
4	33.57009891	69.22376785	2,303	Gujar 2

PW08/R01/F04 - Check dams				
S/N	**Latitude**	**Longitude**	**Altitude (m)**	**Description**
1	33.57197275	69.22166548	2,297	Planned 1
2	33.5717371	69.22219294	2,299	Planned 2
3	33.57285232	69.21944872	2,293	Gul Karem 1
4	33.57250773	69.21980777	2,295	Gul Karem 2
5	33.57350354	69.21806074	2,292	Ghani 1
6	33.57328829	69.21860424	2,293	Ghani 2

Coordinates for the location of the four check dams

11.10.1 Construction Design



11.10.2 Construction cost (Sailani check dam)

Bill of quantity(BoQ) Check Dam

Code:	**PW08-R01-F03**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Habibkhel Qala**
Purpose:	**Saliani Check Dam**		
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**153.70**	**m2**		-
	1.01	0.04	Unskilled labor	7.00	md	7.00	49.00
A2	**2.00**		**Excavation**	**97.90**	**m^3**		-
	2.01	1	Unskilled labor	98.00	md	7.00	686.00
A3	**3.00**		**Stone Masonry**	**203.30**	**m^3**		-
	3.01	1.1	Stone including transportation	223.60	m^3	20.00	4,472.00
	3.02	0.3885	Sand	78.98	m^3	25.00	1,974.50
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	316.00	Bags	7.00	2,212.00
	3.06	80.5	Water				-
	3.07	0.5	Skilled labor on site	101.60	md	14.00	1,422.40
	3.08	1	Unskilled labor on site	203.00	md	7.00	1,421.00
A4	**4.00**		**PCC**	**15.16**	**m^3**		
	4.01	1.055	Sandy gravel	15.99	m^3	25.00	399.75
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	76.00	Bags	7.00	532.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	10.00	md	14.00	140.00
	4.07	3.25	Unskilled labor on site	50.00	md	7.00	350.00
A5	**5.00**		**Pointing**	**66.50**	**m^2**		
	5.01	0.01	Sand	0.67	m^3	25.00	16.63
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	4.00	Bags	7.00	28.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	12.00	md	14.00	168.00
	5.07	0.05	Unskilled labor on site	4.00	md	7.00	28.00
A6	**6.00**		**Personal**				
	6.01	2.00	Foreman	120	md	10.00	1,200.00
	6.02	1.00	Store keeper	60	md	7.00	420.00
	6.03	4.00	Guard	240	md	10.00	2,400.00
A7	**7.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,500.00	4,500.00
						Grand total	**22,419.28**

Prepared by: Eng. Ahmadullah Noorzad

11.10.3 Implementation Time Table

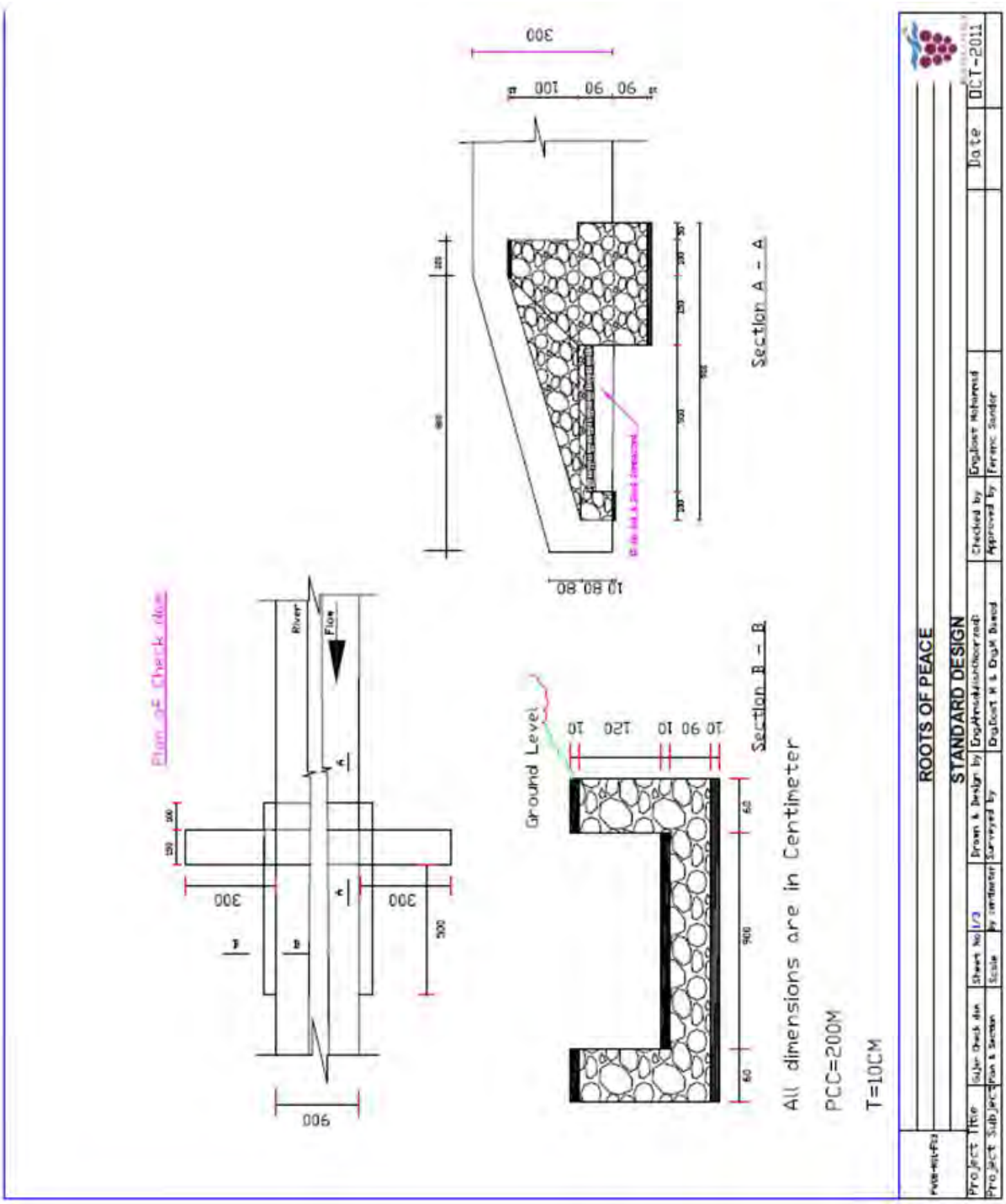
Time table

Code: PW08-R01-F03
Province: Paktya
District: Gardez
Village: Habib Khel Qala
Project: Sailani Check Dam
Duration: Two months

N/S	Description	Weeks							
		1	2	3	4	5	6	7	8
1	Purchasing Material								
2	Site Preparation								
3	Excavation								
4	Stone Masonry								
5	PCC Works								
6	Pointing								
7	M&E								
8	Closing Ceremony								

Prepared by: Ing. Dost Mohammad & Ing. Ahmadllah Noorzad

11.10.4 Construction Design



11.10.5 Construction Cost

Bill of Quantity (BoQ) Check Dam

Code:	**PW08-R01-F03**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Dari Plarani**
Purpose:	**Gujar Check Dam**		
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**153.20**	**m2**		-
	1.01	0.04	Unskilled labor	7.00	md	7.00	49.00
A2	**2.00**		**Excavation**	**95.20**	**m^3**		-
	2.01	1	Unskilled labor	95.00	md	7.00	665.00
A3	**3.00**		**Stone Masonry**	**189.00**	**m^3**		-
	3.01	1.1	Stone including transportation	207.90	m^3	20.00	4,158.00
	3.02	0.3885	Sand	73.42	m^3	25.00	1,835.50
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	294.00	Bags	7.00	2,058.00
	3.06	80.5	Water				-
	3.07	0.5	Skilled labor on site	95.00	md	14.00	1,330.00
	3.08	1	Unskilled labor on site	189.00	md	7.00	1,323.00
A4	**4.00**		**PCC**	**14.80**	**m^3**		
	4.01	1.055	Sandy gravel	15.61	m^3	25.00	390.25
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	74.00	Bags	7.00	518.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	10.00	md	14.00	140.00
	4.07	3.25	Unskilled labor on site	49.00	md	7.00	343.00
A5	**5.00**		**Pointing**	**64.80**	**m^2**		
	5.01	0.01	Sand	0.65	m^3	25.00	16.20
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	4.00	Bags	7.00	28.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	11.00	md	14.00	154.00
	5.07	0.05	Unskilled labor on site	4.00	md	7.00	28.00
A6	**6.00**		**Personal**				
	6.01	2.00	Foreman	120	md	10.00	1,200.00
	6.02	1.00	Store keeper	60	md	7.00	420.00
	6.03	4.00	Guard	240	md	10.00	2,400.00
A7	**7.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,500.00	4,500.00
						Grand total	**21,555.95**

Prepared by: Eng. Ahmadullah Noorzad

11.10.6 Implementation Time Table

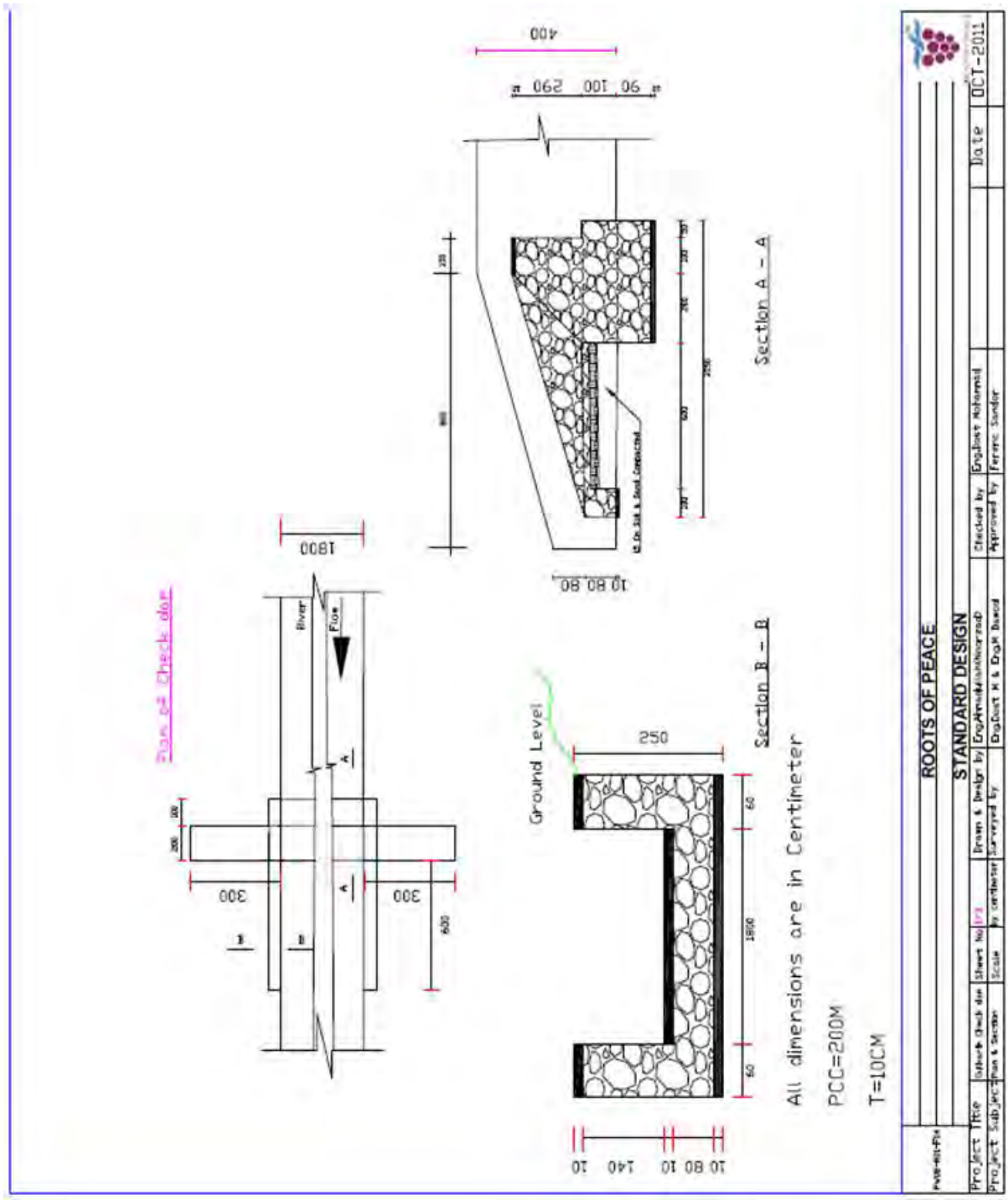
Time table

Code: PW08-R01-F03
Province: Paktya
District: Gardez
Village: Dari Plarani
Project: Gujar Check Dam
Duration: Two months

N/S	Description	Weeks							
		1	2	3	4	5	6	7	8
1	Purchasing Material								
2	Site Preparation								
3	Excavation								
4	Stone Masonry								
5	PCC Works								
6	Pointing								
7	M&E								
8	Closing Ceremony								

Prepared by: Ing. Dost Mohammad & Ing. Ahmadllah Noorzad

11.10.7 Construction Design



11.10.8 Construction Cost

Bill of Quantity (BoQ) Check Dam

Code:	**PW08-R01-F04**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Dari Plarani**
Purpose:	**Gul Karem Check Dam**		
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**205.00**	**m2**		-
	1.01	0.04	Unskilled labor	9.00	md	7.00	63.00
A2	**2.00**		**Excavation**	**197.40**	**m^3**		-
	2.01	1	Unskilled labor	198.00	md	7.00	1,386.00
A3	**3.00**		**Stone Masonry**	**371.52**	**m^3**		-
	3.01	1.1	Stone including transportation	408.67	m^3	20.00	8,173.40
	3.02	0.3885	Sand	144.33	m^3	25.00	3,608.25
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	577.00	Bags	7.00	4,039.00
	3.06	80.5	Water				-
	3.07	0.5	Skilled labor on site	186.00	md	14.00	2,604.00
	3.08	1	Unskilled labor on site	371.00	md	7.00	2,597.00
A4	**4.00**		**PCC**	**23.90**	**m^3**		
	4.01	1.055	Sandy gravel	25.20	m^3	25.00	630.00
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	96.00	Bags	7.00	672.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	16.00	md	14.00	224.00
	4.07	3.25	Unskilled labor on site	78.00	md	7.00	546.00
A5	**5.00**		**Pointing**	**70.10**	**m^2**		
	5.01	0.01	Sand	0.70	m^3	25.00	17.53
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	4.00	Bags	7.00	28.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	12.00	md	14.00	168.00
			Unskilled labor on site		md		
A6	**6.00**		**Personal**				
	6.01	2.00	Foreman	180	md	10.00	1,800.00
	6.02	1.00	Store keeper	90	md	7.00	630.00
	6.03	4.00	Guard	360	md	10.00	3,600.00
A7	**7.00**		**Tools, Stat., Transp.**	**1**	**Ls**	5,000.00	5,000.00
						Grand total	**35,814.16**

Prepared by: Eng. Ahmadullah Noorzad

11.10.9 Implementation Time Table

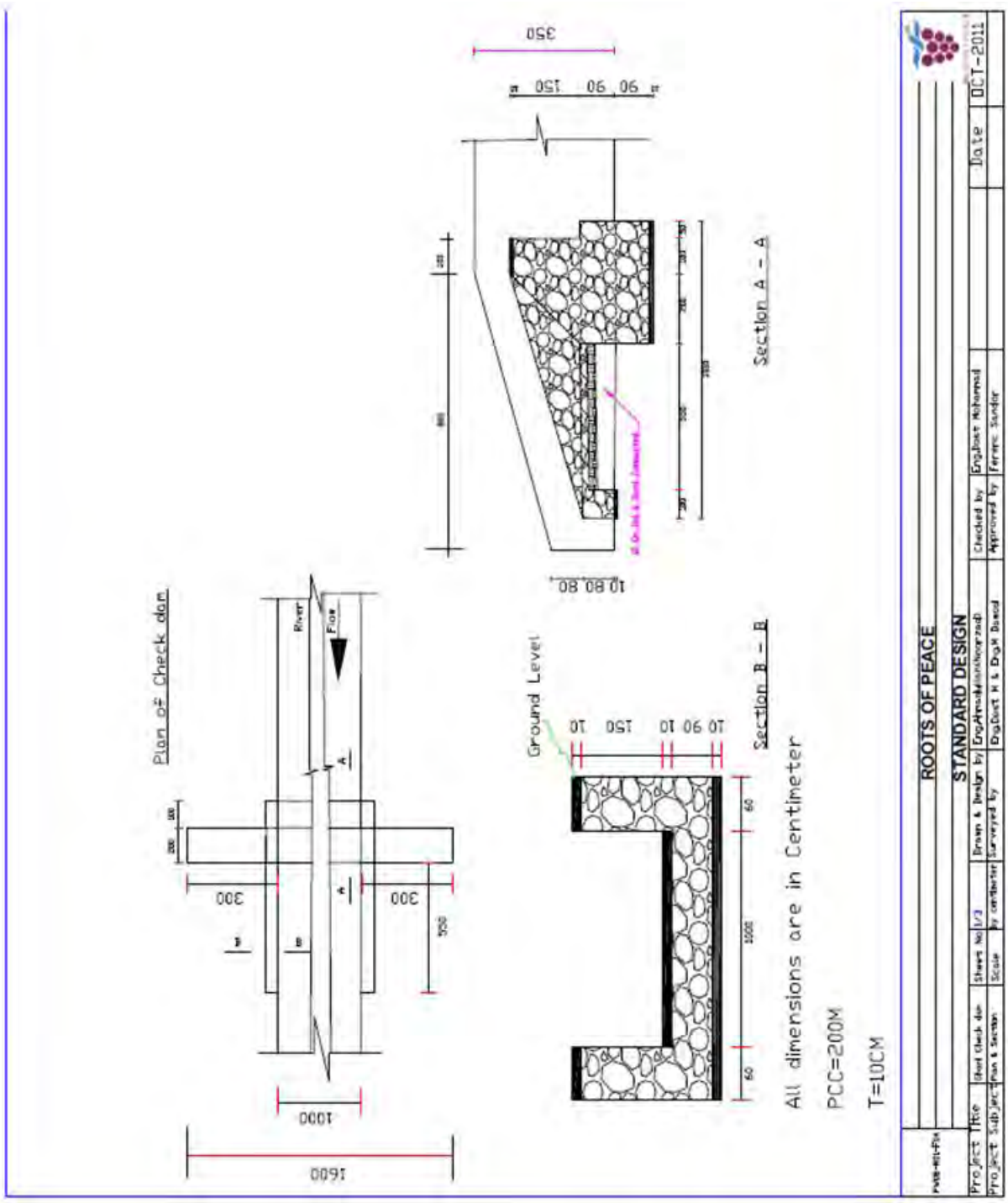
Time table

Code: PW08-R01-F04
Province: Paktya
District: Gardez
Village: Dari Plarani
Project: Gul Karem Check Dam
Duration: Three months

N/S	Description	Weeks											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Purchasing Material												
2	Site Preparation												
3	Excavation												
4	Stone Masonry												
5	PCC Works												
6	Pointing												
7	M&E												
8	Closing Ceremony												

Prepared by: Ing. Dost Mohammad & Ing. Ahmadullah Noorzad

11.10.10 Construction Design



11.10.11 Construction Cost

Bill of Quantity (BoQ) Check Dam

Code:	**PW08-R01-F04**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Dari Plarani**
Purpose:	**Ghani Check Dam**		
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**160.10**	**m2**		-
	1.01	0.04	Unskilled labor	7.00	md	7.00	49.00
A2	**2.00**		**Excavation**	**123.70**	**m^3**		-
	2.01	1	Unskilled labor	124.00	md	7.00	868.00
A3	**3.00**		**Stone Masonry**	**213.70**	**m^3**		-
	3.01	1.1	Stone including transportation	235.07	m^3	20.00	4,701.40
	3.02	0.3885	Sand	83.02	m^3	25.00	2,075.50
	3.03		Unskilled labor for digging				-
	3.04	0.3885	Sand transport				-
	3.05	77.7	Cement (M: 200, 1:3)	332.00	Bags	7.00	2,324.00
	3.06	80.5	Water				-
	3.07	0.5	Skilled labor on site	107.00	md	14.00	1,498.00
	3.08	1	Unskilled labor on site	214.00	md	7.00	1,498.00
A4	**4.00**		**PCC**	**19.96**	**m^3**		
	4.01	1.055	Sandy gravel	21.07	m^3	25.00	526.75
	4.02		Unskilled labor for digging				
	4.03	1.055	Transportation of gravel				
	4.04	250	Cement (M:120, 1:6)	100.00	Bags	7.00	700.00
	4.05	200	Water				
	4.06	0.65	Skilled labor on site	13.00	md	14.00	182.00
	4.07	3.25	Unskilled labor on site	65.00	md	7.00	455.00
A5	**5.00**		**Pointing**	**110.00**	**m^2**		
	5.01	0.01	Sand	1.10	m^3	25.00	27.50
	5.02		Unskilled labor for digging				
	5.03	0.01	Transportation of sand				
	5.04	250	Cement (M: 200, 1:3)	6.00	Bags	7.00	42.00
	5.05	2	Water				
	5.06	0.17	Skilled labor on site	19.00	md	14.00	266.00
	5.07	0.05	Unskilled labor on site	6.00	md	7.00	42.00
A6	**6.00**		**Personal**				
	6.01	2.00	Foreman	180	md	10.00	1,800.00
	6.02	1.00	Store keeper	90	md	7.00	630.00
	6.03	4.00	Guard	360	md	10.00	3,600.00
A7	**7.00**		**Tools, Stat., Transp.**	**1**	**Ls**	5,000.00	5,000.00
						Grand total	**26,285.15**

Prepared by: Eng. Ahmadullah Noorzad

11.10.12 Implementation Time Table

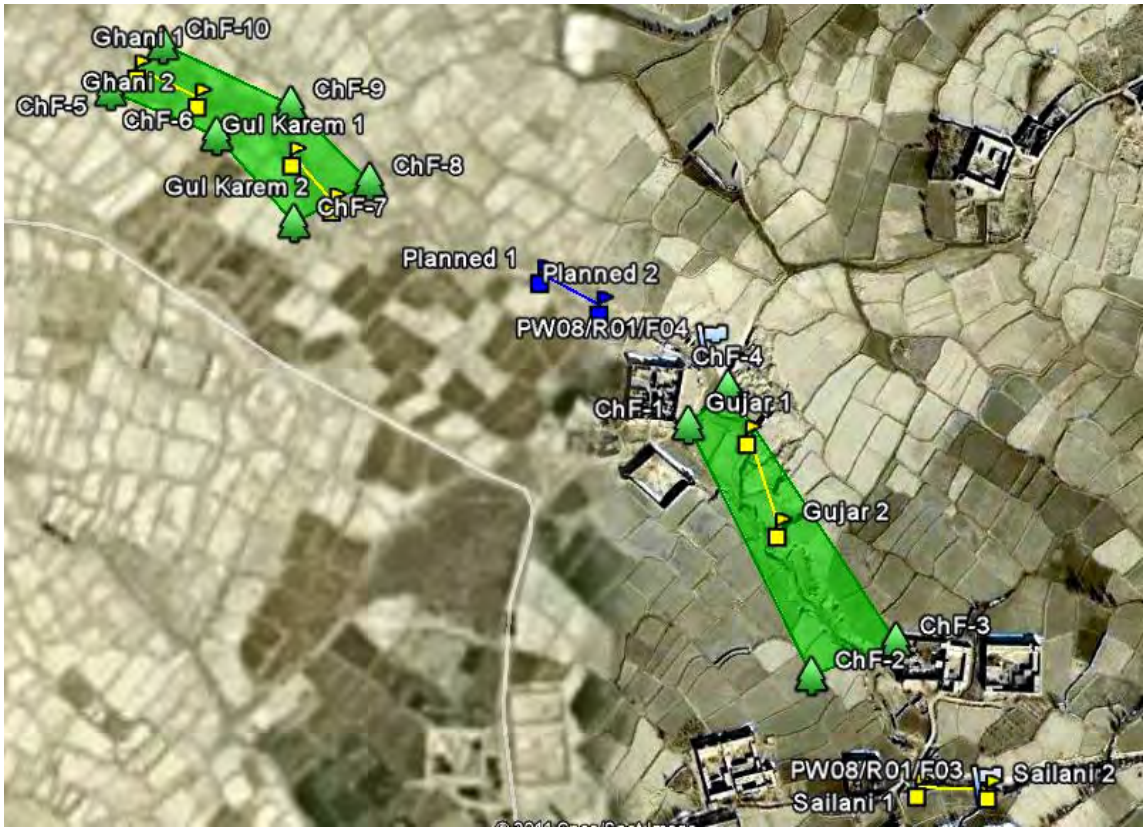
Time table

Code: PW08-R01-F04
Province: Paktya
District: Gardez
Village: Dari Plarani
Project: Ghani Check Dam
Duration: Three months

N/S	Description	Weeks											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Purchasing Material												
2	Site Preparation												
3	Excavation												
4	Stone Masonry												
5	PCC Works												
6	Pointing												
7	M&E												
8	Closing Ceremony												

Prepared by: Ing. Dost Mohammad & Ing. Ahmadullah Noorzad

11.11 Protective Tree Belts (PW08/R01/F03 & F04)



Check dam protection tree belts in the PW08/R01/F03 & F04 landforms

PW08/R01/F03 - Tree belt			
S/N	Latitude	Longitude	Altitude (m)
1	33.57085488	69.22296607	2,300
2	33.5690088	69.22405293	2,303
3	33.56926102	69.22480002	2,303
4	33.57112252	69.22331833	2,300

PW08/R01/F04 - Tree belt			
S/N	Latitude	Longitude	Altitude (m)
1	33.57334193	69.21780762	2,292
2	33.57300564	69.21875982	2,293
3	33.57235514	69.21945497	2,295
4	33.572665	69.2201301	2,293
5	33.57323711	69.21942235	2,292
6	33.57368736	69.21827658	2,292

Coordinates for Protective tree belts (Landform: PW08/R01/F03 & F04)

11.11.1 Implementation Cost

Bill of Quantity (BoQ) Reforestation

Code:	**PW08-R01-F03**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Laghar**
Project:	**Gully Protection**	**Total Area (m^2):**	**5,500**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**5,500.00**	**m^2**		-
	1.01	0.1	Unskilled labor	550.00	md	7.00	3,850.00
A2	**2.00**		**Cutting and Buck filling**	**210.00**	**m^3**		-
	2.01	0.5	Unskilled labor	105.00	md	7.00	735.00
A3	**3.00**		**Poplar**	**5,500.00**	**m^2**		-
	3.01		Kabuly	4,000.00	Sapling	0.30	1,200.00
	3.02		Panja chinar	4,500.00	Sapling	0.30	1,350.00
	3.03		Willow (Aus-L)	179.00	Sapling	3.00	537.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	40.00	Unit	5.00	200.00
	4.02		Axe	20.00	Unit	5.00	100.00
	4.03		Wheel Barrow	6.00	Unit	60.00	360.00
	4.04		Bucket Steel	7.00	Unit	2.00	14.00
	4.05		Axes	5.00	Unit	10.00	50.00
	4.06		Water Colar	4.00	Unit	6.00	24.00
	4.07		Glasses	8.00	Unit	1.00	8.00
	4.08		IBeam for Maintanance	315.00	Meter	3.00	945.00
	4.09		Wier for Maintanance	1,050.00	Meter	0.40	420.00
	4.10		Adze	4.00	Unit	10.00	40.00
	4.11		Scissors	13.00	Unit	35.00	455.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Lump sum**	5,000.00	5,000.00
						Grand total	**17,718.00**

Prepared by Eng. M. Dawood

11.11.2 Implementation Time Table

Time table

Code: PW08-R01-F03
Province: Paktya
District: Gardez
Village: Laghar
Project: Reforestation
Duration: One Month

N/S	Description	Days																													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material	■	■	■																											
2	Site preparation			■	■	■	■	■	■	■	■																				
3	Excavation								■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
4	Planting sapling									■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
5	Buck filling										■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
6	Final report																											■	■		
7	Closing cermony																													■	■
8	M&E	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Prepared by Eng.M.Dawood

11.11.3 Implementation Cost

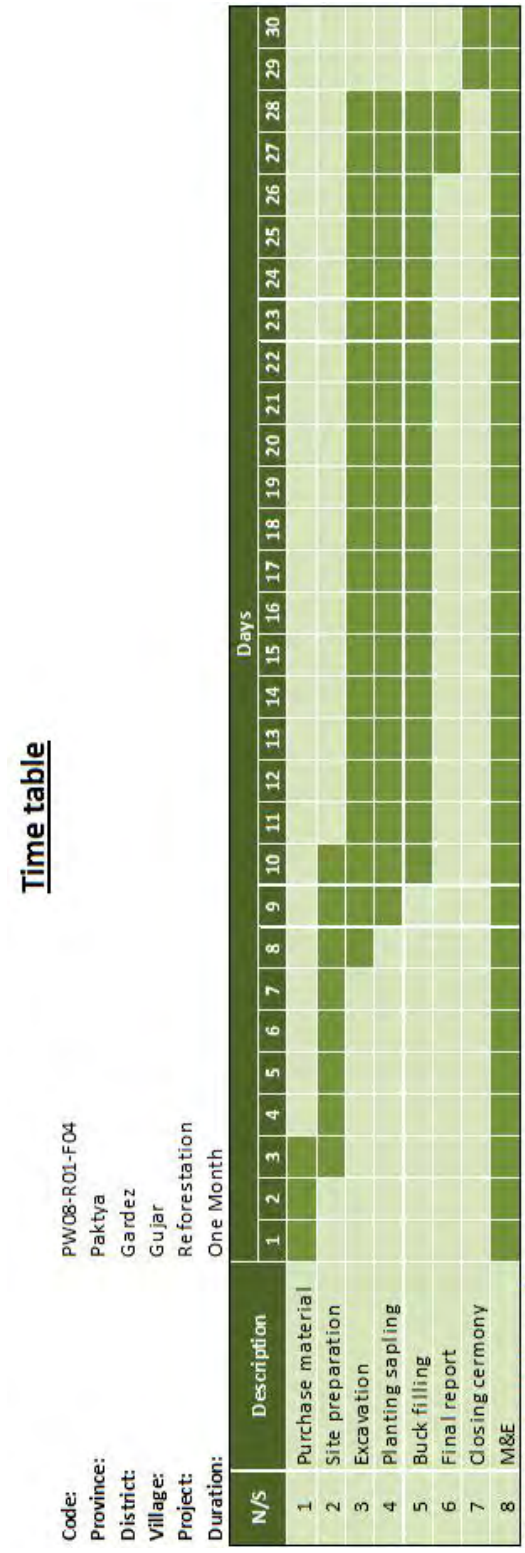
Bill of Quantity (BoQ) Reforestation

Code:	**PW08-R01-F04**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Gujar**
Project:	**Reforestation**	**Total Area (m^2):**	**1,480**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**14,800.00**	**m^2**		-
	1.01	0.1	Unskilled labor	1,480.00	md	7.00	10,360.00
A2	**2.00**		**Cutting and Buck filling**	**363.00**	**m^3**		-
	2.01	0.5	Unskilled labor	182.00	md	7.00	1,274.00
A3	**3.00**		**Almond**	**14,800.00**	**m^2**		-
	3.01		Almond (Abdul wahidi)	1,250.00	Sapling	5.00	6,250.00
	3.02		Almond (Khirodini)	1,500.00	Sapling	5.00	7,500.00
	3.03		Willow -SX 64	286.00	Sapling	3.00	858.00
	3.04		Wild Rose (Rosa webbiana)	900.00	Sapling	3.00	2,700.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	55.00	Unit	5.00	275.00
	4.02		Axe	27.00	Unit	5.00	135.00
	4.03		Wheel Barrow	14.00	Unit	60.00	840.00
	4.04		Bucket Steel	9.00	Unit	2.00	18.00
	4.05		Axes	8.00	Unit	10.00	80.00
	4.06		Water Collar	7.00	Unit	6.00	42.00
	4.07		Glasses	15.00	Unit	1.00	15.00
	4.08		Beam for Maintenance	162.00	Meter	3.00	486.00
	4.09		Wire for Maintenance	540.00	Meter	0.40	216.00
	4.10		Adze	8.00	Unit	10.00	80.00
	4.11		Scissors	20.00	Unit	35.00	700.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,500.00	4,500.00
						Grand total	**36,059.00**

Prepared by Eng. M. Dawood

11.11.4 Implementation Time Table



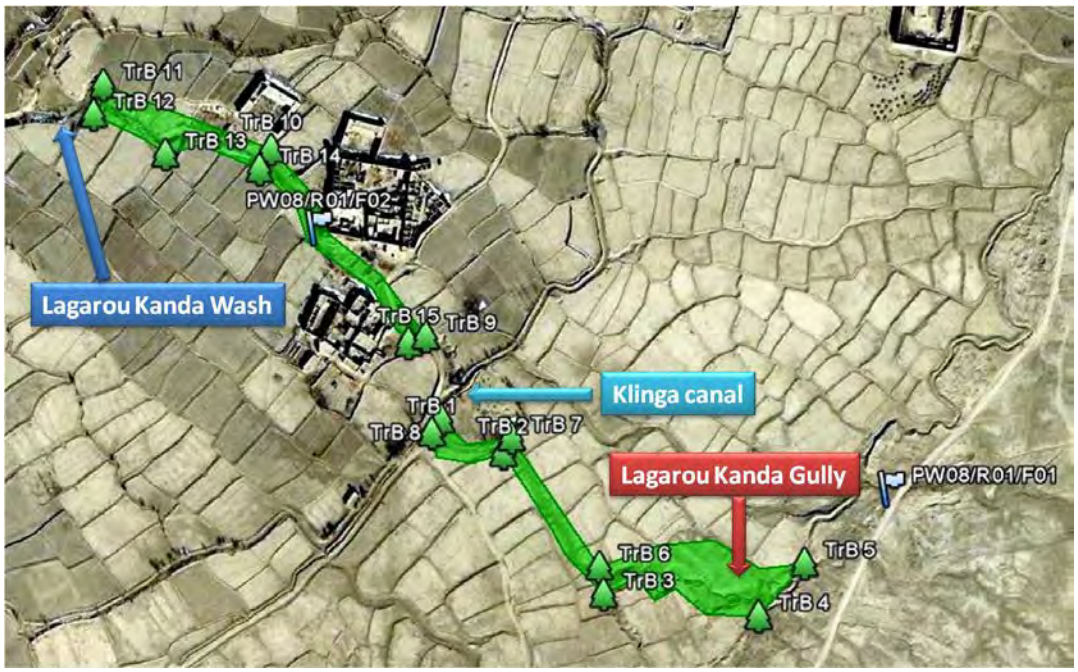
Time table

Code: PW08-R01-F04
Province: Paktya
District: Gardez
Village: Gujar
Project: Reforestation
Duration: One Month

N/S	Description	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Planting sapling																														
5	Buck filling																														
6	Final report																														
7	Closing cermony																														
8	M&E																														

Prepared by Eng.M.Dawood

11.12 Stream Canal Protective Tree Belts (PW08/R01/F01 & 02)



Location of the two stream canal protective tree belts

PW08/R01/F01 - Tree belt			
S/N	**Latitude**	**Longitude**	**Altitude (m)**
1	33.56650431	69.23011734	2,313
2	33.56638028	69.2306405	2,314
3	33.56552565	69.23137076	2,314
4	33.56539921	69.23249209	2,317
5	33.56571721	69.23282604	2,317
6	33.56569068	69.23134175	2,314
7	33.56647578	69.23069954	2,314
8	33.56658622	69.23018589	2,313

PW08/R01/F02 - Tree belt			
S/N	**Latitude**	**Longitude**	**Altitude (m)**
1	33.56709297	69.23007292	2,312
2	33.56823796	69.22893635	2,309
3	33.56863842	69.22769388	2,306
4	33.56845535	69.2276219	2,306
5	33.56820864	69.22815714	2,308
6	33.56811618	69.22885092	2,309
7	33.56705108	69.22994701	2,312

Coordinates for stream canal protective tree belts

11.12.1 Implementation Cost

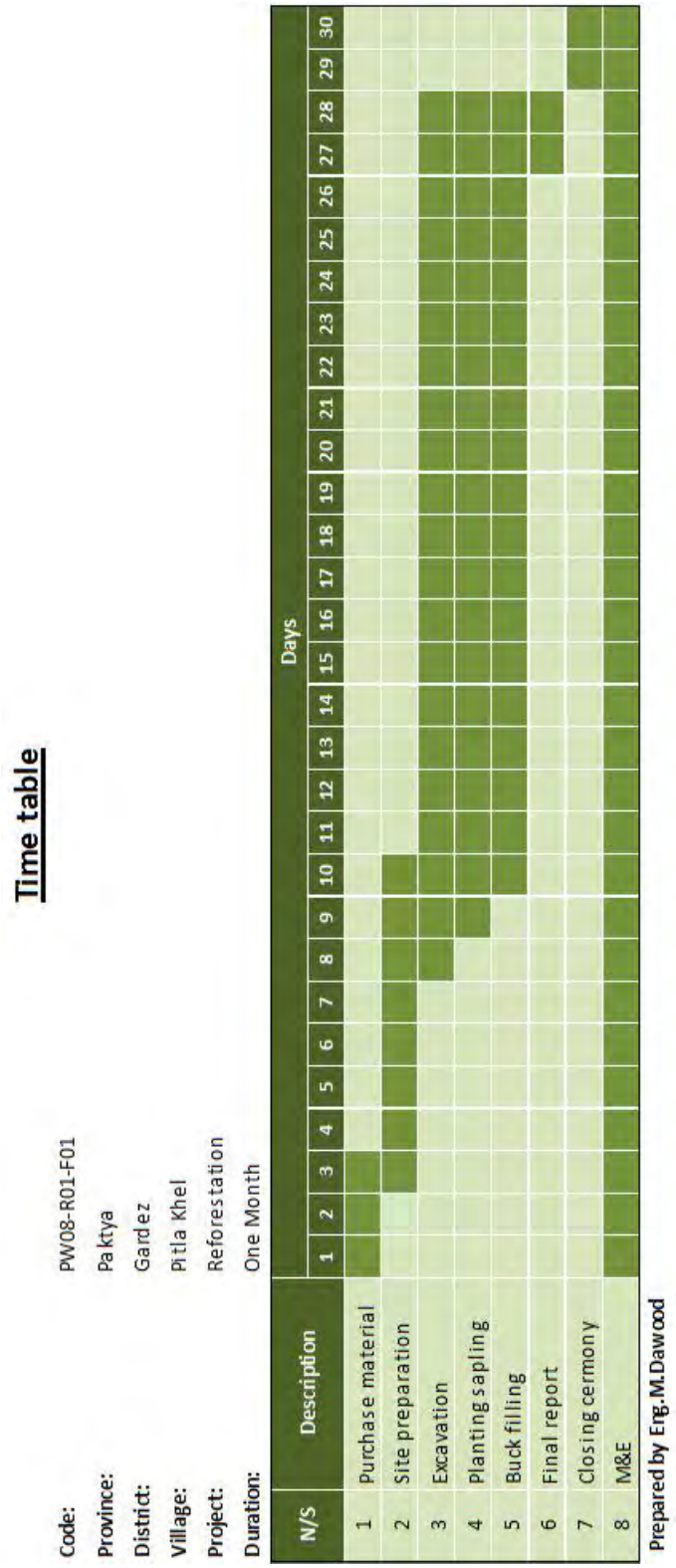
Bill of Quantity (BoQ) Reforestation

Code:	**PW08-R01-F01**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Petlakhel Qala**
Project:	**Reforestation**	**Total Area (m^2):**	**30,000**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**30,000.00**	**m^2**		-
	1.01	0.1	Unskilled labor	3,000.00	md	7.00	21,000.00
A2	**2.00**		**Cutting and Buck filling**	**250.00**	**m^3**		-
	2.01	0.5	Unskilled labor	125.00	md	7.00	875.00
A3	**3.00**		**Poplar**	**30,000.00**	**m^2**		-
	3.01		OP-367	28,000.00	Sapling	0.30	8,400.00
	3.02		NE-389	20,000.00	Sapling	0.30	6,000.00
	3.03		Russian olive(Rood)	6,000.00	Sapling	4.00	24,000.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	80.00	Unit	5.00	400.00
	4.02		Axe	50.00	Unit	5.00	250.00
	4.03		Wheel Barrow	20.00	Unit	60.00	1,200.00
	4.04		Bucket Steel	20.00	Unit	2.00	40.00
	4.05		Axes	10.00	Unit	10.00	100.00
	4.06		Water Collar	10.00	Unit	6.00	60.00
	4.07		Glasses	30.00	Unit	1.00	30.00
	4.08		Beam for Maintenance	1,812.00	Meter	3.00	5,436.00
	4.09		Wire for Maintenance	6,040.00	Meter	0.40	2,416.00
	4.10		Adze	9.00	Unit	10.00	90.00
	4.11		Scissors	25.00	Unit	35.00	875.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	4.00	Foreman	120	md	10.00	1,200.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., TransP.**	**1**	**Ls**	5,500.00	5,500.00
						Grand total	**79,702.00**

Prepared by Eng. M. Dawood

11.12.2 Implementation Time Table



Time table

Code: PW08-R01-F01
Province: Paktya
District: Gardez
Village: Pitla Khel
Project: Reforestation
Duration: One Month

N/S	Description	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Planting sapling																														
5	Buck filling																														
6	Final report																														
7	Closing cermony																														
8	M&E																														

Prepared by Eng.M.Dawood

11.12.3 Implementation Cost

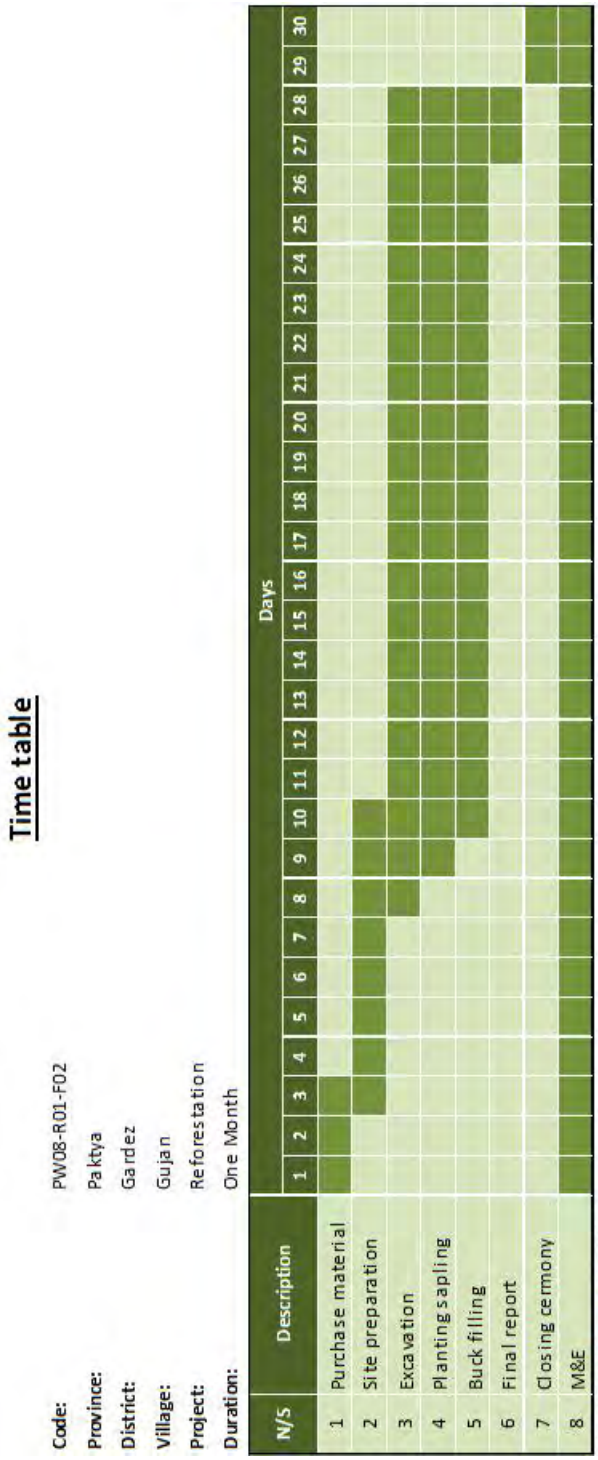
Bill of Quantity (BoQ) Reforestation

Code:	**PW08-R01-F02**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Gajan**
Project:	**Gully Protection**	**Total Area (m^2):**	**13,700**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**13,700.00**	**m^2**		-
	1.01	0.1	Unskilled labor	1,370.00	md	7.00	9,590.00
A2	**2.00**		**Cutting and Buck filling**	**1,150.00**	**m^3**		-
	2.01	0.5	Unskilled labor	575.00	md	7.00	4,025.00
A3	**3.00**		**Poplar**	**13,700.00**	**m^2**		-
	3.01		P-Nigra	10,600.00	Sapling	3.00	31,800.00
	3.02		Russian olive(khurmai)	1,240.00	Sapling	4.00	4,960.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	50.00	Unit	5.00	250.00
	4.02		Axe	25.00	Unit	5.00	125.00
	4.03		Wheel Barrow	12.00	Unit	60.00	720.00
	4.04		Bucket Steel	8.00	Unit	2.00	16.00
	4.05		Axes	7.00	Unit	10.00	70.00
	4.06		Water Collar	5.00	Unit	6.00	30.00
	4.07		Glasses	12.00	Unit	1.00	12.00
	4.08		IBeam for Maintenance	360.00	Meter	3.00	1,080.00
	4.09		Wier for Maintenance	1,200.00	Meter	0.40	480.00
	4.10		Adze	5.00	Unit	10.00	50.00
	4.11		Scissors	15.00	Unit	35.00	525.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls.**	4,000.00	4,000.00
						Grand total	**60,163.00**

Prepared by Eng. M. Dawood

11.12.4 Implementation Time Table

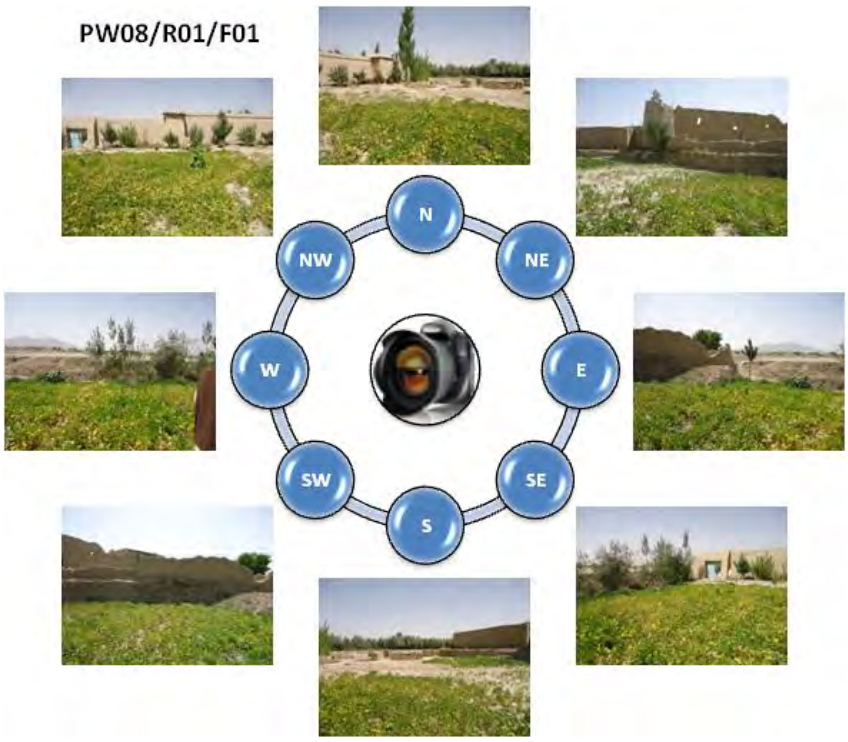


Time table

Code: PW08-R01-F02
Province: Paktya
District: Gardez
Village: Gujan
Project: Reforestation
Duration: One Month

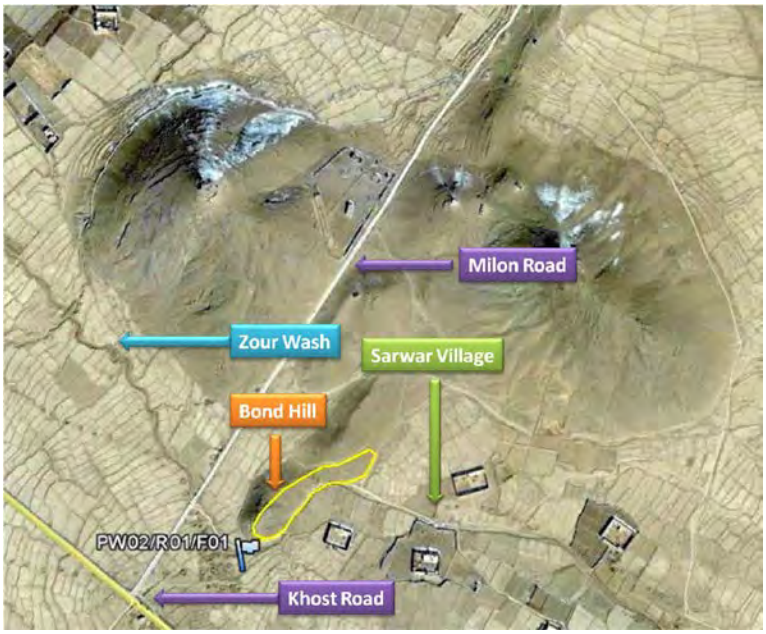
N/S	Description	Days																												
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Purchase material																														
2	Site preparation																														
3	Excavation																														
4	Planting sapling																														
5	Buck filling																														
6	Final report																														
7	Closing cermony																														
8	M&E																														

Prepared by Eng.M.Dawood



11.13 Bond Hill Terrace

In this landscape the land surface feature characterized by strong relief rising straight from plains. It is a prominence smaller than a mountain and like a mountain can be isolated. It has uneven summit heights, separated by the relatively dense hydrographic network. The main stream in this area is the Zour wash.



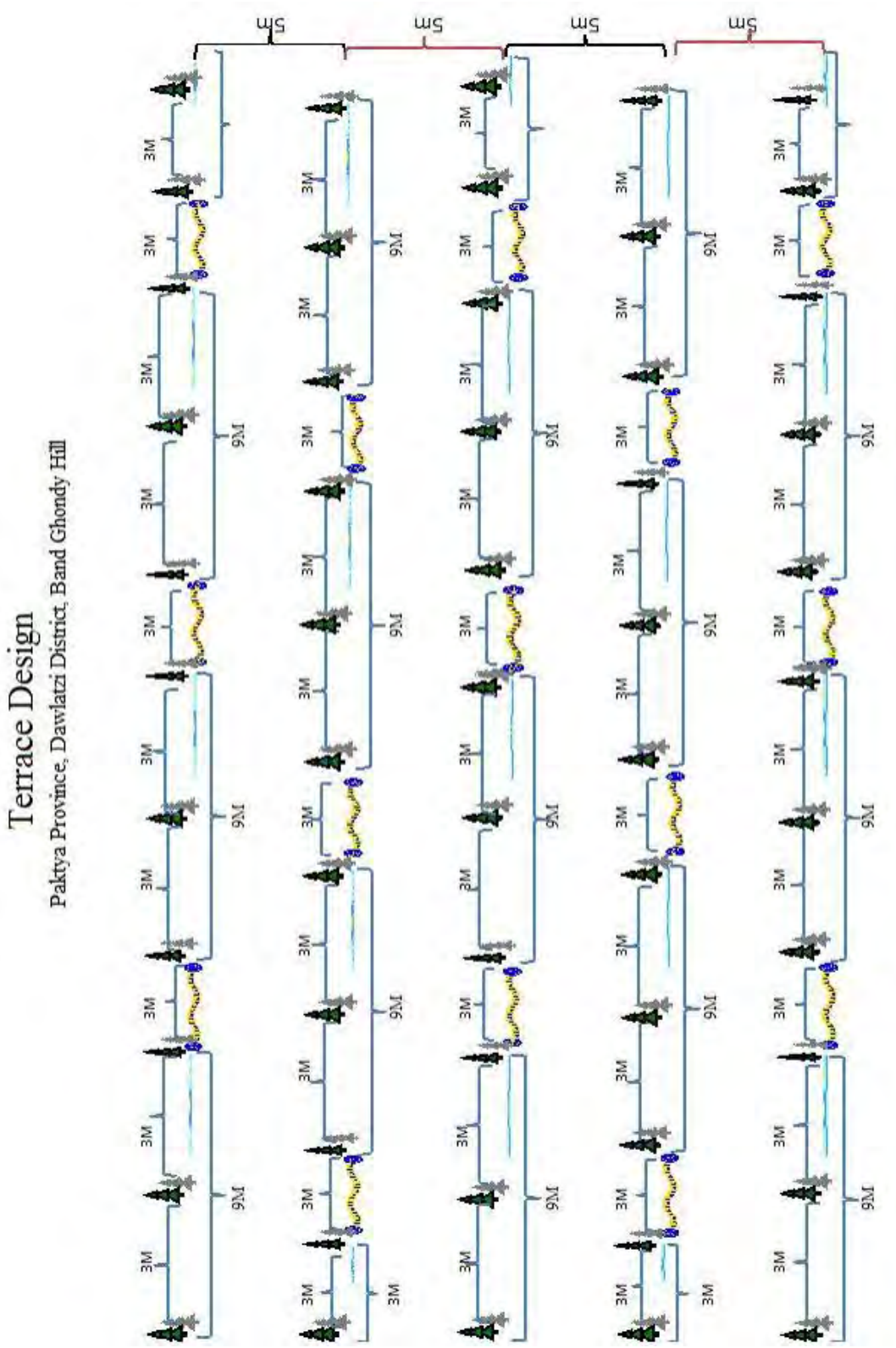
The PW02/R01/F01 landform

PW02/R01/F01 - Bond hill terrace			
S/N	Latitude	Longitude	Altitude (m)
1	33.57850094	69.24790791	2,333
2	33.57866845	69.24827431	2,334
3	33.57928134	69.24883829	2,335
4	33.57945183	69.24917029	2,336
5	33.57947894	69.24959487	2,336
6	33.57958078	69.24991268	2,337
7	33.57994322	69.25014747	2,337
8	33.58003116	69.25002104	2,338
9	33.57977122	69.24938668	2,337
10	33.57973474	69.24905568	2,336
11	33.57943835	69.24844452	2,335
12	33.5789405	69.24777985	2,333
13	33.57871557	69.24762747	2,332
14		Top of the hill:	2,374
PW02-R01-F01- Bond hill sloping aspects			
a	b	c	tan α
25.00	120	122.58	0.2
		Each terrace elevation:	5.0 m
		Total terrace elevation:	25.0 m

The Bond hill's coordinates and characteristics

The proposed area for terrace establishment

11.13.1 Design for Implementation



11.13.2 Implementation Cost

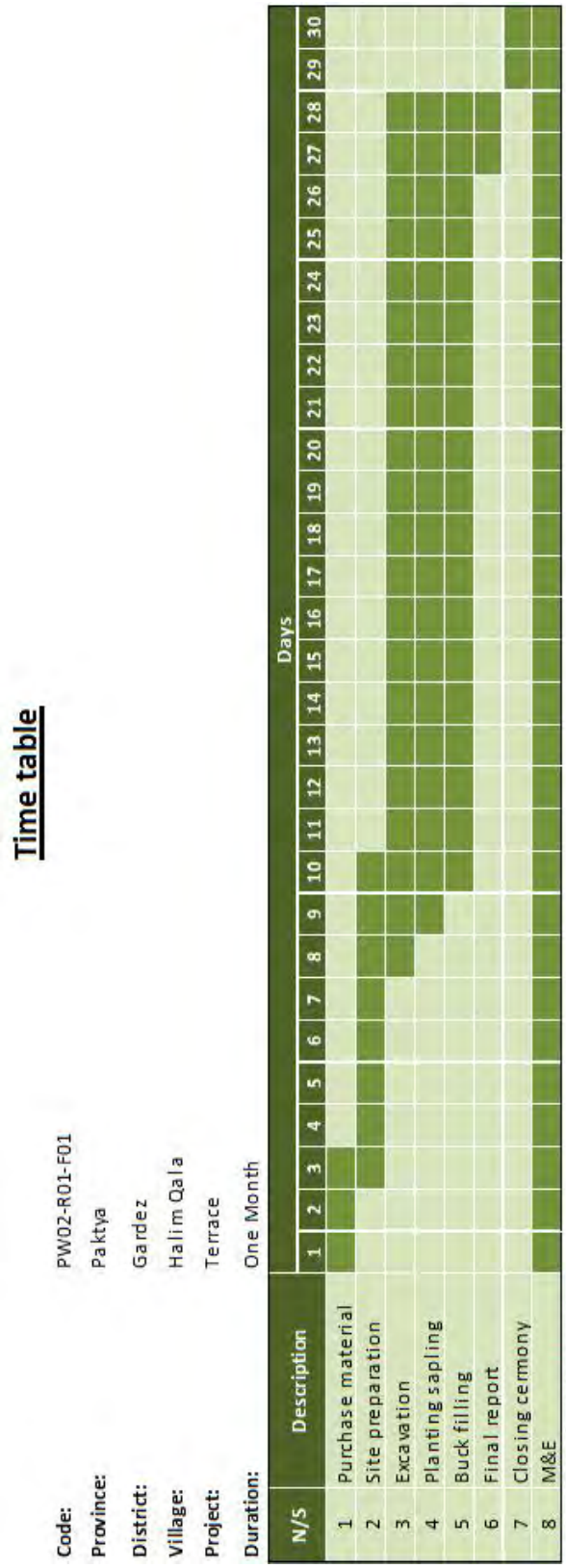
Bill of Quantity (BoQ)Terrace

Code:	**PW02-R01-F01**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Halim Qala**
Project:	**Bond Hill terrace**	**Total Area (m^2):**	**10,020**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**10,020.00**	**m^2**		-
	1.01	0.1	Unskilled labor	1,002.00	md	7.00	7,014.00
A2	**2.00**		**Cutting and Buck filling**	**1,002.00**	**m^2**		-
	2.01	0.5	Unskilled labor	501.00	md	7.00	3,507.00
A3	**3.00**		**Pine**	**10,020.00**	**m^2**		-
	3.01		Afghan Pine (pinus Elderica)	585.00	Sapling	5.00	2,925.00
	3.02		Pine (P.Bratia)	585.00	Sapling	5.00	2,925.00
	3.03		Pine (P.Halepensis)	585.00	Sapling	6.00	3,510.00
	3.04		Pine (P.Nigra)	585.00	Sapling	5.00	2,925.00
	3.05		Black Locust (Robinia pseudoacacia)	500.00	Sapling	5.00	2,500.00
	3.06		Honey Locust (Gleditsia triocanthus)	500.00	Sapling	5.00	2,500.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	45.00	Unit	5.00	225.00
	4.02		Axe	22.00	Unit	5.00	110.00
	4.03		Wheel Barrow	17.00	Unit	60.00	1,020.00
	4.04		Bucket Steel	12.00	Unit	2.00	24.00
	4.05		Axes	10.00	Unit	10.00	100.00
	4.06		Water collar	8.00	Unit	6.00	48.00
	4.07		Glasses	15.00	Unit	1.00	15.00
	4.08		Beam for Maintenance	122.10	Meter	3.00	366.30
	4.09		Wire for Maintenance	407.00	Meter	0.40	162.80
	4.10		Adze	10.00	Unit	10.00	100.00
	4.11		Scissors	25.00	Unit	35.00	875.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,700.00	4,700.00
						Grand total	**30,057.10**

Prepared by Eng. M. Dawood

11.13.3 Implementation Time Table



11.14 Orchard Establishment

The relief is qualified under the criteria of a Dissected Ridge. It is a relatively narrow, elongated steep-sided elevation cut by the Rodak wash and Yaklangi canal. There is an intake where the canal crosses the Rodak wash. The relief itself contains two flood plain landforms for future almond orchards establishment.

The PW07/R01/F02 and PW07/R01/F03 landforms

PW07/R01/F02 & F03 - Reforestation							
S/N	Latitude	Longitude	Altitude (m)	S/N	Latitude	Longitude	Altitude (m)
1	33.562095	69.218649	2,303	12	33.561020	69.222748	2,311
2	33.562059	69.218841	2,304	13	33.561571	69.222528	2,312
3	33.561856	69.219075	2,304	14	33.561615	69.222277	2,312
4	33.562110	69.219480	2,306	15	33.561492	69.222235	2,312
5	33.562039	69.219862	2,306	16	33.561160	69.222329	2,312
6	33.561960	69.220031	2,306	17	33.560950	69.222392	2,312
7	33.562250	69.220285	2,306	18	33.560924	69.222392	2,312
8	33.562382	69.219936	2,307	19	33.560740	69.222622	2,312
9	33.562251	69.219491	2,306	20	33.560478	69.222675	2,313
10	33.562280	69.218639	2,307	21	33.560181	69.223031	2,312
11	33.560566	69.223000	2,311	22	33.560339	69.223251	2,312

Specific coordinates of the orchard establishment areas

11.14.1 Implementation Cost

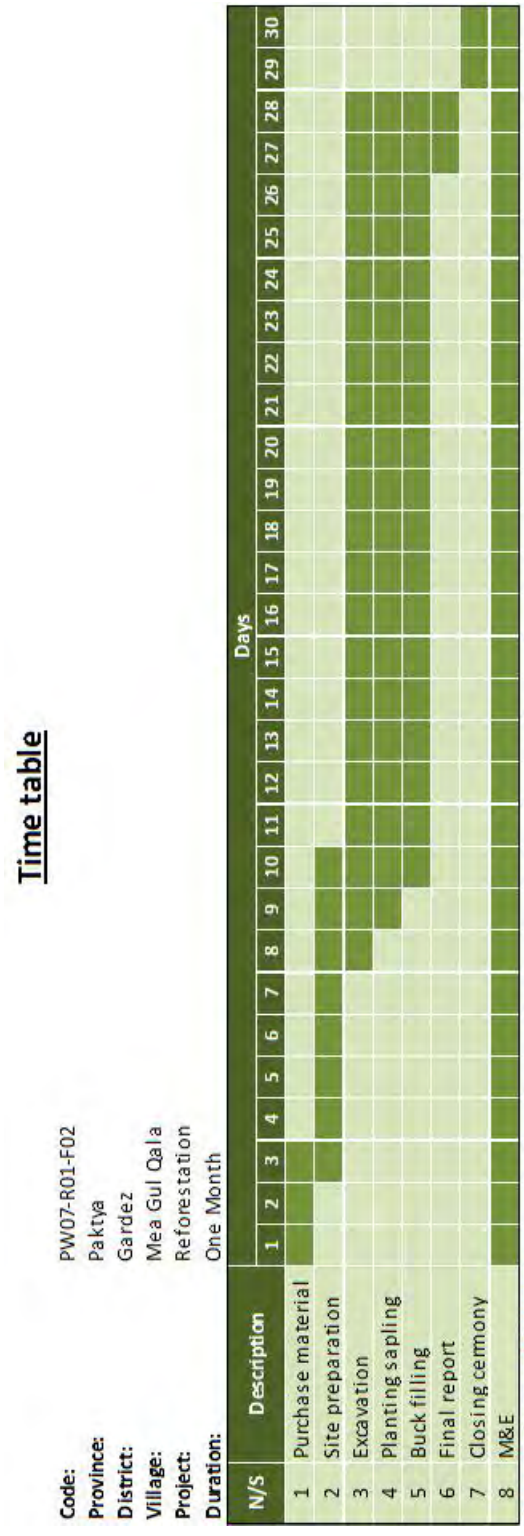
Bill of Quantity (BoQ) Reforestation

Code:	**PW07-R01-F02**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Mea Gul Qala**
Project:	**Almond reforestation**	**Total Area (m^2):**	**14,500**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**14,500.00**	**m^2**		-
	1.01	0.1	Unskilled labor	1,450.00	md	7.00	10,150.00
A2	**2.00**		**Cutting and Buck filling**	**530.00**	**m^3**		-
	2.01	0.5	Unskilled labor	265.00	md	7.00	1,855.00
A3	**3.00**		**Almond**	**14,500.00**	**m^2**		-
	3.01		Almond (Qaharbay)	2,500.00	Sapling	5.00	12,500.00
	3.02		Wild Rose (Rosa webbiana)	1,333.00	Sapling	3.00	3,999.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	52.00	Sapling	5.00	260.00
	4.02		Axe	26.00	Sapling	5.00	130.00
	4.03		Wheel Barrow	26.00	Sapling	60.00	1,560.00
	4.04		Bucket Steel	12.00	Sapling	2.00	24.00
	4.05		Axes	8.00	Sapling	10.00	80.00
	4.06		Water Collar	7.00	Sapling	6.00	42.00
	4.07		Glasses	12.00	Sapling	1.00	12.00
	4.08		Beam for Maintenance	180.00	Meter	3.00	540.00
	4.09		Wire for Maintenance	600.00	Meter	0.40	240.00
	4.10		Adze	8.00	Sapling	10.00	80.00
	4.11		Scissors	20.00	Sapling	35.00	700.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,500.00	4,500.00
						Grand total	**43,101.00**

Prepared by Eng. M. Dawood

11.14.2 Implementation Time Table



11.14.3 Implementation Cost

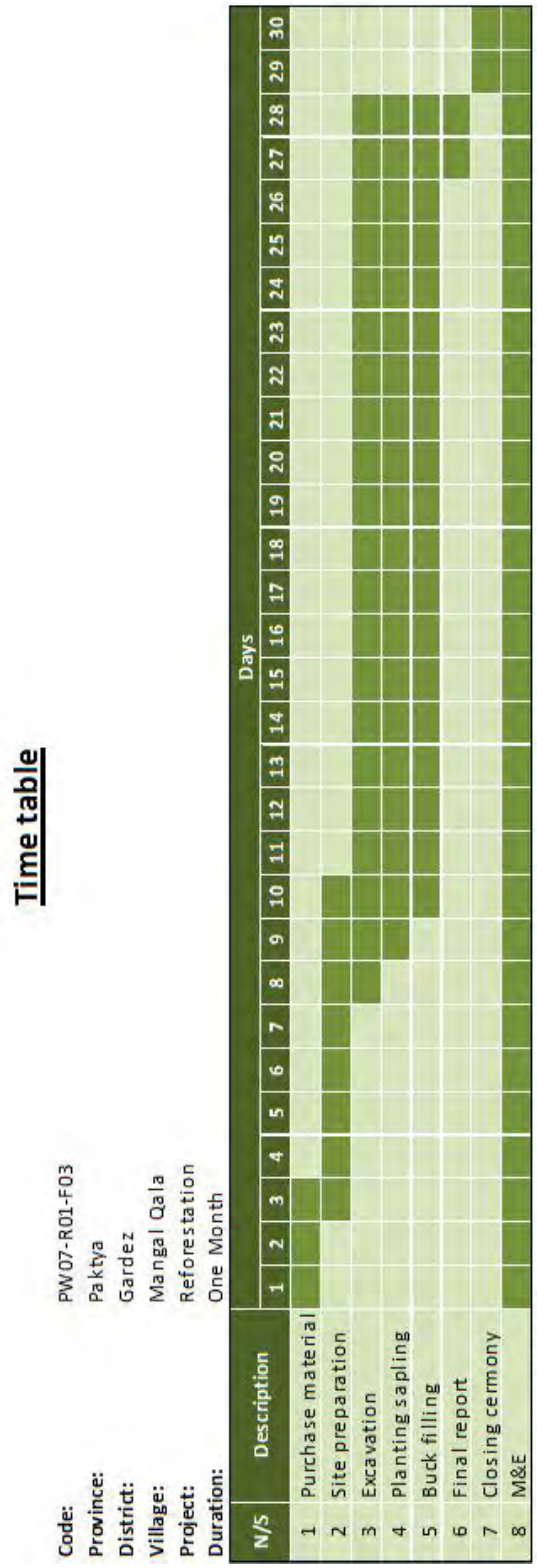
Bill of Quantity (BoQ) Reforestation

Code:	**PW07-R01-F03**	**Province:**	**Paktya**
District:	**Gardez**	**Village:**	**Mangal Qala**
Project:	**Almond reforestation**	**Total Area (m^2):**	**12,000**
Date:	**2011-OCT**		

Title	No.	Norm.	Item	Qty	Unit	Unit cost ($USD)	Total cost ($USD)
A1	**1.00**		**Site preparation**	**12,000.00**	**m^2**		-
	1.01	0.1	Unskilled labor	1,200.00	md	7.00	8,400.00
A2	**2.00**		**Cutting and Buck filling**	**512.00**	**m^3**		-
	2.01	0.5	Unskilled labor	256.00	md	7.00	1,792.00
A3	**3.00**		**Almond**	**12,000.00**	**m^2**		-
	3.01		Almond (Satarbay)	2,500.00	Sapling	5.00	12,500.00
A4	**4.00**		**Purchasing Material**				
	4.01		Shovel	50.00	Sapling	5.00	250.00
	4.02		Axe	25.00	Sapling	5.00	125.00
	4.03		Wheel Barrow	25.00	Sapling	60.00	1,500.00
	4.04		Bucket Steel	10.00	Sapling	2.00	20.00
	4.05		Axes	6.00	Sapling	10.00	60.00
	4.06		Water Colar	6.00	Sapling	6.00	36.00
	4.07		Glasses	12.00	Sapling	1.00	12.00
	4.08		Beam for Maintenance	156.00	Meter	3.00	468.00
	4.09		Wire for Maintenance	520.00	Meter	0.40	208.00
	4.10		Adze	6.00	Sapling	10.00	60.00
	4.11		Scissors	20.00	Sapling	35.00	700.00
A5	**5.00**		**Personal**				
	5.01	1.00	**Team Leader**	**30**	**md**	14.00	420.00
	5.02	2.00	Foreman	60	md	10.00	600.00
	5.03	1.00	Store keeper	30	md	7.00	210.00
	5.04	4.00	Guard	120	md	10.00	1,200.00
A6	**6.00**		**Tools, Stat., Transp.**	**1**	**Ls**	4,500.00	4,500.00
						Grand total	**33,061.00**

Prepared by Eng. M. Dawood

11.14.4 Implementation Time Table



12 Dawlatzi Watershed Rehabilitation Program

This proposal outlines a program that would focus on water sources, water availability and land husbandry, the strengths of Afghanistan and an agricultural sector targeted for priority development by the Afghan government. The program is directed at reducing water scarcity and soil erosion problems in rural areas. It would accomplish this by dramatically increasing the protection of the water sources and the conversion of bare lands and fields to reforested areas. The program is immediate and sustainable. In all activities of the program, the rural population will receive increased income through the "cash for work" approach. The impact will be immediate, because the farmers would have access to water for irrigation and erosion risk will decrease. This impact will increase yields and product quality as well.

Proposed duration of the program is two years.

12.1 Program summary

These costs are only the costs for the specific program inputs, not the project team salaries, allowances, equipment and other direct costs, or indirect costs. See Section 12.2 for the budget summary.

N/S	Infrastructure Rehabilitation	Cost	Duration	Unit
1	Shahed canal rehabilitation	12,254.85	8	week
2	Shahed intake	35,005.74	12	week
3	Shaga intake	38,996.45	16	week
4	Asadullah Karez rehabilitation	179,618.50	24	week
5	Darbal wash stream canal protection wall (Babrak)	134,345.00	16	week
6	Aman U Qala aqueduct	10,516.13	8	week
7	Kochi aqueduct	10,516.13	8	week
8	Saliani check dam	22,419.28	8	week
9	Gujar check dam	21,555.95	8	week
10	Haji Gul Karem check dam	35,814.16	12	week
11	Abdul Ghani check dam	26,285.15	12	week
	Total	**527,327.34**		

N/S	Agro Forestry	Cost	Duration	Unit
1	Shahed canal tree belts	23,559.00	30	day
2	Darbal wash stream canal tree belts (Babrak)	24,740.00	30	day
3	Check dam tree belts (Haji Gul Karem check dam)	17,718.00	30	day
4	Check dam tree belts (Gujar check dam)	36,059.00	30	day
5	Stream canal protective tree belts (Petlakhel Qala)	79,702.00	30	day
6	Stream canal protective tree belts (Gajan Qala)	60,163.00	30	day
7	Bond hill terrace	30,057.10	30	day
8	Orchard establishment (Mea Gol Qala)	43,101.00	30	day
9	Orchard establishment (Mangal Qala)	33,061.00	30	day
	Total	**348,160.10**		

12.2 Budget Summary

Here is the summary of the budget.

Paktya Watershed Study		
I.	Salaries	900,000
II	Fringe	114,423
III.	Allowances	187,600
IV.	Travel and Per Diem	41,500
V.	Program inputs & supplies	259,230
VI.	Other Direct Costs	123,040.00
VII.	Equipment, Vehicles, and Freight	62,250
VIII.	Subcontractors	0.00
	SUBTOTAL	**1,688,042**
	ROP Overhead	**295,914**
	TOTAL BUDGET	**1,983,957**

12.3 Impact on Job Opportunity

Protective measurements such as intakes, Karezes, canals, etc. and agroforestry activities have high demand for labor during installation. The required labor can be directly linked to the project. The following table shows our estimates of the number of labor-man days that will be created by the project.

Unskilled labor summary			
N/S	**Infrastructure rehabilitation**	**Man day**	**Cost ($USD)**
1	Shahed canal rehabilitation	138.55	969.85
2	Shahed intake	552.58	3,868.06
3	Shaga intake	641.60	4,491.20
4	Asadullah Karez rehabilitation	14,811.00	103,677.00
5	Darbal wash stream canal protection wall (Babrak)	2,725.00	19,075.00
6	Aman U Qala aqueduct	84.00	588.00
7	Kochi aqueduct	84.00	588.00
8	Saliani check dam	362.00	2,534.00
9	Gujar check dam	344.00	2,408.00
10	Haji Gul Karem check dam	656.00	4,592.00
11	Abdul Ghani check dam	416.00	2,912.00
	Total	**20,814.73**	**145,703.11**

N/S	Agro forestry	Man day	Cost ($USD)
1	Shahed canal tree belts	770.00	5,390.00
2	Darbal wash stream canal tree belts (Babrak)	530.00	3,710.00
3	Check dam tree belts (Haji Gul Karem check dam)	655.00	4,585.00
4	Check dam tree belts (Gujar check dam)	1,662.00	11,634.00
5	Stream canal protective tree belts (Petlakhel Qala)	3,125.00	21,875.00
6	Stream canal protective tree belts (Gajan Qala)	1,945.00	13,615.00
7	Bond hill terrace	1,503.00	10,521.00
8	Orchard establishment (Mea Gol Qala)	2,115.00	12,005.00
9	Orchard establishment (Mangal Qala)	1,456.00	10,192.00
	Total	**13,761.00**	**93,527.00**

12.4 Impact Summary

IMPACT TABLE					
Consistency with US Government Strategy					
Assistance Objective 5.: A sustainable Thriving Agricultural Economy					
Intermediate Result 5.2: Effort to achieve will concentrate on 1) rehabilitating watersheds; 2) environmental compliance; 3) Conservation of biodiversity through community based natural resource management					
Sub-Intermediate Result 5.2.1.: Improved integrated water management					
Sub-Intermediate Result 5.2.2.: Improved environmental compliance					
Sub-Intermediate Result 5.2.3.: Biodiversity conserved in selected area					
Overall Impact					
The overall impact is to protect and rehabilitate the watershed in order to protect farmlands and natural vegetation and decrease the water scarcity in the area					
Main Outcomes					
1- Production quality and quantity will increase					
2- Soil depletion and degradation will decrease					
3- Water ways and catchment areas will stabilize					
4- Farmland and natural vegetation areas will be protected against the annual flood and monsoon					
5- The period when water is available will increase allowing longer period for irrigated agriculture production					
6- Through cash for work approach and increased agriculture production job opportunity will be created for the rural population					
7- New areas can be used for agriculture and livestock production					
Outcomes and Outputs					
Landform	**Problem**	**Cause**	**Intervention**	**Output**	**Impact**
PW01/R01/F03	Intensive stream canal erosion	High rate of water flow	Shahed intake	Water slow down and regulated	River bank erosion will stop
	Intensive soil erosion of the plain	Unstable water way	Shahed canal	Sedimentation decreases	Farmland area protected against flow
		Sediment polluted water	Shahed tree belt	Stream bank is stabilizing	Fruit yield and quality improves
				River bank protected	Job opportunity created
PW06/R01/F01	Soil loss	Rill and gully development	Aman U Qala aqueduct	Water way regulated	Rill and gully development stop
	Water scarcity	Water stream dry	Kochi aqueduct	Flood plain protected	Soil erosion decrease

Outcomes and Outputs					
Landform	**Problem**	**Cause**	**Intervention**	**Output**	**Impact**
		up			
	Annual flood	Snow melt		Water clearness increases	Water availability period lengthened
	Sedimentation	High rate of water flow			Job opportunity created
PW08/R01/F03	10-25% gully type erosion	Run off effect	Saliani check dam	Water flow rate decrease	The surrounding area and flood plain is protected
	500-1,200MT/Ha soil loss	Water flood	Gujar check dam	Water volume is regulated	
PW08/R01/F03	High rate of sedimentation	Soil carried from the mountain by the water settle down	Haji Gul Karem check dam	Sedimentation decreases	The series of check dams stop the sedimentation on the flood plain area and stabilizing the water way
	Unstable water catchment area		Ghani check dam	Soli erosion decreases	
				Water clearness increases	
					Gully development and soil loss decreases
					Job opportunity created
PW08/R01/F01	10-25% gully type erosion	High rate of water flow	Lagarou Kanda Wash tree belts	Canal bank is stabilizing	Gully development stopped
PW08/R01/F02	500-1,200MT/Ha soil loss	Unstable water way		Water flow rate decrease	Canal bank erosion stopped
	Intensive stream canal erosion			Water volume is regulated	Water availability period lengthened
				Lagarou gully area is protected	Farmland area protected against flow
					Fruit yield and quality improves
					Job opportunity created
PW02/R01/F01	Sheet erosion	Run off effect	Bond Hill terrace	Decreased level of run off	Lower level area is protected against erosion
	Biodiversity loss	Deforestation		Soil degradation stopped	Soil erosion decreases
	Soil degradation			Upper layer canopy is restored	Increased area for production

Outcomes and Outputs					
Landform	**Problem**	**Cause**	**Intervention**	**Output**	**Impact**
					Sheet erosion stopped Job opportunity created
PW07/R01/F02 PW07/R01/F03	Intensive soil erosion of the plain Soil loss Sedimentation Unstable water catchment area	High rate of water flow Unstable water way Sediment polluted water Water flood Soil carried from the mountain by the water settle down	Rodak Wash reforestation (Almond)	Water slow down and regulated Sedimentation decreases River bank protected Flood plain protected Water clearness increases	Farmland area protected against flow Fruit yield and quality improves Soil erosion decrease Soil degradation decreases Agro-forest create product for sale Biodiversity increases Soil moisture content retained Soil formation process increases Job opportunity created
PW03/R01/F01	Intensive stream canal erosion Intensive soil erosion of the plain	High rate of water flow Unstable water way Sediment polluted water	Shaga intake	Water slow down and regulated Sedimentation decreases Stream bank is stabilizing River bank protected	River bank erosion will stop Farmland area protected against flow Fruit yield and quality improves Job opportunity created
PW04/R01/F01	Water scarcity	Karez destruction Karez sedimentation	Asadullah Karez	Water volume is regulated Water clearness increases	Fruit yield and quality improves Water availability period lengthened Job opportunity created

12.5 Physical Measurements

The planned interventions do not cover all necessary actions to be taken. The selection criteria were based upon the identification of the top priorities. The program would address the main problems in the watershed area. Part of the selection process was to focus on the DAIL's request. These physical measurements will give an example in the future for watershed rehabilitation programs. This clearly establishes the central position of irrigated production in the Afghan agricultural economy, and justifies the government's position in naming self-sufficiency in irrigated agriculture its number one priority. This, of course, means not only reaching parity with present demand, but achieving a long-term program in water and natural resource management. The detailed designs for the selected interventions are in the attached Dawlatzi Watershed Survey Report and Recommendations.

12.6 Measurements for Agroforestry

The agroforestry interventions of the program are divided into two categories. First, there are planned interventions, which were selected to protect the infrastructures constructed by the program and the surrounding areas. The second group consist reforestation and terracing, where erosion problems reached a critical level. The detailed designs for the selected interventions are in the attached Dawlatzi Watershed Survey Report and Recommendations.

12.7 Performance Management and Impact Evaluation

PMIE will be handled by ROP in close cooperation with the MAIL and DAIL. This approach will provide an independent review of project progress and support capacity building within the DAIL. In addition to the MAIL M&E system, ROP will establish an internal system for monitoring progress and for assuring the quality of our project activities.

12.8 Cooperation with DAIL

ROP plans to integrate the DAIL extension service into our project implementation using an approach we have used in previous projects. Although DAIL has extension agents throughout the region, most of these agents do not have sufficient technical capacity, experience nor the specific knowledge and skills required to support the targeted interventions. From our experience in previous projects, ROP has established training programs, materials and processes that will be used to upgrade the DAIL extension agents to handle effectively the extension tasks required for successful implementation of this project. ROP will integrate the DAIL extension agents into the project to utilize their training.

12.9 Cooperation with the Rural Communities

ROP staff will work closely with the Shuras and Shura councils. The success and sustainability of the program focus on two critical approach. One of them is to generate job and income opportunities for the community members. This approach will be realized through "cash for work". If a population cannot get any direct benefit from the program, the people will not take care of the established measurements.

Therefore the communities will do the implementation. This is also true for the second approach. The Shuras and the Shura council should manage the maintenance of the measurements with the technical assistance of the DAIL extension service. The intervention in the future (especially forests) will generate income for the Shuras and DAIL to support financially the activities for maintenance.

13 Cross Cutting Issues

The interventions require significant input capacity for the project. ROP staff and DAIL will work together on the development of nursery production for tree saplings and shrubs and other plants. As well in case of the nursery, the program will provide opportunities to local and domestic suppliers ensuring the necessary inputs for the constructions.

14 Table of Figures