Environmental Assessment of the Proposed Mazar Foods Agricultural/Irrigation Development

Final Draft

Balkh Province, Afghanistan

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Final Draft

Prepared for:

USAID/Afghanistan

Prepared by:

Chemonics International
&
The Cadmus Group

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DISCLAIMER

The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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Acronyms

ADA	Afghan Development Association
ADB	Asian Development Bank
AFR/SD	USAID Bureau for Africa Sustainable Development Division
AID	Agency for International Development
ANDS	Afghanistan National Development Strategy
ANE	USAID Bureau for Asia and The Near East Technical Support Division
APPPA	Afghanistan Pilot Participatory Poverty Assessment
ASAP	Accelerating Sustainable Agriculture Program
BAS	Basic Afghanistan Services
BDC	Mazar Foods Business Development Plan
BEO	Bureau Environmental Officer
EA	Environmental Assessment
ECL	Environmental Compliance Language
EIA	Environmental Impact Assessment
EIRRP	Emergency Infrastructure Rehabilitation and Reconstruction Project
EMMP	Environmental Mitigation and Monitoring Plan
ESA	Environmental Site Assessment
ET	Evapotranspiration
FAO	Food and Agriculture Organization of the United Nations
GIS	Geographic Information Systems
GlobalGAP	Global Good Agricultural Practices
GNI	Gross National Income
GPS	Global Positioning System
HACCP	Hazard Analysis Critical Control Point
HP	Horse Power
IFC	International Finance Corporation
IFS	International Food Standard
ILO	International Labor Organization
IOM	International Organization for Migration
ISAF	International Security Assistance Force
JFPR	Japan Fund for Poverty Reduction

KVA	Kilovolt-amps
LDC	Low-Income Developing Countries
LLC	Limited Liability Company
MAIL	Ministry of Agriculture, Irrigation, and Livestock
MEO	Mission Environmental Officer
MIWRE	Ministry of Irrigation, Water Resources and Environment
MWR	Ministry of Water Resources
NEPA	National Environmental Policy Act
NGO	Non-Governmental Organization
O&M	Operations and Maintenance
OPIC	Overseas Private Investment Corporation
OPS	United Nations Office for Project Services
PEA	Programmatic Environmental Assessment
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PRA	Participatory Rural Appraisal
RAMP	Rebuilding Agriculture Markets Program
SAR	Sodium Absorption Ratio
SCADA	Supervisory Control and Data Acquisition System
SMEC	Snowy Mountains Engineering Corporation
TDS	Total Dissolved Solids or Salinity
TIC	Traditional Irrigation Component
UN	United Nations
UNMACA	United Nations Mine Action Centre for Afghanistan
UNDP	United Nations Development Program
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Fund
UNOCA	United Nations Office for the Co-ordination of Humanitarian and Economic Assistance Programmes in Afghanistan
UNODC	United Nations Office on Drugs and Crime
USAID	United States Agency for International Development
UXO	Unexploded Ordnance
WASSA	Women's Activities and Social Services Association

Summary of Findings

Introduction

The United States Agency for International Development's Mission to Afghanistan (USAID/Afghanistan) has selected Chemonics International to implement its Accelerating Sustainable Agriculture Program (ASAP). The purpose of this 40-month (12/2006-3/2010) program "is to accelerate broad-based, market led agriculture development capable of responding and adapting to market forces in ways that provide new economic opportunities for rural Afghans." To fulfill its purpose, ASAP will accomplish two objectives: 1)Accelerate relevant technology generation and transfer, with an increased focus on marketing of high-value commodities, competitiveness, sustainability and natural resource management, and 2) Improve the capacity of the Government of Afghanistan, and specifically the Ministry of Agriculture, Irrigation and Livestock (MAIL), to formulate agriculture sector policies and strategies and carry out administrative and financial coordination needed in support of more competitive, market-led agriculture production and agribusiness.

Under Modification 1 to ASAP, Chemonics is providing customized technical assistance for the establishment of the Mazar Foods Corporation; a proposed 10,000 hectare agricultural/irrigation development in Balkh Province, Afghanistan.

Discussions are underway with OPIC concerning a loan of up to $80 million towards establishment of the Corporation[1].

Figure 1. View of Mazar Foods project site. (Photo by Ali Azimi)

Purpose and Need for the Project

The Mazar Foods Corporation is being established as a state-of-the art, private sector-driven agribusiness venture to produce, process, and market horticultural products for domestic Afghan and regional markets. Its production and processing facilities will be located in the fertile Khulm District, in the Balkh Province. The selected site shall consist of 10,000 hectares (approximately 25,000 acres) of contiguous or closely

Figure 2. Map of Afghanistan

[1] Chemonics International, Inc. 2007. Mazar Foods Project Business Development Plan and Pre-Feasibility Study, dated December 19, 2007. USAID Contract No. 306-C-00-07-00501-00.

joined parcels which will have access to a major airport and a skilled labor pool. Additionally, the site has rail access to markets in Russia via Uzbekistan and road access to the largest domestic market in Kabul.

Mazar Development Foundation
In addition to establishment of the Mazar Foods Corporation, the project also will support the formation of a separate Mazar Development Foundation which is to provide a program of improved basic services to communities throughout the Province.

Program Overview

Farm Site and Surroundings

The Project Area is about 14 km by 31km located west/northwest of Khulm City. The land surface slopes from south to north with some hilly areas. About 25 to 30% of the land is cultivated by local people. The principal crops include wheat, barley, alfalfa, melon, water melon, onion, lady finger, aubergine, tomato, coriander, spinach, etc. The fruit and nut crops include almonds, pomegranate, figs, grapes, cherry and black cherry. (BAS 2007)[2]

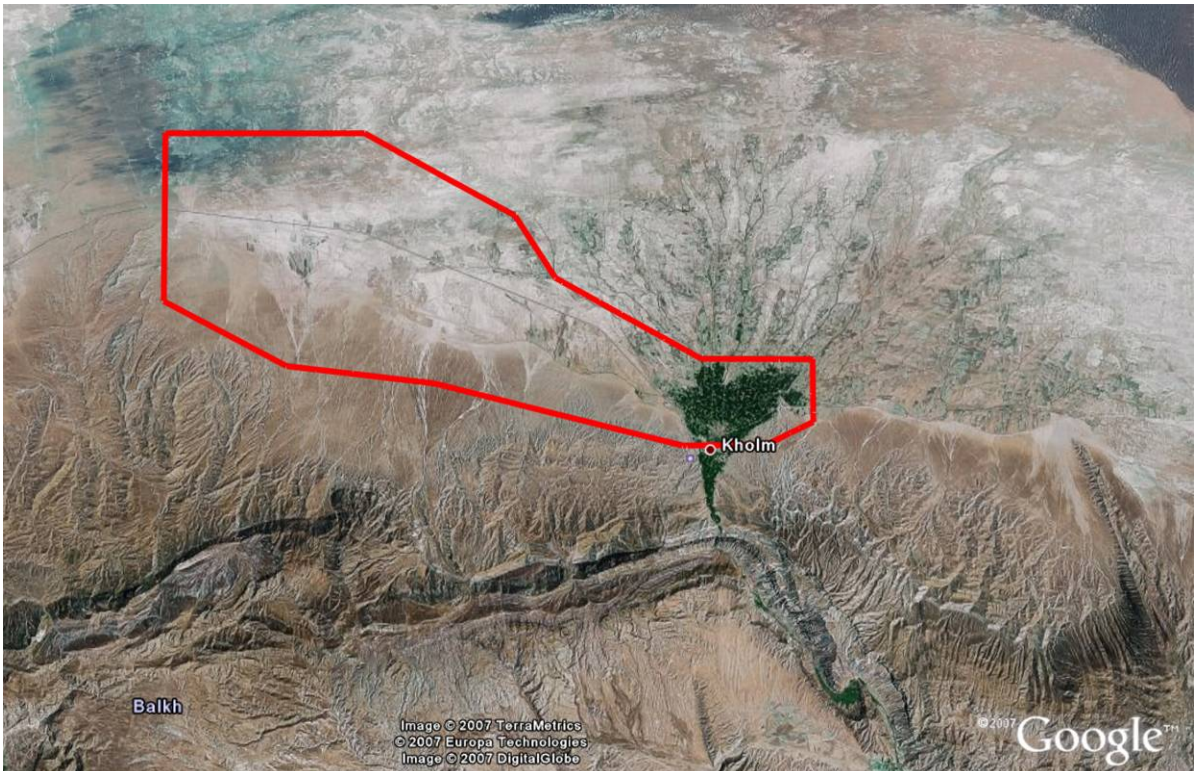

Figure 3. Mazar Foods project site (photo courtesy Google Earth)

The selected farm site is adjacent to the road connecting Mazar-i-Sharif and Khulm, beyond the intersection with the Hairatan road in the province of Balkh. This site was selected from a recent study of several possible locations for the Project. The region has many working farms and

[2] Basic Afghanistan Services. 2007. Report of the Prefeasibility Study, Irrigation Potential, Khulm District, Balkh Province, Afghanistan. ASAP Khulm District Project.

extensive irrigation systems. It is an area accustomed to production farming and is less oriented to the subsistence farming that characterizes other regions of the country.

Because of water quality and quantity concerns arising from the preliminary assessment undertaken for business plan preparation and other reports, as well as existence of scattered settlements around the area, the farm is envisioned to be comprised of two sections each of 5,000

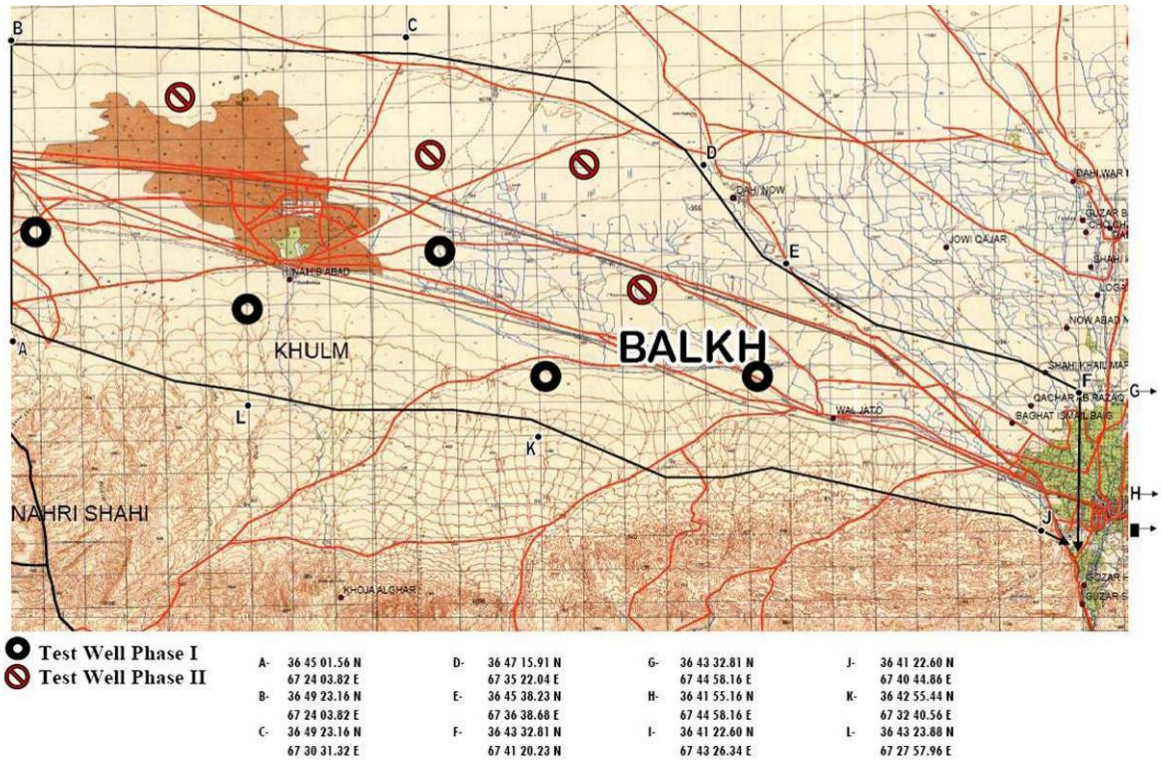

Figure 4. Topographic map of the Mazar Foods Corporation project area located in the Khulm District. Coordinate locations and boundaries shown are for the aerial photography surveys planned for spring 2008 and include land beyond the proposed farm site location boundaries.

hectares: one on the North side of the road, the other on the South side. The resulting farm area of 10,000 hectares, although not wholly contiguous, is proximal and is the total area to be conceded for this project by the Balkh Province (Chemonics 2007).

As outlined in the Business Development Plan (Chemonics 2007), the location offers a number of production advantages:

- Availability of an extensive area of arable land for production, although more work is needed on the evaluation of water and soils before making a final judgment on whether the site is be capable of commercial production of competitively priced food products suitable for export markets.
- The area is served with aquifers that draw their water from nearby high mountains.
- Successful production of the crops of interest already occurs in the area (except for strawberries).
- Nitrogen fertilizers are available from a regional manufacturer, although the urea plant is known to be unreliable with insufficient capacity for current needs. Phosphate fertilizers are imported from Pakistan in the Mazar area.

- The region has an established network of infrastructure. Commercial amounts of electricity are available. Electrical power is eventually to be the primary source of energy for pumping, but diesel pumps are proposed for the initial year(s) of operation
- The farm is close to a major airport, and has rail and road access to markets into Russia and Kazakhstan through Uzbekistan. . The site has direct access to the large nearby market of Mazar-i-Sharif and a connection over good roads to the largest domestic market, Kabul.
- Being in the vicinity of a large town that includes an industrial park will facilitate efforts by the Corporation to mobilize labor and infrastructure equipment.

USAID's 22CFR216.2 (3) (d) defines classes of actions normally having a significant effect on the environment that typically result in a Positive Determination requiring the preparation of an Environmental Assessment (EA). These include irrigation and water management projects and large scale agricultural mechanization. Similarly, the OPIC Environmental Handbook (February2002) *Annex E: Category A Projects Requiring an Environmental Impact Assessment* encompasses large scale agriculture involving the intensification or development of previously undisturbed land.

The Mazar Foods Project Environmental Assessment (EA) conforms to the specific requirements of USAID 22CFR216.6 for preparation of Environmental Assessments, but it also incorporates the instructions for EAs contained in the OPIC Environmental Handbook (February 2002), including *Annex B: Recommended Content and Format for Environmental Assessment* and *Annex C. Recommended Content and Format for Environmental Management and Monitoring Plan*.

The EA also addresses the requirements set forth in the Islamic Republic of Afghanistan *Environment Law* (2006*), Chapter Three: Management of Activities Affecting the Environment*, including Article *17. Comprehensive mitigation plan* and Article *21. Public participation.* Specific EA requirements and regulations are under development by the Afghan National Environmental Protection Agency (NEPA).

The Mazar Foods Project EA was carried out based on a review of available data, background documents and maps for the area, EA Team field work in and near Mazar-i-Sharif and Khulm from January 3-30, 2008, and interviews with representative affected parties in Kabul and the proposed project area covering the time period December 21-February 8, 2008.

While the EA addresses all §216.6 requirements, many of the environmental consequences and mitigation measures will require further refinement as important soils, hydrological, and mapping studies (currently in progress), become available, and the preferred alternative for the project site is more clearly delineated.

Major Conclusions

Recommendation # 1

Required implementation of the Mazar Foods Project Environmental Mitigation and Monitoring Plan is found under Section *6. Environmental Mitigation and Monitoring Plan (EMMP*) and includes:

1) mitigation and monitoring measures in the EMMP, with specifically identified best practice sectoral guidelines and checklists for environmentally sound design and management, especially those found at http://www.encapafrica.org/egssaa.htm and http://www.usaid.gov/our_work/environment/compliance/ane/ane_guidelines.ht .

2) EMMP Section 6.5 Mazar Foods Project Environmental Mitigation and Monitoring Annual Work plan Guidelines

3) employment of an Environmental Mitigation and Monitoring Specialist to coordinate implementation of phased remediation under the Mazar Foods Project Environmental Mitigation and Monitoring Annual Work plan, and following the scope of work and level of effort described in the Mazar Foods Project EMMP.

4) adaptation by the Environmental Mitigation and Monitoring Specialist of the environmental mitigation, monitoring and evaluation methodology and forms from *Afghanistan* (2005) *Annex D: Monitoring and Evaluation Plan* and *Annex E: Training Course Material*s with associated environmental mitigation, monitoring and evaluation reporting forms;

5) budgeting for implementation as described in the EMMP.

6) consistent application of the Mazar Development Foundation Environmental Review Form (ERF) provided as a separate EMMP component in Section 6. This form is to be applied for all activities funded through the Foundation. Training is required in the preparation of ERF Environmental Review Reports by all proposal applicants seeking funding by the Foundation

Recommendation #2

1. A detailed study is required to determine the availability of groundwater for sustained irrigation usage. A carefully executed hydrogeologic study will need to evaluate the subsurface geologic and hydrogeologic conditions: location and thickness of principal aquifers (water bearing zones); as well as intervening confining units (lower permeability zones); the depth and extent of principal fresh water aquifers in the region; water quality changes (i.e. total dissolved solids - TDS) with depth; the potential for up-coming of higher TDS water under sustained groundwater withdrawals; the range of yields for production wells in the Project Area; water-level drawdown interference with other wells (especially domestic wells) in the region and between planned production wells for the project and significantly, quantities of sustained groundwater that can be developed and withdrawn in a sustainable manner into the future.

2. Further aerial surveys and mapping are required: Aerial photography and mapping of the Hairatan and Khulm areas. The outputs will include 1:10,000 color photography, 1:2,000 scale mosaics, photo pairs, and topographic maps of selected areas with a contour interval of 0.5 meters. The aerial mosaics are to greatly facilitate the agricultural soils surveys and land classification. The maps and photos will provide a base for farm layout including land leveling and will in general facilitate work so it can move forward rapidly. These maps and photos will prove

invaluable for preparation of the Supplemental Environmental Analysis and the design of specific mitigation and monitoring measures.

3. Groundwater and agricultural soils and drainage investigations in Hairatan are needed: These studies will assess resource capability to sustain full, economic operations at a site with between 2,000 and 3,000 hectares of land. This site would be considered as an alternative should the full Mazar Farm Project of up to 10,000 gross hectares not be feasible for development in Khulm District. The work will provide new information on test well construction and topographic surveys coupled with mapping of physical features and land ownership boundaries, and include data from digging of pits, and soils and water sampling. Auger hole permeability test data will also be provided to facilitate drainage and irrigation development. (Results are expected in May-June 2008).

Supplementary Environmental Analysis: A Supplementary Environmental Analysis (SEAN) is planned for August 2008, and will revisit all sections of the EA to fill in existing information and data gaps and modify the various sections as appropriate based on the data and information provided through the above studies. More specific delineation of environmental consequences and phased mitigation and monitoring measures will be provided at that time.

Socio-cultural and socio-economic analysis: Upon final demarcation of the Project boundaries, the SEAN should also include an in-depth social analysis to refine potential adverse and beneficial impacts and mitigation measures related to land right disputes and compensation; water rights and impacts on water quality and quantity affecting the site and the environs; competition with other planned public or private development activities in the region; human health and welfare; potential indirect and cumulative impacts associated with the proposed development. This analysis should draw upon the socio-cultural and socio-economic baseline contained in this EA as well as engage additional field techniques for obtaining input from selected representatives of all parties who may be affected by the proposed project.

Approval of the SEAN is required prior to making an irreversible commitment of resources to the Project.

Recommendation #3

1. Development and implementation of a Pesticide Evaluation and Safer Use Action Plan for the Mazar Foods Project must be prepared in accordance with USAID 22CFR216.3 (b). The PERSUAP requires detailed information on pests and crops and proposed IPM/pesticide uses and methods for the Project. It is best prepared by an individual with in-depth IPM/Pesticide experience and familiarity with the PERSUAP process. The PERSUAP should be undertaken in conjunction with or upon completion of the Supplementary Environmental Analysis.

1 INTRODUCTION

The United States Agency for International Development's Mission to Afghanistan (USAID/Afghanistan) has selected Chemonics International to implement its Accelerating Sustainable Agriculture Program (ASAP). The purpose of this 40-month (12/2006-3/2010) program "is to accelerate broad-based, market led agriculture development capable of responding and adapting to market forces in ways that provide new economic opportunities for rural Afghans." To fulfill its purpose, ASAP will accomplish two objectives: 1)Accelerate relevant technology generation and transfer, with an increased focus on marketing of high-value commodities, competitiveness, sustainability and natural resource management, and 2) Improve the capacity of the Government of Afghanistan, and specifically the Ministry of Agriculture, Irrigation and Livestock (MAIL), to formulate agriculture sector policies and strategies and carry out administrative and financial coordination needed in support of more competitive, market-led agriculture production and agribusiness.

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1.1 Purpose and Need for the Project

1.1.1 Purpose

The Mazar Foods Project Business Development Plan details the important social, economic and political factors that combine to generate a need for agricultural development in Afghanistan and outlines why the selected site is suitable for the proposed action. A summary of this discussion is presented here.

Afghanistan is advancing at a rapid pace. Increasing numbers of Afghan exiles are returning to the country, many of whom bring skills, savings, and high motivation to assist and participate in the development of their country. In addition, economic growth is visible in the capital of Kabul, is tangible in all but a few provincial locations, and is clearly evident in Balkh Province, the specific site of the Mazar Foods Project. Nonetheless, with Gross National Income (GNI) per capita at about $230, Afghanistan ranks as one of the world's poorest countries.

The key ingredients for this groundbreaking initiative — political will and economic opportunity — are evident at all levels of government and in the private sector. Strong commitment to the Project exists at the highest levels of government. President Karzai has appointed a small group of senior officials to provide leadership in establishing the Mazar Foods Project and to ensure that the implementation process is supported and facilitated. His commitment is reflected by all key players involved in the project, including the dynamic governor of Balkh Province, the Minister

[3] Chemonics International, Inc. 2007. Mazar Foods Project Business Development Plan and Pre-Feasibility Study, dated December 19, 2007. USAID Contract No. 306-C-00-07-00501-00.

of Agriculture and the Senior Economic Advisor to the President, the Afghanistan Investment Assistance Agency, and USAID/Afghanistan.

The Afghan economy has made remarkable progress since the collapse of the Taliban government in November 2001. The high rates of growth in the legal economy are due to special factors, such as the end of a three-year drought, overflow from the illegal drug economy to the legal economy, and high levels of international assistance. The strong economic recovery that has taken place in recent years is fragile and will likely be sustained only with continued large amounts of international assistance and increased private investment. The long-term sustainability of the extraordinary levels of foreign assistance that in 2004-2005 amounted to about $2.8 billion — equivalent to almost 40 percent of legal Gross Domestic Product (GDP) — is highly uncertain. Rebuilding the Afghan economy, therefore, must emphasize a strong resurgence in private sector activities and a shift from illegal to legal activities. It also entails a shift from a low-productivity, informal, private economy to a high-productivity; formal economy led by private activity. It is in this context that the Mazar Foods Project has a very important role to play in Afghanistan.

The Mazar Foods Corporation is being established as a state-of-the art, private sector-driven agribusiness venture to produce, process, and market horticultural products for domestic Afghan and regional markets. Its production and processing facilities will be located in the fertile Khulm District, in the Balkh Province. The selected site consists of 10,000 hectares (approximately 25,000 acres) of contiguous or closely joined parcels with access to a major airport and a skilled labor pool. Additionally, the site has rail access to markets in Russia via Uzbekistan and road access to the largest domestic market in Kabul (Chemonics 2007).

1.1.2 Need for Agriculture/Irrigation

The farm's production environment is arid land that will be irrigated with ground water coming from aquifers that flow to the north from the Hindu Kush Mountains. The site is located in an area that receives little precipitation in the form of rain and is therefore not capable of supporting rain-fed crops; however, several area in the Balkh Province, including the Khulm District, are occupied by large areas of agricultural land and much of the economy of the region is based upon agriculture. Optimal use of irrigation water is a crucial component to the production strategy. Crops will most likely be irrigated using a wheel sprinkler irrigation system. Some crops will use plastic mulches and other techniques that decrease water use and increase crop health.

Field studies are scheduled in mid February to ascertain the amount and quality of water that would be available for use at the Khulm farm site. These investigations include well tests at five to nine locations. Water quality samples will be taken at each site for each seven-meter interval of depth; field measurements will be made and the samples will be further tested in the laboratory. Pumping tests will be carried out to determine transmissivity and storage coefficients to ascertain the permissible pumping rates and spacing of production wells. The design of well fields will be based on this information and determinations of recharge to ground water. A final schedule for the number and location of production wells to be constructed will be based on the collected information and analyses, as well as refinement of cropping and business plan assumptions. Field investigations of groundwater will require some six months, extending through June 2008. Design of well fields will begin following analysis of the well tests.

1.2 Objectives of the EA and Policy, Legal, and Administrative Framework

1.2.1 Summary Description of Proposed Project Activities

Program Overview

Farm Site and Surroundings

The Project Area is about 14 km by 31k and northwest of Khulm City, Balkh Province, Afghanistan. The land surface slopes from south to north with some hilly areas in the southern part of the site. About 25 to 30 percent of the land is cultivated by local people. The principal crops include wheat, barley, alfalfa, melon, water melon, onion, lady finger, aubergine, tomato, coriander, and spinach. The fruit and nut crops include almonds, pomegranate, figs, grapes, cherry and black cherry.

The selected farm site is adjacent to the road connecting Mazar-i-Sharif and Khulm, beyond the intersection with the Hairatan road in the province of Balkh (see Photo 1 below). This site was selected from a recent study of several possible locations for the Project. The region has many working farms and extensive irrigation systems. It is an area accustomed to production farming and is less oriented to the subsistence farming that characterizes other regions of the country.

Because of water quality and quantity concerns arising from the preliminary assessment undertaken for business plan preparation and other reports, as well as existence of scattered settlements around the area, the farm is envisioned to be comprised of two sections each of 5,000 hectares: one on the North side of the road, the other on the South side. The resulting farm area of 10,000 hectares, although not wholly contiguous, is proximal and is the total area to be conceded for this project by the Balkh Province (Chemonics 2007).

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- The area is served with aquifers that draw their water from snowmelt in nearby high mountains.
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- Nitrogen fertilizers are available from a regional manufacturer, although the urea plant is known to be unreliable with insufficient capacity for current needs. Phosphate fertilizers are imported from Pakistan in the Mazar area.
- The region has an established network of infrastructure. Commercial amounts of electricity are available. Electrical power is eventually to be the primary source of energy for pumping, but diesel pumps are proposed for the initial year(s) of operation
- The farm is close to a major airport, and has rail and road access to markets into Russia and Kazakhstan through Uzbekistan. The site has direct access to the large nearby market of Mazar-i-Sharif and a connection over good roads to the largest domestic market, Kabul.)

Being in the vicinity of a large town that includes a proposed industrial park will facilitate efforts by the Corporation to mobilize labor and infrastructure equipment.

Photo 1: General view of the proposed project area in the winter, as seen facing south from the Old Khulm Road between the villages of Naebabad and Oljatu.

Project Objectives

The objectives of the Mazar Foods Corporation project are to:

1 Establish a large, highly productive commercial farm that can take full advantage of the burgeoning markets in the regions for fresh fruits and vegetables and various processed horticultural products; and

2 Support the Mazar Development Foundation, which will spearhead a program of improved basic services to communities throughout the Province.

The Mazar Foods Corporation would lay the foundation for an approach to accelerated economic development led by private sect and foundation activities, in partnership with official sources of funding, which includes, funding from USAID and OPIC.

The physical establishment of the Mazar Foods Corporation will entail construction and other works which will result in changes to the environment at the proposed site and surrounding areas. These proposed changes include:

1 Construction of various buildings in and around the proposed farm site;
2 Introduction and use of fertilizers, pesticides, and insecticides;
3 The use of deep aquifer well water for irrigation;
4 Introduction of new seed varieties;
5 Introduction of new irrigation techniques. (Chemonics EA SoW Narrative)

1.2.2 Regulatory considerations (Host Country, USAID, OPIC, including relevant international agreements)

1. Policy and Institutional Framework[4]

National Environmental Protection Agency of Afghanistan

The National Environmental Protection Agency (NEPA) is a recent entity, formed in 2005 from the previous Ministry of Irrigation, Water Resources, and Environment (MIWRE). NEPA as an independent institution is responsible for coordinating and monitoring conservation and rehabilitation of the environment, and for implementing the government's policy on environment under the Environment Law (2006).

The Law clarifies administrative roles at the national level and specifies the coordination required with provincial authorities. It spells out frameworks for managing natural resource conservation and biodiversity, drinking water, pollution control, and environmental education. Equally important, according to its supporters, the Law provides tools for enforcement.

Ministry of Agriculture, Animal Husbandry, and Livestock

The Ministry of Agriculture, Animal Husbandry, and Livestock consists of 17 departments. However, only the following are directly involved in environmental protection and management:

- **Department of Forestry and Rangeland Management:** Formulates strategy for forestry and rangeland management. The department's capabilities are weak.
- **Department of Land Management:** Responsible for land registration throughout Afghanistan.
- **Department of Agricultural Inputs and Quality Control:** Within this department, *Soil Resources* is responsible for agricultural inputs and soil conservation, and *Plant Protection* is responsible for pesticide management and IPM implementation.
- **Department of Extension Services:** Provides farmer training in new technologies and environmental protection.
- **Department of Machinery Research:** Charged with identifying tillage machinery and methods suited to Afghanistan; the department is minimally functional.
- **Department of Agricultural Cooperatives:** Responsible for providing agricultural inputs and developing markets; this department also has limited functionality.

The Ministry employs approximately 11,000 people, about 4,000 of which have received university training.[5]

Ministry of Energy and Water (MEW)

MEW provides irrigation water to farmers at no cost, although farmers often provide labor for canal construction and maintenance. They may also make in-kind contributions, typically a percentage of their crop, to a water master at the village or farm level. The water master's responsibility is to distribute irrigation water equitably among farmers, organize labor to maintain

[4] This information was adapted from the USAID/Afghanistan *Environmental Assessment of the Alternative Livelihoods Program in Afghanistan*, *Final Draft*, Abt Associates, December 2005, pp, 65-68.

[5] Verbal comments taken during interview with Nasrullah A. Bakhtani, General Director of Soil Research Dept., MALF, November 2, 2005.

the irrigation system, and collect the fee for service. Water masters are not trained in irrigation management, and often are unaware of methods for controlling water logging, soil salinity, and soil fertility.

MEW does not have the financial resources or technical skills required to repair, design, or construct medium- and large-sized irrigation structures. There is inadequate ability across Afghanistan to provide for storage of peak flows, resulting in water shortages during dry periods and flooding during the spring months.

Ministry of Rural Rehabilitation and Development (MRRD)
The MRRD is responsible for rehabilitating rural infrastructure and strengthening community-based institutions. Design, construction, operation, monitoring, and evaluation of rural infrastructure projects are to be carried out in a highly participatory manner, with extensive community involvement and participation as part of Afghanistan's National Solidarity Program. Typical projects include roads and bridge construction, irrigation canals construction and maintenance, small hydropower projects, flood protection wall construction, provision of disaster relief, and support to women's artisan industries. MRRD projects are often implemented in coordination with NGOs.

Ministry of Mines
The Ministry of Mines is responsible for all mining activities in Afghanistan. Its mission includes promoting mining and protection of the environment through "low-impact" mining operations. It is responsible for enforcing mining laws and for prohibiting informal artisan mining. Its technical capabilities and human and financial resources are extremely weak.
The Ministry lacks the capacity to effectively regulate and monitor environmental and worker safety standards. However, many international mining companies maintain internal environmental and worker safety standards that exceed national or international standards

2. Institutional Capacity-Building Needs

The Finance Ministry provides the budgets to the various ministries and departments with responsibilities for natural resource and environmental management. Budgetary semi-independence exists at the Council *shura* level, which charge in-kind fees for irrigation distribution and management. Afghanistan has no capability to measure water quality, with the exception of the Ministry of Health in Kabul. The country is without a stream gauging network, and has only a few operating weather stations. Because of the inadequacy of historic and current efforts to measure baseline conditions, there is an inability nationwide to effectively manage natural resources or the environment, or to enforce environmental legislation. Recommended World Health Organization (WHO) air, water quality, and health standards are used as the basis for gauging environmental compliance.

Institutional capability requirements focus on enhancing ministerial capabilities to collect environmental information, plan and manage environmental resources, and enforce laws relating to those resources. Without major increases in budgetary, manpower, transport, and equipment resources, the ministries will continue to be unable to provide effective management of Afghanistan's environment and natural resource base. There is a need to examine mechanisms for line ministries to charge for services and retain those revenues to provide for needed environmental and natural management programs, rather than continuing to rely on financing of ministry functions by central government.

3. Existing Environmental Legislation and Regulations

The following legislation contains important environmental provisions:

1981	The Water Law
2000	The Forestry Law of the Islamic Emirate of Afghanistan.
2000	The Islamic Emirate of Afghanistan Law for Land Ownership
1986/2000	Nature protection Law
2000	Agricultural Quarantine Services Law
2000	Veterinary Services Law
2000	Hunting and Wildlife Protection Law
1970/2000	Range Management Law
2000	Agricultural Cooperative Development Law
2000	Charter for Department of Fertilizers and Agro-Chemicals
2000	Seed Improvement Department Charter
2006	Environment Law (draft)

4. International Environmental Agreements

Afghanistan is a signatory and participating member on five international environmental agreements. The earliest of these, the Convention Concerning the Protection of World Cultural and Natural Heritage, was ratified in 1979. (Only the minaret at Jam is registered with the convention.) Afghanistan ratified the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1985, and the Convention to Combat Desertification in 1995. The Convention on Biological Diversity and the United Nations Framework Convention on Climate Change were ratified in 2004. Ratification of each of these conventions allows Afghanistan to access to funds, technology, training, and other support needed to fulfill its membership role. However, Afghanistan must meet the requirements of the different conventions, and its capacity to meet these mandates is minimal.

Compliance with Afghanistan's environmental legislation is very low. Deforestation continues at an alarming rate. The ability to enforce the nation's environmental laws has yet to reach the pre-war levels of the 1970s. Over the next several years, the rebuilding of Afghanistan's capacity to manage its natural resource base and environment and to enforce environmental law will depend almost entirely on international financing.

1.2.3 Requirements of Potential Investors, Lenders, and Insurers

The Mazar Food Project management will carefully evaluate the selection of the Afghan investors who will participate in the formation of the Corporation. Five sets of considerations will be used to help evaluate these potential investors:

- *Experience* with the technologies and markets of interest to the Corporation, including a good understanding of the competitive conditions and amount of capital and lead times needed to brings Mazar Foods products to these markets.
- *Contributions to the formation of the business plan.* Potential investors would have an opportunity to contribute to the development and execution of the business plan and related strategic planning.
- *Management participation and support.* It will be important to understand the expectations of the potential partners as to participation in management (e.g., becoming a

Board member or perhaps an officer of the Corporation). The potential investors should also be able to provide support in locating suppliers and customers.

- *Financial support.* The potential investor should be able to help find other suitable sources of funding for the Corporation.
- *Potential competition from investors and confidentiality.* To avoid subsequent friction among partners, it will be helpful to explore attitudes of potential investors toward possible competition from Mazar Foods Corporation and treatment of confidential information assembled by the corporation about market opportunities.

1.2.4 Relationship of this EA to Other Environmental Documentation

This is the only EA related to the Mazar Food project and there is no other environmental documentation.

1.3 EA Scoping Process

1.3.1 Narrowing Issues for Consideration

Scoping Out the Issues - The USAID Requirements

USAID Reg. §216.3(a) (4) (i), outlines specific procedures for carrying out the EA or PEA. The first step entails a "process of identifying the significant issues relating to the proposed action and of determining the scope of the issues to be addressed...." The regulation states that:

Persons having expertise relevant to the environmental aspects of the proposed action shall ... participate in this scoping process. (Participants may include but are not limited to representatives of host governments, public and private institutions, the A.I.D. Mission staff and contractors.) This process shall result in a written statement which shall include the following matters:

a) A determination of the scope and significance of issues to be analyzed in the Environmental Assessment or Impact Statement, including direct and indirect effects of the project on the environment.

b) Identification and elimination from detailed study of the issues that are not significant or have been covered by earlier environmental review, or approved design considerations, narrowing the discussion of these issues to a brief presentation of why they will not have a significant effect on the environment.

c) A description of

1. the timing of the preparation of environmental analyses, including phasing if appropriate,

2. variations required in the format of the Environmental Assessment, and

3. the tentative planning and decision-making schedule; and

d) A description of how the analysis will be conducted and the disciplines that will participate in the analysis.

Reg. §216.3(a) (4) (ii) states that "These written statements shall be reviewed and approved by the Bureau Environmental Officer."

After the scoping statement has been prepared, the Bureau Environmental Officer (BEO) in USAID's Bureau for Africa (AFR/SD) may circulate copies of it, "together with a request for written comments, within thirty days" if the BEO believes doing so will be useful in preparing the PEA. Comments received are then considered in the preparation of the EA and in design and implementation.

1.3.2 Public and Stakeholder Participation

The net was cast wide to identify key parties who may be affected by—or may be able to influence—the project's outcome in an adverse or beneficial manner. These included individuals owning land or assets both on- and off-site; persons using agricultural land in or near the project area; village development associations; a women's group of Khulm; and a Khulm farming cooperative.

Other stakeholders were contacted including: (i) local government authorities; (ii) Afghan government agencies, including the Director of the National Environment Protection Agency; (iii) local developmental entities and nongovernmental organizations (NGOs); Balkh University staff; and (iii) focus groups consisting of elders and community leaders

1.4 EA Methodology

The methodology used to conduct this Environmental Assessment (EA) conforms to procedures found in USAID regulations at 22 CFR 216.3, the OPIC Environmental Handbook, U.S. Executive Order 12114, and the Afghanistan Environmental Law, Chapter 3 in Official Gazette 873. The EA meets U.S. requirements and procedures mandated by NEPA at 40 CFR 1500 et seq. Afghan regulations for Environmental Assessments have not yet been clearly defined.

Scoping and Public/Stakeholder Comment

The Scoping process was conducted as required by USAID §216.3(4) to provide a preliminary identification of the environmental and social impacts that may be caused by the Mazar Foods Project. Public consultations were undertaken during scoping to ensure that the EA would take into full account the priority concerns of people affected by the project, and more accurately identify the full range of potential impacts. As defined in USAID regulations, the purpose of the Scoping Statement is to identify pertinent issues relative to the project, narrow and eliminate from consideration those issues which are not deemed significant or have been previously analyzed, and define timing, planning, and variations from standard format of the EA. The draft Scoping Statement was completed on January 11, 2008 and submitted to USAID on January XX, 2008.

The Scoping Statement included:

- a review of relevant legislation and guidelines;

- a review of background documents regarding baseline environmental and social conditions in the region;
- review of the Mazar Foods Business Development Plan;
- determining concerns raised by project proponents and the host country through stakeholder interviews in Kabul;
- consultation with village elders in the project area; and
- meetings with government departments and agencies

The scoping/consultation process focused primarily on the Mazar Foods project area; however, additional input was sought from throughout the greater Khulm area.

The primary focus on environmental issues to be addressed was narrowed down to:

- Management of water resources
- Resolution of land use and ownership issues
- Preservation of cultural, historical, and archaeological resources
- Socioeconomic issues
- Health and safety
- Water management
- Management of soil conditions and fertilizer use
- Assessment of agricultural processing facilities strategies and alternatives
- Pest management
- Energy provision
- Transportation infrastructure requirements and impact management
- Wastewater management
- Dust control
- Solid waste management

The issues considered to be significant were selected based on input from community leaders, stakeholder concerns, and existing knowledge of the scarcity of water resources in the region. Several detailed studies on the geology and hydrology of the project area were conducted by Soviet scientists prior to 1979, but many of these reports were lost or destroyed throughout the last three decades of conflict in Afghanistan. At this point, very little is known about the hydrogeological environment in the area, and what little data is available is difficult to assemble in the absence of a centralized or systematic repository (Ashworth 2007).

- Issues eliminated from detailed study include:
- Floodplains
- Wetlands
- Air
- Light Emissions
- Noise Emissions
- Toxic Substances

1.4.1 Team Composition, Responsibilities, and Technical Approach

The Mazar Foods Project Environmental Assessment team is comprised of six development and environmental science professionals. Each team member was assigned specific responsibilities

based on their expertise and role within the EA team. Complete curricula vitae for all members of the EA team are found in section 12.1.1.

Five members of the EA team worked on site in and around the Mazar Foods project area in Balkh Province. An additional team member was based solely in the U.S. The EA team included a mix of the following areas of expertise: biochemist/chemist, environmental science specialist, biological/natural resource specialist, environmental impact specialist, and an agronomist/socio-cultural specialist.

The team conducted detailed site visits over the course of three weeks and collected information from persons residing in and near the project site, Balkh University facility, non-governmental organizations (NGOs), and experts within the Department of Agriculture in the Provincial Government of Balkh. The information collected has informed the analysis of the environmental issues subsequently addressed by the EA.

The EA team consisted of the following individuals. The primary responsibilities of each team member are also highlighted below.

Team Leader, Ali Azimi

With more than 26 years of experience managing environmental issues at the national, regional, and global levels, Mr. Azimi is responsible for overseeing the activities of the EA team, as well as submission of the Mazar Foods project EA according to USAID, OPIC, and Islamic Republic of Afghanistan guidelines. As an Environmental Impact Assessment (EIA) Expert, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- In coordination with the Agribusiness Expert Advisor and other members of the EA team, define the full scope of the EA, which shall include, at minimum:
    - The impact of the new farm on adjacent communities (health, water, waste)
    - An analysis of water management issues including demand, conservation, abstraction, and salinization
    - An analysis of the agrochemicals that may be introduced or used at Mazar Foods Corporation
    - An analysis of management issues including an analysis of what the proposed crops processing necessitates
    - An analysis of energy issues—types and impacts of energy needed for irrigation, operations, processing, transport
    - An analysis of various social elements with emphasis of conformity with ILO standards and destination market requirements (e.g. GlobalGAP, IFS, BRS etc. if export oriented)
    - Other areas as required by 22 CFR 216 and the OPIC Environmental Handbook
- Develop the methodology and templates needed for the collection of data related to the EA
- Conduct at least 1 site visit to Afghanistan to ensure proper data collection and progress of the EA
- Compile and analyze the collected data

- With input from and in coordination with other members of the EA team, draft the final version of the EA, which shall be posted in a public forum as is required by OPIC guidelines
- Perform other tasks as assigned by the Mazar Foods Project Director, or his designee, which is consistent with the Environmental Impact Assessment Expert's experience and Scope of Work

Associate Team Leader, Environmental Impact Assessment Specialist, Wes Fisher

Wes Fisher has more than 30 years' experience in natural resource policy, planning, and management. His specialized expertise includes environmentally sound design and management to enhance program and project sustainability. Together with Mr. Azimi, Mr. Fisher is responsible for managing team activities and submission of the completed EA. As Associate Team Leader and Environmental Impact Assessment (EIA) expert, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- In coordination with the Chemonics Agribusiness Expert Advisor and members of the EA team, take the lead in developing the USAID Scoping Statement and the EA outline and assist the Team Leader in helping define the full scope of the EA, which shall include, at minimum:
    - The impact of the new farm on adjacent communities (health, water, waste)
    - An analysis of water management issues including demand, conservation, abstraction, and salinization
    - An analysis of the agrochemicals that may be introduced or used at Mazar Foods Corporation
    - An analysis of management issues including an analysis of what the proposed crops processing necessitates
    - An analysis of energy issues—types and impacts of energy needed for irrigation, operations, processing, transport
    - An analysis of various social elements with emphasis of conformity with ILO standards and destination market requirements (e.g. GlobalGAP, IFS, BRS etc. if export oriented)
    - Other areas as required by 22 CFR 216 and the OPIC Environmental Handbook;
- Develop the methodology and templates needed for the collection of data related to the EA
- Assist in coordinating the work of the other EA Team members
- Analyze the collected data
- Facilitate the preparation of a practical and implementable Environmental Mitigation and Monitoring Plan (EMMP), also known as the Environmental Management Plan, including developing budgets and responsibilities for implementation.
- With input from and in coordination with other members of the EA team, draft the final version of the EA baseline, EMMP sections, including environmental compliance language (ECL) for project managers which shall be posted in a public forum as required by OPIC guidelines.
- Perform other tasks as assigned by the Mazar Foods Project Director for Chemonics, Tim Prewitt, which are consistent with the Associate Team Leader/Environmental Impact Assessment Specialist's experience and Scope of Work.

Environmental Specialist, Mumtaz Ahmad

Mr. Ahmad is an assessment program and project development specialist with nine years' experience working in Afghanistan's development field with international and national partners. His specializations include the provision of technical assistance and advisory services for the implementation of environmental strategies and policies. As Environmental Scientist/Natural Resource Specialist, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- In coordination with the Chemonics Agribusiness Expert Advisor and members of the EA team, take lead responsibility for assessment and the written preparation of relevant, assigned sections of the EA
    - Develop the methodology and templates needed for the collection of data related to these portions of the EA
- Maintain detailed records of meetings and interviews with affected parties and potential stakeholders, including summaries of who, when, where and the issues discussed and contact information for potential future follow-up communication for incorporation in the public participation section of the EA.
- Conduct at least one site visit to Mazar to ensure proper data collection and progress of the EA; compile and analyze the collected data
- Participate with the full EA Team in developing a practical and implementable Environmental Mitigation and Monitoring Plan (EMMP), also known as the Environmental Management Plan, including developing budgets and responsibilities for implementation.
- With input from and in coordination with other members of the EIA team, draft the final version of the specified sections of the EA, which shall be posted in a public forum as is required by OPIC guidelines.
- Perform other tasks as assigned by the EA Team Leader, Ali Azimi, or by Mazar Foods Project Director for Chemonics, and the Cadmus EIA expert, Wes Fisher, consistent with the Environmental Scientist/Natural Resource Specialist Scope of Work

Biologist, Natural Resource Specialist, Michael Gaglio

Mr. Gaglio is a biologist and environmental project manager with more than eight years of environmental consulting experience, and 10 years' experience performing biological assessments of natural and disturbed areas for research and regulatory compliance. He specializes in site assessments for hazardous materials, National Environmental Policy Act (NEPA) documentation, and biological resources. As Biologist/Natural Resource Specialist, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- In coordination with the Chemonics Agribusiness Expert Advisor and members of the EIA team, take lead responsibility for assessment and the written preparation of relevant, assigned sections of the EA, including but not limited to assessment of impacts to biodiversity, natural forests, and endangered species in accordance with §216..5 Endangered Species and the provisions of the Foreign Assistance Act Sections 118 and 119.
- Develop the methodology and templates needed for the collection of data related to these portions of the EA

- Conduct at least 1 site visit to Afghanistan to ensure proper data collection and progress of the EIA; compile and analyze the collected data
- With input from and in coordination with other members of the EA team, draft the final version of the specified sections of the EA, which shall be posted in a public forum as is required by OPIC guidelines
- Participate with the full Team in developing a practical and implementable Environmental Mitigation and Monitoring Plan (EMMP), including developing budgets and responsibilities for implementation
- Select and prepare maps and graphics to augment understanding of the EA baseline and interpretation of issues by the EA reviewers, applying GIS methodologies where feasible
- Ensure recording of GPS coordinates on baseline locations, including the Team's field photo library
- Perform other tasks as assigned by the EA Team Leader, Ali Azimi, or by Mazar Foods Project Director for Chemonics, and the Cadmus EA expert, Wes Fisher, consistent with the Biologist/Natural Resource Specialist Scope of Work

Agronomist and Socio-cultural Specialist, Hafizullah Rahmani

Hafizullah Rahmani is a trained agronomist with broad development project experience, including the Afghanistan Pilot Participatory Poverty Assessment (APPPA) and multiple OXFAM initiatives. Mr. Rahmani has applied a range of PRA tools, including: social mapping, resource mapping, mobility mapping, seasonal mapping, developing timelines, use of daily activity diagrams, well being analysis, trend analysis, cause and effect diagrams, pair wise ranking and matrix ranking, database establishment, and reporting. As Agronomist/Socio-cultural Specialist, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- Participate in meetings with local government and community members to discuss the Mazar Foods Project and respond to community members queries
- Assist in the preparation of a stakeholder questionnaire to solicit information on agricultural and socio-cultural issues
- Take the lead in public consultations at the village level in Khulm and arrange and participate in meetings with NGOs and Dept. of Agriculture in Mazar-i-Sharif
- Compile the information received and present to the Team Leader for analysis and assessment
- Prepare the socio-cultural section of the EA with assistance from other team members
- In coordination with the members of the EA team, take lead responsibility for assessment and the written preparation of additional relevant, assigned sections of the EA
- Develop the methodology and templates needed for the collection of data related to these portions of the EA
- Maintain detailed records of meetings and interviews with affected parties and potential stakeholders, including summaries of who, when, where, and the issues discussed and contact information for potential future follow-up communication for incorporation in the public participation section of the EA
- Conduct at least one site visit to Mazar to ensure proper data collection and progress of the EA; compile and analyze the collected data
- Participate with the full Team in developing a practical and implementable Environmental Mitigation and Monitoring Plan (EMMP), also known as the Environmental Management Plan, including developing budgets and responsibilities for implementation

- With input from and in coordination with other members of the EA team, draft the final version of the specified sections of the EA, which shall be posted in a public forum as is required by OPIC guidelines
- Perform other tasks as assigned by the EA Team Leader, Ali Azimi, or by Mazar Foods Project Director for Chemonics, and the Cadmus EA expert, Wes Fisher, consistent with the Agronomist/Socio-cultural Specialist Scope of Work

Project Field Reconnaissance Associate, Najmudin Shahrukhi

Mr. Shahrukhi has over five years' experience providing field support to development projects in Afghanistan, including work with World Food Program, UNICEF, UNHCR and IOM. He has extensive knowledge of the Mazar Foods project area and environs, including physical, biological, and socio-cultural and socio-economic baseline conditions. Additionally, he is familiar with stakeholder views and potential project impacts. As Project Field Reconnaissance Associate, his specific responsibilities include:

- Review the proposed technical specifications for the Mazar Foods Corporation
- In coordination with the EA Team Leader and members of the EA team, provide project site background to the EA Team Leader and members of the EA team, both during site visits and in Team discussions of baseline conditions, stakeholder views, and potential project impacts and mitigation strategies
- Accompany the team on all site visits and local meetings and interviews
- Perform other tasks as assigned by the EA Team Leader, Ali Azimi, or by Mazar Foods Project Director for Chemonics, and the Cadmus EIA expert, Wes Fisher, consistent with the Project Field Reconnaissance Associate Scope of Work

PROJECT LOCATION

The Mazar Foods Project proposes to utilize approximately 10,000 hectares of contiguous or closely located land. Prior the EA, the EIA team was provided with a project area map that included a boundary utilized for aerial survey planning. This boundary includes an area of approximately 24,000 hectares centered along the highway between Mazar-i-Sharif and Khulm. The area of concentration for the EA included all areas within the boundary of the aerial survey planning map. It is assumed that the proposed Mazar Foods Project will locate the proposed 10,000-hectare farm site within this area.

Despite the physical locations of the boundary, research and public involvement for the EA reached a broader geographic area that includes villages outside the project area. Although some of these villages are not directly located in the project area, they would likely be affected by the proposed project in terms of employment opportunity, indirect economic benefit, food supply, and social services. Further, the hydrologic and water resources concerns associated with the project force the need to approach the environmental assessment on a regional scale to evaluate characteristics of the, watershed, aquifer, and nearby Amu Darya River.

PROJECT TIMEFRAME

The Mazar Foods Project is anticipated to be a long-term program, achieving a sustainable enterprise of agricultural production and trade. The Business Development Plan includes

economic projections for the Mazar Development Foundation through the year 2015. The plan also calls for a transition in the ownership arrangements of the Mazar Foods Corporation by 2010. The Mazar Development Foundation's initial controlling interest will be reduced within the first three years of operation, so that the existing founding Afghan investors, or a slightly enlarged pool of such investors, will take full control of the company by 2010. The process by which these private investors assume full responsibility for the company will be driven by gradual changes in the proportions of support, autonomy, and control that are provided as the venture grows.

In order to provide a comprehensive assessment, the EA team evaluated both short-term and long-term potential impacts on the natural and human environment. Short-term impacts are defined for immediate, one-year, three-year, and five-year periods. Long-term impacts are more difficult to tangibly quantify, but are estimated for resource categories including water resources and sociocultural aspects of the project.

1.4.2 Schedule of Meeting and Site Visits

The following narrative describes key dates for the EA team, as well as the team's meetings and site visits from late December, 2007 through January, 2008.

On December 23, 2007, Mumtaz Ahmad (EA team Environmental Specialist) conducted separate meetings with staff of the Afghanistan Ministry of Agriculture, Irrigation and Livestock (MAIL) and the National Environmental Protection Agency (NEPA) in Kabul, Afghanistan.

Meeting Participants included:
Mr. Haidar Haidari, Director of Environmental Division, Natural Resources, MAIL.
Mr. Hashem Barakzai, General Director, Natural Resources, MAIL
Mr. Obaidullah Ztenikzai, Environmental Officer, NEPA

The following items were discussed:

- Host country (Afghanistan) environmental procedures
- Groundwater potential and capacity in the Khulm area
- Annual precipitation rate in Northern Afghanistan
- Earthquake record over last 100 years
- Historic flood records and patterns

On December 24, 2007, Mr. Ahmad conducted separate meetings with agricultural experts in the Kabul offices of the Accelerated Sustainable Agriculture Program (ASAP) and the United Nations Food and Agriculture Organization (FAO).

Meeting Participants included:
Mr. Ehsanullah Ehsan, Agriculture, Research and Extension advisor, ASAP
Mr. Sayed Naeem, Operations Officer, FAO Afghanistan
Mr. Ibrahim Sultani, Director Infrastructure, ASAP

The following items were discussed:

- Soil quality, chemical contents, and erosion
- Plant diseases and use of pesticides
- Quality and quantity of water both surface and underground
- Heavy metals (Arsenic, Cadmium lead) in water

- Aquifer consistency in various position in and around the proposed project area

On December 24, 2007, EA Team Leader Dr. Ali Azimi arrived in Kabul to begin EA field work.

On December 31, 2007, Natural Resource Specialist/Biologist Michael D. Gaglio arrived in Kabul to begin EA field work.

On December 31, 2007, the EA Team, along with Chemonics/ASAP staff, met with USAID staff at the USAID offices in Kabul.

Meeting participants included:
Carol Wilson, Cognizant Technical Officer, USAID
Robert Hanchett, Mission Environmental Officer, USAID
David Scott, Environmental Officer, USAID
Kari Goetz, Mazar Foods Start-Up Coordinator, Chemonics
Lou Faoro, Chief of Party, ASAP/Chemonics

The following items were discussed:
- Application of U.S. NEPA and USAID regulations in Afghanistan
- USAID guidelines and procedures for the EA
- Utilizing Afghanistan NEPA resources and building their capacity
- Plant diseases and use of pesticides

On January 1, 2008, Agricultural Specialist Hafiz Rahmani joined the EA team in Kabul.

On January 3, 2008, the EA team traveled by airplane from Kabul to Mazar-i-Sharif to begin local field work and public consultations for the EA.

On January 4, 2008, the EA team traveled to Khulm and met with Sayed Ibrar, Khulm District Commissioner, and various community personnel in the offices of the District Commissioner.

The following items were discussed:
- Traditional irrigation systems in Khulm District
- Land use and tenure issues
- Local resources available in the area
- Main source of income for livelihoods
- Water distribution procedures
- Nearest markets for their products
- School going children
- Major health issues

On January 5, 2008, the EA team recruited Najmudin Shahrukhi as a Project Field Reconnaissance Associate.

On January 5 through January 8, 2008, the EA team traveled to Khulm and surrounding areas to perform site reconnaissance activities.

Throughout January 2008, select members of the EA team conducted a variety of public consultation meetings with various community members, including village elders, women, and government officials in Mazar-i-Sharif, Khulm, and surrounding villages that would be affected

by the project. These meetings were hosted in order to collect inputs from the affected public, as well as to collect data from people knowledgeable of the project area. Individual summaries of these meetings, referred to as Key Informant Interviews, are included in Section 13.7.

1.5 EA Consultation and Review

Advanced planning was undertaken to identify: (i) risks to the project arising from the local environmental and social context; and (ii) the key parties who may be affected by—or may be able to influence—the project's outcome in an adverse or beneficial manner. The District Commissioner of Khulm assisted in identifying representatives of potential project-affected groups living in the project area.

A questionnaire was developed to elicit descriptions of the social and cultural baseline in the project area, including data on local communities: the economy and livelihoods, land, and social organization. A copy of the questionnaire is found in Section 13.6.

Stakeholder identification was undertaken to determine the villages directly or indirectly affected by the proposed project. These included individuals owning land or assets both on- and off-site; persons using agricultural land in or near the project area; village development associations; a women's group of Khulm; and a Khulm farming cooperative.

Other relevant stakeholders also contributed knowledge, including: (i) local government authorities; (ii) Afghan government agencies, including the Director of the National Environment Protection Agency ; (iii) local developmental entities and nongovernmental organizations (NGOs); Balkh University staff; and (iii) focus groups consisting of elders and community leaders.

Following is the list of individuals with whom the EA team met in the course of EA preparation:

	Name	Position	Village- Guzar	Date
1.	Mr. Haidari	Director of Afghanistan Environment Ministry of Agriculture		23-Dec-07
2.	Mr. Hashem Barakzai	General Director of Natural Resources, Ministry of Agriculture, Afghanistan.		23-Dec-07
3.	Mr. Obaidullah	Environmental Officer, NEPA, NEPA Office, Kabul, Afghanistan		24-Dec-07
4.	Mr. Ehsanullah Ehsan	Agriculture, Research and Extension advisor, ASAP program		24-Dec-07
5.	Mr. Sayed Naeem	Operations Officer, FAO Afghanistan		24-Dec-07
6.	Mr. Ibrahim Sultani	Director Infrastructure ASAP program		25-Dec-07
7.	Sayed Ebrar	Khulm District Governor	char sooq	5-Jan-08

	Name	Position	Village- Guzar	Date
8.	Janbar khan	Head of the shura	Baghacha dawlatzai	5-Jan-08
9.	Eshan tahir	Head of the shura	Jalqi	5-Jan-08
10.	Yosuf	Head of the shura	Sultan-dah marda	5-Jan-08
11.	Gul.Mohd	Head of the shura	Da mullah lashkari	5-Jan-08
12.	Zakhil	Head of the shura	H.Ali.afghania	5-Jan-08
13.	Aimal Maiwand	Regional Manager North for AIMS		6-Jan-08
14.	Khalil	Head of the shura	Rozi bi	8-Jan-08
15.	Ab. Wahab	Head of the shura	Da mullah Mohamad	8-Jan-08
16.	Ab. Sabor	Head of the shura	Teli	8-Jan-08
17.	Habibullah	Head of the shura	shorabi	8-Jan-08
18.	Ubaidullah	Head of the shura	Alimardan big	8-Jan-08
19.	Nematullah	Head of the shura	Awimahot	8-Jan-08
20.	Gul nazar	Head of the shura	Khanaqa-kahlifa ashali	8-Jan-08
21.	Habibullah	Head of the shura	Kohna bazaar	8-Jan-08
22.	Ab,khaliq	Head of the shura	Sartrashi	8-Jan-08
23.	Mohd. Nazir	Head of the shura	Tapa-e-shikhi Afghania	8-Jan-08
24.	Mohd.Yasin	Head of the shura	Merza shams	8-Jan-08
25.	Mohd. Tahir	Head of the shura	Jolqi	8-Jan-08
26.	Gul.Mohd	Head of the shura	Negaran district 3	8-Jan-08
27.	H.Hamidullah	Head of the shura	Kaenja bi	8-Jan-08
28.	Habibullah	Head of the shura	esmail khayl	8-Jan-08
29.	M.Sharif	Head of the shura	ganda baghat	8-Jan-08
30.	Mohamadi	Head of the shura	Chochman Qala	8-Jan-08
31.	Hayatullah	Head of the shura	Namazga	8-Jan-08
32.	M.eshaq	Head of the shura	sert Bala	8-Jan-08
33.	Mr.Kazim Shams	Director of Agricultural Dept. Mazar Province		9-Jan-08
34.	Mr.Ah.Zia Aria	Regional seed coordinating office		9-Jan-08
35.	Professor	OIC of Agriculture Faculty of Balkh		9-Jan-08

	Name	Position	Village- Guzar	Date
	Qayum Ansori	University		
36.	Abdul Aziz	Head of the shura	Deh-now	10-Jan-08
37.	Mr. Abdul Salam	Community elder	Uljato	10-Jan-08
38.	Mr.M.Taib	Head of Agriculture Extension Section Agriculture Dept,.		10-Jan-08
39.	Sharafullah	Head of Khulm Agriculture Section		10-Jan-08
40.	Mr.Omran Khan	Head of agriculture plant disease Section, Agriculture Dept.		10-Jan-08
41.	Mr.Mohd Nabi	Professional member of plant disease section, Mazar.		10-Jan-08
42.	Aimal Maiwand	Regional Manager North for AIMS		14-Jan-08
43.	Abdul Wakil Ahmad zai	Operations Assistant for United Nations Mine Action Center for Afghanistan (UNMACA)		14-Jan-08
44.	Eng. Ab.Jamil	Director of Water and Canalization, Mazar		15-Jan-08
45.	Mr. Gh. Nabi Khurami	Environmental Department Director of Mazar.		16-Jan-08
46.	Nasrudin	Farmer	Amin Hosain	17-Jan-08
47.	Edi bi	Farmer	Deh marda Hosain	17-Jan-08
48.	Amanudin	Head of the shura	Amin Hosain	17-Jan-08
49.	M.Dawod	Farmer , cashier for NSP projects	Deh marda Hosain	17-Jan-08
50.	Mawludin	Mason	Amin Hosain	17-Jan-08
51.	Rahmatullah	Shopkeeper	Deh marda Hosain	17-Jan-08
52.	Asadullah	Student	Deh marda Hosain	17-Jan-08
53.	Ab. Hakim	Shopkeeper	Deh marda Hosain	17-Jan-08
54.	Hyatullah	Mason	Deh marda Hosain	17-Jan-08
55.	Ghyasudin	Gardener	Deh marda Hosain	17-Jan-08
56.	Gh. Ali	Farmer and head of the farmers shura	Deh marda Hosain	17-Jan-08
57.	Sadat	Mahasti high school teacher	Guzar Samadi	20-Jan-08
58.	Fahima	Mahasti high school teacher	//	20-Jan-08
59.	Muzda	Mahasti high school teacher	Alchin	20-Jan-08
60.	Aliya	Mahasti high school teacher	//	20-Jan-08
61.	Sangimah	Mahasti high school teacher	Guzar Samadi	20-Jan-08
62.	Suraya	Mahasti high school teacher	//	20-Jan-08
63.	Zahra	Mahasti high school teacher	//	20-Jan-08
64.	Malalay	Mahasti high school teacher	Guzar Dehwardagiha	20-Jan-08
65.	Dawar	Mahasti high school teacher	Ata big	20-Jan-08
66.	Wahida	Mahasti high school teacher	Chochman	20-Jan-08
67.	Zahra	Mahasti high school teacher	Mirza Qasem	20-Jan-08
68.	Safia	Mahasti high school teacher	Mohd. Big	20-Jan-08

	Name	Position	Village- Guzar	Date
69.	Wahida	Mahasti high school teacher	Guzar Samadi	20-Jan-08
70.	Zarin	Mahasti high school teacher	Guzar H. rostam	20-Jan-08
71.	Nafisa	Mahasti high school teacher	Guzar chuchman Qala	20-Jan-08
72.	Monisa	Mahasti high school teacher	//	20-Jan-08
73.	Sadiqia	Mahasti high school teacher	Guzar H.Naser	20-Jan-08
74.	Fazela	Mahasti high school teacher	//	20-Jan-08
75.	Kamela	Mahasti high school teacher	//	20-Jan-08
76.	Pari	Mahasti high school teacher	Guzar Sert	20-Jan-08
77.	Yasamin	Mahasti high school teacher		20-Jan-08
78.	Zarin	Mahasti high school teacher	Guzar aqshikh	20-Jan-08
79.	Nafas gul	Mahasti high school teacher	Guzar gandabaghat	20-Jan-08
80.	Gulshan	Mahasti high school teacher	Guzar sayed khan	20-Jan-08
81.	Najiba	Mahasti high school teacher	Guzar Mieza Qasim	20-Jan-08
82.	Rokhshana	Mahasti high school teacher	Guzar Qalander	20-Jan-08
83.	Faozia	Mahasti high school teacher	Guzar Mirza sharif	20-Jan-08
84.	Raihana	Mahasti high school teacher	Guzar shir ali khan	20-Jan-08
85.	Habibia	Mahasti high school teacher	Guzar Qalandarha	20-Jan-08
86.	Parigul	Principal of Mahasti high school	Guzar Yar Mohd. Khan	20-Jan-08
87.	Shafiqa	Mahasti high school teacher	Guzar Abdar	20-Jan-08
88.	Koko jan	Principal of Mahesti high school	Guzar Mirza sharif	20-Jan-08
89.	Sohiala	Mahasti high school teacher	Guzar Sufi rahmanqul	20-Jan-08
90.	Sharafat	Mahasti high school teacher	Guzar Rozi bi	20-Jan-08
91.	Homaira	Director of Mahesti high school	Damulla lashkari	20-Jan-08
92.	Nadia	Mahesti high school teacher	Namazgah	20-Jan-08
93.	Anisa	Principal of Nahid Shahid school	Guzar Yaqub bi	20-Jan-08
94.	Moqadas	Nahid shahid high school teacher	Guzar Deh wardagi	20-Jan-08
95.	Amena	Nahid shahid high school director	Guzar Sayed Motahar khan	20-Jan-08
96.	Torpikai	Amin Hoain high school teacher	Guzar Abdar	20-Jan-08
97.	Laila	Director of Amin Hosain high school		20-Jan-08
98.	Breshna	Amin Hoain high school teacher	Form Mazar city	20-Jan-08
99.	Zoya	Amin Hoain high school teacher	Form Mazar city	20-Jan-08
100.	Mah gul	Amin Hoain high school teacher	Form Mazar city	20-Jan-08
101.	Afghan gul	Amin Hoain high school principale	Guzar Haq Nazar	20-Jan-08
102.	Latifa	Khanaqa abulkhair school teacher	Guzar Mutahar	20-Jan-08

	Name	Position	Village- Guzar	Date
103.	Moqadas	Amin Hosain female school teacher	Guzar H. rostam	20-Jan-08
104.	Dawar	Amin Hosain female school teacher	Guzar H. rostam	20-Jan-08
105.	Shafiqa	Amin Hosain female school teacher	Guzar H. rostam	20-Jan-08
106.	Kamela	Sardar khan school teacher	Guzar H.Nasir	20-Jan-08
107.	Fahima	Woljato school teacher	Guzar Mirza Qasim	20-Jan-08
108.	Norya	Woljato school teacher	Guzar Mirza Qasim	20-Jan-08

1.6 Public and Stakeholder Comment

The EA team facilitated a range of discussions to gather public and stakeholder comment regarding development of the Mazar Foods Corporation. Discussions were held in a variety of settings, from private meetings with individual stakeholders, to community forums eliciting broad feedback from local residents. Summaries of all of these meetings—referred to as Key Informant Interviews—are included in Section 13.7.

2 PROPOSED ACTION AND ALTERNATIVES

The Mazar Foods Project is unique in the way it proposes to enlist the support of the private sector to accelerate agricultural growth, employment, and incomes in Afghanistan. Through the sale of fruits and vegetables in the domestic and regional export markets, the Project offers a productive and profitable alternative to the opium poppy economy that currently employs up to one-third of Afghanistan's entire labor force. The other unique aspect of the Project is the creation of the Mazar Development Foundation, a U.S. corporation that would be registered as a tax-exempt, nonprofit organization that would work alongside the Mazar Foods Corporation to bring improved health, education, and other basic services to communities living near the farming operation.[6]

2.1 Description of Proposed Actions

The Proposed Action is defined as the establishment and operation of the Mazar Foods Corporation and Mazar Development Foundation. The Mazar Foods Business Development Plan portrays the establishment of these two individual entities as dependant upon one another. Therefore, in order to complete a meaningful environmental assessment, the objectives of the two entities must be viewed in whole. Certainly, it can be considered that mitigation requirements for the Mazar Foods Corporation will be satisfied by the objectives of the Mazar Foundation. And, although the basic services provided and supported by the Mazar Foundation are desperately needed in Afghanistan anyway, the Mazar Corporation will be the vehicle making possible the provision of these services.

The Mazar Foods Corporation is being established as a state-of-the art, private sector-driven agribusiness venture to produce, process, and market horticultural products for domestic Afghan and regional markets. Its production and processing facilities will be located in the fertile Khulm District, in the Balkh Province. The selected site shall consist of 10,000 hectares (approximately 25,000 acres) of contiguous or closely joined parcels which will have access to a major airport and a skilled labor pool. Additionally, the site has rail access to markets in Russia via Uzbekistan and road access to the largest domestic market, (Chemonics Environmental Assessment Statement of Work [SOW] Narrative)

As presented in the Mazar Foods Business Development Plan, the objectives of the Proposed Action are:

- *To demonstrate, through a major commercial farming operation that creates substantial employment and income, that there are commercially viable alternatives to the opium poppy economy. The vehicle for the commercial farming venture will be the Mazar Foods Corporation, a limited liability company that would be incorporated in Afghanistan.*

- *To create a large, commercially viable farming operation in Balkh Province based on production of fruits and vegetables that would be sold domestically and exported to neighboring countries. In this way, the Corporation would help rebuild the traditional role of Afghanistan as a major exporter of horticultural products in the region and beyond.*

[6] Mazar Foods Project Business Plan, Executive Summary

- *To reinforce the employment and income impact of the farming operation on local communities by mounting a substantial companion program that provides these communities with improved access to basic services, such as education and health. The Mazar Development Foundation would be the vehicle for implementing this program. It would be established in the United States and registered with the IRS as a 501 (c) (3) nonprofit corporation, but its operations would be based in Afghanistan.*

At its core, the Proposed Action is the overall establishment and operation of farming activities for Mazar Foods. There are several components to the Proposed Action that warrant independent evaluation in terms of potential environmental impact. The following sections describe individual components of the Mazar Foods Corporation as they are presented in the Mazar Foods Business Development Plan, Part C - Farm Development and Operation.

2.1.1 Land Preparation and Clearing, Ancillary Road Development, Construction Camps, etc.

Site characteristics. The farm's production environment is arid land that would be irrigated with groundwater that emanates from aquifers that flow to the north from the Hindu Kush Mountains and with surface water. In the winter months each year, a significant part of the land area will be fallowed or planted with winter wheat in order to reduce the amount of dust that is generated. If need be, the irrigation system can be used to support the wheat crop. If the wheat fails to mature before the fruit and vegetable production cycle begins in February, the wheat can be plowed under as green manure. A further environment enhancing initiative would be the planting of trees and shrubs for wind breaks in various parts of the farm. Selection would be based on agro-forestry principles (indigenous and productive species) and could also enhance biodiversity and cover for wildlife.

Land Preparation and Clearing

Landmines and Unexploded Ordinance - As a component of land preparation, consideration to mines and unexploded ordnance is justified and necessary. It is believed that no other nation suffers from the extent of mine contamination as Afghanistan, and scattered mine contamination has been confirmed in the project area(Ahmad Zai 2008).[7] In order to increase safety at the site, there is a need to have the site certified as inspected by the United Nations Mine Action Center for Afghanistan (UNMACA) prior to any construction or site development. If contamination is identified, detailed surveys and clearance activities will need to be commissioned by the project.

Farm Site Preparation - Much of the land on the site apparently has been previously utilized for agricultural purposes, especially on the southern half of the site (south of the main highway, towards the mountains). The land has not been actively cultivated due to lack of water for several decades. Current practices at the site include harvesting annual and perennial shrubs for fuelwood and fodder. These practices currently serve as the only or primary source of income for the villagers located in the project area, significantly denuding the area and resulting in the loss of topsoil to erosion. Land preparation activities will include restoring the existing fields to

[7] Ahmad Zai, Abdul Wakil, Operations Assistant, United Nations Mine Action Center for Afghanistan. Personal communication with Michael Gaglio of Mazar Foods EA Team and Mine Clearance Certification Letter for Selected areas of the Proposed Mazar Foods Project Site; sent to Mark Miller, Director of Security USAID/ASAP. Dated Jan. 5, 2008.)

productive conditions, entailing rehabilitation of irrigation ditches, clearing of shrubs, forbs, and grasses that have established themselves (likely by ploughing), and enhancing soil fertility. Site preparation activities along the northern half of the proposed project site will be slightly more intensive as much of the land shows no sign of cultivation, though grazing is likely. The majority of the land on the project site is generally level, therefore major earthwork operations will probably be unnecessary, save for rehabilitation of irrigation ditches.

Building Site Preparation - Geotechnical studies to evaluate soil density and load bearing capacity will be required in order to develop architectural engineering design plans for buildings and structural facilities on the farm (including paved roads), and should take into account potential for earthquakes. Performance of the geotechnical studies by itself will not likely have any environmental impacts that require detailed analysis or mitigation planning.

Road Development

On-farm roads. The requirement is for a main access road to the Corporation farm and an on-farm road network. The total capital cost of the required road network is estimated at about $1.45 million at current prices. The specific requirements have been estimated as follows:

- Main access road to the farm will be about 20 kilometers (km). The road would be 8 m wide and is estimated to cost $15,000/km at 2007 constant prices.
- A 2 km main road from the entrance to the main complex on the farm. This is estimated to cost $24,600/km at 2007 constant prices.
- About 190 km of on-farm roads that provide access to cropped areas and irrigation well-heads. These are estimated to cost $3,000/km at 2007 constant prices.

Off-farm transport infrastructure - At certain times of the year the amount of truck traffic coming onto the farm on a daily basis may be substantial—either to bring in supplies for farm and processing activities or to transport product from the farm to railheads, airports, or local or regional markets. Fertilizer, for example, will probably be brought in to the rail head at Hairatan from Central Asia and trucked the 20-30 km to Khulm. The logistics involved in moving this and other required supplies on to the farm is not unrelated to procurement policies that will be pursued by the company. Policy decisions will have to focus on whether bulk purchases will be made for delivery of supplies prior to the cropping season, or will the delivery of the bulk purchases occur on a regular basis during the cropping season.

In the case of saleable products produced by Mazar Foods, a total of 46,000 tons would be shipped off the farm in 2009. This figure would rise to an estimated 265,000 tons by 2014, including a large quantity of fresh fruits and vegetables that presumably will require immediate shipment. The harvesting season runs from April to November each year, with peak harvesting activities concentrated in May through August. More work is needed on the logistics of shipping this produce to rail and airport terminals, or by road to various markets. Likely transport requirements and their implications for truck loads and load capacities of the roads will need to be estimated and judgments made as to the adequacy of the load specifications of the roads currently being constructed in the area by various donors. The main concern here is the extent to which local roads may deteriorate as a result of persistent overloading of trucks in the region that, in combination with insufficient budget allocations for road maintenance by the Government, results in rising costs for road freight for Mazar Foods Corporation.

Construction Camps

Ancillary construction facilities will likely be required at various stages throughout the life of the farm, and especially in the early developmental years of the project. Typically these facilities will be temporary in nature and consist of equipment storage yards, mobile housing and offices. Due

to the lack of highly developed development plans at the time of this EA, it is impossible to account for and foresee all such features that will be possible or necessary. The logistical planning for each of these features should take into consideration the environmental mitigation and monitoring measures and best management practices outlined in this EA document for construction camps and any other plans or subsequent revisions (e.g., stormwater management plans, environmental monitoring protocols, etc.).

2.1.2 Water Abstraction

Water supply and irrigation. Optimal use of irrigation water is a crucial component to the production strategy. A mechanical move irrigation system has been proposed. Some crops will use plastic mulches and other techniques that decrease water use and increase crop health. Using other season-extending technologies, cropping will also be planned to exploit off-season market opportunities, and quality preferences in the market.

Field studies are underway to ascertain the amount and quality of water that would be available for use at the Khulm farm site. These investigations include well tests at 9 – 11 locations. Water quality samples will be taken at each site for each seven meter interval of depth; field measurements will be made and the samples will be further tested in the laboratory. Over the same interval, undisturbed cored soil samples will be collected for description of the lithology. Pumping tests will be carried out to determine transmissivities and storage coefficients to ascertain the permissible pumping rates and spacing of production wells. The design of well fields will be based on this information and determinations of recharge to ground water. A final schedule for the number and location of production wells to be constructed will be based on the collected information and analyses, as well as refinement of cropping and business plan assumptions.

Field investigations of groundwater will require some six months extending through June 2008. The tentative schedule for these activities is as follows:

- Complete initial phase of well tests by April 2008 and complete all currently programmed test wells by June 2008.
- Complete the first phase of water quality tests by April 2008 and finalize water quality tests from phase 2 test wells by June 2008.
- Draft a report on groundwater recharge by March 2008.
- Design well fields beginning in March 2008, and have designs ready to initiate drilling of production wells by May or June of 2008.[8]

Under the Business Plan, estimates of the required amounts of irrigation water have been developed for each crop, consistent with the areas to be irrigated in Table A. The results of this preliminary assessment are set out in Table B. After a very modest requirement in 2008, the volume of water to be withdrawn from the aquifer for agricultural purposes rises sharply to about 83 million m^3 a year by 2014. An allowance must be added to this estimate for non-farm uses of water. The implication is that perhaps as much as 90 million m^3 of water will be used on the farm at full production.

[8] Timely conversion of test wells to production wells will determine the ability of the project to realize production.

Table A. Planted and Cultivated Area of Fruits, Vegetables, and Animal Feed (hectares)

Crop	2008	2009	2010	2011	2012	2013	2014
Tomatoes	-	600	1,100	1,400	1,500	1,900	2,200
Onions	-	200	400	400	1,000	1,400	1,600
Watermelons	40	200	600	960	1,000	1,200	1,600
Cantaloupe	80	200	600	960	100	1,200	1,400
Strawberries	-	40	300	300	400	400	400
Alfalfa/cover	-	40	300	800	1,000	1,200	1,400
Total planted area	120	1,280	3,300	4,820	5,900	7,300	8,600
Memo item:							
Brought under cultivation	120	1,120	1,760	1,020	880	1,200	1,100
Total cultivated areas	120	1,240	3,000	4,020	4,900	6,100	7,200

Note: The alfalfa crop is planted as a rotation crop when land is not planted to fruits and vegetables.

Table B. Annual Irrigation Water Requirement

Crop	Annual water Requirement (cubic meters/ha)	Total annual water requirement (thousands of cubic meters)						
		2008	2009	2010	2011	2012	2013	2014
Tomatoes	9,110	-	5,466.0	10,021.0	12,754.0	19,131.0	25,508.0	30,974.0
Onions	11,100	740.0	2,775.0	3,700.0	5,920.0	10,730.0	11,100.0	14,800.0
Watermelons	8,710	348.4	1,742.0	5,226.0	8,831.6	8,710.0	10,452.0	13,936.0
Cantaloupe	7,110	568.8	1,422.0	4,266.0	6,825.6	7,110.0	8,532.0	9,954.0
Strawberries	3,519	102.4	520.5	959.8	1,311.7	1,407.6	1,223.2	1,407.6
Alfalfa	13,700	228.3	2,032.2	6,964.2	12,101.7	11,416.7	8,562.5	12,330.0
Total		1,987.9	13,957.6	31,137.0	47,274.6	58,505.3	65,377.7	83,401.6

An issue that will require careful examination following the completion of the proposed hydrology and well tests is whether the annual withdrawal of perhaps 90 million m^3 of water will create problems for communities and other users of this water source and if total withdrawals from the aquifer remain below the estimated aquifer recharge rate.

As Table C indicates, the irrigation system is the single largest capital expenditure required for farm development. The total cost is estimated at $68.5 million at current prices. The well fields are estimated to cost about $34 million. The estimate also includes a supervisory control and data acquisition system (SCADA), which would be used for monitoring and telemetering data on soil conditions and water deliveries to optimize irrigation. This system would include field sensors and communication with a console in the main complex that is monitored. The cost of the sensors, communications system, console and software is estimated in excess of $1 million. The design of the system, technical support and training requirements would add another $0.5 million.[9] After allowing for contingencies, the SCADA system is estimated to cost $2 million.

[9] As part of the training program, Mazar Foods staff would be sent to Imperial Valley and Coachella in California and to the Salt River Project in Phoenix to observe at first hand the operation of such irrigation monitoring systems.

Table C. Capital Cost of Farm Development by Type of Expenditure (thousands of US$)

Capital expenditure	2008	2009	2010	2011	2012	2013	2014	2015-2019
Irrigation								
Well fields	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	-
Irrigation	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	-
Farm infrastructure								
Power	3,502.0	7,766.2	-	-	-	-	-	-
Roads	1,356.0	-	-	-	-	-	-	-
Fences	91.8	91.8	-	-	-	-	-	-
Processing plants	-	-	-	-	-	-	-	-
Fresh	6,401.2	-	-	-	-	-	-	-
Canned	-	-	-	-	7,940.7	-	-	-
Juiced	-	-	-	-	6,365.7	-	-	-
Offices & other equipment	5,049	1,754	1,584	1,309	4,118	3,302	1,559	21,573.5
Total capital outlays	26,187.6	19,400.1	11,372.1	11,096.3	28,211.6	13,090.0	11,346.6	21,573.5
Memo item:								
Cumulative capital cost	26,187.6	45,587.7	56,959.8	68,056.1	96,267.7	109,357.7	120,704.3	142,277.8

2.1.3 Water Distribution Systems Development, Construction, Operation and Maintenance

Demand for water will significantly increase as a result of implementation of the project. An in-depth analysis of the water demand can be expected to be developed following final crop determination and completion of hydrology and well tests. Systems for distribution of water will also be required to ensure that all areas of the farm are irrigated. Certain crops are better suited to different irrigation technologies such as flooding, drip irrigation, sprinklers, and tall plant sprayers. An important component of irrigation system development will be ensuring that downstream users, at the tail end of the irrigation system, are guaranteed their proper allotment of water, that abuse or water theft does not occur upstream, and that water quality is not compromised by pesticides or fertilizers.

Once irrigation systems are in place, resources and trained staff will need to be allocated to the operation, maintenance, and repair of the water distribution system. Equipment procurement, construction, and maintenance of the irrigations systems are expected to require a significant labor force and require at least a temporary sharp rise in resource allocation (such as employment and transportation) during construction.

Agricultural irrigation specialists will need to evaluate available irrigation technology with respect to proposed crops and present a discussion of preferred distribution and equipment alternatives for the EA. It is believed that a variety of technologies will be needed due to the size and scope of the Mazar Foods Project.

2.1.4 Energy Provision – Types and Impacts of Energy Needed for Irrigation, Operations, Processing, and Transport

Power Supply and Consumption

Sources of supply. The Business Plan was predicated on the assumption that a 220 kva transmission line and a substation located at Naibabad inside the farm boundary that is planned to be installed with Asian Development Bank (ADB) financing, will be completed no later than December 2009. It also is assumed that a large block of power will have been fully committed for delivery from generating facilities in Uzbekistan and that a second substation will have been built at Khulm by the year 2013.

Budgeting for supply of power to wells and the administration and processing compound of the farm has been based on these premises and results in a phased program of energy supply element by element. These program elements are as follows:

- *Diesel driven pumping.* As production wells begin to come on line mid-2008, they will be powered with diesel fuel driving submersible well pumps either through electric power generators or through linkage to diesel-mechanical power. By the March planting season in 2010, the intention is to have completed construction of between 100 to 150 wells powered by 40 horse power (HP) pumps. Some of the facilities of the Farm Compound will have been completed by this date and will be powered by generators.
- *Construction of a power distribution network across the entire farm for* direct supply of power and energy to each well. The distribution system will draw power from the Substation at Naibabad over a 20 KVA line and after reductions of voltage within the system will deliver 380 volts to the well motors.
- *Construction of a loop to feed the distribution system from two sources.* Once a substation is built at Khulm, a 20 KVA distribution line will be built to enter the farm on the side opposite Niabadad. Even though both substations are to be fed by the same transmission line, the additional line will provide a considerably more secure power supply because it is at substations where the greatest risk of power interruption occurs.

The Company will require a back-up power supply in the event that there are interruptions to power provided from the local grid. One option is that the generators installed during the 2008-2009 period at the compound are augmented with the best generators from the well field, if any, and that they be used for backup of operations at the compound. Once the above-mentioned loop of the distribution system is in place in 2014 there will be no need to maintain a large backup for supply to the wells. Consideration should be given to maintaining a stock of diesel-mechanical motors that can be stored in a warehouse for possible use during emergencies

Farm consumption of electricity. Work is yet to be completed on power consumption estimates for the farm. Apart from the requirements for offices and facilities, the irrigation system and the processing plants will account for the bulk of electricity consumption. Electricity cost will depend on the source of the power. The cost of energy from the network in Balkh varies from Af 5 ($0.10) to Af 8 ($0.16) per kWh. Currently, the cost of diesel is Af 41 ($0.82)/liter. Potential impacts of energy consumption cannot be forecasted with accuracy without rough estimates of the potential energy consumption. It is recommended that alternative sources of energy be considered, with a focus on renewable energy such as solar power.

2.1.5 Soil Preparation and Agrochemical Use

The soils at the site are deep silt loams and sandy loams that are high in mineral fertility, but low in organic matter. Some information exists on the characteristics of these soils, but no prior systematic surveys and analyses of the soils have been conducted. As a result, specific decisions cannot yet be made on the amount and type of fertilizer that will be required for various crops. Soil samples have recently been taken, and anticipated fertilizer and soil amendment recommendations will be used to modify current assumptions in the business plan.[10] [11]

It is not yet possible to make specific decisions on the amount and type of fertilizer that will be required for various crops because of lack of information on soil characteristics. Soil samples have recently been taken and based on results, soil amendment recommendations will be modified in the Business Plan assumptions.

2.1.6 Crop Management, Seed Selection, Planting, Harvesting, Storage, and Transportation

Crop Production Strategy

The initial focus of the crop production strategy for Mazar Foods Corporation is on fruit and vegetable products that can be sold fresh and/or canned in domestic and regional export markets. To enhance soil conditions, crop rotation schemes will be practiced and will include alfalfa for fodder production and winter wheat and cowpea as green manures. At a later stage of farm development, juiced and dehydrated products may be produced as well.

The crops grown on the Mazar Foods farm are selected for their suitability to the Northern Afghanistan climate and soils and for their marketability. Production on the farm will be in accordance with best practices that conserve water and soil fertility, minimize pesticide use and ensure long term, sustainable use. Extensive soil testing will determine the precise crops to be produced in specific areas. The strategy is to grow crops that, with varying amounts of value added, can be:

- produced in large quantities for domestic and regional markets, using the road and Uzbekistan rail networks for transport of large volumes;
- produced in smaller, high-margin amounts for airfreight to regional markets.

Horticulture crops. The initial crops selected for production are tomatoes and other vegetables, strawberries, cantaloupe, watermelon, and alfalfa as both a soil enhancing rotation/cover crop and commercial crop. Each of these crops brings advantages by:

- spreading revenue flow throughout the year (seasonal opportunities);
- providing highly effective species variation in a crop rotation to prevent build-up of pests and diseases over time;
- requiring varying amounts of irrigation water, thus reducing demand;
- improving soil fertility and thereby reducing input costs.

[10] The samples must be milled in Afghanistan (to avoid contamination of U.S. labs and laboratory employees with foreign soil dust), sampled, labeled and packaged and exported to the U.S. or a regional certified laboratory capable of carrying out pH, key nutrient (N-P-K) and micronutrient analyses accurately.
[11] Estimates of fertilizer use in the current version of the business plan are therefore based on known fertilizer recommendations for the selected crops in Salinas County, California, which has similar soils, albeit with more organic matter.

These classes of crops can be expanded to include more species and cultivars as market opportunities develop and as the production capacity of Mazar Farms becomes progressively more sophisticated. Specifically, these crops bring the following benefits:

- *Processing tomatoes.* Highly productive cultivars are available that perform well in the Mazar Farms environment, local growers are familiar with them, regional markets accept fresh processing tomatoes. Fruits with highly soluble solids produce excellent quality dried tomatoes that use less energy for dehydration and bring a premium.
- *Strawberries.* Imported day neutral cultivars will be grown that can help provide even cash flow through the long season. The local soils and climate will produce a high brix fruit that has both high fresh market value and produces a premium dehydrated berry; brix referring to a scientific measurement of fruit quality and flavor.[12]
- *Cantaloupe.* This is a traditional crop from the area. Improved hybrids will be used that are resistant to common melon viruses prevalent in Afghanistan. Shipment of melons will be directed at the high demand in the Indian market that exists at the time of melon harvest in Northern Afghanistan. Smaller quantities of aromatic melons will be grown for fresh-cut production and air freight export.
- *Watermelon.* Also a traditional crop for the area, watermelon is a profitable, relatively low-input crop that can be marketed domestically and regionally through traditional channels. Additionally, specialty high-value watermelons will be produced for air freighted exports.
- *Alfala/Clover.* Improved varieties will be grown for maximum fodder production and regional sale; both as fresh-cut fodder for dairies in the immediate region, and as hay for winter sale throughout the country. Alfalfa will also serve as a green manure to be rotated every 3-4 years with vegetables, thereby reducing the need for additional nitrogenous fertilizers by about 100 kg of nitrogen per hectare. Alfalfa also improves the texture of the soil, reducing tillage costs.

At a later stage the farm is also expected to produce vegetables for drying. The product mix will focus on 5 to 6 items, such as spinach, turnips and other root crops, leaks, and snap beans. Other products could be brought on line if market studies show their profitability. Short season cultivars can be double-cropped in the Mazar Farms area on either side of the hot, mid-summer weather. For example, domestic and regional markets buy fresh snap beans and the bright days and cool nights in the growing season result in excellent raw material for dehydrated pods for export to European soup makers. Harvested bean plants make an excellent livestock feed that can be sold.

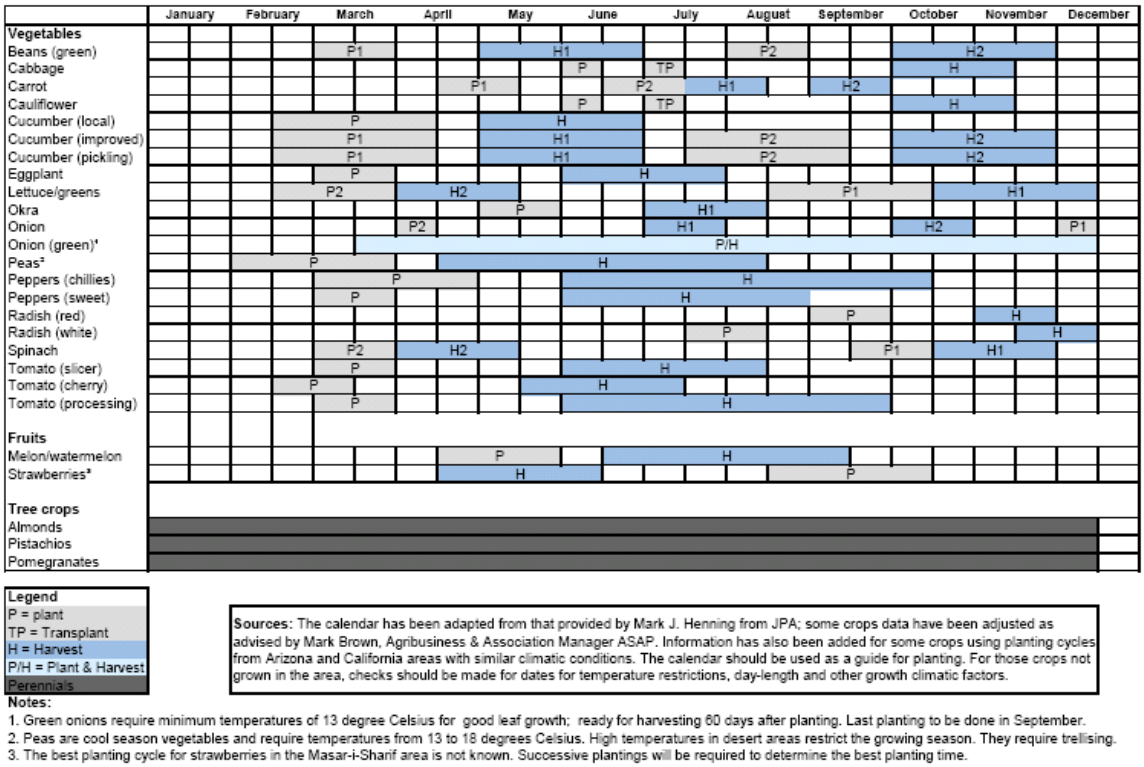
Chart A provides a summary of the crop cycle for a wide range of fruits and vegetables that can be grown in the Masar-i-Sharif area. Not all of these crops have been grown in the area, so some of the crop calendars are based on cycles from areas in Arizona and California that have similar climatic conditions. Once more experience is gained with local conditions and climate variability under Mazar Foods operation, some crop cycles will undoubtedly be adjusted. Chart A suggests the following cropping patterns:

- the cycle typically begins February – March when a wide range of vegetables can be planted. A number of these vegetables have only one planting cycle in the year. However, carrots, spinach, lettuce, cucumbers, and beans all have two crops a year;
- harvesting of crops begins as early as April (spinach, lettuce, and similar greens) and peaks during May through early August. For those vegetables that produce two crops a year, late-year harvesting is concentrated in October and November;

[12] The transplant costs used in the current version of the Business Plan do not include provision for a constant supply of virus-indexed plants through the use of a subsidiary rooted runner operation.

- from mid-December – early February there is no cultivation of vegetables or fruits.

Chart A. Cropping Calendar for Fruits, Nuts, and Vegetables in Masar-i Sharif



Land development program. A key driver in the design of the crop development program for the period 2008 – 2014 are judgments concerning how quickly the farmland can be brought into production. The main assumption underpinning the pace of development is tied to the required quantities of irrigation water that will need to be made available. The results of the preliminary assessment of conditions in the field, including preliminary analysis of the amount and quality of irrigation water that may be available, led to a judgment that it may be possible to bring a total of about 7,200 hectares on the proposed site under cultivation by 2014.13

Table D provides a summary of the farm's planned land use. At this stage, it must be emphasized that the land use plan is highly provisional until the ongoing work on soils analysis and availability of water in various locations are completed. With these qualifications in mind, the Mazar Foods Business Plan assumes 7,200 hectares of land can be irrigated and brought under cultivation by 2014. After allowing for land required for facilities, roads, etc., an area of perhaps 2,600 hectares may remain uncultivated.

[13] Mazar Food Business Plan

Table D. Proposed Land-Use Pattern

Type of land use	Area
Fruits and vegetables	7,200
Non-crop uses	200
Uncultivated land	2,600
Total	10,000
Memo item:	
Irrigated area	7,200

A second key decision for farm development was that the Corporation would concentrate on the production of a limited range of vegetables and fruits, and some fodder as a by-product of crop rotation practices. These include strawberries, cantaloupes, watermelons, tomatoes, and a selection of other vegetables, including onions. Fruit trees would not be part of the business development plan for the site, at least during the period 2008-2014. The cultivated areas would either be under a cover crop or a commercial crop for a substantial part of each year. The area will be brought into production over a seven-year period as set out in Table E.

Table E. Planted and Cultivated Area of Fruits, Vegetables, and Animal Feed (hectares)

Crop	2008	2009	2010	2011	2012	2013	2014
Tomatoes	-	600	1,100	1,400	1,500	1,900	2,200
Onions	-	200	400	400	1,000	1,400	1,600
Watermelons	40	200	600	960	1,000	1,200	1,600
Cantaloupe	80	200	600	960	100	1,200	1,400
Strawberries	-	40	300	300	400	400	400
Alfalfa/cover	-	40	300	800	1,000	1,200	1,400
Total planted area	120	1,280	3,300	4,820	5,900	7,300	8,600
Memo item:							
Brought under cultivation	120	1,120	1,760	1,020	880	1,200	1,100
Total cultivated areas	120	1,240	3,000	4,020	4,900	6,100	7,200

Note: The alfalfa crop is planted as a rotation crop when land is not planted to fruits and vegetables.

The key points about the farm development strategy that emerge from Table E are as follows:

- in 2008 an area of about 120 hectares would be brought under cultivation with watermelons and cantaloupes;
- throughout 2008, the emphasis would be on building the capacities of the Corporation to manage a rapid increase in the areas cultivated from 2009 onwards. In 2009, for example, an additional 1,120 hectares would be brought under cultivation. Each year thereafter would see another thousand or so additional hectares brought under cultivation;
- full development of the site would be achieved by 2014, with a total of 7,200 hectares that could be cultivated under single or double cropping.

After start-up operations in 2008, vegetable production would account for about 45 percent of the planted areas each year. The balance would be devoted to fruits, along with crop rotation that provides for a build-up to 1,400 hectares of land planted to alfalfa each year. The underlying assumption regarding the use of alfalfa as a rotation crop is that approximately 20 percent of the cultivated area would be cropped with alfalfa each year. In other words, the entire cultivated area would be cropped with alfalfa on a five-year rotation cycle.

Crop Production and Gross Revenues

Overview of results from the farm model. Detailed calculations have been made for the build-up of production 2008 – 2014. The large numbers of assumptions regarding crops yield, quantities of input use such as labor, fertilizer, machine hours of equipment, fuel, and so on, are not included in the Business Plan.

Table F gives a summary of the proposed production of crops. A small quantity of saleable produce is planned for 2008 from the 120 hectares of land that will be brought under production in the first year. The volume of production is projected to grow steadily from 2009 onwards as the land development program accelerates and as the supply of irrigation water is increased. Tomatoes are to account for the largest cultivated area each year (about 25 percent of the cultivated area by 2014).

Table F. Productions of Fruits, Vegetables, and Animal Feed (thousands of tons)

Crop	2008	2009	2010	2011	2012	2013	2014
Tomatoes	-	27.3	50.1	63.7	68.3	86.5	100.1
Onions	-	4.5	9.1	9.1	22.7	31.8	36.4
Watermelons	1.4	7.0	21.0	33.6	35.0	42.0	56.0
Cantaloupe	2.0	5.0	15.0	24.0	25.0	30.0	35.0
Strawberries	-	1.7	12.4	12.4	16.5	16.5	16.5
Alfalfa/cover	-	0.6	4.5	12.0	15.0	18.0	21.0
Total	3.4	46.1	112.0	154.8	182.5	224.8	265.0

2.1.7 Pest Management

Based on conversations with local agricultural experts (Ministry of Agriculture, FAO, NGO Staff), locusts are a major concern, followed by melon fly, white fly, Colorado beetles, aphids, and fruit borers. Currently these organizations are implementing Integrated Pest Management (IPM) practices that are proving to be at least moderately effective. Pesticides currently utilized by these organizations include Dimilin and DeltaMethrin. Problems experienced by these organizations include the procurement of mislabeled or highly diluted pesticides and a lack of personnel trained in recognizing safe and unsafe pesticides. There is also the issue of training in safe transportation, application, storage, and disposal. Table G provides planned consumption of pesticides .

Table G. On-Farm Consumption of Fertilizer, Herbicides, Fuel, Packing, and Other Materials

Material	Units	2008	2009	2010	2011	2012	2013	2014
Fertilizer	Tons	141.5	1,742.8	3,443.5	4,753.6	5,677.5	6,647.4	7,731.5
Herbicide & insecticide	Liters (thousands)	11.5	42.6	115.7	182.6	198.3	234.2	282.2
Diesel & gas	Liters (thousands)	7.6	182.0	372.3	472.6	636.0	809.4	966.6
Plastic	Rolls (thousands)	6.4	22.1	60.4	82.5	86.2	104.1	121.4
Field boxes	Boxes (thousands)	2.6	58.9	125.6	169.7	177.9	220.4	268.0
Packing materials	Packs (thousands)	110.2	2,881.6	5,639.3	7,338.0	8,395.9	10,675.8	12,354.5

2.1.8 Crop Processing (e.g., cold chain, washing and packaging, waste generation, and disposition

Food Processing Strategies and Facilities

The ability of Mazar Foods to process and distribute a large volume of varied food products to global standards is one of the most valuable contributions the company can make to agricultural development in Afghanistan. Processing facilities will be designed to process all of the products grown by Mazar Foods, plus the capacity to process food produced under contract from other Afghan farmers. Each crop variety produced will have its own marketing strategy developed prior to seed purchase. As the harvested produce enters the processing facilities, it will have been harvested in accordance with quality parameters from the governing marketing plan.

Food production facilities would be compliant with best current international practices with regard to plant design and construction, layout, equipment, operational specifications, worker and product hygiene, and handling of hazardous materials. Operations will be developed to meet or exceed U.S. Good Manufacturing Practices and Sanitation Standard Operating Procedures.[14] Thermally processed foods will follow generally accepted production specifications or those provided through the U.S. Food and Drug Administration for records and record retention and equipment operation.[15] The facilities will implement hazard analysis critical control point programs (HACCP) from production throughout the distribution channel.[16]

The processing strategy begins with fresh packing grade "A" fruit and vegetables that are field sorted and sent into the cold chain system. Overflow of grade "A" and grade "B" products will be sold either on local markets or processed, depending on market conditions. These products will flow in different directions based on maximizing market opportunities. They will flow from the packing lines to the canning operation, or juicing plant, depending on current market opportunities. Construction of the canning and juice plants will occur in 2012 as the marketing

[14] See Code of Federal Regulations (21 CFR Part 110), *et seq*.
[15] See 12 CFR Part 113, which deals with low acid thermally processed foods and Part 114, which deals with acid or acidified foods.
[16] See, for example, 21 CFR Part 123.

capacities of the company expand. At that time, planting will commence for specific processing varieties to supply the cannery.

Processing Facilities

Fresh pack operations. As Table H indicates, limited processing would commence in 2008, but subsequently fresh fruit and vegetable processing is projected to rise steadily each year to a level of about 90,000 metric tons by 2014. Mazar Foods is to own and operate multiple food processing facilities to maximize flexibility to prepare foods for different market segments. The primary unit will be a network of large, sanitary units for washing, packing, and shipping fresh produce. The facilities will be engineered and managed to be HACCP compliant. The approximate combined capacity of these facilities will be 2,000 metric tons per day fresh packed. The estimated cost of the fresh pack plant is about $6.4 million.

Table H. Farm Production of Processed Products (tons)

Product	2008	2009	2010	2011	2012	2013	2014
Fresh fruit and vegetables	3,230	37,373	94,082	131,205	141,086	74,400	90,025
Canned fruit and vegetables	-	-	-	-	-	68,584	63,464
Juice	-	-	-	-	-	48,521	69,736
Dehydrated fruit and vegetables	-	-	-	-	-	-	-
Alfalfa	-	600	4,500	12,000	15,000	9,000	13,500
Total	3,230	37,973	98,582	143,205	156,086	200,505	236,725

Canning operations. The proposed canning facilities will be medium-scaled and designed to respond to market requirements for specific canned products. Preliminary assessments of market conditions suggest that the plant may begin operations with a tomato-onion sauce. The objective would be to take advantage of second quality onions as well as tomatoes. Final products are to be bottled, not canned, due to greater regional familiarity with bottled products, and the ready availability of bottles from Uzbekistan. As Table H indicates, production of canned and/or bottled goods would begin in 2013 with an output of almost 70,000 metric tons. The estimated cost of the canning/bottling plant, which would be constructed in 2012, is about $8 million.

In the longer run, other market opportunities are expected to emerge: for example, specialty fruit items such as melons may be custom-packed for regional wholesale clients; or large volumes of canned vegetables for institutional clients, such as the military, could be prepared on contract.

Juice concentrate. Local demand for fruit juice and jams is high. Industrially processed products available on the local market are almost entirely imported, primarily from Iran and Pakistan. The estimated value of fruit juice imports is approximately $20 million and is growing by 15 percent per year. However, because profit margins for Mazar Foods on these products may be very low, compared to those for fresh fruits and vegetable trade, a lower priority will be placed on the juicing plant. Lower grade seasonal fruit supplies will be made into juice concentrate. As Table H indicates, production of juices would begin in 2013 with an output of about 50,000 tons. The plant would be built in 2012 at an estimated cost of $6.4 million.

2.1.9 Provision of Food Processing and Storage Facilities

As mentioned above, food production/processing facilities would comply with best current international practices with regard to plant design and construction, layout, equipment, operational specifications, worker and product hygiene, and handling of hazardous materials.

Storage Requirements

The projected annual consumption of key inputs needed for farm operations is set out in Table G. The capacity of these facilities will be determined by the purchasing arrangements for the various types of inputs required. In the case of fertilizer, for example, to take advantage of volume discounts, supplies will be purchased in bulk before the beginning of the planting season. Fuel will be stored in underground tanks in a fuel depot. The fuel will be provided by a local distributor and purchased on an as-needed basis. Agrochemicals will be purchased through local distributors of Pakistani suppliers in 2008 and, as knowledge of exact needs develops, bulk purchases will be made to meet the start of the production cycle. Packaging materials will be purchased from local distributors at the beginning of each cycle and re-ordered as needed during the cycle.

Storage costs for the processed products are included in the estimated capital costs for each processing plant. The capital cost of storing fuel and other inputs and packing materials is included in the estimates for capital outlays on general facilities in Table H.

Table H. Capital Outlays on General Facilities

Capital expenditure	2008	2009	2010	2011	2012	2013	2014	2015-2019
Irrigation								
Well fields	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	4,861.3	-
Irrigation	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	4,926.3	-
Farm infrastructure								
Power	3,502.0	7,766.2	-	-	-	-	-	-
Roads	1,356.0	-	-	-	-	-	-	-
Fences	91.8	91.8	-	-	-	-	-	-
Processing plants	-	-	-	-	-	-	-	-
Fresh	6,401.2	-	-	-	-	-	-	-
Canned	-	-	-	-	7,940.7	-	-	-
Juiced	-	-	-	-	6,365.7	-	-	-
Offices & other equipment	5,049	1,754	1,584	1,309	4,118	3,302	1,559	21,573.5
Total capital outlays	26,187.6	19,400.1	11,372.1	11,096.3	28,211.6	13,090.0	11,346.6	21,573.5
Memo item: Cumulative capital cost	26,187.6	45,587.7	56,959.8	68,056.1	96,267.7	109,357.7	120,704.3	142,277.8

2.1.10 Building Construction and Operation

Detailed estimates have been prepared for the cost of on-farm infrastructure requirements consisting primarily of a power distribution network, backup generation capacity, farm roads, and security fences. Office and other staff facilities include offices and related equipment and furnishings, machinery maintenance and repair shops, staff housing, a health clinic, a school, a staff canteen, and communication facilities.

Offices and Staff Facilities
The total cost of the facilities and equipment, other than for farming and processing, is estimated at about $40 million. The major cost components are office space, office equipment, computer software and licensing, staff accommodation, automobiles, a back-up diesel generator, and workshops for equipment maintenance and repair. These estimates are based on requirements that stem from a permanent staff complement of about 350 people, plus some advisors. The current Business Plan assumes that representative offices of the Corporation in Kabul and other locations throughout the region would lease facilities, as needed. One area of uncertainty that requires further investigation is the capital cost of communications facilities.

2.1.11 Provision of Labor and Housing, Social Service, etc.

These will in part be a function of the Mazar Development Foundation and will mitigate impacts of the Corporation. Costs for housing for senior staff, security, and selected social services are included in the projections presented in the Business Development Plan; however there are no clearly defined discussions regarding details of these plans.

2.1.12 Security Arrangements

The two 5,000 hectare farm sections will be enclosed in a four-stranded barbed-wire fence to exclude livestock for the purposes of food safety and Good Agricultural Practices certification. One section will have all of the offices, storage facilities, fresh pack and processing facilities, housing, and social services for the employees. These will be clustered in a compound centered in that section, surrounded by a high-security fence and guarded gates.

The high-security fence that is planned for the main complex would encompass all offices, processing plants, storage facilities and the like. The estimated cost is $35,000/km. A notional amount of $100,000 is budgeted for the fence. A barbed-wire fence is proposed for the perimeter of the farm, the cost of which is estimated at $150,000. The entire farm will be protected by armed roving and stationary security guards. Not included in these estimates is a high-security fence for that portion of the farm that would produce fresh fruits and vegetables for the ISAF.

2.2 Alternatives to Proposed Actions and Comparison of Alternatives

2.2.1 No Action Alternative

An estimated 80 percent of Afghans are dependent on agriculture for their livelihoods. The No Action Alternative would leave the existing natural, human, and social environments unchanged. This alternative would result in continued poverty and fail to meet USAID's objectives of restoring meaningful livelihoods in Afghanistan. Afghanistan historically has been a prolific producer of high quality agricultural products, but a generation of civil war obliterated the systems and farmers who managed that efficient production. While poppy production and the opium trade have a significant share of Afghanistan's agricultural economy, there are excellent opportunities for licit alternatives to be provided for the rural populace. Mazar Food project can play a significant role in increasing the wealth of the populace in the Khulm regional and provide a replicable project in other parts of Afghanistan. The opium trade is destabilizing as it contributes to insecurity and undermines the rule of law. Mazar Food project can contribute to restoring the agriculture sector in Khulm and demonstrate that people have a legitimate means to earn a living.

2.2.2 Deep Borehole Well/Water Supply versus Other Sources of Irrigation

Any development of agricultural activities will greatly increase the need to exploit the region's water resources. Alternatives to providing this water include:

- surface water use from nearby springs located south of the project (the current existing scheme utilized in the project area);
- surface water use from the Amu Darya River;
- shallow groundwater resources through placement of wells;
- deep groundwater resources through placement of wells.

Each of the alternatives will be considered and evaluated in this EA. A sustainable development program will depend on implementation of a plan that in all likelihood utilizes a combination of these water resources.

2.2.3 Alternative Design Strategies for Irrigation (pivot, sprinkler vs. drip systems, etc.)

Detailed soil and water quality analyses are planned to be undertaken and completed by June 2008. Results of the analysis will provide the information needed for the design strategies for irrigation of Mazar Food project. Pros and cons of the technologies are outlined A number of irrigation regimes are typically utilized in agricultural areas, however some technologies are better suited to arid environments, with advanced water conservation technologies and practices. There are number of alternative design strategies that could be deployed in the Mazar Food Project which include (i) Pivot system; (ii) drip irrigation technology and (iii) surface irrigation.

It is likely that a combination of irrigation technologies and methodologies will be required in order to minimize adverse impacts and maximize benefits. The selection of multiple systems, however, will require a much more diversified field of expertise on staff to install, operate, and repair the selected systems.

2.2.4 Linkages to Alternatives to USAID/OPIC and Host Government Objectives

Rebuilding Afghanistan's legal rural economy is key to economic growth, since an estimated 80 percent of Afghans earn a living through farming. USAID's and Government's efforts have improved irrigation for nearly 10 percent of the country's arable land and improved the health of millions of heads of livestock. Mazar Foods Project is in line with USAID policy to help Afghanistan develop a market-driven agricultural sector by improving linkages between suppliers, producers, and markets, and by providing farmers with improved farm technologies and increased access to financial services.

The preferred alternative presented provides opportunity for capacity building within the various affected regulatory units of the Afghanistan government (see Section 1.2.2 Regulatory considerations) as well as satisfying USAID's objectives under the ASAP program.

2.2.5 Proposed Alternatives

The alternative of developing surface water resources from the Amu Darya river will require international negotiation between Afghanistan and surrounding countries that have access to the Amu Darya river. There are a variety of treaties regulating water use from this river. Furthermore, considering the environmental issues associated with the Aral Sea, to which the Amu Darya is a feeder, significant environmental impacts would require trans-boundary, strategic environmental assessment.

2.2.6 No Action Compared to Proposed Actions

The No Action Alternative would fail to implement USAID development policy for Afghanistan. In addition, governmental bodies and regulations that have been established by the Islamic Republic of Afghanistan will not be exercised and strengthened in this scenario.

2.3 Identification of Preferred Alternative Actions

The identification of a recommended set of proposed actions is difficult because of insufficient critical data, e.g., soil characteristics, and the availability and quality of ground water. Results of the technical assessment expected by July 2008 will provide the information to evaluate preferred alternatives and will be addressed in the Supplementary Environment Analysis. It is certain that implementation of an agricultural development program would prove to have significant beneficial impacts to the economy and human environment in the region. In this sense, the preferred alternative is the proposed action as a whole. Development of best management

practices and selection of the alternatives presented above require additional information that is not yet available. A summary of the preferred actions as they currently exist is presented here:

- Groundwater development
- Irrigation canals sourcing Amu Darya River

3 AFFECTED ENVIRONMENT – BASELINE SITUATION

The Project Area is about 14 km by 31 km and the land surface slopes from south to north with some hilly areas. About 25 to 30 percent of the land is cultivated by local people. The project area is situated in the lower sections of the Khulm watershed on the Amu Darya Plain (also called Turkistan Plain). The area of the Khulm watershed is 11,919 km^2. The project area covers about 10,000 hectares and is located between 67°24' and 67°45' east longitudes and 36°41' and 36°49' north latitudes. Major settlements in the project area include Khulm in the east and Mazar-i-Sharif to the west. Two main asphalted roads traverse the area: an east- to-west road, connecting Khulm and Mazar-i-Sharif, and a north-to-south road connecting these settlements with the "Friendship Bridge," which allows merchandise and people to pass between Afghanistan and Uzbekistan.

3.1 Local and Regional Context and designation of Project Area under Consideration

3.2 Physical Environment

3.2.1 Physical Geography: Climate, Geology, Topography, Historical Precipitation Records, Soils, Agro-ecological zones

1. Climate

Afghanistan is located at sub-tropical latitudes, but it is the topography, in particular the range of high mountains in the middle of the country, that is the primary factor determining climate. Areas to the north of the high mountains and ridges (e.g. the project site) have a dry, continental climate. Temperature falls below freezing during winter nights and rises sharply in spring and reach up to 50° C during the summer.

2. Precipitation

Annual precipitation declines with altitude, from an annual total of perhaps 800-1000 mm in the high mountains, through 200-300 mm in the foothills, to below 100 mm on the open plains towards the Amu Darya. Based on data presented in Favre and Kamal (2003), normal annual rainfall in the Mazar-i-Sharif area is reported to be 189.1 mm, with a maximum of 379.1 mm and minimum of 87.4 mm. Measurements at the Baglhan monitoring station (located east of the site in the Baglhan province) are roughly similar to those of the Mazar-i-Sharif monitoring station. Total annual evapotranspiration (ETP) in the area exceeds precipitation by roughly one order of magnitude and is estimated at 1,376 mm (mean monthly ETP is 3.34 mm). Mean annual temperature is 18.0o C. Mean annual wind speed is 2.2 m/s.

Precipitation data in the lowland plains is based on frontal rainfall and there is in general moderate and short-lived snow at Mazar-i-Sharif, but in the mountains precipitation is almost entirely based on snowfall. (JFPR IEE: Bangala Weir, Feb07). Rainfall is essentially confined to the period of October to May, and it is highly variable year-to-year, month-to-month and day-to-day. Furthermore, by some local accounts, the area experienced a drought from 1998 through

2002. By contrast, in 2005 much of Afghanistan was hit with one of the coldest winters on record which resulted in flooding in some deserts in the southern parts of the country

3. Geology:

The Tadjik block of northern Afghanistan formed the southern margin of the Eurasian continental plate during Permo-Triassic times. The Palaeozoic basement was intruded by Triassic granitoids as a result of subduction related to the first stages of the closure of the Tethys Ocean during the Cimmeride Orogeny. Subsequent to this, a Jurassic clastic sequence was deposited, which changes upwards to Cretaceous carbonate platform sedimentation. This area is now the prime target for hydrocarbon exploration. However, the exposed granitoids in the northeast of the block are prospective particularly for precious (and base) metal mineralization.

Topography

The southern-most edge of the site is located along foothills of the Shadiyan and Marmol Mountains at an approximate maximum elevation of 420 meters above mean sea level, and has a slightly more accentuated relief than the remainder of the site. The majority of the site is located on relatively level, basin-fill sediments that gradually slope to the north to a minimum elevation of approximately 320 m.

Mountains

To the south of the project area are the mountain highlands which consist of a narrow belt of three small ranges known as the Shadiyan and Marmol, which are located directly south of the project area, and the Khulm Mountains, southeast of the town of Khulm. The Khulm River cuts between the Marmol and Khulm ranges in a narrow pass known as Tangi Tashkorghon. The mountain ranges south of the site are mainly composed of limestone with inter-bedded marl, conglomerates, and sandstone of Upper Cretaceous/Paleocene origin, as well as later Paleocene and Miocene sedimentary and volcanic rocks. The limestone is mostly fractured and has joints which absorb rain and snow during the winter season. Later in the year, this absorbed water emerges as springs. These three ranges form a rim on the northern-most extent of the Hindu Kush, a complex and vast mountain range that extends through central Afghanistan and separates the basins of the Amu Darya River from those of the Kabul and Helmand rivers in eastern and southern Afghanistan.

Alluvial Deposits and Sand Dunes

The site is located in a plain variously referred to as the Hairatan Valley, Amu Darya Valley, and Turkistan Plain located at the southern edge of the Central Asian Plateau. Thick Quaternary alluvial deposits consisting of sand, silt, conglomerates, gravel, and clay fill this valley north of the Hindu Kush Mountains. The subsurface lithology near the mountain highlands is mainly gravel, and changes to finer material moving towards the Amu Darya River in the north. However, in the middle of valley there are occurrences of inter-bedded sand and clay, while at the depth of 150 m a gravel bed may be encountered. Cross sections of the project area also reveal the presence of Cretaceous limestone approximately 100 m below the surface just northeast of Khulm. North of the irrigated fields, and beyond the reach of the river deltas that form fans of alluvial deposits, lies the Dasht-i-Shortepa, or Amu Darya Desert. This area is a narrow dune field that runs along the northern Afghanistan border, parallel to the Amu Darya River, and consists of windblown sands. The dunes are migrating eastward and have become a major concern in terms of maintenance of the road that connects the project area (and the rest of Afghanistan) to the northern port town of Hairatan on the Afghan border with Uzbekistan. (See Photo 2 below)

Photo 2. Dunes of the Dasht-i-Shortepa. This photograph demonstrates the shifting sand dunes located along the northern edge of Afghanistan between the proposed project site and the Amu Darya River and exemplifies the challenges and constant maintenance required to keep the road to Hairatan clear; taken about 10 km south of the city of Hairatan, along the only paved road connecting the project area to international markets via Uzbekistan.

Soils

Soils at the site consist of a loamy silt (organic soil with silt) in the upper 0.3 m of the soil profile, and fine sandy silt from 0.3 m to 2 m (BAS 2007). Some areas of semi-hard soil were identified (BAS 2007), suggesting low friability and limited wind erosion potential. Soil pH is neutral to very slightly alkaline, in the 7 – 8 range (BAS 2007). The organic content and pH of the soil suggest it is suitable for agricultural development.

The mineral soils are deep silt loams and sandy loams that are high in mineral fertility, but low in organic matter. There is some information available about the characteristics of these soils, but there are no prior systematic surveys and soil analyses. As a result, it is not yet possible to make specific decisions on the amount and type of fertilizer required for various crops. Soil samples have recently been taken and when fertilizer and soil amendment recommendations are made available, current assumptions in the business plan will be modified for the EA.

The project will need to evaluate the potential impact on soils which could result from modification of soil structure and chemistry as a result of ploughing. Possible concerns include:

- Modification of soil structure could possibly increase wind erosion and generation of dust.
- Modification of soil chemistry that could increase mineral precipitates and result in unproductive fields and also compound the dust problem.

Soil studies have been made by Sredazgiprovodkhlopok (1967) and JEC (1973). These studies concluded that land reclamation was essential to improve the overall quality of irrigated lands in

the region and that installation of a drainage network would be critical to the prevention of leaching with irrigation water.

3.2.2 Agro-ecological zones

There is a total of approximately 6,248 km^2 of irrigated lands in the Northern river basin, of which 3,870 km^2 are intermittently cultivated and 2,378 km^2 are intensively cultivated with one or two crops per year. The Khulm River watershed includes one of four "northern irrigated oases" located in the Northern river basin. Like the other irrigated oases in the area, as the Khulm River empties from the mountain ranges into the open Turkistan Plain it forms a delta that ends in irrigation canals or desert sands.

In the project area, areas irrigated by the Khulm River radiate laterally from the Tangi Tashkorghon and quickly dissipate within approximately 10 to 13 km of the center of the city of Khulm. The eastern extent of the proposed Mazar Foods project site is located near Khulm and encompasses portions of this irrigated oasis, however the majority of the site is situated to the west, well beyond the typical reach of the watershed of the Khulm. Additionally, much of the land that is currently irrigated by this network is centered around the city of Khulm and is held in private ownership by individuals. The Khulm Growers Association (KGA), a USAID-funded farming cooperative, is currently assisting land owners with pomegranate production.

3.2.3 Hydrology

Water use in northern Afghanistan is very low at present, and a substantial increase is not expected during the next two decades. Afghanistan has used only about 2 km^3 of the 9 km^3 of water from the Amu Darya River it is entitled to use under treaties negotiated in 1950s. The agricultural productivity, which is the economic mainstay of the country's population, has suffered in large part due to inadequacy of irrigation water and irrigation infrastructure. Water resources management and development are critically important for all of Afghanistan's major river basins. The Amu Darya basin, which comprises only 12 percent of the Afghan territory, supports about 25 percent of the population (FAO/WFP 2001).

Extensive hydro-geological studies were carried out in the downstream parts of the Balkh and Khulm river basins to explore for gas and oil in the region when the former Soviet Union was supporting the Government of Afghanistan. Unfortunately, these studies are currently not easily accessible and not used by the various organizations developing groundwater.

Surveys of Northern Afghanistan performed by the government in 1987-1988 estimated that 0.5 billion m^3 of groundwater are withdrawn annually from some 723 springs, 276 wells, 592 shaft wells, and 15 karezes (also called qanats) (sources: Ministry of Mines and Industry 1988). These surveys estimated total groundwater resources in Northern Afghanistan at 49 m/s, or 1.5 bcm/year; not the 28 m/sec—about 1 billion m^3 annually—estimated in 1978. Unfortunately, the higher figures may well apply to certain areas where groundwater recharge takes place, but probably not in the downstream parts of the Balkh and Khulm river basins. In these areas surface water resources are the main source of recharge for groundwater, as precipitation in Northern parts of Afghanistan is very low (source: Rehabilitation of the Abdullah canal (Balk River) ADB Initial Environmental Examination, March 2007).

Watershed Description

Favre and Kamal (2004)[17] presents detailed analysis of watersheds in Afghanistan and provides a variety of statistics by river basin and watershed. The following is a brief summary of some of these data as they relate to the proposed Mazar Foods project site.

The site is located within the Khulm watershed of the Northern river basin. The Northern River Basin occupies an area of 7,090,127 ha (70,901 km^2), or approximately 10.98 percent of Afghanistan's land area. On a continental scale, the Northern river basin, coupled with the Amu Darya and Harirod-Murghab river basins, form the Afghan portion of the Aral Sea watershed. However, extensive desertification in recent decades has reduced flow within the Aral Sea watershed causing significant declines in the aerial extent of the sea. The Amu Darya was once one of two major rivers feeding the Aral Sea, but due to agricultural use of the water in the former Soviet nations north of Afghanistan, it no longer reaches the Aral Sea. The situation at the Aral Sea is considered one of the world's worst ecologic and environmental disasters, and international treaties have been developed in an effort to mitigate the loss of coverage of the sea.

There are four recognized river watersheds in the Northern basin: Khulm (in which the project is located), Balkhab, Sar-i-Pul (Ab-i-Safid), and Shirin Tagab. The Northern river basin is bordered to the north by the Dasht-i-Shortepa (Amu Darya Desert), a narrow dune field that runs along the northern Afghanistan border, parallel to the Amu Darya River. The Dasht-i-Shortepa is considered a non-drainage area that essentially intercepts watershed flow from the Northern river basin before it reaches the Amu Darya River by over-land pathways.

Within the Northern river basin, the Khulm watershed covers an area of approximately 1,023,033 ha (10,230 km^2), or roughly 1.58 percent of the land in Afghanistan. The Khulm River, also referred to in various texts and maps as the Tashkorghon and Samangan River, has a rain- and snow-fed regime and the mean annual volume of river discharge is 60 million m^3 (less than 1 percent of the volume for the country). Water from the Khulm watershed is either evapotranspired or absorbed into surface sediments as it is intercepted by the Dasht-i-Shortepa. Historically, the river deltas in the Northern Turkistan plain were close to the Amu Darya. But with the development of traditional irrigation schemes centuries ago, these rivers are no longer contributing to the Amu Darya and are hence considered "blind" rivers as they do not contribute to a larger water body. The rivers dry up in irrigation canals or desert sands long before reaching the Afghan border and the Amu Darya River.

Groundwater

Almost all groundwater in northern Afghanistan is recharged by precipitation (rainfall and snowfall). Groundwater quality data presented in Russian maps generated in 1968 suggest that the Amy Darya also leaks into the surface and possibly contributes to groundwater recharge. However, direct recharge of precipitation to lowland areas is likely to be very small, as evapotranspiration greatly exceeds precipitation. The recharge mechanism is likely to be as follows:

a) pre-Palaeogene bedrocks may be recharged more or less directly by infiltration of precipitation at high altitudes where evaporation is less than run-off for many months of the year (and where snow cover may be persistent);

[17] Favre, R. and G.M. Kamal. 2004. Watershed Atlas of Afghanistan, First Edition. Kabul, January 2004.

b) Neogene/Quaternary aquifers are likely to be recharged in foothills by rivers and streams descending from the high mountains and infiltrating into dominantly coarse-grained alluvial fans. The recharge is likely to be highest during snowmelt season. Thus groundwater recharge is highly dependent on quantities of winter snowfall;
c) further away from the mountains, some recharge to Neogene/Quaternary aquifers is likely to take place by infiltration of water through the bed of perennial rivers;
d) in irrigated areas, substantial recharge is likely to occur via leakage from irrigation channels.

Surface water resources are the main source of recharge for groundwater as precipitation in Afghanistan is comparatively low. Nonetheless, Afghanistan has seen a boom in diesel-powered wells in the recent years of drought. As wells have become an increasingly important source of irrigation water, the water table has been observed to drop by one or three meters per year in recent years in some tube well areas. The diesel well boom could lead to unsustainable use of groundwater in the Khulm river valley, and a plan to assure their sustainability would be required. In regions where precipitation is via the distributed direct infiltration of rainfall, calculations of recharge quantities can be made relatively readily. In this situation, where groundwater recharge occurs only in particular zones (mountain foothills and river valleys) and then flows laterally throughout the aquifer complex, estimates of recharge are almost impossible in the absence of detailed river flow profiles etc.

Based on the Russian groundwater maps produced in 1968, groundwater elevations in the project area were measured at approximately 300 m in the northwest portions of the site where ground elevation is 320 m (translating to an approximate depth of 20 m below ground surface), and up to 330 m in the Khulm area where ground surface elevations are 400 – 420 m (translating to depths of 70 – 90 m below the surface).

3.2.4 Water Quality

Under a subcontract with the Accelerating Sustainable Agriculture Program in Afghanistan (ASAP), the contractor Basic Afghanistan Services (BAS), among other tasks, undertook an inventory of shallow hand-dug and drilled wells in the project area and collected groundwater samples for water quality analysis. Sixty wells were inventoried in the Project area: 11 deep tubewells and 49 hand-dug open wells. Table I provides a summary of well depths, measured static water levels; measured estimated well yields; water quality sampling results; GPS coordinates; and village/farm location.

Table I. Well Survey Summary

Sample No.	Well No.	Well Depth (meters)	Static Water Level (meters)	Well Discharge (Liters/ Second)	Chemical Analysis Results in mg/l							GPS			Well Location	Type Well
					TDS	Ca	Mg	Mn	B	Tur-bidity	pH	El (feet)	N	E		
S-1	S/1	130	36	10	1600	0.32	0.51	0.018	0.6	0	8.3	1244	36.49.269	67.30.728	200m South Rd.	Tube
S-2	S/2	132	38	9	1640	0.41	Under Range	0.023	0.5	0	7.6	1280	36.49.545	67.37.595	300m South Rd.	Tube
S-3	S/3	170	55	6	769	Over Range	0.00	0.003	0.3	0	8.0	1069	36.45.577	67.28.672	Naib Abad Villa	Tube
N-4	N/4	110	36	6	1589	Over Range	68	0.024	1.4	0	7.9	1355	36.45.571	67.36.514	Kabul Bank	Tube
N-5	N/5	100	35.2	6	2020	Over Range	1.28	0.049	1.2	0	7.5	1226	36.44.481	67.38.137	Edi by Garden	Tube
N-6	N/6	130	40	7	1860	Over Range	0.00	0.069	0.7	0	7.6	1077	36.47.400	67.25.819	Janali farm	Tube
N-7	N/7	125	36	5	1850	Over Range	0.27	0.46	0.4	0	7.3	1075	36.47.429	67.25.707	Janali farm	Tube
N-8	N/8	128	36	0	1982	Over Range	0.01	0.078	2.3	0	8.0	1070	36.47.424	67.25.575	Janali farm	Tube
N-9	N/9	135	28	6	1848	Over Range	Under Range	0.039	0.9	0	7.7	1031	36.47.407	67.25.030	Janali farm	Tube
N-10	N/10	120	29	0	1978	Over	Under	0.35	0.5	0	7.5	1072	36.47.425	67.25.231	Janali farm	Tube
N-11	N/11	170	35	7	1642	Over Range	0.00	0.048	0.5	4	7.9	1122	36.46.371	67.38.089	Asadullah	Tube
N-12	N/12	20	16.4	0.3	2630	Over Range	0.86	0.030	1.3	0	8.2	1190	36.46.718	67.35.995	Mamawakeel V.	Dug
N-13	N/13	19	16.3	0.2	8000	0.39	0.34	0.051	4.1	4	7.3	1200	36.46.852	67.36.006	Dehnow Village	Dug
N-14	N/14	20	16.7	0.3	3620	1.96	0.66	0.033	3.5	0	7.7	1135	36.46.825	67.35.934	Dehnow Village	Dug
N-15	N/15	20	16.4	0.3	2640	Under Range	0.04	0.054	1.4	4	8.0	1126	36.46.204	67.35.828	Dehnow Village	Dug
N-16	N/16	19.5	16.6	0.28	3600	0.95	0.23	0.017	6.0	4	8.1	1155	36.46.904	67.35.873	Dehnow Village	Dug
N-17	N/17	20	16.4	0.3	3600	1.06	0.71	0.069	4.2	0	8.2	1193	36.46.814	67.35.923	Dehnow Village	Dug
N-18	N/18	20	16.7	0.35	3600	0.95	0.54	0.033	4.4	0	8.2	1155	36.46.904	67.35.873	Dehnow Village	Dug
N-19	N/19	19.6	16.4	0.3	3470	1.01	0.19	0.26	3.6	0	8.0	1137	36.46.812	67.35.819	Dehnow Village	Dug
N-20	N/20	19.5	16.7	0.3	7950	1.28	0.59	0.065	3.2	11	7.6	1026	36.46.799	67.35.881	Dehnow Village	Dug
N-21	N/21	20	16.5	0.3	3600	0.83	Under Range	0.044	4.0	7	7.6	1036	36.46.760	67.35.920	Dehnow Village	Dug
N-22	N/22	20.5	16.5	0.3	3600	2.10	0.24	0.050	4.1	12	7.6	1054	36.46.802	67.35.870	Dehnow Village	Dug
N-23	N/23	20	16.2	0.3	3630	0.50	0.12	0.029	3.6	4	7.8	1141	36.46.781	67.35.829	Dehnow Village	Dug
N-24	N/24	19.8	16.4	0.3	3630	1.15	0.29	0.034	3.2	7	7.8	1067	36.46.810	67.35.851	Dehnow Village	Dug
N-25	N/25	20.3	16.5	0.3	3600	Under Range	0.21	0.032	4.1	8	7.9	1171	36.46.790	67.35.996	Dehnow Village	Dug
N-26	N/26	20	16.4	0.3	1956	0.60	0.70	0.076	0.5	10	7.6	1165	36.46.785	67.35.970	Dehnow Village	Dug
N-27	N/27	20	16.5	0.3	2640	1.46	0.90	0.200	1.9	6	7.6	1164	36.46.831	67.35.872	Dehnow Village	Dug
N-28	N/28	20.5	16.4	0.3	3620	1.45	0.89	0.034	4.5	13	7.9	1122	36.46.812	67.35.904	Dehnow Village	Dug
N-29	N/29	20	16.5	0.3	432	Under Range	0.52	0.002	0.1	9	7.6	1173	36.46.815	67.35.890	Dehnow Village	Dug
N-30	N/30	20.5	1.55	0.3	2180	Under Range	0.23	0.042	1.1	7	7.5	1125	36.46.809	67.35.821	Dehnow Village	Dug

Table I. Well Survey Summary cont.

N-31	N/31	20	16.4	0.3	1223	Under Range	0.42	0.060	0.7	11	7.6	1084	36.46.818	67.35.874	Dehnow Village	Dug
N-32	N/32	19.5	16.6	0.3	3610	0.89	0.57	0.029	4.5	10	7.9	1108	36.46.804	67.35.879	Dehnow Village	Dug
N-33	N/33	20	16.5	0.3	3271	Under Range	0.61	0.022	3.2	3	8.1	1112	36.46.827	67.35.852	Dehnow Village	Dug
N-34	N/34	20.5	16.8	0.3	2885	0.78	0.43	0.0191	4.0	5	7.9	1109	36.46.875	67.35.854	Dehnow	Dug
N-35	N/35	20	16.4	0.3	3127	0.53	0.45	0.050	3.70	8	8.1	1136	36.46.886	67.35.815	Dehnow Village	Dug
S-36	S/36	53	50	0.25	6660	0.18	0.29	0.039	1.6	2	7.7	1286	36.43.268	67.37.552	Woljato Village	Dug
S-37	S/37	57	55	0.3	1840	0.10	0.01	0.033	0.9	12	7.6	1334	36.43.183	67.37.993	Woljato Village	Dug
S-38	S/38	54	52	0.25	2660	0.35	0.24	0.038	0.3	9	8.0	1339	36.43.299	67.37.670	Woljato Village	Dug
S-39	S/39	53	52	0.2	2740	0.23	0.31	0.027	0.8	5	8.1	1361	36.43.382	67.37.712	Woljato	Dug
S-40	S/40	57	55	0.2	2780	0.41	0.47	0.031	0.6	7	8.2	1344	36.43.230	67.37.720	Woljato Village	Dug
S-41	S/41	NA	NA	1	421	Under Range	Under Range	0.007	Under Range	2	7.9	1101	36.40.121	67.29.512	Khawja Alghar	Spring
N-42	N/42	60	45	0.3	1490	1.5	0.59	0.026	0.8	3	7.9	1264	36.45.030	67.41.771	Baghat Ghuly	Dug
N-43	N/43	49.4	48.4	0.2	1225	0.41	0.42	0.017	1.2	13	7.8	1274	36.45.068	67.41.750	Baghat Vil	Dug
N-44	N/44	45	43.9	0.3	1265	0.37	0.41	0.019	0.8	7	7.8	1262	36.45.052	67.41.763	Baghat Vil	Dug
N-45	N/45	56	44	0.3	1495	0.45	0.36	0.021	1.1	11	7.8	1234	36.45.737	67.41.680	Deh Logary	Dug
N-46	N/46	44	42	0.35	1267	0.32	0.47	0.032	1.3	14	7.8	1237	36.45.637	67.41.701	Deh Logary	Dug
N-47	N/47	60	42	0.4	1230	Under Range	0.44	0.043	0.9	11	7.8	1240	36.45.721	67.41.697	Logary Village	Dug
N-48	N/48	60	40	0.4	1227	0.72	0.64	0.070	0.6	13	7.8	1206	36.45.150	67.41.716	Chonman Village	Dug
N-49	N/49	59	41	0.3	1236	0.61	0.53	0.060	0.8	12	7.7	1212	36.45.374	67.41.689	Chonman Village	Dug
N-50	N/50	50	44	0.3	1489	0.98	0.58	0.046	3.7	16	7.9	1257	36.45.217	67.41.718	Wardagy Village	Dug
N-51	N/51	48	43	0.3	1674	0.81	0.56	0.018	2.4	14	8.0	1263	36.45.176	67.41.654	Wardaghy Village	Dug
N-52	N/52	45	43	0.2	1280	0.65	0.43	0.026	1.9	11	7.9	1254	36.45.213	67.41.708	Deh Shahi Village	Dug
N-53	N/53	47	44	0.2	1371	0.54	0.33	0.031	2.1	7	7.9	1249	36.45.189	67.41.671	Deh Shahi Village	Dug
N-54	N/54	38	33.5	0.2	1270	0.41	0.12	0.028	1.7	9	7.6	1236	36.45.507	67.41.339	Deh Wardah Vill	Dug
N-55	N/55	35	32	0.3	1846	0.18	Under Range	0.054	0.9	5	7.7	1239	36.45.519	67.41.409	Deh Wardah Vill	Dug
N-56	N/56	40	36	0.3	1473	0.21	0.07	0.073	1.4	9	8.0	1221	36.45.072	67.41.320	Deh Hasan Village	Dug
N-57	N/57	44	36	0.32	1298	0.63	0.23	0.043	1.9	10	7.9	1224	36.45.284	67.41.005	Deh Hasan Village	Dug
N-58	N/58	39	38	0.2	1534	0.51	0.32	0.037	0.9	13	8.0	1216	36.45.140	67.41.921	Deh Hasan Village	Dug
N-59	N/59	34	29	0.3	1431	0.47	0.39	0.067	1.6	9	7.7	1219	36.44.729	67.37.419	Ziarat Village	Dug
N-60	N/60	38	32	0.3	1289	0.52	0.23	0.034	2.6	8	7.5	1246	36.44.540	67.37.563	Mirwais Village	Dug

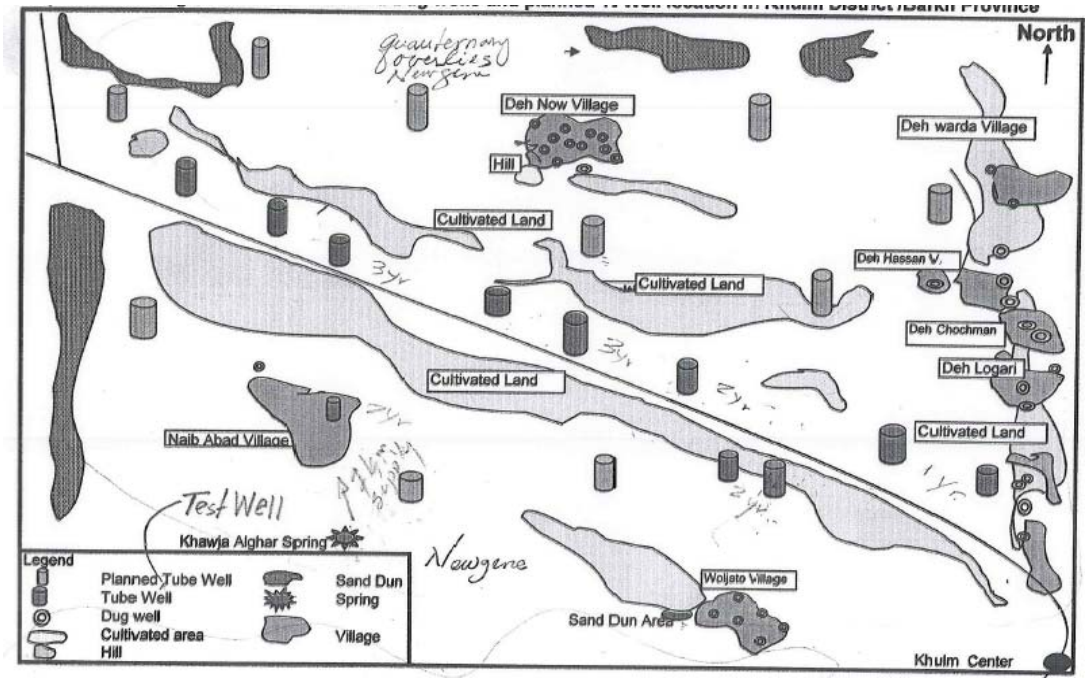


Figure 5. Sketch of area with Tube Dug wells and planned T. Well location in Khulm District/Balkh Province

Basic Afghanistan Services (BAS) ASAP – Khulm District Project Report. *Report of Pre-Feasibility Study Irrigation Potential Khulm District, Balkh Province Afghanistan, July 2007 (draft).*

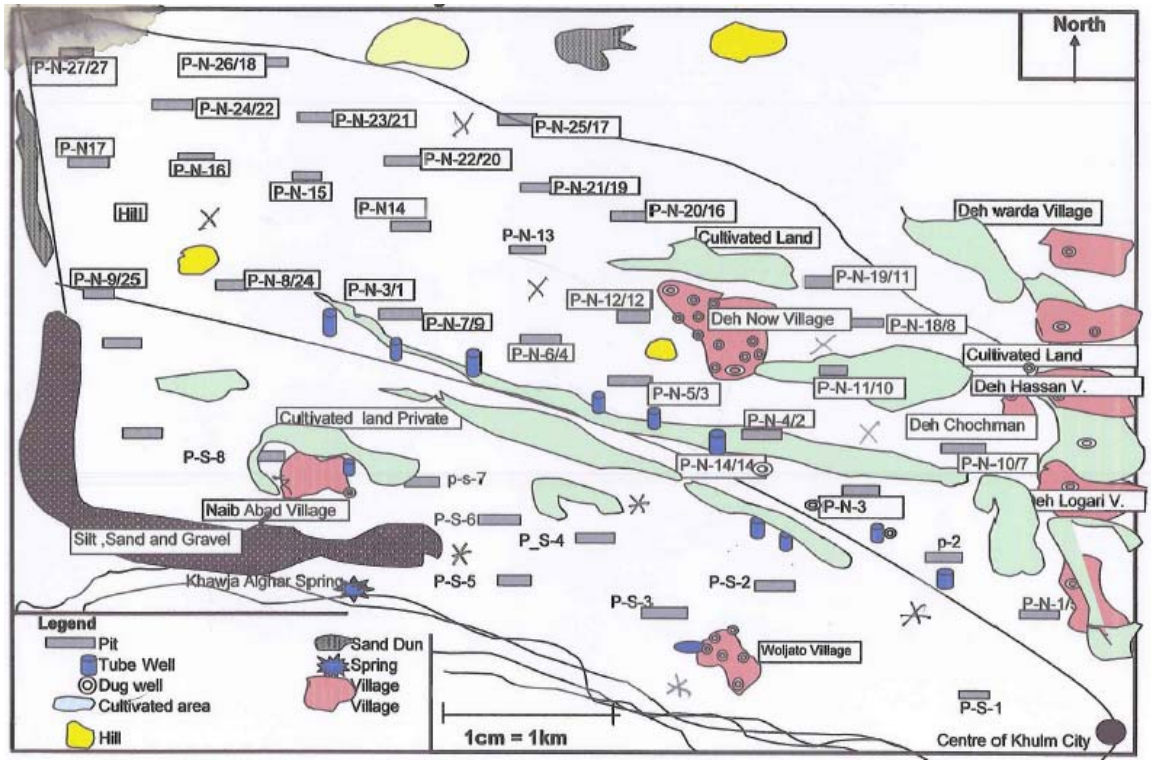


Figure 6. Sketch of Target Area in Khulm District/Balkh Province

Basic Afghanistan Services (BAS) ASAP – Khulm District Project Report, *Report of Pre-Feasibility Study Irrigation Potential Khulm District, Balkh Province Afghanistan, July 2007 (draft).*

Deh Now Village—The water quality in the shallow hand-dug wells in Dehnow Village show a much higher concentration of total dissolved solids (from approximately 2,000 mg/l TDS to as much 8,000 mg/l of TDS) as compared to the deeper tube wells. The TDS levels in many of the wells might be too high for irrigation applications.

Woljato (Oljatu) Village—Five (5) wells were inventoried in this village. Well depths for these hand-dug wells ranged from 53 – 57m and static water levels ranged from 50 – 55 m below the top of the well. Well yields are quite low: in the range of 0.2 to 0.3 lps. The total dissolved solids (TDS) content in these five hand-dug wells ranged from 1,840 to 6,600 mg/l.

Khawja (Khoja Alghar) Spring—This spring has a flow of 1 lps and a TDS concentration of 421 mg/l; the lowest TDS measured in the Project Area.

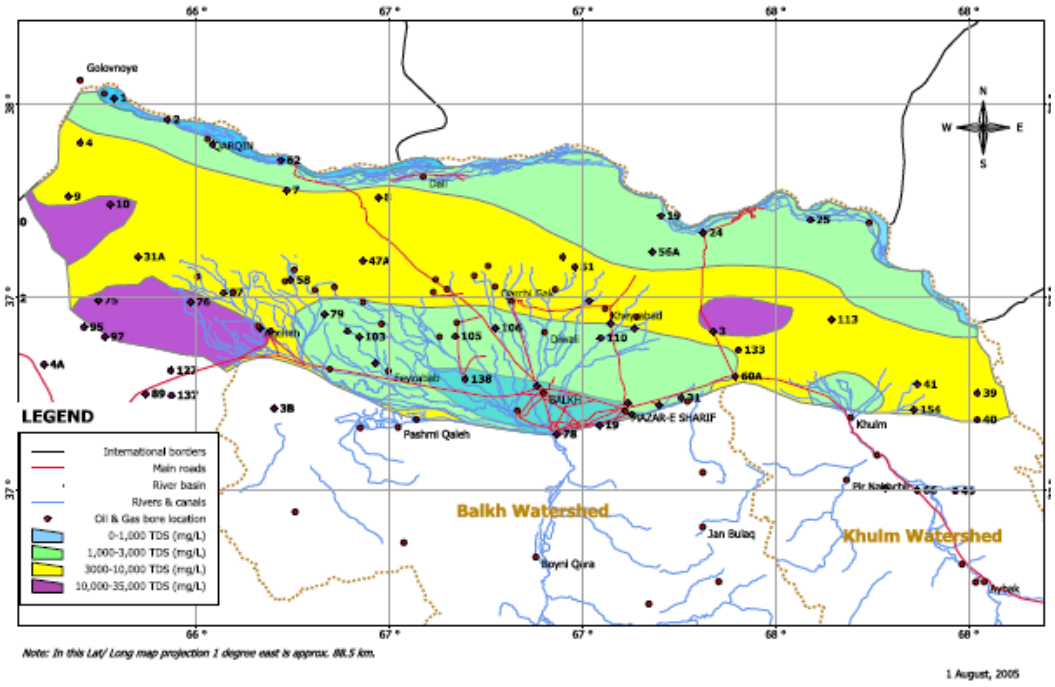
Baghat, Deh Logary, Chonman, Wardaghy, Deh Shahi, Deh Wardah, Deh Hasan, Ziarat, and Mirwais Villages—Twenty (20) hand-dug wells were inventoried in these villages with depths ranging from 34 m to 60 m. The concentrations of TDS in these relatively deep hand-dug wells ranged from 1,227 to 1,846 mg/l.

Salinity Distribution

The distribution of borehole salinity is shown on Figure 7 (Ashworth) below . This figure is a digital reproduction of Miskin's (1968) work, and shows the historic extent of the total dissolved solids (TDS) in the groundwater. The salinity of this groundwater was grouped into four classes:

1) 0 – 1,000 mg/l;
2) 1,000 – 3,000 mg/l;
3) 3,000 – 10,000 mg/l; and
4) 10,000 – 35,000 mg/l.

Figure 7. Map showing the groundwater salinity of the Quaternary Aquifer



This map shows the following:

- 0 – 1,000 mg/l (fresh water) groundwater was located at the mouth of the Balkh River and immediately adjacent to the Amu Darya River. Near the Balkh River this groundwater formed a plume that spread in a north-westerly direction following the regional groundwater flow pattern. This low TDS suggests groundwater recharge in these areas and that the Amu Darya River leaks though its base, despite the thick clays recorded there by Miskin.
- 1,000 – 3,000 mg/l (fresh to brackish water) groundwater was located around the Balkh recharge mound, in a broad swathe south of the Amu Darya River, and where the Samangan River debouches onto the plain. These areas indicated where groundwater recharge was mixing with higher salinity water. It is noticeable that along the Amu Darya River this band of groundwater thickens eastwards, confirming the groundwater flow pattern described above.
- 3,000 – 10,000 mg/l (brackish water) groundwater occurred in a broad band between the fresh to brackish groundwater and occupied the greatest proportion of the area.
- 10,000 – 35,000 mg/l (saline water) groundwater is shown on the western boundary of the map and forming around borehole No.3. In the west, the high salinity can be explained by the absence of recharge from active rivers and canals. Borehole No. 3 is an overflowing artesian well producing hot water and must have been screened in pre-Quaternary sediments. The salinity here is therefore not representative of the overlying Quaternary aquifers.

Driscol (1986) provides another groundwater quality classification based on Sodium Adsorption Ratio (SAR) and EC, and suggests that if water with a salinity of between 3000 (~1,900 TDS) and 10,000 µS/cm (~6,200 TDS) is used for irrigated agriculture then the soils must be permeable, drainage must be adequate, considerable excess irrigation water must be applied, and very salt-tolerant crops should be selected. In the context of the irrigated agriculture, the 'fresh' (0 – 1,000 mg/l TDS) and 'fresh to brackish water' (1,000 – 3,000 mg/l TDS) highlighted on Figure 7 above. The suitability of the 'brackish' water (3,000 – 10,000 mg/l TDS) for irrigated agriculture is marginal. Areas of 'saline' water (10,000 – 35,000 mg/l TDS) are unsuitable for irrigated agriculture.

3.2.5 Natural Events History (earthquakes, floods, fires, etc.)

The mountains located south of the project site represent the presence of an east-to-west trending fault that extends from Shebarghan in the west, to the Baglhan Province to the east. A minor splay of this fault extends northward to Khulm, and is represented by the Tangi Tashkorghon. As a result, the areas of Balkh, Mazar-i-Sharif, and Khulm have a significantly increased seismic hazard, which is evidenced by a relatively large number of earthquakes in the area (USGS Earthquake Hazard Map). A summary of earthquakes in Afghanistan cataloged more than 1,300 events since 719 A.D.(Ambraseys and Bilham, 2003)..

Spring rains can result in flash floods. BCEOM (2003) reported a maximum flood of 1000 – 1500 m/sec, although an earlier source gives 700 m/sec. Floods typically recede quickly within a few hours. The Balkh River flood of May 2005 is generally considered by the local people to be the worst in living memory. From water stage and river flow measurements, the peak flood flow is estimated to have been 450 m^3/sec, which is estimated to be approximately a 1:50-year flood.

3.3 Biological Environment

The project site is occupied by a very sparse cover of low perennial shrubs (predominantly *Artemesia* and *Acacia* species) and scattered annual forbs and grasses. Currently the village members harvest shrubs and grass in the area to use as fuel wood and fodder. This practice is in some cases their only livelihood, and has resulted in a severely denuded landscape. Wildlife mainly consists of smaller animals, including upland songbirds and rodents. Rodents are in fact a problem for many farmers as they destroy the walls of the irrigation canals and structures.

3.3.1 Biodiversity and Threatened or Endangered Species

Biological (and "socio-biological") modification of any environment tends to change the species composition of an ecological community. Afghanistan has prepared a comprehensive draft policy on conservation of species and is embodied in the Environment Act. The Act has been submitted to the Cabinet for approval.

Based on conversations with local villager, there were, at one time, many types of wild animals and birds in the remote areas of Khulm District including deer, dogs, foxes, horses, jackasl, leopards, *nanny* (wild goat), rabbit, rams, wolves, and snakes. Wild birds such as cuckoo (fakhta), hoopoe (hototak), pigeon, quail (Budana), owl, nightingale (Bulbul), hawk (Baz), goose (Qaaz), falcon, crow, crane (kolang), and canary were also common. However, a significant decrease in the biodiversity of the area has been noted as a result of many factors including prolonged drought, conflict, increased population, poor land management, and lack of conservation mechanisms enforced by the government

Wildlife and/or Rare/Endangered Species
Although Afghanistan mandates conservation of endangered species in their Environmental Law, the government has not established a national list of threatened and endangered species. As previously noted, Afghanistan adopted the policies of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1985. No protected or endangered species listed by CITES are known to occur or have been reported in the area. Many migratory bird species may pass through the region. As such, creation or degradation of any habitat features (e.g., wetland features associated with Khoja Alghar Spring, or created wetland nutrient filters), may impact beneficially or adversely on some bird species. Siberian Cranes, traditionally migrated 5000 km southeast from Western Siberian over Afghanistan to their wintering grounds in northeast India. The wetlands used by Siberian Cranes is vital to the survival of cranes. Dasht-e Nawar and Ab-i-Estada in southern Afghanistan are among the key sites where Siberian Cranes have been reported to consistently rest during their migration. The project site does not provide a resting habitat for Siberian Cranes.

The project site has traditionally provided pasture land for sheep. Grazing commonly affects plant communities through desertification and introduction of weed species when not carefully managed. Under such circumstances, biological concerns can be socioeconomically important.

Possible biological issues at the site include:

- Protection of wetland resources
- Changes in land use from grazing to agricultural use
- Introduction of weeds and/or insect pests

In general, the project is not likely to adversely affect endangered species.

Forests/Protected Areas
There are no forests or protected areas in the vicinity of the canal area. There are wetlands associated with the Chashma-e-Hayat and Khoja Alghar Springs and riverine ecosystems upstream of the project. A detailed analysis of the project site for wetlands has not been undertaken. The project has a slight potential to affect the hydrology of wetlands upstream, within, and downstream (if any) of the project site. However, it is anticipated that wetlands will not be significantly affected and will ultimately be eliminated from further detailed study.

3.3.2 Proximity to Protected Areas and Forest Resources or Unique or Sensitive Natural Habitat

There are no protected areas or sensitive natural habitats in proximity of the project site. As noted, there are wetlands associated with the Khoja Alghar and Chashma-e-Hayat springs and riverine ecosystems upstream of the project. Based on our field visits to date and conversations with local farmers and government organizations, there are no wetlands within the proposed Mazar Foods project area. Therefore it is not anticipated that the project will have direct impacts on wetland systems. However, analysis of hydrologic regimes will need to be conducted to ensure that upstream riparian areas are not affected by massive surface water usage and drainage. A monitoring program should be implemented to ensure that no adverse indirect impacts occur to wetland systems in the project area.

3.3.3 Proximity to Sensitive Cultural or Archeological Sites

During preliminary site visits, ancient ruins was identified outside the village of Deh Hassan, north of the proposed project boundary. Although this resource is well north of the current project boundary, the proximity of the project warrants discussion in the event that project boundaries are modified.

Khulm is commonly identified with the ancient town of Aornos on Alexander the Great's line of march (330-329 B.C.). Later known as Khulm, it was destroyed in the mid-16th century, the ruins of which are to the north of present day Khulm.

3.3.4 Renewable or Non-Renewable Resources

Rangelands are being depleted by harvesting of perennial shrubs from the sandy rangelands in the project area. These materials are brought to Mazar-i-Sharif , Khulm and other villages for sale and use as heating fuel wood. The loss of this vegetation, used as a fuel source for homes and brick making, is leading to instability of the dune lands in the project area.

3.3.5 Vegetation and Vegetative Cover Loss

Many areas of the Northern river basin are facing degradation as a result of grazing encroachment, poor land management, soil erosion, and vegetation replacement. Inhabitants of villages in the project area harvest annual and perennial shrubs for use and sale as fuel wood and fodder. Villagers stated that in some cases this practice generates their only means of income. In many cases, these shrubs are manually collected by uprooting the entire plant. This practice has dramatic implications and effects on surface soil stability, and leads to increased soil erosion through wind and rain, and lower water holding capacity of the soil (due to mechanical modification of the soil's surface). Furthermore, based on conversations with villagers, they are continuously extending their radius for plant collection as previously harvested areas have not recovered from earlier collection efforts. This indicates that the practice is not sustainable. In its current condition, much of the land on the proposed project site is greatly denuded of most vegetation, save for a low-density scattering of small shrubs throughout much of the area.

3.4 Socio-Economic (Human) Environment

3.4.1 Description of Residential and Occupational Population in or Near the Project Area

There is a bazaar in the town of Khulm. Persons living near the bazaar have access to more work opportunities than persons living at a distance from the town center. Occupations include sheep herder, farmer, carpenter, sign painter, small shopkeepers, tinsmith, tailor, cook, coppersmith, cotton spinner, and carpet weaving.

Much of the area is unfarmed. However, there are some homesteads scattered about and villages dot the landscape. There is also free-range grazing of the traditional type, with shepherds tending flocks, and some harvesting of wild plants for drying and storing as fodder in the area. It is not yet clear whether, under some form of agreement with the Corporation, local communities might be able to continue to exercise grazing, residential, and other rights on the 2,600 hectares that are not likely to be cultivated. This will be a matter for further investigation. (Chemonics 2007).

3.4.2 Description of Previous, Current, and Planned Land Use Activities and Ownership in or Near the Project Area (e.g. agriculture, agribusiness, livestock, and fisheries), including use or habitation by indigenous peoples

Khulm, also referred to as Tashkurgan, has extensive fruit orchards and is a market for wool and sheep and had a notable covered bazaar. Khulm is commonly identified with the ancient town of Aornos.

Irrigation has been practiced in the Balkh area for thousands of years. The earlier records speak of the Achaemenid civilization of 3000 B.C., which had a highly developed society where water and water management were the core of its cultural, religious, and social structure. The flourishing and subsequent decline of the irrigation practices drastically altered the landscape. Throughout the area, remnants of what must have once been large and well laid out canal systems can still be observed..

3.4.3 Other Existing or Proposed Agriculture/Irrigation, Agribusiness Projects in the Region

The Asian Development Bank (ADB) is working with the Ministry of Energy and Water to develop a comprehensive program to improve the irrigation sector in the Balkh river basin. As part of a larger Emergency Infrastructure Rehabilitation and Reconstruction Project (EIRRP AFG Loan 1997), the Government of Afghanistan decided to invest $15 million in the irrigation and water sector. The irrigation rehabilitation civil works (approximate cost: $ 11.1 million) will support the civil works to rehabilitate irrigation systems and develop the contracting process. Eleven canals are planned to be covered under the project.

ADB under TA JFPR 9060–AFG, is undertaking the construction of the Bangala Weir, (located to the distant west of the project site) designed to provide a degree of water management for a very large area amounting to a net irrigable area of some 200,160 ha.

USAID has supported the infrastructure requirements for an industrial park situated outside the Mazar city's boundary. No industries have installed their operations at the site .

3.4.4 Local/Regional Cultural and Institutional Setting

The Balkh Province Provincial Development Plan (BPPDP) reports that approximately 66 percent of the population of Balkh lives in rural districts while 34 percent lives in urban areas. Around 51 percent of the population is male and 49 percent is female. The major ethnic groups living in Balkh Province are Tajiks and Pashtoons, followed by Uzbek, Hazaras, Turkman, Arab, and Baluch. Dari is spoken by about half of the population and 58 percent of the villages. The second-most frequent language is Pashtu, spoken by the majorities in 266 villages (representing 27 percent of the population), followed by Turkmani (11.9 percent) and Uzbeki (10.7 percent).

Balkh Province also has a population of Kuchis, or nomads, whose numbers vary in different seasons. In winter, 52,929 individuals, or 2.2 percent of the overall Kuchi population, stay in Balkh, living in 80 communities. Half of these are short-range partially migratory, another third are long-range partially migratory, and 18 percent are settled. Overall, for long- and short-range migratory categories, less than half of the community migrates. In the winter both groups stay mostly in one area and do not move around during the season. In the summer season, some 120 long-range migratory Kuchi households come from Saripul Province to Balkh Province (BPPDP 2004).

Agriculture is the major source of revenue for 42 percent of households in Balkh Province, including 61 percent of rural households and 7 percent of households in the urban area. Seventy percent of rural households and 6 percent of urban households own or manage agricultural land or garden plots in the province. However, more than half of households (58 percent) in the urban areas, and more than one-fifth of households (21 percent) in rural areas derive their income from trade and services. More than a third of households (35 percent) in urban and at least a quarter (25 percent) in rural areas earn their income through non-farm-related labor. Livestock also accounts for the income of 29 percent of rural households (BPPDP 2004).

3.4.5 Sites of Archeological, Historical, or Cultural Importance

This issue is addressed above in Section 3.3.3: Proximity to Sensitive Cultural or Archeological Sites.

3.4.6 Socio-Economic Characteristics

After almost three decades of conflict, the level and quality of basic services available to many Afghan communities is low by any international standard. This is no less true for communities in Balkh Province, where large segments of the population have minimal access to basic services (BPPDP 2004).

- While access to basic education is somewhat better in Balkh Province than the national average, the level of access is very low compared with many other low-income developing countries.
- Only 12 percent of rural households have access to safe water, and only 10 percent have access to adequate sanitation. In some respects, Balkh Province lags behind the rest of the country, and in any event, these are extremely low levels of access compared with other low-income countries.
- Access to electricity appears to be somewhat better than in a number of other provinces, although levels of access in rural areas are very low.
- About 30 percent of the population in Balkh Province has less than the required minimum daily caloric intake. This appears to be a predominantly urban problem. There are no estimates for the level and distribution of income for the province, but these caloric intake data suggest that around one-third of the population of the province may be below the poverty line.
- If earlier national estimates of the literacy rate of people aged 15 years and above applies to Balkh Province, it would imply that about two-thirds of this population group is illiterate—that is, as many as 500,000 of the 800,000 in this age group may be illiterate.

Table K summarizes key socio-economic indicators for Balkh Province as presented in the 2005 *National Risk and Vulnerability Assessment*.

Table K – Selected Social Indicators for Balkh Province and National Averages

Social indicator	Balkh Province	National Average
Population (mid-2005 in millions)	1.5	29.9
Urban	0.5	10.2
Rural	1.0	19.7
Households (in thousands)	214	4,276

Urban	73	1,457
Rural	141	2,819
Average household size (number of members)	7.0	7.0
Overall literacy rate (% of population 6 years & older)		
Female	32.0	18.0
Male	54.0	36.0
Net enrollment rate for 6-13 year-olds (% of 6-13 year old population)		
Female	48.0	29.0
Male	66.0	43.0
Population with single-family house (% of total population)		
Rural	92.0	77.0
Urban	77.0	63.0
Households with access to safe water (% of total households)		
Rural	12.0	26.0
Urban	67.0	64.0
Households with access to electricity (% of total households)		
Rural	14.0	4.0
Urban	92.0	66.0
Households own/manage agricultural land	48.0	47.0

(% of total households)		
Households with access to irrigation (% of total households)	67.0	74.0
Population under minimum daily caloric intake (% of population)		
Rural	17.0	30.0
Urban	53.0	31.0

Table L compares selected social indicators for a group of 12 low-income countries, who are among the poorest in the world, with those for Afghanistan.[18] The GNI per capita for these 12 countries is estimated at about $240 in 2005, compared with the $230 for Afghanistan (ANDS.

Table L - Selected Social Indicators for Afghanistan and Averages for 12 Comparable Low-Income Developing Countries

Indicator	Afghanistan	Group of 12 LDCs
Population mid-2005 (mill)	30	22
GNI per capita 2005 (US$)	234	243
Below international poverty line (% of population)		
Less than US$1 a day	35	34
Less than US$2 a day	72	69
Adult literacy (% population 15 years & older)		
Male	43	46
Female	13	34
Net primary school enrollment (%) 66		

[18] 12 countries are as follows: Burundi, Ethiopia, Madagascar, Malawi, Mozambique, Nepal, Niger, Rwanda, Sierra Leone, Tajikistan, Tanzania, and Uganda.

Children underweight (% of children under 5 years)	39	32
Access to safe water (% of population)	39	52
Access to adequate sanitation (% of population)	12	32

Afghanistan lags behind these countries in adult literacy and access to safe water and sanitation. Almost 40 percent of children under five years of age are underweight, compared with about 32 percent for the comparable countries. Estimates of the number of people in Afghanistan living on less than US$1 a day are not available, but the recent National Risk and Vulnerability Assessment, 2005, indicated that about 30 percent of the population had a caloric intake below the required minimum daily average.

These results suggest that the average incidence of poverty for the comparable countries is likely to be broadly applicable to Afghanistan. About 34 percent of the population in those countries lives on less than US$1 a day, and about 70 percent lives on less than US$2 a day. If these levels of poverty are representative of conditions in Afghanistan, the implication is that about 11 million people are living on less than $1 a day, and as many as 22 Khulm communities have been not able to irrigate all their own land and the most significant issues related to the irrigation problems associated with the Khulm irrigation network are broad social and socio-political problems. These include:

- The loss of trust between people and the prevalence of narrow self–interest as a result of almost 30 years of conflict and civil war.
- The absence of a functional government and the breakdown of traditional social structures and community authority.

Specific irrigation related socio-economic issues currently facing communities of Khulm include:

- The shortage of irrigation water during the low-flow period (July – Sep) appears to critically impact crop yields for many communities of Khulm.
- Many other districts are continually looking for more profitable crops to grow due to their apparent access to unlimited water. This results in more attention to the cultivation of high-water-demand crops such as rice and cotton.

Because upstream users of the Khulm River are consistently abstracting more than their rightful share of water, water often does not reach the most downstream villages. Consequently, downstream Khulm villages face the following problems:

1) Villages and marginal agricultural lands are being abandoned due to lack of irrigation water, resulting in urban migration.
2) Many Khulm communities have serious drinking water shortages.

3) Economic development is constrained by a lack of irrigation water for most, if not all, Khulm villages. Many of these villagers depend increasingly on subsistence farming and daily laboring.
4) Economic development is not constrained among communities capable of irrigating all of their land; they are able produce two crops per year (where this was often not previously the practice) and engage in more cash cropping.
5) Khulm villages are typically poorer than other villages; families from Khulm villages have fewer coping strategies and are therefore more vulnerable.

4 ENVIRONMENTAL CONSEQUENCES

4.2 Potential Adverse and Beneficial Impacts of Mazar Foods Agricultural/Irrigation Actions during Design, Construction, Operation, and Maintenance

4.2.1 Water Hydrology, Demand, Quantity and Quality, and Aquifer Abstraction Impacts

Water Quantity and Demand

Quantity—After a modest requirement in 2008, the volume of water to be withdrawn from the aquifer for agricultural purposes rises sharply to about 83 million m^3 a year by 2014. An allowance must be added to this estimate for non-farm water uses. The implication is that perhaps as much as 90 million m^3 of water will be used on the farm at full production. An issue requiring careful examination is whether an annual withdrawal of this quantity of water will create shortages for communities and other users of this water source. Detailed hydrogeologic parameters for the aquifer in the project area, including hydraulic conductivity, transmissivity, capacity, and recharge rate, are unknown; therefore the impact of groundwater abstraction cannot be determined at present. Subsurface hydrogeologic studies are planned to take place at the farm site beginning in February to June 2008.

Kamal and Favre (2004) report an estimated annual flow of 60 million m^3 within the Khulm River, which is assumed to be the primary source of aquifer recharge to the area. Much of the surface water from the Khulm River is currently utilized to support irrigation and domestic water uses in Khulm and outlying villages. Though much of the surface water utilized for irrigation is returned to the aquifer, a large percentage of it is lost to evapotranspiration. Accurate estimates of loss through evapotranspiration are not readily available. A large portion of the area proposed for the Mazar Foods farm site lies beyond the current typical reach of surface water from the Khulm River, as evidenced in part by the lack of human habitation in these areas (between Oljatu and Naebabad villages). Surface water derived from the Khulm River clearly would be unable to meet the projected demand of 90 million m^3 of water when the farm is fully operational, in addition to meeting the needs of current users.

Much of the information related to current groundwater conditions and trends presented in this EA is derived from data concerning relatively shallow wells; wells reaching 40 m – 120 m below ground surface. It is apparent that the technologies needed to drill deeper wells are not readily available in the region. The proposed hydrogeologic study will explore geology in the area to depths of more than 300 m below ground surface. As such, there is a significant chance that untapped groundwater resources will be made available. Drilling and maintaining deep wells, however, does require equipment and training that may be a constraint in a setting like Mazar-i-Sharif. Energy inputs required for this purpose will be also significant

Based upon the apparently limited amount of non-saline water resources in the local aquifer system, the relatively small quantity of surface water available from the Khulm River, and the drop in groundwater levels throughout the region, an annual withdrawal of groundwater at a rate of 90 million m^3 may not be sustainable over the long term. Sustainable groundwater abstraction depends on adequate recharge to replace the water being removed from the aquifer system by pumping. The recharge rate for the aquifer is at present unknown and will need to be determined.

Additional concerns associated with rapid groundwater withdrawal are the increased potential for land surface subsidence and potential salt water incursion (discussed below under Water Quality).

As previously stated, full assessment of the impacts of groundwater withdrawal will require additional study and discussion in a Supplemental Environmental Assessment once that information becomes available.

Water Quality

The quality of underground water resources the Khulm area varies in different locations (Ashworth, 2005). For example, TDS concentrations range from 1,000 – 35,000 mg/l in the Khulm watershed near the project site. The Mazar Foods project area is located where TDS concentrations may range from 3,000 –10,000 mg/l, which, depending on soil type, may not be suitable for agricultural use. If saline groundwater is used for irrigation in an arid climate, such as in the project area, there may be a risk of groundwater—as well as soil—salinization. Irrigation water is strongly evaporated and transpired when applied to agricultural land. Dissolved salts are concentrated in that portion of water not lost to evapotranspiration, but which may infiltrate the ground and seep down to the water table, increasing groundwater salinity. The same groundwater may then be abstracted and reapplied for agriculture. This "recycling" of groundwater for irrigation may thus result in a progressive increase in soil and groundwater salinity. This is a further argument for preferring surface water (which is generally less saline than groundwater) over groundwater for long-term irrigation purposes (Ashworth 2005).[19]

Increased pumping from groundwater systems with limited capacity and slow recharging rates tends to result in increased concentration of dissolved solids in the water, a process referred to as saltwater incursion. If water resources are abstracted from the aquifer at an unsustainable rate, water chemistry will almost certainly be affected.

Detailed technical assessment related to groundwater investigation, including water quality analysis, is scheduled to begin in February 2008 and conclude in June 2008. Results of the technical assessment will require that a Supplementary Environmental Assessment be prepared to address:

i) the issue of adequate water supply to meet agricultural and domestic demands in the area and the specific sources;
ii) whether groundwater withdrawal exceeds the rate of recharge from surface water sources in the area (e.g., Khulm River and Khoja Alghar Spring) leading to a falling water table with potential long-term changes to chemical characteristics of groundwater (e.g., salt water incursion in the aquifer); and
iii) competing water uses in the region (e.g., proposed future development of the Mazar-i-Sharif Industrial Park) that may increase the demand for water in the project area, and could exceed the estimated requirements for the Mazar Foods Project.

Water abstracted from the aquifer will also in all likelihood be used to meet drinking water needs, requiring water testing for potability and applying WHO water quality parameters. These standards cover biological, chemical, metal, and radionuclide contaminants, with recommended maximum contaminant levels (MCLs) that are

[19] Ashworth, J.M. 2003. Groundwater Assessment of the Downstream Portions of the Balkh and Kulhm Watersheds - Inception Report. Prepared for Ministry of Energy and Water under ADB Loan 1997 AFG: Emergency Infrastructure Rehabilitation and Reconstruction Project, Traditional Irrigation Component.

considered safe for human consumption. The potential presence of arsenic is of particular concern to USAID due to problems of arsenic poisoning from wells provided through USAID project funding in Bangladesh.[20]

4.2.2 Water Management Issues _ Demand Management, Distribution System Construction, Operation and Maintenance, Use of Equipment, and Equipment Maintenance

Based on public consultation with village leaders, a water use management association prescribes water distribution patterns in the Khulm District. Distribution is based on the amount of land owned and historical water rights. It is not certain if the proposed Mazar Foods Project would be subject to the requirements of this management association; but if irrigation water is drawn from sources other than deep boreholes (e.g., the Khulm River), Mazar Foods would have to engage with the traditional association. If the project is located on privately held land and derives water from a source other than the Khulm River and Khoja Alghar spring, the project could operate without being subject to the association's requirements.

Once irrigation systems are in place, resources and trained staff will need to be allocated to the operation, maintenance, and repair of the water distribution system. Equipment procurement, construction, and maintenance of the irrigation systems are expected to require a significant labor force and require at least a temporary sharp rise in resource allocation (such as employment and transportation) during construction. Under the Supplemental Environmental Assessment it will be essential to evaluate available irrigation technology with respect to proposed crops and present a further discussion of preferred alternatives.

4.2.2.1 Summary of impacts associated with water resources

The potential impacts to water resources as a result of implementation of the proposed action are summarized by the following points:

- potential to draw down water levels, causing existing drinking water wells in villages to go dry;
- potential for unsustainable well yields in the long term;
- exceeding the capacity of the surface water resources to adequately recharge groundwater resources;
- potential for land subsidence;
- impacts to water quantity will be negligible during design and construction phases of the project relative to the operational demand for water;
- potential to adversely affect groundwater chemistry (e.g., increased salinity) through excessive pumping of wells; and
- potential to adversely affect surface soil conditions as a result of mineral deposit accumulation in the soil.

[20] More information concerning arsenic contamination and USAID's work in Bangladesh can be found in a variety of USAID-funded project documents, including *Annual Report: Food Security in Bangladesh: Improving Wheat, Maize and Papaya Production and Impacts of Arsenic Contamination* (August 2003), located online at http://pdf.usaid.gov/pdf_docs/PDACJ807.pdf

Following completion of the detailed hydrogeologic studies, a Supplementary Environmental Assessment will address and quantify the potential impacts of the Mazar Foods Project on water resources.

4.2.4 Potential Pesticide-Related Impacts

A pesticide must be effective in the control of the target organism when applied in a convenient manner at a predetermined rate. Few pesticides possess a high degree of specificity, with most of them being toxic to target and non-target organisms alike. They therefore carry a potential hazard to ecological system stability and human health. Health impacts extend to those who transport, apply, store, and dispose of pesticides, as well as to those who consume the treated crop.

It has been estimated that at least three million cases of pesticide poisoning occur worldwide each year, with 220,000 deaths. The majority of these poisonings occur in developing countries where less protection against exposure is applied, knowledge of health risks and safe use is limited, and harmful pesticides are easily accessible. Despite the magnitude of the problem of pesticide poisoning, there have been very few analytical studies in developing countries to identify risk factors.
The dangers of pesticide use to human health can be summarized as:

- acute poisoning caused by intentional, occupational, or accidental exposure; and
- adverse health effects caused by long-term (mainly occupational) exposure.

The high use of pesticides in irrigation schemes makes the study of pesticide-related health problems especially relevant to irrigation communities.

Chemicals such as parathion and metamiphos, trade in which is subject to the Rotterdam Convention, are freely imported from neighboring countries and sold in the Khulm bazaar by traders with no knowledge of their properties. Such products are a hazard to those who use them, aggravate pest problems by killing natural enemies, and reduce the value of export products that may be contaminated by them. As is the case in so many other sectors, plant protection in Afghanistan suffers from a lack of trained and experienced personnel.

The measures taken recently in the U.S. should help to reduce potential problems related to parathion, but they merely highlight the difficulties of using such a product under conditions that exist in Afghanistan, where protective clothing and training are often lacking or ineffective. As a result, methyl parathion should be more severely restricted in Afghanistan.

4.2.5 Impacts of Fertilizer Use

Excessive and incorrect use of mineral fertilizers used in agriculture can adversely affect agricultural productivity and the environment. Because there is no institutional quality control mechanism in Mazar-i-Sharif (and throughout Afghanistan in general), the quality of fertilizers imported and made available to farmers is questionable. Interviews with various governmental and NGO workers in the agriculture sector indicated that fertilizers imported from Pakistan are are commonly mislabeled and diluted. Also, most farmers are illiterate and lack the knowledge to properly identify or use fertilizers.

The overuse of fertilizer can negatively impact the Project area environment. Fertilizers can run off the soil surface and contaminate nearby streams, which provides a source of drinking water to both farm animals and persons in nearby communities. Fertilizers also have the potential to contaminate groundwater when over-applied. The nitrogen content of fertilizer is converted to nitrate by biological processes in the soil. Nitrate is mobile in soils and can leach into the groundwater. High levels of nitrates in water collected from wells can be hazardous to public health.

Any fertilizer application has to be considered in the context of the overall farming system, including the use of organic manure, soil cultivation, and crop rotation, all of which influence the efficiency of nutrient use. Generally, farmers are required to be made aware of the challenges and problems associated with the use of fertilizer in their farms.

4.2.6 Seed Selection and Genetically Modified Organism Issues

Mazar Foods will not be using genetically modified crops. Improved cantaloupe hybrids will be used that are resistant to the common melon virus. Hybrid crops are known for their vigor and increased insect and disease resistance. The issue is primarily financial in nature: as Mazar Foods will not be able to use the seeds from a hybrid crop to grow the same crop the following year, there has to be some benefit in hybrid seeds to justify the purchase of new seeds each year.

4.2.7 Potential Impacts on Soil Conditions, Including Soil Erosion

Improperly managed agricultural land can suffer significant erosion impacts as a result of grazing, excessive rain, and flood irrigation. The proposed Mazar Foods Project will likely have a beneficial impact; in some ways reversing the negative impacts of vegetation cover loss. This may be achieved in two ways: first, the proper management of irrigated fields will likely reduce the amounts of soil that are susceptible to wind and water erosion; secondly, by providing an alternative means of income for the local population, the unsustainable practice of shrub collection for fuel wood and fodder can be minimized. Fuel wood could then be purchased, or at minimum, local residents could be provided with the proper tools (e.g., hand-held shrub clippers/pruners) and education regarding sustainable fuel wood collection methods.

Left unmitigated, and improperly managed, however, the effects of soil erosion can be drastic. A clear example of the effects of excessive surface water use resulting in erosion is the expanding sand dune field known as the Dasht-i Shortepa, located north of the project site and extending to the Amu Darya River. Historically, the surface water drainage network of creeks emanating from the Khulm River reached the Amu Darya River; however, centuries of traditional irrigation have resulted in these waters being diverted to irrigated fields that now prevent the flow of surface water to the Amu Darya River. This dune field has been slowly expanding for hundreds of years, and now covers what was once an irrigation canal that carried water from the Amu Darya River to the Khulm region. If agricultural development in the project area fails after years of surface soil manipulation, it is likely that it will contribute to an increased rate of sand dune expansion due to the effects on surface soil mechanics.

Increased deposition and leaching of salts in surface soils can drastically modify the arability of the land and ultimately result in hyper-alkaline soils that support virtually no vegetation. Such

cases have been documented in the Helmand Province in southern Afghanistan and the agricultural fields that once surrounded the Aral Sea. Although detailed data regarding the groundwater and surface soil chemistry is not yet available for the project area, information gathered from irrigation systems restoration work in the nearby Balkh watershed (located 120 km west of the site, also in the Northern river basin) can be utilized as a reference due to the relatively similar hydrologic conditions present.

Soil studies conducted by Sredazgiprovodkhlopok (1967) and JEC (1973) determined that land reclamation was essential to improving the overall quality of the lands, and that installation of a drainage network was necessary prior to any leaching with irrigation water (JFPR IEE: Bangala Weir, Feb07). Driscol (1986) suggests that if water with a salinity of 1,900 – 6,200 TDS is used for irrigated agriculture then the soils must be permeable, drainage must be adequate, considerable excess irrigation water must be applied, and very salt-tolerant crops should be selected.

As previously mentioned, there is a slight concern for surface soil subsidence as a result of excessive groundwater withdrawal. Soils rich in carboniferous materials and dolomites are subject to dissolution and mobilization as a result of groundwater movement. The geology of the area suggests such soils may be present at great depths below the ground surface in the project area as a result of the limestone parent materials in nearby mountains. Ground surface subsidence is not anticipated to be a significant concern at the project site; however, additional detailed analysis of this issue can be presented in a Supplemental Environmental Assessment following the proposed soil and groundwater studies at the project site.

4.2.8 Impacts on Vegetation

The Proposed Action is not likely to have adverse impacts on existing vegetation. Because the Proposed Action is intended to provide a legitimate means of livelihood for local populations, it will serve to alleviate the pressures placed on local ecology caused by harvesting of native shrubs for fuel wood as a means of income. Furthermore, it is suggested in the Mazar Foods business plan that trees will be planted as wind breaks and biodiversity enhancement measures. Such practices would have beneficial impacts to vegetation and biodiversity.

Nonetheless, a potential indirect impact of the project on vegetation would be the continued collection and use of shrubs, as well as forestry resources in remote locations (away from the project site), as a fuel wood to support the heightened demand for building materials (specifically bricks) and domestic needs of the increased population in the project area.

With the introduction of new land management practices and plant species, there is a potential for weeds (non-native, invasive plant species) to be introduced in the region. The potential for such problems can be minimized by implementing a strong seed selection protocol, as well as a field monitoring and eradication program that includes inspection by trained personnel.

4.2.9 Other Potential Impacts on Natural and Biological Resources

No other impacts to biological resources are anticipated.

4.2.10 Potential Effects on Biodiversity and Threatened or Endangered Species

No impacts to internationally recognized threatened or endangered species are anticipated. As previously stated, the project may have beneficial impacts to biodiversity if non-cropped areas are planted with windbreaks and harvesting of wild native shrubs can be curbed.

4.2.11 Potential Impacts on Parks, Reserves, or Other Protected Areas

No parks, reserves, or other protected areas are known to exist in the project area. Therefore no such areas will be affected by the Proposed Action.

4.2.12 Potential Adverse and Beneficial Human Impacts

Potential adverse impacts are difficult to predict, as a number of key aspects of the project will not be known until the technical assessments.These are to be addressed in the Supplemental Environmental Assessment, planned for the summer of 2008. Among the key issues that will require careful examination is whether the annual withdrawal of perhaps 90 million m^3 of water will create problems for communities and other users of this water source.

The Mazar Foods Corporation can play a significant role in increasing the wealth of the populace in the Khulm region, in addition to serving as a replicable project for other parts of Afghanistan. The opium trade is destabilizing, contributing to insecurity and undermining the rule of law. The Mazar Foods Corporation can help restore the agriculture sector in Khulm and demonstrate that people have a legitimate means to earn a living.

4.2.12.1 Population and Settlements (including impacts on adjacent communities – health, water, waste)

Land Ownership
As most of the allocated project area is officially government-owned land, the Proposed Action will not raise issues of resettlement. A general agreement has been reached with all claimants to land; they will benefit by leasing the land to the project for the period of 99 years. However, potential conflicts over current ownership exist which will require resolution, as well as the establishment of the compensatory leasing arrangements.

Water
Access to water, rather than a scarcity of land, remains the greatest obstacle to agricultural development for farmers and communities in the Khulm area. The Chashma Hayat spring (see Photo 3 below) is the only source of water for both irrigation and drinking purposes. Mitigation measures will be required to ensure that abstraction of 90million m^3 water does not adversely affect this resource. In addition, the quantity and quality of potable water from existing sources may be adversely affected by borehole abstraction from the aquifer.

Waste
The potential exists for accumulation of significant quantities of agricultural waste with spillover effects on workers and adjacent communities for which mitigation measures will be required. Liquid wastes associated with agricultural processing facilities may also become significant as production expands, with potentially adverse effects on surface and groundwater, both on-site and on neighboring lands. Potential impacts of human waste from up to 7,000 workers will require effective water and sanitation strategies and facilities.

Health
Beneficial health effects on farmers and neighboring communities can be expected as a result of both the construction of a proposed clinic on-site, as well as the potential for implementation of health programs and water and sanitation projects under Mazar Development Foundation-funded community initiatives. However, potential adverse health affects can occur if latrines, clinics, and potable water systems are not designed and managed in an environmentally sound manner. Best practice environmental guidelines will need to be employed to minimize these effects.

Photo 3: Chashma-e-Hayat Spring Chashma-e-Hayat Spring, located along the Khulm River in the Tangi Tashkorghon, south of the town of Khulm. Water derived from this spring joins the Khulm River and provides much of the surface water utilized for irrigation in the Khulm District.

4.2.12.2 Sensitive Cultural, Historic, or Archaeological Resources

As mentioned in the Scoping Statement, ruins of the ancient town of Aomos has been identified outside the village of Deh Hassan, approximately 5 km north of the project site. Although this resource is well north of the current project boundary, the proximity of the project warrants discussion in the event that project boundaries are modified.

Specific measures must be in place to protect the historical resource during and after the project is completed. As projected, approximately 7,000 – 8,000 people will be working at the Mazar Foods Corporation, with the increased population posing a potential threat to the ruins. Khulm is commonly identified with the ancient town of Aornos on Alexander the Great's line of march

(330-329 BC). It was destroyed in the mid-16th century. Before the project is initiated, local authorities—at both the provincial and district level—must be contacted to ensure the protection of these historical resources. Cataloging of the site within the proposed development area is a mitigation measure that could help protect the historical area.

4.2.12.3 Potential Health and Disease Impacts in the Project Area and Regionally

Communicable diseases in the Balkh area are tuberculosis (TB), cholera, and hepatitis A. A screening program for early detection and treatment for Khulm farm workers and their family members who are at risk for and/or living with communicable disease is advised. At least 100 agricultural workers will need to be educated about communicable diseases; 50 of these will be tested for TB. Workers testing positive will be referred to a "Basic Package Health Service (BPHS)" health center.

BPHS is official policy of the Islamic Republic Government of Afghanistan. It is used as the basis for implementing health programs and should be available as an integrated whole, rather than being available piecemeal, as individual services, or only through vertical programs. The BPHS provides a comprehensive list of services to be offered at four standard levels of health facilities within the health system: the health post, basic health center, comprehensive health center, and district hospital. The national health policy emphasizes a *community based health care* component, including the training of female health workers. The aim of the *community based health care* component is to improve coverage of health services and ultimately reduce high mortality and morbidity among children and women.

The Mazar Foods Corporation will need to undertake the following activities to contain communicable diseases:

1. Water shall be readily available to both shed and field workers in covered containers with sanitary drinking fountains.
2. Water for drinking and hand washing shall be obtained from a properly protected and located ground water supply approved by the local director of health.
3. Hand-washing facilities shall be available for shed and field workers.
4. Portable or permanent privies shall be provided in adequate numbers and shall be readily accessible to all workers.
5. Privies are to be located hundred feet from kitchen and dining rooms, living quarters, or source of water supply.

4.2.12.4 Potential Occupational and Safety Hazards in the Project Area and Regionally

Agriculture is one of the most hazardous industries in the U.S. While Afghanistan does not keep annual statistics on occupational fatalities or work-related disabling injuries, physically demanding tasks, utilization of machinery, and exposure to environmental toxins make farming an inherently dangerous occupation. The diversity of tasks, work environments, and workforce demographics associated with agribusiness creates unique ergonomic and workplace safety challenges.

The lack of safety regulations, inconsistent employee training regarding hazards and use of personal protection equipment, and the perilous nature of the agricultural industry combine to create a work environment that is fraught with potential for injury. Machinery-related injuries and deaths, falls, respiratory disorders, certain cancers, neurologic disorders, skin problems, hearing loss, burns, eye injuries, and stress all occur frequently in agriculture. Because of the physical nature of their work, farm workers are prone to musculoskeletal disorders, which can be particularly problematic. Back pain, repetitive motion injuries, sprains, and strains can be difficult to heal without cessation of the causative activities.

Clinicians can obtain an occupational history to identify individuals at risk for agricultural injuries and counsel workers about safe machinery practices, and use of personal protective equipment. Mazar Food management can enact meaningful workplace safety guidelines.

4.2.12.5 Other Socio-economic Consideration, with an Emphasis on Conformity with ILO Standards and Destination Market

Based on International Labor Organization (ILO) standards, employment policy of Mazar Foods Corporation will be such that no personnel under the age of 18 will be hired to work on the farm site.

4.2.13 Energy and Other Resource Commitments

Electricity is planned to be provided by import from Uzbekistan via a 220 kva transmission line. Budgeting for supply of power to wells and the administration and processing compound of the farm has been based on this premise. As production wells begin to come on line mid-2008, they will be powered with diesel fuel driving submersible well pumps either through electric power generators or through the linkage to diesel-mechanical power.

Attention should be paid to minimizing the potential for contamination of soils and water supplies associated with storage of fuels, fueling engines, and maintenance of diesel equipment. The amount of air pollution generated from the diesel power generators will be minimal and will not affect ambient air quality.

Consumption of wood and biomass for cooking and heating may also result in loss of vegetative cover beyond the project area, requiring a program of conservation and forest management to counter potential adverse affects.

4.3 Impacts of No Action Alternative

The No Action Alternative would leave the existing natural, human, and social environments unchanged. This alternative would result in continued poverty and fail to meet USAID's objectives of restoring meaningful livelihoods in Afghanistan. An estimated 80 percent of Afghans are dependent on agriculture for their livelihoods. Afghanistan historically has been a prolific producer of high-quality agricultural products, and the Proposed Actions would help to provide the rural populace with licit alternatives for high-value agricultural production.

5 Proposed Environmental Prevention and Mitigation Measures

Proposed Environmental Prevention and Mitigation Measures are presented for each of the environmental resources described in Section 4 that are likely to be affected by implementation of the project. The following sections describe mitigation measures for appropriate resources that will be affected by each phase of the project: Design, Construction, and Operations Phases. In addition, for certain actions, alternative mitigation measures are presented for applicable environmental resources.

5.1 Design Phase Mitigation (Mazar Foods site selection, irrigation technologies)

Design-phase mitigation measures are primarily directed at minimizing impacts during construction and operations phases of the Mazar Foods Project.

5.1.1 Site Selection

In order to minimize land use and tenure conflicts during the project, careful site selection for the farm lands will be required. Land owned by the government should be given priority when deciding on the final site location for the Project. Studies on hydrology and soils currently being conducted in the Balkh region with USAID funding will allow an informed decision on the preferred site location. These studies are to be completed by early summer of 2008. Detailed aerial photography and topographic maps of the site are also scheduled to be completed at that time. This information, together with follow-up socio-cultural and socio-economic analysis, should provide a clear site choice and allow for further specification of the farm layout, including land leveling requirements, soil suitability, land ownership mapping, and the design of specific mitigation and monitoring measures.

5.1.2 Selection of Irrigation Technologies

Irrigation technologies should be selected based upon a calculated balance of crop needs, water resource consumption and conservation, soil drainage characteristics, system durability and flexibility, initial capital investment requirements and limitations, O&M labor force and training requirements, and operational costs. The system's water conservation ability should be given greater weight when determining which systems to utilize, since water resource availability is the greatest limiting factor for the proposed project and will, in the long-term, prove to be what determines the sustainability of the Mazar Foods Corporation farm site.

In all likelihood a variety of irrigation technologies will be needed because of the size and scope of the Mazar Foods project. The selection of technology and irrigation methods must be tailored realistically to Afghan environmental and social conditions in the area. Based on experience in the Afghan setting, it will be important to ensure effective maintenance training for farm staff (combined with maintenance contracts) for the selected technologies. Attention to provision of

spare parts should extend to ensuring efficiency in procurement and delivery and a sufficient measure of redundancy over the life of the project. This is also true for distribution equipment. The provision of adequate trained maintenance personnel for pumping systems is essential. The approach taken to ensuring farm staff are sufficiently trained in the operation and maintenance of the water distribution systems will also be critical. The degree to which the Project can be assured of reliable energy and dependable transport networks will also affect irrigation technology choices.

5.1.3 Water Demand and Conservation

Water demand and conservation mitigation measures are primarily a concern of the Operations Phase of the project; however, on-farm water use can be reduced substantially without decreasing productivity through improved irrigation technologies and efficient water management practices that should be considered in the Design Phases of the project. Additional discussion regarding water conservation mitigation measures is presented in Section 5.3.1—Water Conservation, Operations Phase Mitigation.

5.2 Construction Phase Mitigation

Construction-phase mitigation measures should be utilized to actively minimize impacts caused by actual construction activities. Where impact avoidance and minimization are not realistic, mitigation measures and alternatives are presented.

5.2.1 Construction Materials Acquisition and Support

Where feasible, the Project should utilize local materials for construction, but avoid use of fired brick because of potential deforestation impacts in the region. An assessment should be carried out to determine the potential for using quarried stone. If this alternative appears feasible, mitigation should include the development of a quarry or borrow pit management plan to reduce environmental impacts and minimize health and safety hazards.

5.2.2 Access Roads

Construction of access roads will lead to short-term air quality impacts and noise. These impacts will be mitigated by implementation of standard engineering controls and construction best management practices, and could include application of water for dust control, use of emissions controls and mufflers on construction vehicles, etc. For non-paved surfaces, and if road materials are acquired from borrow pits, a simple management plan should be developed for the location of pits and for environmentally sound excavation and restoration. The long-term impact of unplanned borrow pit development should be addressed in the plan. Road development should take into account local soil erosion conditions, including effects of wind, extreme rainfall events, or flooding though a review of historical precipitation data or interviews with village elders.

5.2.3 Biological Impacts

Local villagers in the project area rely heavily on hunting as means of procuring food. Due to the socio-economic conditions of the area, lack of established and enforceable conservation regulations, and probable lack of education regarding conservation, it is not likely that these patterns will change with respect to implementation of any conservation measures. An increased population in the project area will likely have indirect effects on biological resources, although it is not clear to what extent. There are no readily available data regarding game and wildlife population trends in the area, other than an internationally recognized general trend in decreasing populations of waterfowl and large mammals. In all probability, the project has the potential to attract increased numbers and diversity of birds, particularly migratory species. As a result, these species may in fact be adversely affected by traditional hunting practices in the area. Afghanistan does have in effect regulations regarding hunting; however it is not known how well these laws are enforced, or will be enforceable. Since one of the goals of the project is to increase financial stability among individual families in the region, it is envisioned that a movement away from traditional hunting can be facilitated by greater financial flexibility and means with which to purchase such foods

Currently, villagers in the Khulm District rely heavily upon collection of native shrubs, grasses and forbs that grow in the project area and nearby mountainsides for use and sale as fuel wood and fodder. The practice of collecting these plants is not likely to dramatically subside as a result of implementation of the project, therefore a potential mitigation measure for income displacement and biological diversity enhancement is the establishment of crops of these native plant species in certain areas of the farm site, particularly around the perimeter. Although these plants are not considered traditional agricultural products, in the context of the region, they provide an opportunity for mitigation because they are drought tolerant, require little water to be established, and will grow rather rapidly with only minimal additional water input. Growing these shrubs in an agricultural setting would satisfy several objectives by:

1. creation of buffer zones around the perimeter of the farm that would aid in stabilization of soils and prevention of sand dune encroachment;
2. provide a sustainable crop of fuel wood and fodder
3. continue to provide a means of income to local villagers working the farm area

5.2.4 Erosion, Dust, and Noise Control

Construction activities will result in short-term air quality impacts and noise. These impacts should be mitigated by implementing standard engineering controls and construction best management practices; for example, application of water for dust control and use of emissions controls and mufflers on construction vehicles.

Erosion control is not anticipated to be a major issue during project construction. However, standard temporary storm water management procedures should be implemented at construction sites in order to reduce the amount of pollutants (e.g. construction materials and chemicals, concrete, and sediments) discharged to the environment from construction sites).

5.2.5 Energy and Water Provision during Construction

The construction phase of the project will result in a dramatic increase in energy requirements in the form of fuel (for vehicles) and electricity. Energy conservation should be utilized at all phases, including the use of renewable energy to reduce the impact of energy use. For example, the farm will produce vegetables for drying. A solar dryer could be effective for this purpose. The Mazar area has high solar insolation and solar water heaters could provide hot process water and accrue savings in fuel use. Power and fuel shortages occur frequently in Afghanistan and could delay construction activities unless alternative backup energy supplies are available.

5.2.6 Construction Camp Operation and Management

Standard construction best management practices should be implemented in order to minimize the potential for impacts from construction camps. These include proper provision of water and sanitation (e.g. Ventilated Improved Pit (VIP) latrines); energy for cooking and heating which does not rely on non-renewable harvesting of trees or shrubs; fuel storage and maintenance areas designed to minimize soil and water contamination (e.g., fuel tanks in secondary containment); and a well-managed solid waste site with an established plan that prevents access by animals or children, ensures frequent below-ground burial, and minimizes the opportunity for disease transmission by vectors including, insects, small mammals, birds, and grazing animals.

5.2.7 Worker Community Health and Safety

During the construction phase it is likely that injuries and community health at large will be a prevalent concern. A Basic Health Service Program should be implemented that includes provision of a clinic at the development stage of the project. Additional details regarding community and occupational health and safety are discussed in the Operations Phase Mitigation Measures section below. Best practice guidelines for medical waste should be followed—these are available at: http://www.encapafrica.org/egssaa.htm. Many of the concepts presented in that section can apply to the construction phase, as appropriate. Arrangements also need to be made for the identification and effective management of activities with risks to health and safety. These activities may include: the storage and distribution of materials; the movement of vehicles on site; control and disposal of waste; and protection from falling materials.

5.2.8 Construction Phase Waste Minimization and Disposal

Construction waste often consists of large quantities of inert rubbish, such as wrapping and packing material, scrap wood and metal, paper, wood, and surplus/scrap construction materials. During the construction phase, provisions for site cleaning and maintenance should be made available to workers so that proper waste disposal is achieved. A policy guiding waste disposal activities should be conceived in the early stages of project development. Workers should be trained and made aware of proper waste disposal procedures. Waste minimization strategies should also be incorporated at all stages of construction. A municipal landfill is located in Mazar-i-Sharif, although it is not clear if construction waste from other districts can be disposed of at this site. Nor is this site managed in an environmentally sound manner. (See Photo 4 below) Development of an on-site landfill in a relatively remote or safe location is recommended.

Photo 4: View of the municipal landfill conditions in Mazar-i-Sharif. This landfill collects solid waste from the city of Mazar-i-Sharif, however it is not operated in an environmentally sound manner as evidenced by the lack of daily cover, exposed waste and uncontrolled access to the site.

Hazardous materials, chemicals, and concrete utilized during the construction process require specialized disposal procedures that should be developed as part of an overall construction management program.

5.3 Operations Phase Mitigation

5.3.1 Water Conservation

On-farm water use can be reduced substantially without decreasing productivity through improved irrigation technologies and efficient water management practices. Accurate water measurement and soil moisture monitoring are key components of efficient on-farm water management practices. Irrigation flow meters can be used to help calculate the efficiency of irrigation systems, identify water loss from leaks in conveyance systems, and to accurately determine necessary amounts of water based on soil moisture levels and weather conditions. Soil moisture monitoring should be used in conjunction with weather data and crop evapotransporation requirements to schedule irrigation. Fields should be designed for efficient water use by grading land, creating furrow dikes to conserve rainwater, and by retaining soil moisture through conservation tillage.

Using surge flow valves and reusing runoff water can increase water use efficiency for gravity irrigation systems. Drip irrigation is a very water-efficient method of irrigation that can be effective with certain crops and on uneven terrain.

A detailed water quality analysis needs be considered for the project area in conjunction with climatic conditions, soil types and crops to be irrigated, and the irrigation method employed. The most comprehensive guidelines on irrigation quality are probably those of the FAO, which consider water quality problems in terms of salinity, permeability, and specific ion toxicity.

A separate analysis of the latest developments in drip irrigation technology should be undertaken as part of the technology selection process.

Regardless of the irrigation system used, scheduling irrigation must be based on the water needs of specific crops. Crop water need is often assessed by monitoring soil moisture. There are many ways to measure soil moisture, each method having its own advantages and disadvantages and varying degrees of accuracy. The most obvious and common method of soil moisture monitoring is to manually observe the soil feel and appearance at various soil depths within the crop root zone.

It has been suggested by a local geology expert that production wells be located in areas lying closer to the mountain foothills south of the project site as TDS concentrations are typically lower (<3,000 mg/l) and recharge may be facilitated by fractured limestone bedrock units. As previously stated, full assessment of the impacts of groundwater withdrawal will require additional study, and an Environmental Analysis Amendment will be prepared once that information becomes available.

5.3.2 Salinization

The most effective mitigation strategy available for soil salinization problems is through prevention and improved soil drainage. Prevention is achieved by meeting crop water requirements, but not exceeding them. This requires skillful irrigation management, possibly by using frequent, light applications. The key is to avoid water logging or over saturation, where more water is used than is needed to provide a moist root zone for the crop. This may be achieved through careful management of existing irrigation schemes, or may also occur by changing irrigation practices, possibly by changing basin irrigation to furrow or border irrigation. It may also be possible to leach accumulated soil salts below the root zone with pulses of water that are significantly more than needed by the plants. Other practices might call for improving delivery efficiency by lining canals and installing soil drainage networks. Finally, crops resistant to the levels of soil salinity encountered in a particular irrigation system may be called upon to replace those crops presently grown if they are not producing sufficient yield (see Table M).

Monitoring soil salinity requires measuring the conductivity of irrigation water and of the saturated soil paste. Table M gives guideline values to evaluate crop productivity under conditions of soil and water salinity (conductivity).

Failure to adequately mitigate against soil salinity is visible as accumulations of salt on the soil surface, where it sometimes forms a glistening, whitish crust that crackles underfoot. Long before this happens, however, crop productivity will decline. Declines in crop productivity can be anticipated by high conductivity readings of irrigation water or of the saturated soil paste. Conductivities of irrigation and pore water from coarse sandy soils will be approximately equivalent. Convention varies when preparing a soil paste. Sometimes the soil is saturated and a reading made; at other times different volumes of water are added to the soil, 20% and 50% of the soil volume being common amounts used.

Table M: Generalized data on rooting depth of full-grown crops

Crop	*Rooting depth, m*
Alfalfa	1.0–2.0
Barley	1.0–1.5
Beans	0.5–0.7
Carrots	0.5–1.0
Citrus	1.2–1.5
Cotton	1.0–1.7
Small grains, winter crop	1.5–2.0
Grapes	1.0–2.0
Maize	1.0–1.7
Melons	1.0–1.5
Olives	1.2–1.7
Onions, spinach	0.3–0.5
Tomatoes	0.7–1.5
Wheat, ripening stage	1.0–1.5

FAO Irrigation and Drainage Paper 24. *Crop Water Requirements*.

5.3.3 Erosion Control and Soil Conservation

Operations at the farm site have the potential to increase erosion from wind and rain during certain times (e.g., non-growing periods) and in certain areas (fallow fields, undeveloped/vacant areas, new construction sites). The installation of wind breaks through planting of trees or shrubs, or through mechanical means, should be carried out along the perimeters and selected areas within the project site. Selection of plant barriers should include specialized agroforester knowledge of productive wind break species that also provide food, fodder, or useful chemical extracts.

Long-term stormwater management in developed areas should be engineered to capture and, if possible, harvest for re-use rainwater that falls on impermeable surfaces of built-up areas of the site (e.g., roof tops of office buildings and processing facilities, staff housing, schools, as well as paved parking areas). Rainwater harvesting and storage should be built into the design phase of the project to maximize available water resources, while also controlling erosion.

Erosion control during the operational phases of the project can be implemented in a variety of ways, depending on site-specific needs. Erosion control along irrigation ditches should be accomplished by use of a biological mechanism, such as Vetiver grass planting. Vetiver grass is a native to Afghanistan, requires low maintenance, uses little water, is drought-tolerant, and can be relatively easily established in desired locations. The grass is effective at soil stabilization

because it has roots that penetrate deep into the soil (>50 cm); it also forms a debris barrier prohibiting trash from entering irrigation ditches 21

The project will likely have beneficial positive impacts on reducing soil erosion. However, the erosion-reducing effectiveness of plant and/or mulch covers depends on the type, extent, and quantity of cover. Vegetation and mulch combinations that completely cover the soil, and which intercept falling rain at/close to the surface, are most efficient in controlling soil erosion. Partially incorporated mulches and well-developed plant root systems are also important as these provide channels that allow surface water to move into the soil. The effectiveness of any crop management system or protective cover also depends on how much protection is available at various periods during the year, relative to the amount of erosive rainfall that falls during these periods. In this respect, field crops typically provide protective cover for a major portion of the year (e.g., alfalfa or winter cover crops) and can reduce erosion much more than crops that leave the soil bare for a longer period of time (e.g., row crops), particularly during periods of high erosive rainfall (spring and summer). Most of the erosion on annual row crop land can be reduced by leaving a mulch cover greater than 30 percent after harvest and over the winter months, or by inter-seeding a forage crop (e.g., red clover).

Certain conservation measures should be employed to reduce soil erosion by both water and wind. Tillage and cropping practices, as well a land management practices, directly affect the overall soil erosion problem and solutions on a farm. When crop rotations or changing tillage practices are not enough to control erosion on a field, a combination of approaches or more extreme measures might be necessary. For example, contour plowing, strip cropping, or bunding may be considered.

As previously mentioned, an engineered wetland that acts as an agricultural nutrient filter can also be effectively designed to control off-site erosion and assist with soil conservation as a result of unforeseen flooding.

Soil erosion will be measured by visual observation. Soil salinity will be measured by conductivity of the saturated paste and by visual observation of soil characteristics. In cases where the depth to groundwater lies within the rooting depth of common crops, soil waterlogging will be measured by the depth to groundwater. Evaluation of soil disturbance, erosion, salinity, or waterlogging and of their mitigation strategies will be by comparison with its pre-project baseline condition as documented by photographs, measurements, and observations.

5.3.4 Energy Conservation and Management

Energy efficiency measures should be in place for all project energy requirements. Equipment energy efficiency should be ascertained prior to procurement. An on-site energy distribution network is proposed for the Mazar Foods project area. It is anticipated that this network will derive energy from a main electric power transmission line coming from Uzbekistan and will be backed up by diesel-powered generators to power office buildings and wells where needed. Use of diesel generators requires development of plans to prevent soil and water contamination during fueling, storage, and maintenance of generators.

[21] Carlin, G.D., P. Truong, F.J. Cook, E. Thomas, L. Mischke, K. Mischke1. *Vetiver Grass Hedges for Control of Runoff and Drain Stabilisation*, Pimpama Queensland. CSIRO Land and Water, Brisbane. Technical Report 46/03, February 2003.

Options for installing renewable energy technologies such as solar and wind should be ascertained, e.g. use of solar drying in food processing operations. .

Procurement of fuel in Afghanistan can be limited at times, particularly in during emergencies or times of heightened conflict. One potential option for fuel to power generators to ensure a continuous fuel stock is to produce biofuel or biodeisel with processing facility wastes or greases collected from local sources. Small scale biodiesel production systems capable of producing over 200 gallons per day are compact, relatively inexpensive, and simple to construct and operate. A feasibility assessment to determine the viability of installing and operating such systems to provide fuel and waste minimization alternatives should be conducted during the design phase of the project.

An additional means of conserving energy is to utilize solar water heaters in all buildings and houses associated with the project. Solar water heaters consist of a black metal tank within a reflective housing and glass cover. The apparatus is installed on the roof of the building and oriented toward the sun. The plumbing is routed such that water from the solar water heater will empty into a convential heater; however the conventional heater will require only a small fraction of the energy needed to maintain the hot water temperature. Solar water heaters can be readily constructed of locally available materials, are very inexpensive, and can be retrofitted into the plumbing of nearly any structure.

Consumption of wood and biomass for cooking and heating for an additional 6,000 – 7,000 workers and their families in the area will likely result in loss of vegetative cover beyond the project area. In order to offset the impacts of the unsustainable collection of fuel wood for these purposes, it is recommended that planting and seeding of native shrubs both on- and off-site take place as part of the project. Agro- and social forestry and ecological restoration plans should be developed in order to counter the potential indirect adverse impacts caused by the energy demands of the increased population.

5.3.5 Operations-Phase Waste Minimization, Treatment and Disposal

A significant impact of any new development project is the creation of new and addition to existing waste streams. The implementation of the proposed Mazar Foods Project will generate significant quantities of new waste as a result of construction activities, farming operations, and increased population of the area. Although waste generation is an inevitable impact of development, it is critical to properly manage wastes in order to ensure public health and safety and sanitary conditions. There are several mechanisms available to mitigate adverse impacts which fall into the following generalized categories: minimization, treatment, landfill disposal, and off-site transport.

5.3.5.1 Waste Minimization

At present, Afghanistan is without the institutional means or capacity to implement recycling programs, however, site-specific wastes can be minimized through recycling and reuse. As such, waste minimization should be a goal of the proposed project, by maximizing processing efficiencies and educating staff in proper waste management techniques. Maximizing process efficiencies requires detailed study of the on-site processes in order to manipulate them effectively. By contrast, educating staff to be conscientious of waste minimization can be a

relatively inexpensive activity that extends beyond the workplace and into people's homes and lifestyles.

5.3.5.2 Waste Treatment

A major project concern is waste management associated with the disposal of organic materials produced through agricultural operations, food processing, and domestic activities. Utilization of organic waste is probably the single most overlooked opportunity in the region for waste reduction, recycling, and treatment by way of composting. Compost is aerobically decomposed organic matter useful in horticulture and agriculture as a soil conditioner and fertilizer. It is also useful for erosion control, land reclamation, wetland construction, and as a landfill cover. It serves as a porous, absorbent growing medium that can be added to the soil as an amendment to aid in plant growth. For the most part, any organic material can be composted; however, depending on the degree of sophistication and commitment to the composting process, certain materials should not be composted including animal carcasses and wastes, petroleum hydrocarbons, and dairy products. Several countries including the USA, Great Britain and Germany have adopted standards for composting both on domestic and industrial levels. A composting process which adheres to a defined and accepted standard should be developed for the Mazar Foods Project. The composting activities will not only reduce wastes that require landfill disposal but will also provide nutrient supplements to growers at the farm, and may also generate a revenue source as a saleable commodity.

5.3.5.3 Landfill Disposal and Off-site Transport

Technologies for treatment of solid, liquid, inorganic, and chemical wastes that cannot be composted are not likely to exist in the immediate project area, therefore would require alternative means for disposal.

As previously mentioned, a municipal landfill is located in Mazar-i-Sharif west of the site; however it is not certain if wastes from out of the city may be deposited in this landfill. Furthermore, although the landfill is operated by a municipal entity, the landfill does not appear to be managed in an environmentally sound fashion. It is recommended that on on-site landfill be developed that satisfies the needs of the project in an environmentally sound way. Separate feasibility studies and a solid waste management operational plan will be needed to select an appropriate site, ensure protection against leaching, establish appropriate measures to maximize recycling, control access by human and animals and reduce the potential for the spread of disease by vectors, including insects, rodents and other small mammals and birds.

Chemical and hazardous wastes will require special storage and disposal considerations in order to comply with Afghanistan environmental law. It is likely that alternatives for on-site disposal of certain contaminated materials can be developed, for example: land-farming of petroleum hydrocarbon contaminated soils. Special arrangements for off-site disposal of other hazardous materials will need to be made. It is recommended that Mazar Foods develop a waste management plan that addresses each of these concerns.

5.3.6 Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) Requirements and Process

Khulm is known to have several pests and diseases that will need to be controlled. The area's dry hot weather favors particular insect pests. The melon fly is present and can be a pest on tomatoes, as well. White flies, aphids, and other vectors of serious virus pathogens are likely to plague most of the products that will be produced by Mazar Foods. Additionally, mites are a problem for a number of crops.

Adequate mitigation measures and careful monitoring regarding the proper use, handling, storage, and disposal of pesticides as well as adherence to controls on restricted use pesticides are indicated under Section 216.3(b) of 22 CFR 216.

A pesticide must be effective in the control of the target organism when it is applied in a convenient manner at a predetermined rate. Few pesticides possess a high degree of specificity, with most of them being toxic to target and non-target organisms alike. Unless properly used, they carry a potential health hazard to those who handle them, as well as to those who consume the treated crop,

The establishment of a full national regulatory system goes beyond the capacity of this project. The task will be restricted to those commodities associated with the project, and with the initial steps needed to establish compliance with international standards necessary for negotiating trade agreements for those commodities. The commodities in Mazar Foods project will include figs, grapes, almonds, apricots, pistachios, pomegranates, and walnuts.

Actions need to be taken nationally which are beyond the scope of this EA. These include:

- Review the existing regulatory framework for the import, sale, and use of agricultural pesticides to Mazar in consultation with the Department of Agriculture. Revive the host country pesticides law.
- Identify products currently imported and sold in Khulm District and create a database of pesticides currently in use in northern Afghanistan, or those likely to be imported in the future. (The database would contain information on efficacy, toxicity, and environmental impact to provide the basis for decision making by the registration working group.)
- Publish a first list of provisionally approved pesticides for use in northern Afghanistan in an official Gazette.
- Establish a system of registering importers, dealers, and retailers of pesticides who are able to satisfy requirements of technical knowledge, facilities for safe handling, and compliance with safe practice and responsible marketing.

The most significant plant diseases in the Mazar area are Covered Wheat Smut and Loose Smut. Historically, these two diseases were only common in rain-fed areas and did not typically affect irrigated crops. However, due to cultivation of different varieties of seeds in the area and the lack of any institutionalized governmental inspection and disease prevention measures, these diseases spread to irrigated crops several decades ago. Wheat and maize crops were most significantly affected by these diseases, resulting in losses of 25 – 30 percent of the harvest in Khulm, Marmul, Shurgara, Zare, and Keshen Deh districts.

The primary chemical pesticides used to control these diseases are Vitavax and Thiram, both of which are fungicides (Vitavax contains Thiram as an active ingredient). These pesticides are

utilized to treat seeds to prevent fungus growth. Thiram is registered as a General Use Pesticide by the U.S. Environmental Protection Agency (EPA) and is classified as toxicity class III – slightly toxic.

The following list includes some of the other major pest species in the area:

- Anthracnose (leaf blight)
- Grape powdery mildew
- Crown spot
- Crop rust
- Downy Mildew
- Leaf roll
- Soft rot
- Aphids
- Boll worm
- Bulb mite
- Cut worms
- Weevil (several species)
- Locust
- White fly
- Sun pest
- Tomato fruit worm
- White grub

Many of the pests are specific to certain crops. Treatment methods will therefore depend on the crop selection of the project.

Anticipated use of pesticides under the Mazar Foods Project will require preparation of a Pesticide Evaluation and Safer Use Action Plan in accordance with USAID §216.3 (b) Pesticide Procedures. Preparation of a PERSUAP requires the specialized expertise in Integrated Pest Management and cradle- to-grave use of approved pesticides. It is preferable to have the PERSUAP carried out my individuals with previous experience with preparation of similar documents and the ability to provide on-site training of Afghan staff and farmers in PERSUAP implementation.

The PERSUAP is to be prepared in conjunction with the Supplementary Environmental Analysis scheduled for the summer of 2008.

5.3.7 Natural Resource Management (e.g., sustainable management of biological resources)

The project is not expected to impact other natural resources. Previous sections of this EA discuss the potential impacts and mitigation measures on water resources, vegetation, biological resources and biodiversity, and environmental enhancement.

5.3.8 Mitigation of Impacts of Cultural Resources

There are no cultural resources within the project site. Ruins of the ancient town of Aornos, described in Section 4, are about 5 km north of the project site. To preserve Afghanistan's cultural heritage, local authorities—at both the provincial and district level—must be contacted to ensure the protection of the site before the project is initiated. Cataloging of the site within the proposed development area is a mitigation measure that could help protect the historical area.

5.3.9 Mitigation of Human Impacts: Compensation, Training, etc.

Mazar Foods Corporation will implement an employment policy that complies with International Labor Organization standards; it will implement a policy that only persons over the age of 18 will be employed.

The Mazar Development Foundation is being formed to contribute to the social and financial viability of the project and will be the primary shareholder in the Mazar Foods Corporation at its inception. As presented in the Mazar Foods Project Business Development Plan, the objectives of the Mazar Development Foundation are twofold:

- *To support the creation of the Mazar Foods Corporation, which will be an Afghan registered corporation. The mandate of the latter is to provide commercially viable alternative livelihoods for a substantial number of families in the Balkh Province by rebuilding the traditional fruit and vegetable export industries of Afghanistan. The proposed grant of $25 million to the Foundation from USAID will include the funding required for the purchase of voting stock that will be held by the Foundation. At the time of incorporation, the Foundation will be the majority shareholder in the Mazar Foods Corporation.*
- *To support the provision of a range of services, such as health and education, to the communities of the Balkh Province. In addition, the Foundation would mount programs that expand community access to microfinance, promote the development of small business activities that can take advantage of the presence of the Corporation and its need to purchase a range of goods and services, and provide financial support for deserving students from low-income families who are qualified for entry into tertiary education institutions within Afghanistan or abroad.*

As the Mazar Foods Corporation builds up its commercial fruit and vegetable operations and establishes a presence in the Afghanistan market and in neighboring countries, the Foundation would dispose of a portion of its shareholdings and become a minority shareholder in the company. In this way, the Foundation would continue to contribute to the success of the company and its effective management. The dividends paid by the company would provide an ongoing source of income to operate the Foundation's community development programs in the longer term. In addition, the sale of some of the company stock would provide the Foundation with a substantial block of funds that can be invested to generate additional income for these community programs.

The business plan also describes the planned development programs that the Foundation will undertake, a summary of which is presented here. In achieving its objectives and implementing the programs described below, the Mazar Development Foundation would provide mitigation

measures for the human impacts imposed by the project by offering basic services and legitimate financial opportunities that currently do not exist.

Mazar Development Foundation Program Design and Implementation

• Food supplement programs and educational programs for mothers and children about nutrition and hygiene that target children five years of age and younger, and especially those families whose children are underweight.
• Support for expansion of basic education to reach the 170,000 children who may not have access to schools.
• Through the local purchase of goods and services, the Mazar Foods Corporation will provide substantial opportunities for development of local business activities. The Mazar Development Foundation will conduct skills development and adult education programs for members of the labor force, including entrepreneurs, with particular attention to women's groups that are interested in developing small-scale business activities.
• Some form of support for those 65 years old and older who are in need of assistance.

Before these types of community development programs are designed and launched, the Foundation will need to undertake a series of assessments to identify programs and interventions that will be responsive to the perceived needs of these local communities.

The prevalence of illiteracy among adults in the Balkh Province raises a range of important questions about the selection criteria for employees in the Mazar Foods Corporation and the possible need for adult education programs. The issue then is the extent to which the Foundation supports adult education programs in these communities, the criteria that will be applied in hiring people for the Corporation. The intent is for the Foundation to fund these types of programs.

There are many examples from East Asia where large private companies, established in relatively poor areas to extract resources or farm land, have operated as enclaves with only minimal benefits to local communities (for example, the Freeport Mine in West Papua). The failure of such companies to ensure that their operations contribute to the development of local communities has created antagonism among these communities and opposition that has, in several instances, created serious security problems for the companies concerned. One lesson from these experiences is the importance of ensuring that the presence of a company such as Mazar Foods Corporation brings tangible benefits to local communities.

As discussed earlier, the level and quality of basic services available to many Afghan communities is low by any international standard. This is equally true for communities in Balkh Province, where the Corporation will be operating. An important Project objective, therefore, is to improve substantially the basic services available to communities in Balkh Province. With the proposed design of the Project, the benefits of the investment would accrue to a significant number of families in the Province, not just the relatively small number of families that find employment with the Corporation.

In addition to the above-listed mitigation measures, objectives of the Mazar Development Foundation, it is recommended that health care and emergency medical facilities be developed to support the employees and families associated with the project.

5.3.10 Occupational Safety and Health Measures

The management of Mazar Foods will need to develop workplace safety regulations and provide for employee training regarding hazards. They will also need to supply personal protection equipment, such as respiratory masks, gloves, sound protectors, safety goggles, and other protective clothing. Farm workers are prone to musculoskeletal disorders, which can be particularly problematic. Back pain, repetitive motion injuries, sprains, and strains can be difficult to heal without cessation of the causative activities and effecting rotation of tasks among the workers.

5.3.11 Major Hazard Prevention and Emergency Response

As defined in the Mazar Foods Business Development Plan, farming and industrial production facilities would be compliant with best current international practices with regard to plant design and construction, layout, equipment, operational specifications, worker and product hygiene and handling of hazardous materials. Operations will be developed to meet or exceed U.S. Good Manufacturing Practices and Sanitation Standard Operating Procedures. Thermally processed foods will follow generally accepted production specifications or those provided through the U.S. Food and Drug Administration (FDA) for records and record retention and equipment operation. The facilities will have and implement hazard analysis critical control point programs (HACCP) from production throughout the distribution channel.

Proper maintenance of farm equipment and vehicles is also critical to the continued safety of the project. Trained staff and service contracts should be procured to ensure these activities are carried out on a regularly scheduled basis.

A number of options exist to mitigate adverse human impacts caused by occupational hazards of the agricultural industry. Clinicians can obtain an occupational history to identify individuals at risk for agricultural injuries and counsel workers about safe machinery practices, use of personal protective equipment. Mazar Food management can enact meaningful workplace safety guidelines. Proper training and management of staff at all levels of employment, and particularly those involved in high risk activities, should be an occupational safety management priority. It is recommended that the Mazar Foods Corporation develop a corporate Occupational Health and Safety Plan modeled after the requirements set forth by the US Occupational Health and Safety Administration (OSHA). These plans typically define protocols for identification and classification of hazardous work conditions, personnel training, health and safety monitoring, and limitations on work functions related to certain tasks.

5.3.11.1Emergency Preparation

Multiple factors contribute to occupational emergencies. An emergency management plan should be developed that addresses:

- Survey of possible emergencies;
- Planned actions to reduce impact on the workplace;
- Employee information and training;
- Emergency drills as needed.

5.3.11.2Medical Programs

A company's medical program is an important part of the safety and health system. It can deliver services that prevent hazards that can cause illness and injury, recognize and treat illness and injury, and limit the severity of work-related injury and illness. The size and complexity of a medical program will depend on many factors, including the:

Type of processes and materials and the related hazards,

- Type of facilities,
- Number of workers,
- Characteristics of the workforce, and
- Location of each operation and its proximity to a health care facility.

Medical programs consist of everything from basic first aid to CPR response for sophisticated approaches for the diagnosis and resolution of ergonomic problems.

The Mazar Development Foundation can play a significant role in the hazard prevention and emergency response mitigation for the project by providing educational, health monitoring, and emergency preparedness services.

5.4 Decommissioning Measures

Decommissioning of the operations related to the Mazar Foods Project will require a separate assessment of the social and environmental conditions created as a result of implementation of the project. It is recommended that the processes described in the Mazar Foods Environmental Management Guidelines and the Mazar Development Foundation Environmental Review Form be followed in order to evaluate environmental impacts of specific decommissioning activities throughout the life of the project.

5.5 Mitigative Measures for Indirect, Induced, and Cumulative Impacts

In addition to the direct implications as stated above several indirect socio-economic and environmental impact issues may occur that cannot be readily foreseen or quantified, and may be beyond any reasonable control. Examples of such impacts include:

- unpredictable market fluctuations that affect prices and logistics associated with agriculture
- deforestation related to resource procurement for increased population
- transportation issues
- natural disasters
- political conflict and terrorism

The Mazar Foods Project aims to increase economic stability and improve socio-economic conditions in Balkh Province. In doing so, these unforeseeable issues can likely be mitigated through wise management and increased independence of individuals associated with growing financial stability.

Another anticipated benefit is a potential reduction in resource conflicts benefit that will result from sustainable economic development. The proportion of new investment and employment opportunities that will accrue to communities and residents of the region depends on the local sourcing of labor and materials, supplies and equipment. Local sourcing is affected by factors such as the type of use, the proximity of the development to communities in the Plan Area, and local production capacity and the hiring policies of tenure holders. Economic benefits of the proposed project are expected to accrue to both the Plan Area and to communities in the surrounding area.

6 ENVIRONMENTAL MITIGATION AND MONITORING PLAN (EMMP)

Environmental Management Guidelines have been developed for the Mazar Foods Corporation. and an Environmental Review Procedure has been developed for use by the Mazar Development Foundation. The use of these two protocols will provide a mechanism for monitoring impacts caused by the project as well as serve as a feedback loop for gauging the effectiveness of mitigation measures. This section describes in detail the monitoring plan and makes recommendations for selecting qualified monitoring personnel in the format of a employment position announcement for the Monitoring Specialist. Monitoring of direct, induced, and indirect impacts resulting from the implementation of the project will be executed by way of following the recommended formats and monitoring procedures described in this section.

6.1 Scope of Work – Environmental Mitigation and Monitoring Specialist

Position Announcement

Chemonics ASAP, a USAID-financed project in Afghanistan seeks Expressions of Interest (EOI) from consulting firms, non-governmental organizations or independent consultants to implement the Mazar Foods *Environmental Mitigation and Monitoring Plan*. Environmental impact monitoring for all activities to be undertaken by Mazar Foods and the Mazar Foods Foundation, a planned 10,000 agricultural irrigation project in northern Afghanistan. .

Interested and qualified firms, organizations or independent consultants must have experience in monitoring for results; and will have expertise in environmental impact assessment and agricultural production practices, including irrigation, farming systems, pesticides, and integrated pest management (IPM). Those who believe their firm and/or NGO are qualified to undertake this work under contract to Chemonics should contact Chemonics at ASAP@chemonics.com to obtain the Terms of Reference for this position. Please, no phone calls.

TERMS OF REFERENCE FOR EXPRESSIONS OF INTEREST (EOI)
ENVIRONMENTAL MITIGATION AND MONITORING PLAN IMPLEMENTATION SPECIALIST

Background: The United States Agency for International Development's Mission to Afghanistan (USAID/Afghanistan) has selected Chemonics International to implement its Accelerating Sustainable Agriculture Program (ASAP). The purpose of this 40-month (12/2006-3/2010) program "is to accelerate broad-based, market led agriculture development capable of responding and adapting to market forces in ways that provide new economic opportunities for rural Afghans." To fulfill its purpose, ASAP will accomplish two objectives: 1)Accelerate relevant technology generation and transfer, with an increased focus on marketing of high-value commodities, competitiveness, sustainability and natural resource management, and 2) Improve the capacity of the Government of Afghanistan, and specifically the Ministry of Agriculture, Irrigation and Livestock (MAIL), to formulate agriculture sector policies and strategies and carry

out administrative and financial coordination needed in support of more competitive, market-led agriculture production and agribusiness.

Under Modification 1 to ASAP, Chemonics is providing customized technical assistance for the establishment of the Mazar Foods Corporation; a proposed 10,000 hectare agricultural/irrigation development in Balkh Province, Afghanistan.

Discussions are underway with OPIC concerning a loan of up to $80 million towards establishment of the Corporation[22].

Purpose and Need for the Mazar Foods Project

The Mazar Foods Corporation is being established as a state-of-the art, private sector-driven agribusiness venture to produce, process, and market horticultural products for domestic Afghan and regional markets. Its production and processing facilities will be located in the fertile Khulm District, in the Balkh Province. The selected site shall consist of 10,000 hectares (approximately 25,000 acres) of contiguous or closely joined parcels which will have access to a major airport and a skilled labor pool. Additionally, the site has rail access to markets in Russia via Uzbekistan and road access to the largest domestic market in Kabul.

Mazar Development Foundation

In addition to establishment of the Mazar Foods Corporation, the project also will support the formation of a separate Mazar Development Foundation which is to provide a program of improved basic services to communities throughout the Province.

Objectives

The objectives of the Mazar Foods Corporation project are to:

1) Establish a large, highly productive commercial farm that can take full advantage of the burgeoning markets in the regions for fresh fruits and vegetables and various processed horticultural products; and
2) Support the Mazar Development Foundation, which will spearhead a program of improved basic services to communities throughout the Province.

The Mazar Foods Project would lay the foundation for an approach to accelerated economic development led by private sect and foundation activities, in partnership with official sources of funding, which includes, funding from USAID and OPIC.

The physical establishment of the Mazar Foods Corporation will entail construction and other works which will result in changes to the environment at the proposed site and surrounding areas. These proposed changes include:

1. Construction of various buildings in and around the proposed farm site;
2. Introduction and use of fertilizers, pesticides, and insecticides;
3. The use of deep aquifer well water well for irrigation;
4. Introduction of new seed varieties;
5. Introduction of new irrigation techniques.

[22] Chemonics International, Inc. 2007. Mazar Foods Project Business Development Plan and Pre-Feasibility Study, dated December 19, 2007. USAID Contract No. 306-C-00-07-00501-00.

Scope of Work:

Chemonics ASAP requires the services of a consulting firm, a non-governmental organization (NGO), or an expert consultant with the capacity to implement the Mazar Foods *Environmental Mitigation and Monitoring Plan* that is a result of a recent Environmental Assessment.

Monitoring will encompass all measures to minimize the Mazar Foods and Mazar Foods Corporation potential adverse environmental and social impacts. Monitoring also includes monitoring of pesticide safe use practices and Integrated Pesticide Management. The expected results of the monitoring and reporting is that Mazar Foods Corporation implements the mitigation measures recommended in the EA.

Only firms, organizations or independent consultants with experience in monitoring for results and with experience and expertise in environmental impact assessments and irrigation, agricultural production practices, including farming systems, pesticides, and integrated pest management (IPM) should respond to this solicitation. Chemonics ASAP will review the EOI´s received and prepare a short-list of firms, NGOs or individuals who qualify to undertake the contract. Interviews will also be held with the top five to six parties to narrow the short-list to no more than four interested and qualified firms, NGOs and/or individuals

Interested firms, NGOs and/or independent consultants should submit an Expression of Interest electronically in Microsoft Word to ASAP@chemonics.com prior to 5:00 PM (17:00 hrs) on April 1, 2008. (late receipt will disqualify the offeror). The EOI should contain the following information:

a) Firm, NGO, individual(s) name, address and contact information (i.e., Telephone numbers, Cellular phone numbers, www page, e-mail addresses).
b) Corporate, NGO or individual(s) capability statement documenting the background and experience of the firm, NGO and/or individual(s) interested in participating in the tender resulting from this EOI. Individual consultants should submit their complete Curriculum Vitae.
c) List of current on-going work in Afghanistan or with similar agricultural irrigation projects, providing name and contact information of the client(s), value of the contract/grant and a brief description of the services performed.
d) List of past work (last two to three years) in Afghanistan or with similar agricultural irrigation projects, providing name and contact information of the client(s), value of the contract/grant and a brief description of the services performed.
e) If a firm or NGO, provide CV´s of the individuals likely to carry out the terms of any contract that might result from this EOI and subsequent tender.

Chemonics will review the EOI´s received and may contact offerors to clarify an aspect of their document or request additional information. Selected firms, NGOs or individual(s) will be notified by e-mail whether or not they have been short listed.

Chemonics ASAP issued this call for EOI on the belief that it will select a firm, NGO or individual(s) to undertake the work. However, nothing in this call for EOIs obligates Chemonics ASAP to award a contract and any such commitment is neither implied nor promised vis-à-vis this call for EOIs.

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ENVIRONMENTAL MITIGATION AND MONITORING PLAN IMPLEMENTATION SPECIALIST
Scope of Work

The **Environmental Mitigation and Monitoring Specialist** shall ensure the EMMP is implemented over the life of the Mazar Foods Project and the Mazar Development Foundation. This Specialist should have significant environmental mitigation experience with irrigation projects and will have the following responsibilities:

1. oversee the EMMP implementation process from Project and Foundation inception;
2. coordinate and direct the Mazar Food and Mazar Development EMMP Team of appropriate specialists and staff to ensure EMMP implementation;
3. apply due diligence to determine the extent of EMMP implementation; whether implementation was successful or whether certain specific mitigation measures were inadequate/insufficient to minimize adverse impacts;
4. determine whether environmental impacts occurred that were not predicted, and therefore no mitigation were proposed or implemented;
5. as appropriate, propose alternative mitigation measures, or remedies to ensure any adverse impacts are minimized;
6. refine the EMMP, including reassessment of implementation responsibilities, budgets, indicators and timing for monitoring activities;
7. Adapt the environmental mitigation, monitoring and evaluation methodology and forms as appropriate from USAID's Environmental Assessment of the Alternative Livelihoods Programs in Afghanistan (2005) *Annex D: Monitoring and Evaluation Plan and Annex E: Training Course Materials* with associated environmental mitigation, monitoring and evaluation reporting forms;
8. oversee implementation of the Mazar Foods Pesticide Evaluation and Safer Use Action Plan (PERSUAP) in the same manner as described in 1 through 6 above.

When going into the field to conduct monitoring, the Environmental Mitigation and Monitoring Specialist will coordinate closely with Mazar Foods technical advisors to ensure the Specialist is able to meet key producers, and visit agricultural fields and carry out his/her work effectively, as a team member, as well as independently.

The Environmental Mitigation and Monitoring Specialist must be aware of Mazar Foods Corporation and the Mazar Development Foundation reporting requirements. Mazar Foods and the Mazar Foods Foundation is required to report to USAID on implementation and success of mitigation measures, and Mazar Foods and the Mazar Development Foundation will be relying on the Environmental Mitigation and Monitoring Specialist to supply the data for Mazar Foods or Mazar Development Foundation reporting.

Mazar Foods and the Mazar Development Foundation is required to report to USAID, on an annual basis, any changes in project implementation. In addition, the Specialist should have available the Mazar Foods EA and the Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP) for reference when conducting monitoring activities. .

Mazar Foods is required to disseminate information from the EMMP and PERSUAP to a wide audience: Information from the EMMP and the PERSUAP will be translated into Dari and Pashtoo and should be disseminated to farmers, agricultural service providers, project staff, consultant trainers, the Environmental Mitigation and Monitoring Specialist, and other interested parties.

6.2 Mazar Foods Project Environmental Mitigation and Monitoring Annual Workplan Guidelines

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Mazar Foods Project Environmental Mitigation and Monitoring Annual Workplan Guidelines

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Organization of the Guidelines

These *Environmental Mitigation and Monitoring Plan Guidelines* for Mazar Foods and the Mazar Development Foundation:

- help the Mazar Foods Environmental and Technical Management Team apply principles of environmentally sound design and management to all Project activities to ensure their long-term sustainability;

- provide a systematic approach to the implementation of mitigation and monitoring measures identified in *Environmental Reviews* conducted for proposed activities; and

- explain the requirements for the preparation and submission of the annual *Environmental Mitigation and Monitoring Workplan* for Mazar Foods, which is to accompany annual budget justifications.

The *Guidelines* are divided into four sections:

Section 1 provides instructions for completion of the *Environmental Mitigation and Monitoring Workplan* for Mazar Foods;

Section 2 provides a detailed compendium of key mitigation measures organized by activity phase: *planning & design, construction, operation & maintenance,* and *decommissioning (abandonment)*;

Section 3 explains how to complete the mitigation and monitoring forms which are to be submitted with the *Environmental Mitigation and Monitoring Workplan* ;

Section 4 consists of blank template environmental mitigation and monitoring forms, to be completed by the Environmental Mitigation and Monitoring Plan (EMMP) Team under the overall direction of the EMMP Coordinator for Mazar Foods.

Section 1
Instructions for Completion of the Environmental Mitigation and Monitoring Annual Workplan for Mazar Foods

The *Annual Environmental Mitigation and Monitoring Workplan* for Mazar Foods is to be completed by the Mazar Foods Environmental Management Team under the overall direction of the Mazar Foods EMMP Coordinator. Both the Team and the EMMP Coordinator are to be selected by Mazar Foods Corporation senior management. Other members of the Environmental Management Team should consist at a minimum of the key persons responsible for:

- irrigation/water distribution infrastructure and equipment (construction, operation and maintenance and decommissioning);
- building infrastructure (offices, staff quarters, school, clinic, vehicle maintenance, processing facilities, and storage facilities)
- road improvements and maintenance
- water and sanitation
- agricultural processing waste
- solid waste
- worker health and safety
- Mazar Development Foundation activities and community relations
- IPM/Pesticide use and PERSUAP implementation

Other members may be added on an as- needed basis.

Use the following format to complete the *Workplan* and provide:

1. A list of activities planned for the coming year. Include in the list:
   - materials, equipment and labor requirements
   - estimated budgets
   - time schedule
   - appropriate maps (topographic, sketch, etc.) showing proposed locations of infrastructure

2. A summary of the mitigation and monitoring measures that will be undertaken during planning and design, construction, operation, and decommissioning/abandonment of Mazar Foods Corporation and Mazar Development Foundation infrastructure. Provide timetables and estimated costs for implementation. This summary should be drawn from the completed mitigation forms found in Section 4 of these *Environmental Mitigation and Monitoring Workplan Guidelines.*

3. A summary of *Workplan* elements that require follow up monitoring (supervision) to ensure mitigation measures are working; the monitoring indicators to be used; the adequacy of baseline information and data; a description of how often monitoring will take place (frequency), and estimated costs. When appropriate, include recommendations for monitoring sensitive locations and exceptional resources, or particular environmental features or components, particularly when impacts may occur and where no mitigative measures are feasible (in other words, there are residual impacts that cannot be mitigated).

4. A review of special issues and future needs. Special requests including budget and personnel estimates for environmental assessments; focused environmental analyses; ecological studies; protection strategies for exceptional resources; modification of Project infrastructure and farming system plans, to improve environmentally sound design and management.

5. Completed mitigation and monitoring forms from *Section 4* of these *Guidelines*.

6. A copy of the previous annual *Workplan*, together with a commentary on results and targets achieved and those still pending under the new *Workplan.*

Section 2
Key Mitigation Measures organized by Activity Phase: Planning & Design, Construction, Operation & Maintenance, and Decommissioning (Abandonment)

Table 3. Summary of Impact Mitigation/Enhancement Measures

Number	*Impacts*	EA Reference	*Mitigation Measure*
	Potential Adverse and Beneficial Impacts of Mazar Foods Agricultural/Irrigation Actions		
1	**Water Hydrology**		
1.1	*Planning and design*	5.3.2	• Conduct detailed hydrologic analysis prior to finalizing site location and crop selection
2	**Water Demand**		
2.1	*Planning and design*	5.3.4	• Incorporate principles of efficient water management in field design (i.e., grading) • Prioritize selection of irrigation technologies based on water efficiency • Incorporate rainwater harvesting and reuse into design of on-site structures to improve water conservation
2.2	*Construction*	5.3.4	• Create furrow dikes to conserve rainwater for irrigation
2.3	*Operation and maintenance*	5.3.4	• Employ irrigation flow meters for efficient use of irrigation water • Use surge flow valves and re-use runoff to maximize available water resources for gravity irrigation • Gather soil moisture data and couple with weather monitoring and eT requirements • Base irrigation schedules on the needs of specific crops

Number	*Impacts*	EA Reference	*Mitigation Measure*
			• Practice conservation tillage • Use drip irrigation to manage water demand for certain crops and topography • Ensure adequate sufficient training of farm personnel charged with operating and maintaining the selected irrigation technology/technologies • Practice storm water management and rainwater harvesting to control water erosion and meet future irrigation needs • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
3	**Water Quality**		
3.1	*Planning and design*	5.3.2	• Conduct detailed water quality analysis prior to finalizing site location and crop selection • Base crop selection on use of irrigation water with potentially high levels of TDS
3.2	*Construction*	5.3.3	• Implement standard temporary storm water management procedures at construction sites to prevent pollutant run-off • Ensure that construction camps incorporate adequate sanitation facilities (e.g., VIP latrines, lined soak away pits) to prevent contamination of ground and surface water resources • Place fuel tanks in secondary containment areas to limit impact of potential spills/accidents • Ensure proper management of wastes generated during construction
3.3	*Operation and maintenance*	5.3.4	• Construct artificial wetland to filter agricultural contaminants from irrigation run-off • Ensure access to adequate sanitation facilities (e.g., VIP latrines, lined soak away pits) for farm staff in order to prevent surface and ground water contamination • Maintain utility yards and other farm facilities to prevent seepage of industrial waste (fuels,

Number	*Impacts*	EA Reference	*Mitigation Measure*
			chemicals, fertilizers, pesticides) into ground or surface water resources • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
3.4	*Decommissioning*		• Ensure that quality of local water resources is not negatively impacted by decommissioning activities
4	**Aquifer Abstraction Impacts**		
4.1	*Planning and design*	5.3.2	• Conduct detailed hydrologic analysis prior to initiating project activities to determine utility/accessibility of aquifer resources
5	**Water Demand Management**		
5.1	*Planning and design*	5.3.4	• Base crop selection on limitations of local water resource (ground and surface water)
5.2	*Operation and maintenance*	5.3.4	• Monitor water levels is domestic wells in the region for excessive drawdown caused by irrigation withdrawl • Provide immediate feedback to Mazar Foods management of water levels are receding • Employ irrigation flow meters for efficient use of irrigation water • Use surge flow valves and re-use runoff to maximize available water resources for gravity irrigation • Gather soil moisture data and couple with weather monitoring and eT requirements • Base irrigation schedules on the needs of specific crops • Practice conservation tillage • Use drip irrigation to manage water demand for certain crops and topography • Practice storm water management and rainwater harvesting to help meet irrigation needs

Number	*Impacts*	EA Reference	*Mitigation Measure*
			• Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
6	**Water Distribution System**		
6.1	*Planning and design*	5.3.2	• Select a water distribution system for which spare parts will be easily available • Design irrigation system to ensure proper distribution of water allocations and monitor for abuse or water theft
6.2	*Operation and maintenance*	5.3.4	• Ensure proper training of operation and maintenance staff to limit potential negative impacts • Insure that water rights are properly distributed among system users and that abuse of water rights is not occuring
6.3	*Decommissioning*		• Ensure that wells, canals, ditches, and other components of the farm's water collection/distribution system are safely decommissioned (e.g., well are capped, holding/settlement ponds are drained, canals are shored up to prevent subsidence or collapse) • Ensure that decommissioning will not adversely affect users
7	**Water Equipment Use and Maintenance**		
7.1	*Planning and design*	5.3.2	• Select water equipment for which spare parts will be readily available
7.2	*Operation and maintenance*	5.3.4	• Ensure proper training of operation and maintenance staff to limit potential negative impacts
7.3	*Decommissioning*		

Number	*Impacts*	EA Reference	*Mitigation Measure*
			• Ensure that diesel fuel, contaminated materials and other wastes (hazardous and non-hazardous) are disposed of safely.
8	**Salinization Issues**		
8.1	*Planning and design*	5.3.4	• Assess feasibility of installing a wetlands drainage area to filter agricultural wastes and excess nutrients
8.2	*Operation and maintenance*	5.3.4	• Install properly engineered land features (including a wetlands drainage area, if appropriate) and implement industry-proven best management practices for agricultural land • Install a network of drainage canals • Additional “Best Practice” mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil
9	**Pesticide Related Impacts**		
9.1	*Planning and design*	5.3.4	• Base the selection of pesticides on the needs of specific crops • Select pesticides that can be used legally in Afghanistan under applicable environmental law • Account for safe storage of pesticide in the design of farm facilities
9.2	*Operation and maintenance*	5.3.4	• Train farm staff in proper storage, handling, application, and disposal of pesticides • Provide staff working with pesticides the necessary tools, including protective clothing, gloves, respirators, etc. • Maintain only needed quantities of pesticides in short-term storage. Avoid stockpiling of pesticide supplies • Ensure proper disposal of pesticide contaminated materials

Number	*Impacts*	EA Reference	*Mitigation Measure*
9.3	*Decommissioning*	5.3.4	• Dispose of remnant pesticides and contaminated materials in an environmentally sound fashion
10	**Impacts of Fertilizer Use**		
10.1	*Planning and design*		• Base crop selection on use of locally available fertilizers and inputs, including manure
10.2	*Operation and maintenance*		• Train farm staff in proper storage, handling, application, and disposal of chemical fertilizers • Provide staff working with fertilizers the necessary tools, including protective clothing, gloves, respirators, etc.
10.3	*Decommissioning*		• Dispose of remnant fertilizers in safe fashion
11	**Impacts on Soil Conditions, including Soil Erosion**		
11.1	*Planning and design*	5.3.3	• Selection of building materials other than fired brick (firing process regularly requires fuel wood gathered from surrounding areas, accelerating soil erosion) • Assess risk of flood or extreme rainfall events prior to road construction by reviewing historical precipitation data or meeting with community members (in lieu of data)
11.2	*Construction*	5.3.3	• Implement standard temporary storm water management procedures at construction sites to prevent soil erosion by rainfall/flooding • Avoid use of fired brick construction material • Investigate use of quarried stone as a brick alternative, with possible development of a quarry of borrow pit • Employ standard engineering controls during road construction (e.g., applying water for dust control) • Additional “Best Practice” mitigation measures are found in Part II, Chapter 14 (Rural Roads) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/roads.pdf

Number	*Impacts*	EA Reference	*Mitigation Measure*
11.3	*Operation and maintenance*	5.3.4	• Plant field crops (e.g., alfalfa or winter cover crops) providing high ground to reduce erosion • Plant Vetiver grass along irrigation canals to control erosion • Use mulch with row cropping to reduce erosion • Practice storm water management and rainwater harvesting to control water erosion and meet future irrigation needs • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
12	**Impacts on Vegetation**		
12.1	*Planning and design*		• Selection of building materials that do not directly or indirectly impact biological resources (i.e. choose materials other than fired brick or adobe mud construction as these require collection of vegetation for yse ad fuel wood and stabilizer material)
12.2	*Construction*		• Avoid use of fired brick construction material • Investigate use of quarried stone as a brick alternative, with possible development of a quarry of borrow pit • Ensure construction camps are provided with cooking and heating fuel that does not entail harvesting of plants/shrubs for use as fuel wood • Evaluate use of biodiesel as alternative fuel source
12.3	*Operation and*		• Establish native plant species along perimeter of project area for harvesting as fodder/fuel wood by local populations to reverse historic denuding

Number	*Impacts*	EA Reference	*Mitigation Measure*
	maintenance		• Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
13	**Other Impacts on Natural and Biological Resources**		
13.1	*Construction*	5.3.3	• Implement standard temporary storm water management procedures at construction sites to prevent soil erosion by rainfall/flooding • Avoid use of fired brick construction material • Employ standard engineering controls during construction of roads and buildings to protect natural and biological resources
13.2	*Operation and maintenance*	5.3.4	• Establish native plant species along perimeter of project area for harvesting as fodder/fuel wood by local populations, stabilizing soil and preventing desertification • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
13.3	*Decommissioning*		• Ensure that decommissioning activities do exacerbate negative environmental impact (i.e., resettlement of farm-based population leading to increased vehicle traffic, or release of hazardous materials while shutting down farm facilities, or leaving the land in a condition not suitable for future natural vegetation recovery)
14	**Human Impacts—Population and Settlements (including impacts on health, water, and waste in adjacent communities)**		
14.1	*Planning and design*	5.3.2	• Prioritize site selection to minimize land use and tenure conflicts (e.g., use only government-owned land, if possible)

Number	*Impacts*	EA Reference	*Mitigation Measure*
14.2	*Construction*	5.3.3	• Employ standard engineering controls during road construction (e.g., use of emissions controls and mufflers on construction vehicles)
14.3	*Operation and maintenance*	5.3.4	• Implement recycling and reuse programs to minimize waste stream flows; educate farm staff regarding waste minimization • Maximize process efficiencies to limit liquid and solid waste generated by food processing activities • Reuse organic waste generated by food processing as compost • Establish native plant species along perimeter of project area for harvesting as fodder/fuel wood by local populations, providing income source • Ensure wastes are disposed of properly and in an environmentally sound fashion • Ensure proper management of an on-site landfill • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf ; and Part III, Chapter 4.2 (Food Processing: Cleaner Production Fact Sheet and Resource Guide) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/foodprocessing.pdf
14.4	*Decommissioning*	5.3.4	• Ensure that landfills and other waste disposal areas are sealed and inaccessible by humans and animals at time of decommissioning • Ensure waste stream generated by decommissioning activities (including fuels, debris, rubbish, and machinery) is effectively managed
15	**Human Impacts—Sensitive Cultural, Historic, or Archeological Resources**		
		5.3.4	

Number	*Impacts*	EA Reference	*Mitigation Measure*
15.1	*Planning and design*		• Meet with local and provincial authorities before the project is initiated to ensure protection of cultural/historical site(s)
15.2	*Construction*		• Route construction-related traffic and establish construction camps a safe distance from local resources; demarcate loading/unloading and storage areas for construction materials and supplies at safe distance • Additional "Best Practice" mitigation measures are found in Part II, Chapter 3 (Small-Scale Construction) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/construction.pdf
15.3	*Operation and maintenance*		• Educate newcomers to Khulm area (non-native farm labor, visitors) on presence of local cultural resources and importance of protecting surrounding sites and mitigating any impacts of farm operations
15.4	*Decommissioning*		• Ensure decommissioning-related activities (e.g., demolition, resettlement of resident farm workers) do not negatively impact sensitive, cultural, historic, or archeological resources
16	**Human Impacts—Health and Disease in the Project Area and Regionally**		
16.1	*Construction*	5.3.3	• Ensure construction camps are equipped with adequate water and sanitation facilities (e.g., VIP latrines
16.2	*Operation and maintenance*		• Educate farm workers and their families concerning issues of public health and potential farm-related health impacts (e.g., possible exposure to pesticides and fertilizers; inhalation of increased particulate matter caused by farm dust [soil erosion]) • Test and treat farm workers and their families for common conditions stemming from farm

Number	*Impacts*	EA Reference	*Mitigation Measure*
			activities • Additional "Best Practice" mitigation measures are found in Part II, Chapter 1 (Agriculture: Soil and Water Resources, including Irrigation) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/agriculture.pdf
16.3	*Decommissioning*		• Ensure that irrigation system infrastructure remaining in place (e.g., canals, drainage ditches, constructed wetlands/settlement ponds, etc.) does not contribute to the spread of waterborne diseases
17	**Human Impacts—Occupational and Safety Hazards in the Project Area And Regionally**		
17.1	*Planning and design*	5.3.3	• Implement Basic Health Service Program, including on-site clinic
17.2	*Construction*	5.3.3	• Identify and develop management strategy for activities that pose a risk to health and safety (e.g., materials storage and distribution, movement of vehicles, and waste control and disposal) • Additional "Best Practice" mitigation measures are found in Part II, Chapter 3 (Small-Scale Construction) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at: http://www.encapafrica.org/EGSSAA/construction.pdf
17.3	*Operation and maintenance*	5.3.4	• Implement and enforce workplace safety regulations • Train employees on workplace hazards • Provide personal protection equipment, as needed (e.g., respiratory masks, gloves, goggles, and other protective clothing) • Additional "Best Practice" mitigation measures are found in Part III, Chapter 4.2 (Food Processing: Cleaner Production Fact Sheet and Resource Guide) of the *Environmental Guidelines for Small-Scale Activities*; accessible online at:

Number	*Impacts*	EA Reference	*Mitigation Measure*
			http://www.encapafrica.org/EGSSAA/foodprocessing.pdf
17.4	*Decommissioning*		• Identify and manage occupational health and safety risks posed by decommissioning-related work (e.g., clean-up of hazardous waste/remnants, demolition of buildings/facilities, disassembly and removal of irrigation equipment and farm machinery)
18	**Human Impacts—Other Socio-Economic Considerations (emphasis on conformance w/ILO standards and destination market requirements**		
18.1	*Planning and design*	5.3.4	• Ensure business planning efforts account for International Labor Organization (ILO) standards, including standards governing employment of individuals younger than 18 years of age
18.2	*Construction*	5.3.4	• Hire construction firms that adhere to ILO standards
18.3	*Operation and maintenance*	5.3.4	• Implement a labor policy that conforms with ILO standards • Limit employment at Mazar Foods to individuals aged 18 years and older
18.4	*Decommissioning*	5.3.4	• Hire contractors engaged to perform decommissioning-related work that adhere to ILO standards
19	**Energy and Other Resource Commitments**		
19.1	*Planning and design*	5.3.3	• Consider use of renewable energy sources (e.g., solar and wind) in planning and design of farm systems • Adapt principles of “green building” design for use in on-site facilities, particularly offices and housing (e.g., use of insulating materials and site planning to minimize/maximize heat gain) • Evaluate options for reuse of process wastes in production of biodiesel

Number	*Impacts*	EA Reference	*Mitigation Measure*
19.2	*Construction*	5.3.3	• Use fuel-efficient vehicles to support construction efforts • Use local building materials (except fired brick—see above); these require less energy for transportation to the construction site • Ensure availability cooking and heating fuel in construction camps that does not entail harvesting of plants/shrubs for use as fuel wood
19.3	*Operation and maintenance*	5.3.4	• Understand the energy demand/requirements of farm operation equipment prior to procurement • Use alternative technologies for food processing requirements (e.g., solar dryer to dry fruits/vegetable for market; solar-powered water heaters to provide hot process water) • Develop plan for safe fueling, storage, and maintenance of diesel generators • Plant additional native shrubs on- and off-site to compensate for increased foraging by rising population of farm workers and their families
19.4	*Decommissioning*		• Plan for safe collection and disposal of fuels located in the project area (e.g., diesel, gasoline, kerosene, propane, and fuel oil) • Plan for safe disassembly and removal of electrical transmission infrastructure, including transformers (containing PCBs) and other high-voltage equipment • Plan for removal of diesel generators from project area
20	**Impacts of No Action Alternative**		
20.1	*Operation and maintenance*		• Ensure that rural livelihoods in northern Afghanistan are sustainable and not based on production of illicit agricultural products

Section 3
Instructions for Completion of Environmental Mitigation and Monitoring Forms for Mazar Foods

Completing the mitigation forms

1. Review the range of adverse environmental impacts found in the Mazar Foods Environmental Assessment, Section 4.2 Potential Adverse and Beneficial Impacts of Mazar Foods Agricultural/Irrigation Actions during Design, Construction, Operation & Maintenance
2. Briefly describe the adverse/beneficial environmental impact under consideration using Section 4.2 of the EA as a guide and the mitigation tables found in Section 2 of these Environmental Mitigation and Monitoring Workplan Guidelines
3. Enter the adverse environmental impact number found in Section 2 of these Guidelines for the environmental impact under consideration.
4. Enter the year covered under this annual Environmental Mitigation and Monitoring Workplan submission.
5. In column a, describe the appropriate mitigation/enhancement measures by activity phase (planning & design, construction, operation & maintenance, and decommissioning (abandonment)).
6. Assign each mitigation measure a number for tracking purposes (e.g., 1.11, 1.12, etc.)
7. Under column b, describe the nature of required follow up for each mitigation /enhancement measure.
8. Under column c, provide needed follow up dates.
9. Under column d, identify who will be responsible for carrying out each of the identified mitigation/enhancement measures and any necessary follow up. (Try to be as specific as possible. It is better to identify a specific individual with responsibility rather than simply to name an entire department or unit.)
10. In column e, estimate the cost for each mitigation/enhancement measure. Try to be specific, but if this is not possible, indicate whether the cost will be high, medium, low or very low.
11. Leave column f blank. Fill in when mitigation/enhancement measures are achieved or describe implementation problems during mid- and end-of-year reviews.
12. Note nature of problems encountered, nature of needed follow up action, responsible individual for follow up, the schedule for follow up.
13. Provide additional comments, if needed.
14. Sign and date the form.
15. Submit forms as Part 5 of the annual Environmental Mitigation and Monitoring Workplan.

Table 4. Mazar Foods Environmental Mitigation Form
[SAMPLE ONLY]
(To be submitted with *Environmental Mitigation and Monitoring Annual Workplan*)

Adverse Impact Description: Soil Erosion **Impact No. 1** **Year: 2008**

No.	a. Description of Mitigation/Enhancement Measure	b. Description of Needed Follow up	c. Follow up Dates	d. Unit(s)/ Individuals Responsible (Initials)	e. Cost high(h); medium (m); low(l); very low (vl)	f. Mitigation Achieved (If yes, provide date. If no, elaborate below))
1.1	**Planning and Design**			**Unit** **Indiv**		
1.11	Develop and provide design standards to control erosion	Quarterly Review of Progress		Mazar Foods Agroforestry Specialist	L-M	
1.12	Develop standards for selection of wind breaks, including selection of trees/shrubs Develop standards for selection and utilization of ground cover	Quarterly Review of Progress		Mazar Foods Agroforestry Specialist	L-M	
1.13	Use a multidisciplinary team in selecting soil erosion control strategies. Establish planting and harvesting schedules to reduce wind and water erosion.	On-going		Mazar Foods Agronomist, Agroforestry, Botanical & Civil Engineering Specialists		
1.2	**Construction**					
1.2.1	Minimize amount of clearing			Civil Engineer	L	
1.2.2	Protect disturbed areas			Civil Engineer	M	
1.2.3	Store topsoil for respreading			Civil Engineer	L	
1.2.4	Installation of temporary erosion protection	Check to see protection is still in place		Civil Engineer	M	
1.2.5	Test permanent erosion protection methods, materials and trees shrubs and ground cover	Check effectiveness		Mazar Foods Agronomist,	H	

No.	a. Description of Mitigation/Enhancement Measure	b. Description of Needed Follow up	c. Follow up Dates	d. Unit(s)/ Individuals Responsible (Initials)	e. Cost high(h); medium (m); low(l); very low (vl)	f. Mitigation Achieved (If yes, provide date. If no, elaborate below))
				Agroforestry, Botanical & Civil Engineering Specialists		
1.2.6	Revegetation of disturbed areas	Check to see reveg doing OK		Civil Engineer	M	
1.2.7	Drainage improvements as required based on erosion	Clean as required		Civil Engineer	M	
1.3	**Operation**					
1.3.1	Replant bushes/shrubs and ground cover as needed	Replant as required		Mazar Agroforestry Specialist and Agronomist direct Farm Worker Staff		
1.3.2	Maintain drainage structures	Clean as required		Civil engineer with Farm Worker Staff	M	
1.3.3	Maintain roadway surfaces	Grade as required		Civil engineer with Road Maintenance Staff	M	
1.3.4	Use higher grade gravel on heavily-used route			Civil engineer with Road Maintenance Staff	H	
1.3.5	Temporarily close road to allow environment to recuperate			Civil engineer with Road Maintenance Staff	H	
1.3.6	Install/maintain water-catchment trenches	Clean as required		Civil engineer with Farm	M	

No.	a. Description of Mitigation/Enhancement Measure	b. Description of Needed Follow up	c. Follow up Dates	d. Unit(s)/ Individuals Responsible (Initials)	e. Cost high(h); medium (m); low(l); very low (vl)	f. Mitigation Achieved (If yes, provide date. If no, elaborate below))
				Worker Staff		
1.4	**Decommissioning (Restoration)**					
1.4.1	Reroute / decommission original road segments			Civil engineer with Road Maintenance Staff	H	
1.4.2	Ensure successful vegetation	Verify reveg survival		Botanical Specialist and Farm Worker Staff	M	
1.4.3	Provide drainage/shaping as required to prevent erosion/siltation	Verify erosion not occurring		Civil engineer with Farm Worker Staff	M	

Problem(s) Encountered:

Nature of needed follow up action:

Responsible individual for follow up:

Schedule for follow up:

Other comments:

Signature of Preparer: _____ Date: _____

Completing the monitoring forms

1. Briefly describe the adverse environmental impact under consideration, matching the completed mitigation forms for the *Environmental Mitigation and Monitoring Annual Workplan Guidelines* for the Mazar Foods Project.
2. Enter the adverse environmental impact number found in *Section 2* of these *Guidelines* for the environmental impact under consideration.
3. Enter the year covered under this E*nvironmental Mitigation and Monitoring Annual Workplan* submission.
4. In column a, describe the appropriate mitigation/enhancement measures/issues/ elements to be monitored by activity phase (planning & design, construction, operation & maintenance, and decommissioning (abandonment)).
5. Assign each monitoring measure a number for tracking purposes (e.g., 1, 2., 3, etc.)
6. Under column b, identify who will be responsible for carrying out each of the identified monitoring measures. (Try to be as specific as possible. It is better to identify a specific individual with responsibility rather than simply to name an entire department or unit.)
7. Under column c, describe the indicator(s) used for monitoring.
8. Under column d, describe the monitoring method to be used.
9. Under column e, identify the monitoring frequency needed.
10. In column f, estimate the cost for each monitoring measure. Try to be specific, but if this is not possible, indicate whether the cost will be high, medium, low or very low.
11. Leave columns f and g blank. Fill in when monitoring has taken place or problems have been encountered, or describe implementation problems during mid- and end-of-year reviews.
12. Note nature of monitoring problems encountered, nature of needed follow up action, responsible individual for follow up, and the schedule for follow up.
13. Provide additional comments, if needed.
14. Sign and date the form.
15. Submit forms as Part 5 of the *Environmental Mitigation and Monitoring Annual Workplan* for the Mazar Foods Project

Table 5. Mazar Foods Environmental Monitoring Form
[SAMPLE ONLY]
(To be submitted with annual *Environmental Mitigation and Monitoring Annual Workplan*)

Adverse Impact Description: Soil Erosion **Impact Number: 1** **Year: 2001**

No.	a. Mitigation/Enhancement Measure/ Issues/Elements to be Monitored	b. Unit(s)/ Individuals Responsible		c. Indicator(s) For Monitoring	d. Monitoring Method Used	e. Monitoring Frequency	f. Monitoring Cost high(h); medium (m); low(l); very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Monitor Date(s):
	Design	**Unit**	**Indiv**						
	Construction								
1	*Minimize amount of clearing*	Construction supervisor		Erosion	Visual inspection	daily	L		
2	Limit earth moving to dry seasons	Construction supervisor		Erosion	Visual inspection	daily	L		
3	Restore disturbed areas	Construction supervisor		Erosion	Visual inspection	Start, midterm, finish	M		
4	Store topsoil for respreading	Construction supervisor		Erosion	Visual inspection	Start, midterm, finish	L		
5	Installation of temporary erosion protection	Construction supervisor, AgroforesterBotanist		Erosion	Visual inspection	Start, midterm, finish	H		
6	Installation of permanent erosion protection	Construction supervisor, Agroforester/Botanist		Erosion	Visual inspection	Start, midterm, finish	H		

No.	a. Mitigation/Enhancement Measure/ Issues/Elements to be Monitored	b. Unit(s)/ Individuals Responsible	c. Indicator(s) For Monitoring	d. Monitoring Method Used	e. Monitoring Frequency	f. Monitoring Cost high(h); medium (m); low(l); very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Monitor Date(s):
7	Revegetation of disturbed areas	Construction supervisor, AgroforesterBotanist	Reveg and erosion	Visual inspection	Start, midterm, finish	M		
8	Reroute / decommission original road segment	Construction supervisor, AgroforesterBotanist	Reveg and erosion	Visual inspection	Start, finish, +1 year	L		
9	More drainage turnouts as required based on erosion	Construction Supervisor and Civil Engineer	Erosion	Visual inspection	Start, finish, +1 year	M		
10	Drainage check dams as required based on erosion	Construction Supervisor and Civil Engineer	Erosion	Visual inspection	Start, finish, +1 year	M		
11	Higher quality murram or surfacing based on continuing road damage	Construction Supervisor and Civil Engineer	Road surface deterioration	Visual inspection Visual inspection	Start, finish, +1 year	M		
12	Sufficient culverts for good distribution of surface runoff	Construction Supervisor and Civil Engineer	Vegetative effects each side of road	Visual inspection photos	Start, finish, +1 year	M		
13	Minimize cuts/fills in sensitive areas (wetlands)	Civil Engineer and Botanical Specialist	Vegetative effects each side of road	Visual inspection	Start, finish, +1 year	M		
	Operation							
15	Maintain drainage structures	Civil Engineer directs Farm Worker	Erosion & siltation	Photos	yearly	M		

No.	a. Mitigation/Enhancement Measure/ Issues/Elements to be Monitored	b. Unit(s)/ Individuals Responsible	c. Indicator(s) For Monitoring	d. Monitoring Method Used	e. Monitoring Frequency	f. Monitoring Cost high(h); medium (m); low(l); very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Monitor Date(s):
		Monitor						
	Monitor mitigation to prevent soil loss during planting, weeding and harvesting to reduce wind and water erosion	Agronomist directs Farm Worker Monitor						
16	Maintain roadway surface	Civil Engineer directs Road Maintenance Monitor	Surface condition	Photos	yearly	M		
17	Higher grade murram on heavily-used route	Civil Engineer directs Road Maintenance Monitor	Surface condition	Photos	yearly	M		
18	Temporary road closure to allow environment to recuperate	Civil Engineer directs Road Maintenance Monitor	Surface condition	Photos	yearly	H		
19	Install/maintain water-catchment trenches	Civil Engineer directs Road Maintenance Monitor	Erosion & siltation	Photos	yearly	M		
20	Drainage turnouts sufficient to allow runoff percolation	Civil Engineer directs Farm Worker Monitor	Erosion & siltation	Photos	yearly	M		
	Decommissioning (Restoration)							
22	Ensure successful revegetation	Agroforestry	Reveg and	Photos	Start, finish, +1	M		

No.	a. Mitigation/Enhancement Measure/ Issues/Elements to be Monitored	b. Unit(s)/ Individuals Responsible	c. Indicator(s) For Monitoring	d. Monitoring Method Used	e. Monitoring Frequency	f. Monitoring Cost high(h); medium (m); low(l); very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Monitor Date(s):
		Botanist and Farm Worker Monitor	erosion		year			
23	Provide drainage/shaping as required to prevent erosion/ siltation	Civil Engineer directs Farm Worker Monitor	Reveg and erosion	Photos	Start, finish, +1 year	M		

Problem(s) Encountered:

Nature of needed followup action:

Responsible individual for followup:

Schedule for followup:

Other comments:

Signature of Preparer: _____ Date: _____

Section 4
Template: Environmental Mitigation and Monitoring Forms for Mazar Foods

Mazar Foods Environmental Mitigation Form

(To be submitted with annual *Environmental Mitigation and Monitoring Annual Workplan*)

Adverse Impact Description: _____ Impact No. _____ Year _____

No.	a. Description of Mitigation/Enhancement Measure	b. Description of Needed Followup	c. Followup Dates	d. Unit(s)/ Individual(s) Responsible (Initials)		e. Cost high(h); medium (m); low(l); very low (vl)	f. Mitigation Achieved (If yes, provide date, If no, elaborate below)
	Design			**Unit**	**Indiv**		
	Construction						
	Operation						

No.	a. Description of Mitigation/Enhancement Measure	b. Description of Needed Followup	c. Followup Dates	d. Unit(s)/ Individual(s) Responsible (Initials)		e. Cost high(h); medium (m); low(l); very low (vl)	f. Mitigation Achieved (If yes, provide date, If no, elaborate below)
	Decommissioning (Abandonment)						

Problem(s) Encountered:

Nature of needed followup action:

Responsible individual for followup:

Schedule for followup:

Other comments:

Name of Preparer (Print): _____

Title of Preparer: _____

Signature of Preparer: _____ Date: _____

Mazar Foods Environmental Monitoring Form

(To be submitted with annual *Environmental Mitigation and Monitoring Annual Workplan*)

Adverse Impact Description: _____ Impact No. _____ Year _____

No.	a. Description of Mitigation/ Enhancement Measure/Issues/ Elements to be Monitored	b. Unit(s)/ Individual(s) Responsible (Initials)		c. Indicator(s) Used for Monitoring	d. Monitoring Method Used	e. Monitoring Frequency Needed	f. Monitoring Cost High(h) Medium (m) Low(l) Very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Dates Monitored
		Unit	Indiv						
	Design								
	Construction								

No.	a. Description of Mitigation/ Enhancement Measure/Issues/ Elements to be Monitored	b. Unit(s)/ Individual(s) Responsible (Initials)		c. Indicator(s) Used for Monitoring	d. Monitoring Method Used	e. Monitoring Frequency Needed	f. Monitoring Cost High(h) Medium (m) Low(l) Very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Dates Monitored
	Operation								

No.	a. Description of Mitigation/ Enhancement Measure/Issues/ Elements to be Monitored	b. Unit(s)/ Individual(s) Responsible (Initials)		c. Indicator(s) Used for Monitoring	d. Monitoring Method Used	e. Monitoring Frequency Needed	f. Monitoring Cost High(h) Medium (m) Low(l) Very low (vl)	g. Problem Encountered (Check if yes, and elaborate below)	h. Dates Monitored
	Decommissioning (Restoration)								

Problem(s) Encountered:

Nature of needed followup action:

Responsible individual for followup:

Schedule for followup:

Other comments:

Name of Preparer (Print): _____

Title of Preparer: _____

Signature of Preparer: _____ Date: _____

6.3 Environmental Review Form

Program logo here, if

25 January 2008

Mazar Development Foundation
USAID/Afghanistan

Instructions for Environmental Review of Mazar Development Foundation Project Activities

Introduction

This Environmental Review Form (ERF) is for the use of Mazar Development Foundation Managers during the grant proposal review phase. The form should be filled out as early as possible during this phase, but must be completed *prior* to obligating funds for the specific project. If mitigation measures are necessary, the Small Grants Manager should ensure that the proposal budget reflects the costs of these measures.

The intent of the ERF is to identify potential environmental impacts at an early stage in project design, when environmental considerations can be easily incorporated. This ERF is meant to be used for reviewing activities that are not predicted to have significant environmental consequences.

All proposed activities should be evaluated in the ERF, including ancillary activities—the support activities that are part of the overall project, such as excavation of fill material, provision of water and electricity, and disposal of solid or liquid waste.

The Mazar Development Foundation Director is responsible for approving or rejecting the ERF and, following his/her review, submitting it to the USAID CTO and MEO for clearance. For optimal results, and to ensure local partners are involved, the Mazar Environmental Specialist should conduct the environmental review in consultation with the project proponent.

Any support[23] for the procurement or use or pesticides must be evaluated separately before the Mazar Development Foundation can provide such support.

Note:

These instructions accompany the "Environmental Review Form for Mazar Development Foundation Project Activities."

Please **follow, but DO NOT SUBMIT, these instructions.**

Who must submit the Environmental Review Form (ERF)?

ALL implementing Partners applying to perform activities under the Mazar Development Foundation must complete the ERF UNLESS the project or activity is carried out to address an

[23] Support is defined as the procurement and/or promotion of use [of chemicals] for increased productivity.

emergency (e.g., international disaster assistance). *Emergencies are determined by the US Ambassador or USAID, not by the applicant.*[24]

Importance

The proposed project or activity cannot be approved and no "irreversible commitment of resources" can be made until the environmental documentation, including the ERF, as well as any mitigation measures, is approved by the Mission Environmental Officer (MEO). Approval by other USAID authorities may also be required.
NOTE: USAID may request modifications, or reject the required environmental documentation.
If the proposed activities are found to have significant adverse impacts, a full Environmental Assessment (EA) must be conducted. The Mazar Development Foundation, USAID, and the applicant will confer in any such case to determine next steps.

Step 1. Provide requested "Applicant information" *(Section A of the ERF)*

Step 2. List all proposed activities

List all proposed activities in Section B of the ERF. Include all phases: *planning, design, construction, operation & maintenance*. Include ancillary activities. (These are activities that are required to undertake the primary activity. Examples include building or improving a road so that heavy vehicles can reach the project site, excavation of fill material or gravel for construction, provision of electricity, water, or sewage facilities, disposal of solid waste, etc.)

Step 3a. Screening: Identify low-risk and high-risk activities

Use the table below to determine if *each* activity you have listed in Section B of the ERF is categorized as a low-risk activity, or a high-risk activity.

If an activity is specifically identified as "very low risk" or "high risk" in the table below, please indicate as such in the "screening result" column in Section B of the ERF.

Very low-risk activities (Activities with low potential for adverse biophysical or health impacts; including §216.2(c)(2))	**High-risk activities** (Activities with high potential for adverse biophysical or health impacts; including §216.2(d)(1))

[24] See 22 CFR §216.2(b)(1). Most activities carried out under emergency circumstances are considered EXEMPT from USAID environmental procedures, except for the procurement or use of pesticides

Very low-risk activities (Activities with low potential for adverse biophysical or health impacts; including §216.2(c)(2))	**High-risk activities** (Activities with high potential for adverse biophysical or health impacts; including §216.2(d)(1))
Provision of education, technical assistance, or training. (Note that activities directly affecting the environment do not qualify.) **Community awareness** initiatives. **Controlled agricultural experimentation** exclusively for the purpose of research and field evaluation confined to small areas (normally under 4 ha. /10 acres). This must be carefully monitored and no protected or other sensitive environmental areas may be affected). Technical studies and analyses and other information generation activities not involving intrusive sampling of endangered species or critical habitats. **Document or information transfers**. **Nutrition, health care, or family planning**, EXCEPT when (a) some included activities could directly affect the environment (construction, water supply systems, etc.); or (b) bio-hazardous (esp. HIV/AIDS) waste is handled or blood is tested. **Rehabilitation of water points** for domestic household use, shallow, hand-dug wells, or small water storage devices. Water points must be located where no protected or other sensitive environmental areas could be affected. **NOTE:** USAID guidance on potable water requires water quality testing for arsenic, coliform, nitrates, and nitrites. **Small-scale construction.** Construction or repair of facilities if total surface area to be disturbed is less than 10,000 ft^2 (approx. 1,000 m^2), and when no protected or other sensitive environmental areas could be affected. **Intermediate credit.** Support for intermediate credit arrangements (when no significant biophysical environmental impact can reasonably be expected). **Maternal and child feeding** conducted under Title II of Public Law 480. **Title II Activities.** Food for development programs under Title III of P.L. 480, when no on-the-ground biophysical interventions are likely. **Capacity for development.** Studies or programs intended to develop the capability of recipients to engage in development planning. (Does NOT include activities directly affecting the environment) **Small-scale Natural Resource Management activities** for which the answer to ALL SUPPLEMENTAL SCREENING QUESTIONS (see *Natural Resources supplement*) is "NO."	**River basin development.** **New lands development.** **Planned resettlement** of human populations. **Penetration road building or rehabilitation** of roads (primary, secondary, some tertiary) over 10 km in length, and any roads which may pass through or near relatively undegraded forest lands or other sensitive ecological areas. **Substantial piped water supply and sewerage** construction. **Major bore hole or water point construction.** **Large-scale irrigation.** **Water management structures** such as dams and impoundments. **Drainage of wetlands** or other permanently flooded areas **Large-scale agricultural mechanization.** **Agricultural land leveling.** **Procurement or use of restricted-use pesticides**, or wide-area application in non-emergency conditions under non-supervised conditions. (Consult MEO.) **Light industrial plant production or processing** (e.g., sawmill operation, agro-industrial processing of forestry products, tanneries, cloth-dying operations). **High-risk and typically not funded by USAID:** **Actions affecting protected areas and species.** Actions determined likely to significantly degrade protected areas, such as the introduction of exotic plants or animals. Actions determined likely to jeopardize threatened and endangered species or adversely modify their habitat (esp. wetlands, tropical forests) **Activities in forests, including:** ▪ **Conversion of forest lands** to rearing of livestock ▪ **Planned colonization of forest** lands ▪ **Procurement or use of timber harvesting equipment** ▪ **Commercial extraction of timber** ▪ **Construction of dams** or other water control structures that flood relatively undegraded forest lands ▪ **Construction, upgrading, or maintenance of roads** that pass through relatively non-degraded forest lands, including temporary haul roads for logging or other extractive industries.

(This list of activities is taken from the text of 22 CFR 216 and other applicable laws, regulations and directives)

Step 3b. Identifying activities of unknown or moderate risk.

All activities listed in Section B of the ERF that are NOT categorized as "very low risk" or "high risk" are considered to be of "unknown or moderate risk." Common examples of moderate-risk activities are provided in the table below. Check "moderate or unknown risk" in the "Screening Results" column of Section B of the ERF for ALL such activities.

Common examples of moderate-risk activities

CAUTION:
If ANY of the activities listed in this table may adversely impact (1) protected areas, (2) other sensitive environmental areas, or (3) threatened and endangered species and their habitat, THEY ARE NOT MODERATE RISK. All such activities are HIGH-RISK ACTIVITIES.

Small-scale agriculture, NRM, sanitation, etc. (You may wish to define what you consider to be "small scale" for each activity)

Agricultural experimentation. Controlled and carefully monitored agricultural experimentation exclusively for the purpose of research and field evaluation of MORE than 4 ha.

> **NOTE Biotechnology/GMOs:** No *biotechnology testing or release* of any kind are to take place within an assisted country until the host countries involved have drafted and *approved* a regulatory framework governing biotechnology and biosafety.
>
> All USAID-funded interventions which involve biotechnologies are to be informed by the ADS 211 series governing "Biosafety Procedures for Genetic Engineering Research". In particular, this guidance details the required written approval procedures needed before transferring or releasing GE products to the field.

Medium-scale construction. Construction or rehabilitation of facilities or structures in which the surface area to be disturbed exceeds 10,000 ft^2 (1000 m^2), but funding level is $200,000 or less. (E.g. small warehouses, farm packing sheds, agricultural trading posts, produce market centers, and community training centers.)

Rural roads. Construction or rehabilitation of rural roads meeting the following criteria:

- Length of road work is less than ~10 km
- No change in alignment or right of way
- Ecologically sensitive areas are at least 100 m away from the road and not affected by construction or changes in drainage.
- No protected areas or relatively undegraded forest are within 5 km of the road.

Title II & III Small-Scale Infrastructure. Food for Development programs under Title II or III, involving small-scale infrastructure with the known potential to cause environmental harm (e.g., roads, bore holes).Quantity imports of commodities such as fertilizers.

Sampling. Technical studies and analyses or similar activities that could involve intrusive sampling of endangered species or critical habitats. (Includes aerial sampling.)

Water provision/storage. Construction or rehabilitation of small-scale water points or water storage devices for domestic or non-domestic use. (Covers activities NOT included under "Very low-risk activities" above.)

> **NOTE**: USAID guidance on water quality requires testing for arsenic, nitrates, nitrites, and coliform bacteria.

Support for intermediate credit institutions when indirect environmental harm conceivably could result.

Institutional support grants to NGOs/PVOs when the activities of the organizations are known and may reasonably have adverse environmental impact.

Pesticides. Small-scale use of USEPA-registered, least-toxic general-use pesticides. Use must be limited to NGO-supervised use by farmers, demonstration, training and education, or emergency assistance.

> **NOTE**: Environmental review (see step 5) must be carried out consistent with USAID Pesticide Procedures as required in Reg. 16 [22 CFR 216.3(b)(1)].

Nutrition, health care, or family planning, if (a) some included activities could directly affect the environment (e.g., construction, supply systems, etc.), or (b) bio-hazardous healthcare waste (esp. HIV/AIDS) is produced, syringes are used, or blood is tested.

Step 4. Determine if you must complete an Environmental Review Report

Examine the "screening results" for all proposed activities as they are entered in Section B of the ERF.

- If ALL proposed activities are categorized as "very low-risk" no further review is necessary—check the box labeled "very low-risk activities" in Section C of the ERF and skip to Step 8 of these instructions.
- If ANY of the proposed activities are categorized as "unknown or moderate risk," you MUST complete an ENVIRONMENTAL REVIEW REPORT addressing these activities. Proceed to Step 5 of these instructions.
- If ANY of the proposed activities are categorized as "high risk" note that USAID regulations usually require a full environmental assessment study (EA). Because these activities are assumed to have a high probability of causing significant, adverse environmental impacts, they are closely scrutinized. *Any* proposed high-risk activity should be discussed in advance with USAID.

  In some situations, it is possible that effective mitigation and monitoring can reduce or eliminate likely impacts so that a full EA will not be required. If the applicant believes this to be the case, the Environmental Review Report must present this argument clearly and thoroughly. Proceed to Step 5 of these instructions.

Step 5. Complete the Environmental Review Report, if required

The Environmental Review Report presents the environmental issues associated with the proposed activities and documents mitigation and monitoring commitments. Its purpose is to allow the applicant and USAID to evaluate the likely environmental impacts of the project.

For moderate-risk activities, the Environmental Review Report is typically a SHORT 2–3 page document. The Report is typically longer when (1) activities are of higher or unknown risk, and (2) when a number of impacts and mitigation measures are being identified and discussed.

The Environmental Review Report follows the outline below:

A. **Summary of Proposal.** Summarize background, rationale, and expected outputs/results. (Reference proposal, if appropriate). Be sure to include project name, project director, and project objective.

B. **Description of activities.** Succinctly describe location (province, village, etc.), siting, and surroundings for all moderate- and high-risk activities listed in Section B of the ERF; include a map—even a sketch map. Provide quantitative and qualitative information on actions that will be necessary through all project phases, as well as who will perform those actions. (This information can be provided in a table.) Also explain any alternatives that have been considered and rejected because the proposed activity is deemed more environmentally sound.

C. **Environmental Situation & Host Country environmental requirements.** Describe the type of environment/environmental characteristics of the site(s) where the proposed activities will take place. Focus on site characteristics of concern (e.g., water supplies, animal habitat, steep slopes, etc.). With regard to these critical characteristics, is the environmental situation at the site degrading, improving, or stable? Also describe applicable host country environmental regulations, policies, and practices.

D. **Evaluation of Potential Environmental Impacts.** Include impacts that could occur before construction begins, during construction, and during operation, as well as any environmental impacts that might arise with abandoning, restoring, or reusing the site at the end of the anticipated life of the facility or activity.

Explain direct, indirect, induced, and cumulative effects on various components of the environment including air, water, geology, soils, vegetation, wildlife, aquatic resources, historic, archaeological or other cultural resources, people and their communities, land use, traffic, waste disposal, water supply, energy, etc.

E. **Environmental Mitigation Actions (Including Monitoring).** Provide a workplan and schedule that identifies the following:

Mitigation Measures. Identify the means taken to avoid, reduce, or compensate for environmental impacts (e.g., restoration of borrow or quarry areas, replanting of vegetation, compensation for any relocation of homes and residents). Include all applicable mitigation measures and a discussion of expected effectiveness for each potential environmental impact. If standard mitigation or best practice guidance exists and is being followed, cite this guidance.

Monitoring. Indicate how mitigation measures will be monitored to ensure that they accomplish their intended result. If some environmental impacts are uncertain, describe the monitoring which will be conducted to identify and respond to these potential impacts. Include the following points in developing and implementing an impact mitigation monitoring strategy: (a) monitoring criteria/indicators; (b) frequency; and (c) reporting to USAID CTO/MEO on application and effectiveness. Also consider additional budget requirements for mitigation and monitoring activities.

Responsible parties. Identify who will undertake mitigation and who will conduct the monitoring, and at what frequency.

F. **Other Information**. Where possible, and as appropriate, include photos of the site and surroundings; maps; and list the names of any reference materials or individuals consulted in preparation of the Environmental Review Report.

(Pictures and maps of the site can substantially reduce the written description required in parts B & C)

Step 6. Based on the Environmental Review Report, reach a "Recommended Determination" for each high-risk or unknown/moderate-risk activity

For each high-risk or unknown/moderate-risk activity listed in Section B of the ERF, the Environmental Review Report will help you decide between one of three recommended determinations:

- **No significant adverse impacts**. The proposed activity in question will not result in significant, adverse environmental impacts. Special mitigation or monitoring is not required. Typically, this determination is not appropriate for high-risk activities.
- **No significant adverse impacts given specified mitigation and monitoring.** With mitigation and monitoring as specified in the Environmental Review Report, the

proposed activities in question will not result in significant adverse environmental impacts.

- **Significant adverse impacts**. The proposed activities in question are likely to cause significant adverse environmental impacts and cannot be mitigated with best practices or other measures. A full environmental assessment (EA) will be required.

Indicate the appropriate "recommended determination" for each high-risk or unknown/moderate-risk activity listed in Section B of the ERF.

Step 7. Summarize recommended determinations

In Section C of the ERF, summarize your "recommended determinations" by checking ALL categories indicated in Section B.

Step 8. Sign ERF certifications (Section D)

Step 9. Submit ERF to USAID project officer.

Attach Environmental Review Report, if applicable.

Program logo here, if

25 January 2008

Mazar Development Foundation
USAID/Aghanistan

Environmental Review Form
for Mazar Development Foundation Activities

Note: Follow, but do not submit, the attached instructions.

A. Applicant information

Organization	Parent grant or project
Individual contact and title	Address, phone & email (if available)
Proposed activity (brief description)	Amount of funding requested
Location of proposed activity	Start and end date of proposed activity

B. Activities, screening results, and recommended determination

Proposed activities (continue on additional page if necessary)	**Screening result** (Step 3 of instructions)			**Recommended Determinations** (Step 6 of instructions. Complete for all moderate/unknown and high-risk activities)		
	Very Low Risk	High-Risk*	Moderate or unknown risk*	No significant adverse impact	With specified mitigation, no significant adverse impact	Significant Adverse impact
1.						
2.						
3.						
4.						
5.						
6.						

7.						
8.						

*These screening results require completion of an Environmental Review Report

C. Summary of recommended determinations *(check ALL that apply)*

The proposal contains. . .	*(equivalent Regulation 216 terminology)*
☐ Very low risk activities	*categorical exclusion(s)*
☐ After environmental review, activities determined to have **no significant adverse impacts***	*negative determination(s)**
☐ After environmental review, activities determined to have **no significant adverse impacts, given specified mitigation and monitoring***	*negative determination(s) with conditions**
☐ After environmental review, activities determined to have **significant adverse impacts***	*positive determination(s)**

*for these determinations, the form is not complete unless accompanied by Environmental Review Report

D. Certification:

I, the undersigned, certify that:

1. the information on this form is correct and complete

2. The following actions have been and will be taken to assure that the activity complies with environmental requirements established for this Project:

- Those responsible for implementing this activity have received training in environmental review AND training and/or documentation describing essential design elements and best practices for activities of this nature.
- These design elements and best practices will be followed in implementing this activity.
- Any specific mitigation or monitoring measures described in the Environmental Review Report will be implemented in their entirety.
- Compliance with these conditions will be regularly confirmed and documented by on-site inspections during the activity and at its completion.

(Signature) _____ (Date) _____

(Print name) _____
(Title) _____

Note: if screening results for any activity are "high risk" or "moderate or unknown risk," this form is not complete unless accompanied by an Environmental Review Report.

BELOW THIS LINE FOR USAID USE ONLY

Clearance record

USAID CTO ☐ Clearance given ☐ Clearance denied	(print name)	(signature)	(date)
USAID MEO ☐ Clearance given	(print name)	(signature)	(date)

☐ Clearance denied			
USAID REO* ☐ Clearance given ☐ Clearance denied	(print name)	(signature)	(date)
USAID BEO* ☐ Clearance given ☐ Clearance denied	(print name)	(signature)	(date)

*REO & BEO approval required for all "high risk" screening results and for determinations of "significant adverse impacts"

Note: if clearance is denied, comments must be provided to applicant (use space below & attach sheets if necessary)

Program logo here, if

25 January 2008

Supplement to the Environmental Review Form for Mazar Development Foundation Natural Resources Activities

Additional Screening Criteria for Natural Resource Activities under the Mazar Development Foundation Program

Purpose

This is a supplement to "Instructions for Environmental Review of Mazar Development Foundation Project Activities," and is to be used for natural *resources-based activities*, including:

- Community-Based agricultural and alternative livelihoods activities
- Natural resources-based enterprise development with micro- and small enterprises
- Natural Resource Management (CBNRM)

This supplement provides additional questions to determine if proposed activities should be categorized as "very low risk:"

- If the answer to ALL of the following questions is "NO," the proposed natural resource-based activity is considered "very low risk."
- If the answer to ANY of the following questions is "YES," the activity CANNOT be considered "very low risk."

Screening criteria for potential impacts

Check, if yes. Will the proposed activities...

	Natural Resources
1.	Lead to unsustainable or unnecessarily high water extraction and/or wasteful use?
2.	Alter stream flow or reduce seasonal availability of water resources?
3.	Increase erosion by wind or water?
4.	Withdraw or discharge into surface or groundwater?
5.	Contaminate surface water and groundwater supplies?
6.	Decrease soil fertility and/or permeability?
7.	Disturb land or water to extract renewable natural resources?
8.	Disturb land or water to extract non-renewable natural resources?

9.	Result in wasteful energy use?
10.	Restrict traditional customary access to natural resources?
11.	Affect grazing areas and/or lead to restricted access to a common resource?
12.	Lead to unsustainable use of natural resources, such as shrubs/grasses or forests?
13.	Reduce local air quality by generating dust, burning of wastes, or using fossil fuels and other materials in improperly ventilated areas?
14.	Require off-site overburden/waste disposal or borrow pits?
15.	Entail excavation or placing fill in a river, stream, lake or wetland?
16.	Contribute to unsustainable cumulative impacts in the region?
	Ecosystems and Biodiversity
17.	Drain wetlands, or be sited on wetlands or floodplains?
18.	Harvest wetland plant materials or sediments?
19.	Lead to the clearing of natural vegetation for agriculture
20.	Lead to the over-harvesting of valuable forest species?
21.	Lead to increased hunting, or the collection of animals or plant materials?
22.	Increase the risks to endangered or threatened species?
23.	Introduce new exotic species of plants or animals to the area? Or lead to the spread of existing non-native plants or animals?
24.	Lead to road construction or rehabilitation, or otherwise facilitate access to fragile areas (natural grass and bushlands, forested areas, wetlands, erosion-prone areas)?
25.	Cause disruption of wildlife migratory routes?
26.	Disturb important bird nesting habitat?
27.	Contribute to unsustainable cumulative impacts in the region?
	Agricultural and Forestry Production
28.	Lead to the loss of high-quality pastoral areas or farmlands?
29.	Affect existing or traditional agricultural production systems?
30.	Lead to forest plantation harvesting?
31.	Result in burning of grasslands or pastureland?
32.	Result in a reduction in fallow periods?
33.	Affect domestic livestock (i.e., by reducing grazing areas, or creating conditions where livestock disease problems could be exacerbated)?
34.	Have an impact on existing or traditional agricultural production systems by reducing seed availability or reallocating land for other purposes?
35.	Involve the use of insecticides, herbicides and/or other pesticides?
36.	Affect crop diversity?
37.	Affect existing food storage capacities by reducing food inventories or encouraging the incidence of pests?
38.	Involve the use of insecticides, herbicides and/or other pesticides?
39.	Contribute to unsustainable cumulative impacts in the region?
	Socio-Cultural and Socio-Economic Issues

40.	Cause or aggravate land-use conflicts?
41.	Involve the relocation of farmers, pastoralists, or local community?
42.	Require resolution of land rights issues?
43.	Require compensation for land holders?
44.	Increase migration to the area? Increase population pressures?
45.	Affect labor availability in the region?
46.	Affect potable water supplies?
47.	Affect sanitation?
48.	Affect farmer and community health and safety?
49.	Increase potential HIV/AIDS prevalence?
50.	Affect solid waste generation?
51.	Lead to the generation of non-biodegradable waste?
52.	Result in a substantial increase in vehicle traffic (include construction and operation)?
53.	Affect prehistoric, historic, or paleontological resources?
54.	Affect culturally or ethnically important sites adjacent or on-site?
55.	Contribute to unsustainable cumulative impacts in the region?

- This list of potential environmental impacts stemming from natural resources-based activities is not inclusive and is illustrative only. Such a list can be used as a guide to help identify and formulate project-specific potential environmental impacts and mitigation measures. Please first identify all proposed project activities, then, as described above, consider each activity's potential impacts. Expand or refine the set of impact questions above as needed, based on the proposal under consideration.

- For all questions with a "Yes" response (check mark), elaborate above on both the impact and how the impact will be mitigated and monitored.

- Where appropriate, provide above an estimated budget for proposed mitigation and monitoring measures.

7 ENVIRONMENTAL AUDIT AND EVALUATION CONSIDERATION

Auditing of environmental impacts and mitigation measures during the course of the proposed action is a requirement of OPIC. An Initial Environmental Audit (IEAU) is required one year after approval of the proposed action. Utilization of the environmental monitoring procedures and forms developed in Section 6 of this EA will provide a body of data that will be utilized for completing the IEAU. OPIC regulations define a the recommended content and format of the IEAU in Appendix D of the OPIC Environmental Handbook . It will be the responsibility of the Environmental Monitoring Specialist to complete the Audit and submit to OPIC as needed.

Mazar Food Project Evaluation will determine what effects project activities have had on environmental receptors and whether the mitigation strategies and plans and monitoring have been effective. Evaluation includes documenting lessons learned and applying the knowledge gained through the analysis of monitoring data to make adaptive decisions in management that will improve the implementation of the particular project activity. Specifically, the evaluation process will help project activity managers determine if changes need to be made to mitigation plans or implementation, or whether time and resources can be more effectively used by adjusting monitoring plans, intervals, indicators used, etc. This phase of the project is of vital importance as a monitoring program is only as useful as the information generated that allows managers to make applied decisions about how to proceed with project activity implementation.

Environmental evaluation is the overall process of assessing the physical, chemical, biological, and aesthetic nature of the receptor. In the majority of cases, monitoring will be done to measure the continued suitability of a receptor for its intended use. Monitoring will be used to measure the effectiveness of the mitigation strategy to preserve the environmental receptor's pre-project qualities. The monitoring program will use numerous indicators and compare them to collected baseline values as the project is implemented. Time series of sequentially collected measurements of appropriate indicators of environmental receptors qualities are an integral part of the process.

Audits and Evaluation shall be planned to precede Project Annual Workplan reviews. Evrery two years an independent external environmental audit/evaluation should be conducted.

8 PROJECTED NET ENVIRONMENTAL IMPACTS (POST-MITIGATION)

Impact and Mitigation Analysis Summary Matrix

Impact Category	Beneficial Impacts	No Net Impact	Adverse Impacts	Mitigation Required?	Mitigation Comments
Natural Environment					
Water Resources			**X**	**Yes**	**The project will require a significant amount of water resources to be allocated. There are several potentially negative environmental impacts associated with such a large water demand; however, the socio-economic benefits may prove to be more valuable to the Balkh region considering the economic state of Afghanistan. Mitigation measures to conserve water will be required at every phase of the project in order to ensure an environmentally sound and sustainable economic development.**
Groundwater			**X**	**Yes**	**Proposed maximum groundwater abstraction rates may not be sustainable and cause decreased levels in water table and dry domestic wells. Additional data will be gathered during early 2008 to assist determining groundwater potential for project. Mitigation measures include water efficiency design in irrigation, utilizing low-water crops, water harvesting and re-use.**
Surface water			**X**	**Yes**	**Surface water resources from the Khulm river are entirely committed to sustain the farms and villages in the Khulm District. The Amu Darya river is a potential source of surface water for the project; however use of the Amy Darya will require coordination under transboundary water use agreements, address downstream environmental issues, require possible site relocation, and addition of major infrastructure.**

Impact Category	Beneficial Impacts	No Net Impact	Adverse Impacts	Mitigation Required?	Mitigation Comments
Water Management	X				The exploitation of water resources for agricultural development will likely have an positive socio-economic impact to the people of the and the economy of Northern Afghanistan. If successful, the project may be modeled and replicated in other parts of the country.
Salinization			X	Yes	A potential negative impact of agricultural developments in arid environments is the accumulation of salts in surface soils and groundwater. Additional data will need to be collected to determine the site-specific parameters and potential for salinization at the site. Possible mitigation measures include soil amendments, irrigation drainage networks, engineered wetlands, and crop selection.
Pesticides			X	Yes	Identification of pesticides to be used at farm site will enable preparation of a PERSUAP to accompany the Supplementary Environmental Analysis scheduled for the summer of 2008. The PERSUAP is to outline IPM strategies as well as cradle-to grave use of approved pesticides. Training in implementation of the PERSUAP is also required and should be budgeted for in advance of PERSUAP implementation. . .
Fertilizers			X	Yes	Use of fertilizers can result in contaminated soil and water resources. Mitigation measures include: no application of fertilizer, use of organic compost, establishment of a well defined and managed, multi-tiered quality control program, and construction of engineered wetlands to act as nutrient filters.
Seed Selection		X		No	Potential negative impacts, such as disease introduction and crop intolerance, if seeds are not carefully selected for the project. Detailed analysis and planning will be required in the design phase of the project to ensure no negative impacts.
Soil Conditions			X	Yes	See Salinization

Impact Category	Beneficial Impacts	No Net Impact	Adverse Impacts	Mitigation Required?	Mitigation Comments
Vegetation	**X**			**Yes**	**It is recommended that native shrubs that occur in the areas around the project site be grown as part of the farming operation in order to provide fuel wood, create an ecological buffer zone around the farm, create wildlife habitat, and expedite passive ecological restoration to the area.**
Biological Resources	**X**			**No**	**Hunting in this part of Afghanistan is commonly utilized to supplement domestic food resources. The project may decrease hunting by providing families the economic resources to purchase meats instead.**
Threatened and Endangered Species		**X**		**No**	**The project is not likely to affect threatened and endangered species.**
Parks, Reserves, Protected Areas		**X**		**No**	**The Project will not affect parks, reserves and protected areas.**
Human Environment					
Population and Settlements (Displacement)			**X**	**Yes**	**The land acquisition strategy for the project calls for primarily government owned lands to be utilized for the project site. However, land ownership pattern in the area are not fully documented at this time. A cadastral survey is planned for the project area and may involve resettlement of a few isolated families. There is uncertainty at the present regarding the geographical scope of the project. Specific site boundaries will be determined on the basis of the results of technical analysis of the water regime and other factors.**

Impact Category	Beneficial Impacts	No Net Impact	Adverse Impacts	Mitigation Required?	Mitigation Comments
Cultural, Historic and Archeological Resources		**X**		**No**	**There are no Cultural, Historic and Archeological Resources located on the project site.**
Community Health	**X**			**Yes**	**The Mazar Development Foundation will provide mitigation measures for the project by making basic services such as basic health care available.**
Occupational Safety and Health			**X**	**Yes**	**The agricultural industry is one of the most hazardous work environments. The Mazar Foods Corporation should develop a well managed Occupational Health and Safety Program for the benefit of its employees.**
Other Socio-economic Considerations	**X**			**Yes**	**The Mazar Development foundation will also provided education, employment training and other social services to the employees and people in the project area.**
Energy			**X**	**X**	**The project will require significant amount energy for electricity and fuel. It is recommended that energy conservation mechanisms be implemented and designed into every development phase of the project.**

9. PUBLIC STAKEHOLDER AND COMMENT

The following are summary transcripts of public and stakeholder comments derived from meetings held as part of the EA public consultation process.

Key informant interview
Date: Dec. 23, 2007
Venue: Ministry of Agriculture
Participants: Mr. Haidari, Director of Afghanistan Environment Ministry of Agriculture
Main points raised:
Mr. Haidari was asked for background information and environmental documents on the northern region; specifically Khulm District of Balkh Province. According to Mr. Haidari, the Afghanistan environment in the north is quite fragile and susceptible to potential risks from large stocks of dangerous or illegal pesticides used in the past to control insects, including annual infestations of Moroccan locusts.

He noted that Khulm District's economy is based on agriculture and that farming is the main occupation of the residents. According to him, farmers make up more than 80 percent of the population in Khulm. He questioned the use of pesticides and chemicals for pest management. He stated that traditional/cultural pest management practices have been quite effective in the past. Pest damage was reported from Khulm District in Balkh Province and from parts of Samangan, but estimates of crop losses were not available. As in previous years, grasshoppers were a problem in rice fields. Water scarcity is a significant issue, especially during summer and fall. A shortage of labor for harvesting is expected to be a major problem in 2008. The transplanting of rice is also being hampered by a labor shortage. Tractor diesel fuel is in limited supply and may delay harvesting.

Key informant interview
Date: Dec. 23, 2007
Venue: Ministry of Agriculture, Kabul
Participants: Mr. Hashem Barakzai, General Director of Natural Resources, Ministry of Agriculture, Afghanistan
Main points raised:
Mr. Barakzi provided background to the team on the existing water resources in Khulm District, emphasizing what he believes is the rich potential of the aquifer in Khulm District. He mentioned the quantity might not be constant and may vary from location to location, and that the shallowest water table is 30-40 m. It may go up to 150 m in some parts. Mr. Barkzai was unable to provide reliable data on the quality of the underground water in Khulm, its salinity, or the potential for contamination, but he is optimistic that most of the underground water in Khulm is potable. When asked whether there is sufficient water in Khulm for irrigation, he described this as a serious issue and added that the Hayat spring (chashma) is insufficient to meet domestic and commercial water demands in the Khulm area.

Key informant interview
Date: Dec. 24, 2007
Venue: NEPA office, Kabul
Participants: Mr. Obaidullah Environmental Officer
Main points raised:

Mr. Obaidullah was contacted in order to learn of standard EIS/EIA regulations and policies in Afghanistan. According to him, the policy is under consideration by the cabinet and would be available for public reviews.

Key informant interview
Date: Dec. 24, 2007
Venue: ASAP office, Kabul
Participants: Mr. Ehsanullah Ehsan, Agriculture, Research and Extension advisor, ASAP program
Main points raised:
Mr. Ehsanullah was contacted to provide information concerning the results of soil samples taken by the ASAP team. According to him, the purpose of the testing is to determine the quality of soil for agriculture and for the use of any fertilizers in the area. Currently work is being done to identify laboratories in Afghanistan or nearby countries with the necessary expertise and equipment to conduct laboratory analyses of soil samples.

Key informant interview
Date: Dec. 24, 2007
Venue: FAO office, Kabul
Participants: Mr. Sayed Naeem, Operations Officer, FAO Afghanistan
Main points raised:
Mr. Naem was contacted to find out if FAO has pesticide or insecticide programs in Khulm District. He indicated that insecticide use is not a big issue in Khulm, though there have been reports of a locust problem in the district. Regarding the type and nature of crops and fruits in Khulm Mr. Naem mentioned wheat, barley, etc.

Key informant interview
Date: Dec. 25, 2007
Venue: ASAP office, Kabul
Participants: Mr. Ibrahim Sultani, Director Infrastructure, ASAP program
Main points raised:
Mr. Ibrahim designed/implemented numerous medium and large irrigation projects in the north and is exceptionally aware of various hydrological and water quality issues in northern Afghanistan. He seemed reluctant to provide any kind of information regarding the project site before water testing results become available; however he said the water in many locations is salty. Results will be available in a few months' time.

Key informant interview
Date: Jan. 5 & Jan. 8, 2008
Venue: Khulm District office, Balkh Province
Participants: Sayed Ebrar, District Governor and community members noted below:
Main points raised:
For the purpose of this planning study, a key issue related to the current status of the Khulm River mirab system is recognizing that traditional respect for mirab bashi and merabs is still maintained among canal communities—they continue to play an important role in the operation and maintenance of individual canals, annual clearing, repair from flood damage, etc. Farmers' respect for—and acceptance of—the traditional mirab system, however, has been undermined during the years of conflict due to its inability to counter flagrant abuse of water rights by powerful, armed local landowners, militia commanders, and warlords. This situation has been compounded by the inability of local government to support the mirab bashis and mirabs in the resolution of disputes over abuse of water allocations between upstream canal users of the network and downstream users along individual canals.

The mirab bashi , mirabs and chak bashis are appointed to their positions through a system that is accepted by the canal communities they serve, and appointments are made broadly without manipulation of vested local interests by the majority of those appointed, some of whom have been performing their duties for many years.

Many of the older mirab bashi and farmers interviewed during this study referred to the time of king Zahir Shah, commenting that there were relatively few problems with water allocation and irrigation (with the exception of excessive and illegal use of water in Khulm). At that time it seemed the traditional mirab system was able to effectively mange the Khulm irrigation network; mirab bashis were well respected and generally effective in resolving disputes between users. Large amounts of irrigable land were often held by influential Khans and Maliks (leaders) who supported the traditional irrigation system. This likely made conflict resolution easier than it is today as land holdings are at present much smaller. Up until the 1980s one mirab bashi was always appointed as head mirab bashi and spoke on behalf of all mirab bashis. This is likely to have facilitated the resolution of conflicts and disputes between canals.

Discussion of water resources, effects of water shortage in the area: A spring is located at Joe Barzoi Dheqan, which may begin from Qala-e-Zall. In the past this spring had a very significant quantity of water used by the population of Mazar-i-Sharif, but not at present.

Participants' requests: The community and District Governor emphasized the potential of using the Amu Darya River to supply water for the project, believing it would be more cost effective than wells drawing from the aquifer. It would also encourage additional development in the area by other NGOs and government entities.

Land issues: Individuals in the area have official documents from three different sources: the Dr. Najib, Burhanodin Rabani, and Taliban eras. Land amounting to 42,000 jiribs in the South of Khulm District were allocated through bribery. Similarly, under the governorship of Osman Salikzai,, an additional 5,600 jiribs of land were allocated through bribery. One community in Khulm District is in the process of developing an application for 20,000 jiribs of land to build houses.

Key informant interview
Date: Jan. 6, 2008
Venue: Afghanistan Information Management Services (AIMS) office at UNDP compound
Participants: Aimal Maiwand, Regional Manager North
Main points raised:
Topographical and district maps were procured from AIMS..

Key informant interview
Date: Jan. 9, 2008
Venue: Ministry of Agriculture office, Mazar Province
Participants: Mr. Kasim Shams
Main points raised:
Mr. Shams explained that the Mazar area consists of 12,8000km^2 total area, 115,000ha forest, 138,200 ha pasture, 25,000 ha gardens, 27,2000 ha irrigated land and 150,000ha rain-fed land with 14 districts. Two land conflicts exist. The first involves 42,000 jiribs of fertile land located to the South of Khulm District purchased by local people. These lands are productive, but because of water shortage, currently uncultivated. Individuals have official documents from three different sources: the time of Dr. Najib, Burhanodin Rabani, and Taliban. The land has been

distributed to more than 150 people through issuance of official documents during the time of Osman Salikzai representing the provincial governor of Mazar. Different people have built on part of this land, and some have sold their land or houses to the other people. The second dispute involves 5,600 jiribs of fertile land distributed to other people through issuance of official documents (Qabala) from the Nahri Shahi District Justice Department.

The meeting was also held to discuses the project objective: to create a major commercial farming operation that provides substantial employment and income in the area, and to demonstrate that there are commercially viable alternatives to the opium poppy economy. Also, that it will create a large, commercially viable farming operation in Mazar Province based on production of fruits and vegetables that would be sold domestically and exported to neighboring counties. Mr. Shams was informed by the team that project proponents also estimate the creation of approximately 7,000 – 8,000 additional jobs in the region.

Key informant interview
Date: Jan. 9, 2008
Venue: FAO office, Mazar
Participants: Mr. Ah.Zia Aria, FAO Regional Seed Coordinating Officer
Main points raised:
Integrated Pest Management (IPM) was the main agenda point as FAO had recently prepared an proposal related to IPM assessment and capacity building for donor financing..

Key informant interview
Date: Jan. 9, 2008
Venue: Faculty of Agriculture Mazar University.
Participants: Professor Qayum Ansori, OIC of Agriculture Faculty, Mazar University
Main points raised:
The director indicated the cooperation of the Agriculture Faculty by extending support of his staff and students in agriculture science.

Key informant interview
Date: Jan. 10, 2008
Venue: Deh-now and Uljato villages, Khulm District.
Participants: Abdul Aziz, Head of the shura and Mr. Abdul Salam, community elder
Main points raised:
Key water resource issues and potential impacts of the project on the aquifer were explained to them by Dr .Azimi, and they were made aware of the potential for possible adverse impact of the proposed project on the underground water resources in Khulm. At the same time they were assured that proposed measures of mitigation are foreseen for minimizing these impacts. Abdul Aziz, the community elder from Uljtu village, described water as the most precious substance for sustaining their lives in Uljatu. According to him, they don't have rights to Chashma-e-hayat water, except for drinking. This water becomes extremely dirty and polluted in summer, and there are certain waterborne diseases associated with this. The water table in Uljatu is typically at 120 m depth; however, this is not a constant level because the quantities of water in wells of such depth are not sufficient or sustainable. Mr. Aziz, believes the ideal well depth in Uljatu should be no less than 130 m, which would make them sustainable.

In response to a question regarding current water quality in Deh-now, Mr. Salama described the water as salty at shallow levels, but that it could be drinkable if abstracted from a deeper level. All kind of crops can be grown in Deh District, but water has always been the issue, he said.

According to him, most of the childhood diseases in Deh can be attributed to unsafe drinking water.

Monthly income of a single family (the average family size in Khulm is 7-8 people) is not more than $100 per month, and regular trade involves bringing brush from the nearby mountain and selling them in Mazar City (Abdul Aziz).

Mr. Aziz said that the agricultural potential for growing all kinds of crops (wheat, barley, melons, etc.) in Uljatu Village was high, but the major problem is water.

The total population of Uljatu is 2,200 people, with 300 school-going children. Multiple issues were discussed with the team, including the potential socio-economic impacts, concerns over the degradation of existing water resources, and employment opportunities. Mr. Abdul Salam, the community elder, provided a quick snapshot of his village: Deh-now is the most isolated and poorest village of Khulm District. There is a clinic in the village, but it has the highest child mortality and maternal death rate in the district. Like other villages of Khulm water is the most daunting issue. The village has a small school that accommodates 80 students, but the number of school-aged children far exceeds the school's capacity. The total population of Deh-now is 700 – 800 people and the daily income is hardly 100 Afghanis ($2).

Key informant interview
Date: Jan. 10, 2008
Venue: Agriculture Department, Mazar Province
Participants: Mr. M. Taib, Head of Agriculture Extension Dept. and Sharafullah, Head of Khulm Agriculture section
Main points raised:
Irrigated land in Khulm totals 144,000 jiribs. Of this, 48,000 jiribs are cultivated each year and the other three parts are left uncultivated because of water shortage. The rain-fed area is 500 jiribs. Fruit trees are grown in 42,000 jiribs and include various nut tees, such as pistachio and wild almond; pasture land totals 18,000 jiribs.

The Mazar Agriculture Department sends quarterly reports to the Ministry of Agriculture, Irrigation and Livestock, which include total sowing and harvesting for different crops. (See Table N.)

Table N. Balkh Agriculture Department Extension Section: Agriculture Production— Yearly Report 2007

	Type of plant	Sowing area /ha	Yield /Ton	Remarks
1	Improved wheat seed	58759	130,000	
2	Irrigated local wheat seed	23227	20,000	
3	Lalmi local wheat seed	73865	7,000	
4	Paddy (Rice)	5000	2,688	
5	Maize	1200	1,063	
6	Irrigated barley	19400	5,187	
7	Lalmi barley	7500	2,330	
8	Pea	800	500	
9	Cotton	9500	15,000	
10	Zegher irrigated	778	4,228	
11	Zegher lalmi	538	2,000	
12	Sesame irrigated	884	9,129	

	Type of plant	Sowing area /ha	Yield /Ton	Remarks
13	Sesame lalmi	214	900	
14	Watermelon	570	2,800	
15	Melon	930	6,000	
16	Apple	120	6,000	Including the yield of trees which had been planted many years ago
17	Almond	280	1,357	//
18	Walnut	50	700	//
19	Grape	150	350	//
20	Apricot	170	3,350	//
21	Peach	50	6,250	//
22	Plum	40	440	//
23	Other fruits	150	50	//
24	Pomegranate	403	9,900	//
25	Onion	482	5,506	
26	Potato	215	4,000	
27	Tomato	385	2,280	
28	Egg plant	230	1,675	
29	Turnip	150	1,018	
30	Carrot	300	90,000	
31	Other vegetables	900	5,280	
32	Alfalfa	713	50,617	
33	Clover	320	10,016	

The improved wheat seed that farmers in Khulm and other districts are using include: (1) Ghori-99; (2) PBH-154; (3) Bakhtawar-92; (4) Roshan-96; (5) Sulha-2000; (6) Daima-96; (7) Rona–96; (8) Takhar-96; (9) MH-97; (10) Heart-99; (11) Lalmi-1; (12) Aamo-99; (13) Godalof Franch; (14) Andlof Franch; and (15) Parwa.

Key informant interview
Date: Jan. 10, 2008
Venue: Agriculture Department, Mazar Province
Participants: Mr. Omran Khan, Head of Agriculture Plant Disease Dept. & Mr. Mohd Nabi, professional member of plant disease section, Mazar.
Main points raised:
The most significant plant diseases in the Mazar area are Covered Wheat Smut and Loose Smut. Historically, these two diseases were only common in rain-fed areas and did not typically affect irrigated crops. However, due to cultivation of different varieties of seeds in the area and the lack of any institutionalized governmental inspection and disease prevention measures, these diseases spread to irrigated crops several decades ago. Wheat and maize crops were most significantly affected by these diseases, resulting in losses of 25 – 30 percent of the harvest in Khulm, Marmul, Shurgara, Zare, and Keshen Deh districts.
The primary chemical pesticides used to control these diseases are Vitavax and Thiram. The following list includes some of the other major pest species in the area:

- Anthracnose (leaf blight)
- Grape powdery mildew
- Crown spot

- Crop rust
- Downy Mildew
- Leaf roll
- Soft rot
- Aphids
- Boll worm
- Bulb mite
- Cut worms
- Weevil (several species)
- Locust
- White fly
- Sun pest
- Tomato fruit worm
- White grub

Soil in Mazar Province is generally clay loam, with a pH above 8.5. Soil quality is very low—only 9 percent productive. The major problems with the soil are lack of fertility, the presence of disease, and the high pH of the sol. There are areas of productive soil in Khulm District stemming from the flood cycle, when nutrients are carried from other lands.

Key informant interview
Date: Jan. 14, 2008
Venue: United Nations Mine Action Center for Afghanistan (UNMACA)
Participants: Abdul Wakil Ahmad Zai, Operations Assistant for UNMACA
Main points raised:
Mr. Ahmad Zai clarified the UNMACA procedure for evaluating land for mines and the certification process. He stated that coordinate locations are surveyed for mines upon request. The survey area includes a 100 meter radius around the coordinate point. In response to a request by the Mazar Foods Security director, Mr. Zia provided the EA team and Mazar Foods Security Coordinator with a map showing areas known to have mine contamination and certified the corner points of the aerial survey boundary. He stated that one location in the southwest corner of the project was contaminated with mines. He also stated that the entire area of the site had not yet been surveyed, and that a special request and contract for surveying would need to be arranged in advance of the surveys. Based on this information, it is recommended that a prioritization schedule for site development areas needing mine clearance be developed in coordination with UNMACA.

Key informant interview
Date: Jan. 15, 2008
Venue: Office of Water and Canalization Director, Mazar Province
Participants: Eng. Ab.Jamil, Director of Mazar Water and Canalization.
Main points raised:
There are two water resources in Mazar: surface water and aquifer. Although there has been no research on the topic, surface water has historically been the primary source for both the government and local populations. Many parties, including NGOs, companies, factories, and local people are building wells and fixing pumps without approval from the Office of Water, which is responsible for these matters. He also expressed his opinion that water is one of Afghanistan's

most vital natural resource and that it is the right of people, government, and others to use water, but according the law and regulation.

There are a numbers of water usage regulations in Mazar that the office is applying. Regardless of Afghanistan's water regulations, however, people are building wells and fixing pumps at depths of 100 - 130 m. Because of these problems (in Mazar and other provinces), he suggests the establishment of new water usage laws.

The Office of Water is also responsible for providing water for a range of users, including the Municipality Department, the Fire Department, and drinking water for local residents, NGOs, and businesses.

He agrees with the option of providing the project area with water from the Amu Darya River. Eng. Ab. Jamil stated that groundwater levels measured in wells in the Mazar area have receded approximately 3% in the past three years.

Key informant interview
Date: Jan. 16, 2008
Venue: Office of Environment Director, Mazar Province.
Participants: Mr. Gh. Nabi Khurami, Environmental Department Director, Mazar
Main points raised:
Introduction of the project and the EA team. Nabi Khurami explained the Environmental Department as the following: (1) Environmental Shura for Mazar; (2) Environmental volunteer for Mazar; and (3) Environments protect Shura of Mazar. Through these Shuras and volunteers the Office has done many activities related to environmental issues, such as removal of a diesel pump station, transferring mechanics and their shops from the city center, maintenance and repair of green areas, planting of saplings, nursery establishment, and pistachio forest rehabilitation.

The Environment Department of Mazar is working on a proposed project to provide water from the Amu Darya River to the road to Hairatan.

Key informant interview
Date: Jan. 17, 2008
Venue: Guzar Amin Hosain village & Deh marda Hosain village
Participants: Nasrudin, Edi bi, Amanudin, M.Dawod, Mawludin ,Rahmatullah, Asadullah, Ab. Hakim ,Hyatullah ,Ghyasudin, Gh. Ali
Main points raised:
Hydrology and water quality: Floods occur April – June in this area and damage agricultural land, houses, mosques, gardens, shops, bridges, streams, pools (for collecting water for irrigation), roads, and springs. Amanudin, one of the villagers, said, "There are a number of springs which we are using, but these are not sufficient for all communities such as: Cheshma Hayat, Chetgari, Hazrat Sultan, Shor Qul, and Mangqala." Water levels fluctuate during summer and winter, and in summer the supply is insufficient. In winter he stated that they had too much water.

There are often conflicts over water during the summer and fall seasons. The water table has dropped in the last 10 years, and there are many wells in the area at 50 – 60m, but after a few years they are dry. For depths of 40 – 50m they are using hand pumps, and for deeper wells generators are used. The main water resources for their community are springs and rivers, which do not provide safe drinking water. This results in health problems such as diarrhea, fever, and

skin diseases. There are no wetlands. The most sensitive plants to saline water are melon, watermelon, and various vegetables

Biological Impacts: there are many types of wild animals and birds in the remote areas of Khulm District. Wild animals include deer, dog, fox, horse, jackal, leopard, mule, nanny (wild goat), rabbit, ram, wolf, and snake. Wild birds include cuckoo (fakhta), hoopoe (hototak), pigeon, quail (Budana), owl, nightingale (Bulbul), hawk (Baz), goose (Qaaz), falcon, crow, crane (kolang), and canary. Twenty years ago the number of these animals and birds was very high, but year by year, because of drought, increased population, poor government structure, and more than 20 years of war, the number of these animals and birds has decreased. Some varieties have disappeared altogether.

Agriculture: Below is a list of fruit produced by the community. This is used to generate income, and to meet a portion of the community's firewood needs.

	Fruit	**Yield/jerib**	**Remarks**
1	Pomegranate	500seer	access to enough irrigation water
2	Almond	60seer	access to enough irrigation water
3	Apricot	800seer	access to enough irrigation water
4	Grape	800seer	access to enough irrigation water
5	Fig	700 seer	access to enough irrigation water

Below is a list of crops produced by the community:

	Crop	**Yield/jerib**	**Remarks**
1	Wheat	100seer	
2	Barley	100seer	
3	Sesame	30seer	
4	Cotton	100seer	

The main water resource is spring and river, which produce very little water. The number of animals kept in Khulm villages is approximately:
Sheep—200000
Cow—50000
Donkey—50000
Horse—50000
Camel—40000

Dairy production in the community is divided in two parts: the first part is used for family consumption, and the second part is sold. There is no area where land becomes saline due to over watering because they do not have access to enough water—they have a shortage of water and land that is uncultivated because of this shortage. Pastures belonging to the community have already been distributed by community leaders with government agreement and are located in Naib abad, Oljato, Khushtoot, and Khai abad.

Social-economic Impacts: There are no land ownership issues among the people; people are solving their land issues according to inheritance law within the community. There are, however, important land issues between the people and government, specifically regarding 42,000Jirib and 56,000 Jirib. Also, the area and pastures of each district have already distributed by the government. There was a mine accident this year—one mine exploded. We have already mentioned existing of mines, but mine cleaners do not pay attention and there are areas that we suppose to have mines, such as Teka zar , Gulzar , Taghara Basar , Kaza , Narko, and Chahe Qazi.

He said that the most significant needs of his community are: (1) water for both drinking and irrigation; (2) health and veterinary clinics; (3) road construction; and (4) electricity. The community is using wood and bushes as fuel wood for cooking, and diesel and gas for lighting; people have been cutting pistachio trees for firewood.

Education of girls: According to Mr. Ghyasudin, "We agree on girls attending schools, but according to Islamic laws and regulation—there is no prevention of education of girls. We have three schools in Deh Marda. Two out of three are government schools, and one of them is Madrasa, which does not belong to the government."

Chemical Inputs: The communities are using pesticides for gardens, melon, and grapes. Government and other NGOs advise them not to use pesticides, and on the appropriate use of fertilizer and manure Mr. M. Dawod said, "We have been using both fertilizer and manure. Both are expensive: the price of one truck of manure is 3000 Afs (delivered to the land), which is enough for one Jeribs of land."

The following list includes some of the significant fruit diseases in the area:

- Grape anthracnose
- Grape powdery mildew
- Crown spot
- Downy mildew
- Leave roll
- Aphids
- Cut worms
- Weevil (different species)
- Locust
- Sunn pest

Mr. M. Dawod also said, "All of the soil in the Khulm District is productive; it is very popular in Afghanistan. The black color of the soil is the productive portion, and the very yellow-colored soil is the poorest one. There is not a serious problem of erosion when the floods come from the Tashqughan River, which starts in Samangan. The flood stops in Khulm areas when it happens during spring time."

Key informant interview
Date: Jan. 20, 2008
Village: Mahasti high school meeting room. (See Photo below)
Participants: Sadat, Fahima, Muzda, Aliya, Sangimah, Suraya, Zahra, Malalay, Dawar, Wahida, Zahra, Safia, Wahida, Zarin, Nafisa, Monisa, Sadiqia, Fazela, Kamela, Pari, Yasamin, Zarin, Nafas gul, Gulshan, Najiba, Rokhshana, Faozia, Raihana, Habibia , Parigul, Shafiqa, Koko jan, Sohiala, Sharafat, Homaira and Nadia from Mahasti high school-- Anisa, Moqadas, Amena from Nahid Shahid school-- Torpikai, Laila, Breshna, Zoya, Mah gul, Afghan gul, Moqadas, Dawar,

Shafiqa from Amin Hosain famele school-- Latifa from Khanaqa abulkhair school -- Kamela from Sardar khan school and Fahima, Norya from Woljato school.

Main points raised:

The community meeting with local women yielded much of the same information presented in the preceding Key Informant Interview summary. There were, however, a number of unique/different perspectives, which are recounted below.

Photo 5. An all-women community meeting was held at a local high school to gather information on surrounding villages and livelihoods, as well as unique perspectives on the Mazar Foods Project.

Agriculture: Below is a list of fruit produced by the community. This is used to generate income, and to meet a portion of the community's firewood needs.

	Fruit	**Yield/jerib**	**Remarks**
1	Pomegranate	300seer	access to enough irrigation water
2	Almond	40see	access to enough irrigation water
3	Apricot	1000seer	access to enough irrigation water
4	Grape	800seer	access to enough irrigation water
	Fig	800 seer	access to enough irrigation water

Below is a list of crops produced by the community:

	Crop	Yield/jerib	Remarks
1	Wheat	500seer	
2	Barley	300seer	

3	Seasome	100seer	
4	Cotton	120seer	

Pastures belonging to the community have already been distributed by community leaders with government agreement and are located in Naib abad, Oljato, Khushtoot, Khai abad, Deh naw, and Marsurakh.

Education of girls: Mrs. Rokhshana, a female teacher, explained the idea, saying, "We agree on girls attending schools, but according to Islamic laws and regulation. From my point of view, 20 percent of parents do not agree on girls attending school."

Chemical Inputs: The use of chemicals is good and is controlling pests. Government and other NGOs are advising us to not use pesticides and fertilizer and use manure instead. Mrs. Fahima said: "We have been using both fertilizer and manure." She agrees to use manure then fertilizer.

Ideas about Mazar Foods Project: Women participating in the community meeting provided the following opinions.

- Water for the project must be provided by the Amu Darya or other water sources.
- Provide work opportunities for women of Khulm.
- Establish a project office to buy dairy products from Khulm communities
- Human resource must be drawn from Khulm population.
- New and productive varieties should be introduced to the area both for the project and local people.
- Establish cold storage in the area to store other farmers' products.
- Establish a pant diseases clinic and plant diseases medicine.

Women's participation in family income: Women are also contributing to the family income. There are a number of skills, such as carpet weaving, tailor, Mohradozi, Qurs dozi, handicrafts, dairy production, and hen keeping which generate income within the community, particularly for women. Women possessing these skills and abilities also use their sons, brothers, husbands, or fathers to sell their dairy, carpets, or hand–sewn products. Ninety (90) percent of this income is used by the family for different expenses. The remaining 10 percent is used for the woman's personal costs, like shoes, cloth, sandals, etc. The market for these types of products is limited, and women are working according to market demand. Still, there are many women that want to produce more and more. The community agrees on girls attending school; they are now aware of the importance of education and there are a high percentage of girls attending school. However, 20 percent of the community does not agree with girls attending school. There are a number of reasons preventing girls from attending school, including

- Poor economic situation of the families
- Limited education facilities
- Illiteracy
- Tradition

10 CONCLUSIONS

The Mazar Foods Project could play a strategic role in bringing dramatic change to the agricultural based society of Afghanistan. The successful deployment of the project could provide a model for other parts of Afghanistan and contribute to security and political stability. The strong economic recovery that has taken place in recent years is fragile and will likely be sustained only with increased private sector investment in the long term with international donor support. Rebuilding the Afghan economy, therefore, must emphasize a strong resurgence in private sector activities and a shift from illegal to legal activities. It also entails a shift from a low-productivity, informal, private economy to a high-productivity; formal economy led by private investment. It is in this context that the Mazar Foods Project has a very important role to play in Afghanistan. It aims to provide an attractive alternative to the cultivation of opium poppies, offering the region's primarily rural agrarian population a legitimate path to high-value agricultural production. Social changes will be echoed in the natural environment, where large-scale commercial farming operations will significantly alter land use practices and natural resource management. While these impacts—human and environmental—will challenge the development of the Mazar Foods Project, they are not insurmountable. In fact, this EA has identified a number of the most daunting potential problems and offers recommended alternatives for monitoring and mitigation; a roadmap for ensuring that the Mazar Foods project is implemented in as environmentally sound a manner as possible.

These specific recommendations are embodied in the Mazar Foods Project *Environmental Mitigation and Monitoring Plan* (EMMP), located in Section 6 of this EA. The EMMP not only addresses the unique attributes of the Mazar Foods initiative, it also relies on "best practice" approaches to environmentally sound design and management by sector/industry. The EMMP includes guidelines for an Annual Workplan, as well as checklists to ensure that monitoring and mitigation efforts remain on track. Implementation of the EMMP would be further strengthened by the employment of an Environmental Mitigation and Monitoring Specialist to coordinate implementation of phased mitigation presented in the annual work plan.

It is critical that Mazar Foods allocate the budget for implementation of the monitoring and mitigation efforts as described in the EMMP. Furthermore, consistent application of the Mazar Development Foundation Environmental Review Form (ERF), also included in Section 6, enhances the likelihood that smaller, Foundation-funded development efforts will implement environmental best practices.

In addition to laying the groundwork for ongoing monitoring and mitigation of potential environmental impacts, Mazar Foods should perform additional analysis of the proposed project site in order to fully understand the nature of the impacts it may face. Most critically, a detailed study is required to determine the availability of groundwater for sustained irrigation usage. A carefully executed hydrogeologic study will need to evaluate the subsurface geologic and hydrogeologic conditions: location and thickness of principal aquifers (water bearing zones); as well as intervening confining units (lower permeability zones); the depth and extent of principal fresh water aquifers in the region; water quality changes (TDS) with depth; the potential for upward movement of higher TDS water under sustained groundwater withdrawals; the range of yields for production wells in the Project Area; water-level drawdown interference with other wells in the region and between planned production wells for the project and significantly, quantities of sustained groundwater that can be developed and withdrawn in a sustainable manner into the future.

Aerial surveys and mapping of the Hairatan and Khulm areas is also required. Outputs including 1:10,000 color photography, 1:2,000 scale mosaics, photo pairs, and topographic maps of selected areas with a contour interval of 0.5 meters will greatly facilitate the agricultural soils surveys and land classification. The maps and photos will also provide a base for farm layout, including land leveling, and will in general enable work to proceed at a more rapid pace.

These maps and photos will prove invaluable for preparation of the Supplemental Environmental Analysis and the design of specific mitigation and monitoring measures.

Studies of groundwater and agricultural soils and drainage in Hairatan will assess resource capability to sustain full economic operations at a site with between 2,000 and 3,000 hectares of land. This is important as the Hairatan site would be considered as an alternative should the full Mazar Farm Project of up to 10,000 gross hectares not be feasible for development in Khulm District. These groundwater and soil investigations will provide new information on test well construction and topographic surveys coupled with mapping of physical features and land ownership boundaries, and include data from digging of pits, and soils and water sampling. Auger hole permeability test data will also be provided to facilitate drainage and irrigation development

Using information gathered in these and other analyses, a Supplementary Environmental Analysis (SEAN) is to be prepared in accordance with USAID 22CFR216.6 for Environmental Assessments to address key issues, impacts and mitigation measures which are deferred under this EA. The SEAN is planned for August 2008, and will revisit all sections of the EA to fill in existing information and data gaps and modify the various sections as appropriate based on the data and information provided through the above studies. More specific delineation of environmental consequences and phased mitigation and monitoring measures will also be provided at that time.

Upon final demarcation of the Project boundaries, the SEAN should also include an in-depth social analysis to refine potential adverse and beneficial impacts and mitigation measures related to land right disputes and compensation; water rights and impacts on water quality and quantity affecting the site and the environs; competition with other planned public or private development activities in the region; human health and welfare; potential indirect and cumulative impacts associated with the proposed development. This analysis should draw upon the socio-cultural and socio-economic baseline contained in this EA, as well as engage additional field techniques for obtaining input from selected representatives of all parties who may be affected by the proposed project.

With completion of the SEAN and its attendant studies and analyses, Mazar Foods will have a fuller understanding of the project's potential environmental impacts, as well as strategies for monitoring and mitigation those effects.

11 LIST OF PREPARERS

11.1 Author Information

11.1.1 Names, Affiliations, and Qualifications of Project Team

Team Leader, Ali Azimi

Mr. Azimi has more than 26 years' experience in global, regional, and national environment management issues arising from development in many parts of the world, including South Asia, the Far East, USA, and the Caribbean. He has worked widely in Afghanistan, the Indo-Pakistan subcontinent, and Nepal, as well as several years' involvement in China. His experience covers a wide range of issues of environmental and development issues. He has been involved in managing the process of environmental assessment for more than 60 projects in agriculture, energy, and industry. His environmental review work was instrumental in changing the design of an irrigation project that could have adversely impacted a world heritage national park in Nepal. He conducted an independent review of a pesticide disposal project and formulated a strategy for expired pesticides and agrochemicals in Nepal. He successfully negotiated the environmental covenants of a 1400 MW coal-fired power generation facility in the Philippines and introduced an environmental guarantee fund, independent project monitoring scheme, and communal benefits to improve the socioeconomic conditions of the community.

Mr. Azimi has also introduced innovative pilot projects, including drip irrigation technology in Afghanistan. Technical expertise includes: environmental assessment, planning, monitoring, management, and training, as well as land use planning and formulation of resource baselines. He has considerable experience in management, advisory, and supervisory roles. He holds a doctorate in Environmental Studies from the American University in London (2004), an M.S. in Environmental Science from the University on New Haven, Connecticut (1980), and a B. A. in Biochemistry/Chemistry from California State University at San Francisco (1974).

His professional background includes serving recently as Senior Environment Specialist for the Asian Development Bank (ADB), Kabul, Afghanistan (February 2005 – May 2007); Senior Advisor (equivalent to Deputy Foreign Minister), Ministry of Foreign Affairs (February 2004 – January 2005) Kabul, Afghanistan; and Senior Environment Specialist, ADB, Manila, Philippines (Sept. 1997 – January 2004).

He has worked in Afghanistan, Pakistan, Tajikistan, Uzbekistan, India, Nepal, Sri Lanka, Maldives, Bangladesh, Thailand, Cambodia, Vietnam, Laos, China, Mongolia, Indonesia, Malaysia, Philippines, Kenya, Dominican Republic, and USA. Mr. Azimi is also fluent in Dari/Farsi.

Associate Team Leader, Environmental Impact Assessment Specialist, Wes Fisher

Weston Fisher is a Principal with the Cadmus Group, Inc. He has more than 30 years' experience in natural resource policy, planning, and management. His specialized expertise includes environmentally sound design and management to enhance program and project sustainability. Examples of relevant work include:

- Researched and provided lessons from the experience of other countries in Asia as a basis for the establishment of a new Afghanistan Department of Environment within the Ministry of Irrigation, Water Resources and Environment (MIWRE). The objective was

to ensure that the new Department's organizational structure and functions would be well conceived during its formative stages. The assessment was prepared for the Minister and senior staff of MIWRE and entitled Assessment of Alternative Organizational Models for the New Department of Environment under the Afghanistan Ministry of Irrigation, Water Resources and Environment (MIWRE).

- Principal Trainer in Environmental Assessment and Environmentally Sound Design and Management. Planned and conducted a five-day course in environmentally sound design, environmental impact assessment, and environmental management for staff of the nascent Afghanistan Department of Environment and Government of Afghanistan line ministries. Course held 4-9 October 2003 with case site exercises in and around Kabul.

- USAID/TANAPA Programmatic Environmental Assessment (PEA) for Road Improvements in Tanzania National Parks, African Wildlife Foundation (Arusha, Tanzania) and USAID Bureau for Africa. Mr. Fisher led the Scoping Exercise, organized the PEA Team, and served as Associate Team Leader for the fieldwork and preparation of draft sections of the PEA. Subsequently consolidated the findings and recommendations of the PEA Team and prepared and oversaw production of the final PEA documents.

Mr. Fisher holds an MS in Geology (1966), BS in Geology (1965) and an AB in Biology (1964) from Stanford University. He has worked in 28 developing countries, primarily in Africa and Asia.

Environmental Specialist, Mumtaz Ahmad

Mr. Ahmad is an assessment program and project development specialist with nine years' experience working in the development field in Afghanistan with international and national partners. Mr. Ahmad has provided technical assistance and advisory services for the implementation of environmental strategies and policies. While working with USAID's RAMP project, he was responsible for carrying out the reports of assessments based on critical environmental impact statements, served as a project leader, and provided technical assistance to staff. He contributed to the development of long- and short-term plans, the review of proposals, and prepared work planning for proposals. Mr. Ahmad holds and M.Sc. in Environmental Science from the University of Montana (2007) and a B.Sc. in Civil Engineering from Nangarhar University, Afghanistan (1997).

Mr. Ahmad is also a recent Fulbright scholar, studying environmental science at the University of Montana. He is fluent in Pashtu, Farsi, Urdu, English and basic Arabic.

From 2004 to 2006 he was a Projects Development Specialist for USAID/Afghanistan's Rebuilding Afghanistan Market Program (RAMP) where he developed more formal and efficient systems for incubating and developing new projects and researched/evaluated the feasibility of project concepts; he tracked status of all ideas, concept papers, proposals and coordinated/chaired concept papers and proposals review committee meetings. He evaluated the efficiency and effectiveness of project activities and assisted each sector in prioritizing needs, reviewing sectoral plans, reinforcing the linkages between sector plans, and integrating them with the donor agency (USAID) strategies and line ministry procedures and priorities.

Mr. Ahmad was the focal point for program environmental issues, and performed a variety of responsible tasks including carrying out project EIAs and serving as a member of a project team

in the resolution of problems related to solid and hazardous materials, soil erosions, site remediation, water resources, construction management, air resources, and pollution prevention. He reported and made recommendations based on critical environmental impact statements, and served as a project leader and provided technical direction to other staff. He coordinated and lead the entire program development process to ensure a continuous pipeline of new projects funded under RAMP. He worked closely with organizations submitting proposals to provide guidance and training on concept papers and proposals submissions. He helped coordinate development of RAMP deliverables such as work plans, quarterly reports, and annual reports. He conducted desk review of the project proposals to ensure compliance with USAID policy, strategies, and verification of proposed activities and undertook field visits and draft task order assessments.

From 2003-2004 he was a Contracts & Grants Officer for RAMP and from 2000-2003, he served as a Program Associate in Water Supply & Environmental Sanitation for UNICEF, Afghanistan. In this role, one of his many responsibilities was to develop, monitor, and evaluate strategy, taking into consideration quantitative and qualitative data, to plan specific impact studies aiming at improving water supply and sanitation programs, and include findings in strategy reviews.

Biologist, Natural Resource Specialist, Michael Gaglio

Michael Gaglio is currently an ownership partner in High Desert Environmental, a consulting division of High Desert Native Plants, LLC. Mr. Gaglio is a biologist and environmental project manager with more than eight years of environmental consulting experience in the southwestern United States. His specialized experience is in site assessments for hazardous materials, National Environmental Policy Act (NEPA) documentation, and biological resources. Mr. Gaglio managed the Phase I Environmental Site Assessment (ESA) department for the El Paso office of a global engineering firm. He has conducted hundreds of ESAs on properties ranging from several-thousand-acre ranches in remote areas, to large commercial and industrial facilities within major metropolitan areas of the US southwest, as well as in Mexico.

Mr. Gaglio has ten years of experience conducting biological assessments of natural and disturbed areas for research and regulatory compliance, and more than eight years of experience compiling NEPA documents. With High Desert Native Plants, Mr. Gaglio has focused on conservation through the collection of desert vegetation from developing areas for environmental restoration and landscape projects. Mr. Gaglio frequently utilizes Global Positioning System (GPS) equipment, Geographic Information Systems (GIS), specialized data analysis software, magnetometers, and other sophisticated technical equipment to accomplish data collection and evaluation for projects. Other capabilities include corrective action/remediation, wetlands delineation, geo-technical studies, and re-vegetation planning.

Mr. Gaglio holds a B.S. in Biological Sciences (1998) and a M.S. in Biological Sciences (2000) from the University of Texas at El Paso.

Agronomist and Socio-cultural Specialist, Hafizullah Rahmani

Hafizullah Rahmani has work experience in Afghanistan that includes serving most recently as a researcher for the Afghanistan Pilot Participatory Poverty Assessment (APPPA). Through civil society involvement, the APPPA aims to collect, document, disseminate, and advocate the 'voices' of poor Afghans for inclusion in the formation of the upcoming Afghanistan National Development Strategy (ANDS). The project is funded by the Asian Development Bank (ADB) and managed by ACBAR, which is overseeing project implementation in partnership with

OXFAM GB in Badakhshan, the Afghan Development Association (ADA) in Nangahar and Uruzghan, and the Women's Activities and Social Services Association (WASSA) in Heart.

Mr. Rahmani worked as a researcher with the OXFAM team in Badakhshan province. Working in Shikan village of Shahr-i-Buzurg District and in Yasif village of Yawan District, Badakhshan Province, he was responsible for the following activities: community consultations; writing reports based on consultation outcomes; launching meetings with village men Shuras; meeting with different community groups such as farmers, livestock keepers, laborers, disabled adults, mullahs, Arbobs, commanders; and meeting with community influencers such as schoolteachers, school heads, head of the Education Dept. He was also responsible for data collection. Mr. Rahmani was based between the OXFAM office in Faizabad and the district office in Yawan and Shar-e-Buzurg, and completed this research under difficult physical and security conditions, traveling by horse and on foot. The findings of these reports will contribute to the final ANDS report, in addition to a series of communication and advocacy initiatives.

Mr. Rahmani has also worked as a Monitoring & Evaluating assistant with the OXFAM team in Daikond Province. Working in Ashtarlay, Sangtakht, and Khider district, and at different locations such as Jingan, Baghal-e-Kando, Shaikhmeran, Quchanghi, Tas Qul, Khoskak, Kotal-e-Merasi, Talkhaknaw, and Arbab Karam, he was responsible for: conducting a baseline survey of the emergency program; visiting cash for work (CFW) projects to ensure OXFAM/ECHO standards were being met; ensuring beneficiaries were selected according to the proposed criteria, and were the most vulnerable; ensuring physical work ran according to the schedule and LFM; assessing the immediate impact of the CFW and FFD projects on target communities and surrounding markets though markets survey forms; being present at food distributions points to ensure OXFAM procedures were being followed and to ensure accountability; assisting in reporting for visibility through interviews and pictures; and advising on monitoring and evaluation procedures. Specific responsibilities concerning the monitoring and evaluation objectives included: studying the drought response program's proposal and log-frame; designing pre-structured questionnaires/forms for the baseline survey; conducting the baseline survey; conducting interviews of the beneficiaries to determine project visibility; regularly monitoring the CFW and FFD projects; and assisting in analysis of the baseline survey.

Mr. Rahmani has applied a range of PRA tools, including: social mapping, resource mapping, mobility mapping, seasonal mapping, developing timelines, use of daily activity diagrams, well being analysis, trend analysis, cause and effect diagrams, pair wise ranking and matrix ranking, database establishment, and reporting. Mr. Rahmani graduated from the Kabul University Faculty of Agriculture (Agronomy Section) (1986) and is fluent in Dari and Pashto.

Project Field Reconnaissance Associate, Najmudin Shahrukhi

Mr. Shahrukhi has extensive knowledge of the Mazar Foods project area and environs, including physical, biological, and socio-cultural and socio-economic baseline conditions. In addition to the project area's baseline conditions, he is familiar with stakeholder views and potential project impacts. Mr. Shahrukhi has at least five years' experience providing field support to development projects in Afghanistan.

Mr. Shahrukhi's work history includes employment with the World Food Program in their food distribution, school feeding program; with UNICEF on school feeding and hygiene education programs; work with UNHCR on shelter and food distribution programs; IOM on food distribution and emergency programs; Goal on construction projects; and Relief Ion construction projects.

Mr. Shahrukhi is a graduate of Ghazi Abdullah High School (1993) and on the History Faculty (1996). He has local language facility (Dari, Uzbaki, Pashtu), as well as understanding in English and Russian. He has a demonstrated ability to work collaboratively as part of multidisciplinary teams.

11.1.2 Relationship of Authors to Project Sponsors

Members of the EA team, who also serve as the authors of the EA report, were fielded by the development consulting firms Chemonics International and The Cadmus Group, Inc. The following members of the EA team/EA authors were hired by Chemonics International:

- Mumtaz Ahmad, Environmental Specialist
- Michael Gaglio, Biologist/Natural Resource Specialist

The following members of the EA team/EA authors were hired by, or are employees of, the Cadmus Group, Inc.:

- Ali Azimi, Team Leader
- Wes Fisher, Associate Team Leader & Environmental Impact Assessment Specialist
- Hafizullah Rahmani, Agronomist & Socio-cultural Specialist
- Najmudin Shahrukhi, Project Field Reconnaissance Associate

No member of the EA team is associated with, or maintains a vested interest in, either the Mazar Development Foundation or the Mazar Foods Corporation, project sponsor USAID, or project financier Overseas Private Investment Corporation (OPIC).

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13 ENVIRONMENTAL ASSESSMENT QUESTIONNAIRE

Mazar Foods Program 2008

VILLAGE:

INTERVIEW DATE :

A. Hydrology /Water Quality

1. What is the frequency of flooding in Khulm area ?

2. Where is the flood plain located ?.

3. How many springs are in the Khulm area and does the water level fluctuate during summer and winter.

4. Has the water table risen or dropped in the last 10 years.

   a) What is the water table level depth ?

   b) Is water withdrawn with handpumps or diesel generators ?

   c) What is your water source ?

5. Are there any wetlands?

   a) Is the water quality different in other locations of Khulm ?

   b) Which crops are sensitive to saline water? (also Govt/Univ.)

6. Are their health problems associated with water in the Khulm area? (also Govt/Univ).

B. Biological Impacts

7. What kinds of wild animals and birds are found in the Khulm area ? (Govt./Univ).

C. Agriculture

8. What kind of fruits are grown and what is the yield per jerib ?

9. What kinds of crops are grown and the yield per jerib ?

10. What are the sources of irrigation ?

11. What is the number and types of animals ?

12. Are the dairy products used in village or sold ?

13. Are their areas where land has become saline due to over watering or where land is not productive because of soil conditions ?

14. Where are the grazing areas of livestock?

15. Are there areas where lands have become saline or are their areas where land is not productive because of soil conditions ? (Govt/Univ)

D. Socio-Economic Impacts

16. Are their issues with land ownership ?

17. Accidents in the recent times with mines or UXOs in the Khulm area ?

18. What is total population of this village by breaking them down by school age and gender?

19. What are your views on girls attending schools and are there schools/clinics available in the area?

20. What are your needs in near term (e.g. veterinary services, etc.,)

21. What are your energy source for cooking & lighting ?

E. Chemical Inputs

22. Do you use pesticides if not, do you know what would be effective ones (also Govt./Univ).

23. Do you use fertilizer or manure, cost if fertilizer (also Govt/Univ).

24. What are the common plant diseases affecting different fruits ? (also Govt/Univ).

F. Soils

25. Where are the productive soils? What types of soils are most productive? What types/where are least productive soils? (Govt/Univ)

26. Are there erosion problems? Where? What causes them? When does erosion occur? (Govt/Univ)

14 POPULATION OF KHULM DISTRICT BY VILLAGE/GUZAR

A summary of the population of Khulm District is provided in Table XX and Table XY below. Khulm District consists of 131 villages and Guzars. There are a range of ethnic groups in the Khulm area, with villages being either predominantly Tajik or Pashtoon. There are 108 villages and guzars located inside the project area (Table O), and 23 villages and guzars located outside the project area (Table P). Villages, hamlets, and marginal agricultural land at the downstream end of the irrigation scheme are being abandoned due to lack of irrigation water resulting in urban migration.

Table O: **Khulm District villages and Guzars inside proposed Mazar Foods project area**

	villages/Guzars name		**No. of Families**	**land type**
1	Guzar-e-nawabad	گذر نواباد	32	Irrigated
2	Esmail khail village	خیل قریه اسماعیل	308	rainfed
3	guzar sultan dahamda	مرده گذر سلطان ده	141	rainfed
4	guzar ouemahot	اویماهـوت گذر	135	Irrigated
5	guzar baghdar	باغـدار گذر	80	Irrigated
6	guzar ganda baghat bala	با لا گذر گنده باغات	155	Irrigated
7	guzar ganda baghat payen	پایین گذر گنده باغات	55	Irrigated
8	guzar sayed ghyasudin	الدین گذر سید غیاث	32	Irrigated
9	Sar trashi village	سر تراشی گذر	66	Irrigated
10	guzar Ouljato	اولجتـو قریه	156	rainfed
11	dehnaw village	قریه ده نو	124	rainfed
12	mula sultan villge	سلطان قریه ملا	137	Irrigated
13	guzar kohna bazar	گذر کهنه بازار	74	Irrigated
14	guzar mula sadi	گذر ملا سعـدی	145	Irrigated
15	guzar H.karim tajikia	تاجکیه گذر حاجی کریـم	67	Irrigated
16	guzar H.karim afghania	کریـم افغانیـه گذر حاجی	44	Irrigated
17	guzar sarhang payen	گذر سـر هنگ پایین	70	Irrigated

18	guzar sarhang bala	بالا گذر سـر هنگ	102	Irrigated
19	guzar e shashpaykal	گذر شش پیکال	66	Irrigated
20	guzar e chehel aywan	چهـل ایوان گذر	140	Irrigated
21	guzar e khanaqa e abdulkhair	خانقای عبدالخیـر گذر	60	Irrigated
22	guzar e shah rahim	گذر شـاه رحیـم	67	Irrigated
23	guzar e sayed mutahar	سیـد مطهـر گذر	68	Irrigated
24	guzar e yaqub bai	یعقـوب بای گذر	44	Irrigated
25	guzar e charsoq	چهـار سوق گذر	16	Irrigated
26	guzar e tepa shekhi tajikia	تاجکیه تپه شیخـی گذر	75	Irrigated
27	guzar Deh hosaini	حسـن گذر ده	23	Irrigated
28	guzar qubadaini	گذر قبادیان	14	Irrigated
29	guzar Aaqshikh	گذر اق شیخ	93	Irrigated
30	guzar alchin	گذر الچیـن	46	Irrigated
31	guzar char darayab	گذر چهار دریاب	25	Irrigated
32	guzar sayed khan	گذر سیـد خان	47	Irrigated
33	guzar H.rustam	گذر حاجی رستـم	65	Irrigated
34	guzar merza sharif	گذر میرزا شـریف	38	Irrigated
35	guzar tora qul	گذر تـوره قـل	26	Irrigated
36	guzar damula lashkari	گذر ده ملا لشـکری	145	Irrigated
37	logariha village	ها قریه لوگـری	81	rainfed
38	guzar hasan nazar	گذر حسـن نظـر	85	Irrigated
39	guzar madrasa sarhang	گذر مدرسـه سر هنگ	40	Irrigated
40	guzar damula Mohd.nabi	نبی گذر دا ملا محمد	52	Irrigated
41	guzar chatgari	گذر چتگـری	87	Irrigated
42	guzar qazaghli ali	گذرقضا غلی	28	Irrigated

43	guzar baghancha ali Mohd محمد گذر باغانچه علی	121	Irrigated
44	guzar merza shamsh شمـس گذر میـرزا	154	Irrigated
45	guzar rozi bai روزی بای گذر	114	Irrigated
46	guzar baghancha khanmurad گذر باغیچه خانمراد	59	Irrigated
47	guzar haet qul bai بای گذر حییت گل	116	Irrigated
48	guzar Ab.nazar گذر عبدالنظر	84	Irrigated
49	guzar khwaja burhan برهان گذر خواجه	103	Irrigated
50	guzar mirhazar میـر حضر گذر	96	Irrigated
51	guzar damarda hosain گذر دمـرده حسین	137	Irrigated
52	guzar H.mirbai حاجی میـر بای گذر	31	Irrigated
53	guzar Amin hosain گذر امین حسین	134	Irrigated
54	guzar Qalai babar بابر گذر قلعه	11	Irrigated
55	guzar qachar awal گذر قچــر اول	27	Irrigated
56	guzar Ab.razaq گذر عبدالرزاق	48	Irrigated
57	guzar mulaquli گذر ملا قلی	244	Irrigated
58	Khanaqa mirza khairudin خیرالدین خانقا میرزا	105	Irrigated
59	guzar chuchman گذر چوچمن	73	Irrigated
60	guzar samadi گذر صمـدی	108	Irrigated
61	guzar sart bala بالا گذر سـرت	176	Irrigated
62	guzar mirza Mohd. qasim گـذر میرزا محمد قاسم	89	Irrigated
63	guzar yar Mohd, khan گذر یار محمد خان	5	Irrigated
64	guzar chuchman qala گذر چوچمن قلعه	44	Irrigated
65	guzar H.Mohd.nasir khan محمد نصیـر خان گذر حاجی	170	Irrigated
66	guzar Abdar گذر ابـدار	81	Irrigated
67	guzar nazar bai گذر نظـر بای	140	Irrigated

68	guzar Haramsari	گذر حـرم سرای	35	Irrigated
69	guzar eshan daki	ایشان داکی گذر	45	Irrigated
70	guzar jari qazi	قاضی گذر جـر	40	Irrigated
71	guzar shirali khan	گذر شیر علی	73	Irrigated
72	guzar khatib	گذر خاطب	68	Irrigated
73	guzar yahya bai	گذر یحیی بای	54	Irrigated
74	guzar qalandarha	گذر قلنـدر ها	102	Irrigated
75	guzar garmsili	گذر گرمسیـری	29	Irrigated
76	guzar quchin	گذر قوچیـن	17	Irrigated
77	guzar masoom big	گذر معصـوم بیک	13	Irrigated
78	guzar mirza Saleh Mohd.	محمـد گذر میر صالح	15	Irrigated
79	guzar dehwardagi	گذر ده وردگی	60	Irrigated
80	guzar aata big	بیک گذر عطـا	44	Irrigated
81	guzar H.nawroz khan	خان گذر حاجی نوروز	39	Irrigated
82	guzar qoshrabati	قوشرباطی گذر	35	Irrigated
83	guzar kaincha bai	گذر کینچی بای	66	Irrigated
84	guzar shahmardan qul	گذر شاه مردان	39	Irrigated
85	chochman village	قریه چوچمن	30	Rainfed
86	guzar sultan neyaz	نیاز گذر سلطان	34	Irrigated
87	guzar qachar	گذر قچـر	6	Irrigated
88	guzar eshani	گذر ایشـانی	23	Irrigated
89	guzar jahanger big	بیک گذر جهـانگر	58	Irrigated
90	guzar merza saleh Mohd	محمد گذر میرزا صالح	37	Irrigated
91	guzar big morad	مـراد گذر بیک	9	Irrigated
92	naeb abad village	نایب اباد قریه	35	Irrigated

93	qala arab big قریه عرب بیک	104	Irrigated
94	guzar nasrullah bai بیک گذر نصــر الله	114	Irrigated
95	guzar julqi گذر جولقی	108	Irrigated
96	guzar nasrullah doom گذر نصــر الله دوم	35	Irrigated
97	guzar tili awal گذر تیلی اول	43	Irrigated
98	guzar tili dowom گذر تیلی دوم	51	Irrigated
99	guzar cheqer گذر چقــر	90	Irrigated
100	guzar qachar dowom گذر قچــر دوم	25	Irrigated
101	Nawabad village قریه نواباد	54	Rainfed
102	guzar takht taq گذر تخت طاق	34	Irrigated
103	guzar tapai shikhi afghania افغانیه گذر تپه شیخی	75	Irrigated
104	guzar ali mardan big مردان بیک گذر علی	52	Irrigated
105	guzar baghancha e Ab.Nazar عبدالنظــر گذر باغانچه	118	Irrigated
106	guzar rash Mohd.big بیک گذر راش محمد	24	Irrigated
107	guzar Mohd.ali big بیک گذر محمد علی	263	Irrigated
108	guzar sofi rahmanqul قل گذر صوفی رحمان	49	Irrigated
	total families	8069	
	average persons/family	**6**	
	total population	48414	
	2 percent adjustment to reflect presence of rich families in the district (not included in this census)	+968	
	2 percent adjustment to account for population growth (data was collected two years ago)	+968	
	Adjusted total population	**50350**	

Table P: **Khulm District villages and Guzars outside proposed Mazar Foods project area**

	villages/Guzars name	**No. of Families**	**land type**
1	shahidan Afghania village شهیدان افغانیه	14	rainfed
2	shahidan Tajikia village شهیدان تاجکیه	62	rainfed
3	Haji Ali Tajikia village قریه حاجی علی تاجکیه	195	rainfed
4	Haji Ali Afghania village علی افغانیه قریه حاجی	55	rainfed
5	Khoshtoot village خوشتوت قریه	82	rainfed
6	yangi ariq village اریق نگی قریه یا	440	rainfed
7	Ghaziabad e payen پایین قریه غازی اباد	166	rainfed
8	Ghaziabad e bala با لا قریه غازی اباد	83	rainfed
9	choli zai village زی قریه چهـولی	93	rainfed
10	baba sediq village صـدیق قریه بابه	180	rainfed
11	kohna khulm village خـــلم قریه کهنه	153	rainfed
12	guzar kata karwan bashi گذر کته کاروان باشـی	83	Irrigated
13	guzar khalifa ashur ali علی گذر خلیفه عاشور	148	Irrigated
14	sayad village قریه صیـــاد	389	Irrigated
15	arabhai shahikhayl village قریه شا هی خیل عربیه	73	rainfed
16	guzar mula Mohd.Omar عمـــر گذر ملا محمد	36	rainfed
17	guzar soom گذر صـــوم	79	Irrigated
18	guzar H.gh.rasul غلام رسـول گذر حاجی	77	Irrigated
19	Deh hasan village حسن قریه ده	209	rainfed

20	Deh warda village قریه ده ورده	186	rainfed
21	pachah mardan مردان قریه پادشاه	8	rainfed
22	shahi khayel afghania village افغانیه قریه شاهی خیل	32	rainfed
23	Sayghanchi village سیــغانچی قریه	36	Irrigated
	total families	**2879**	
	average persons/family	6	
	total population	17274	
	2 percent adjustment to reflect presence of rich families in the district (not included in this census)	+345	
	2 percent adjustment to account for population growth (data was collected two years ago)	+345	
	Adjusted total population	**17964**	

15 MAPS AND SKETCHES OF WATERSHEDS

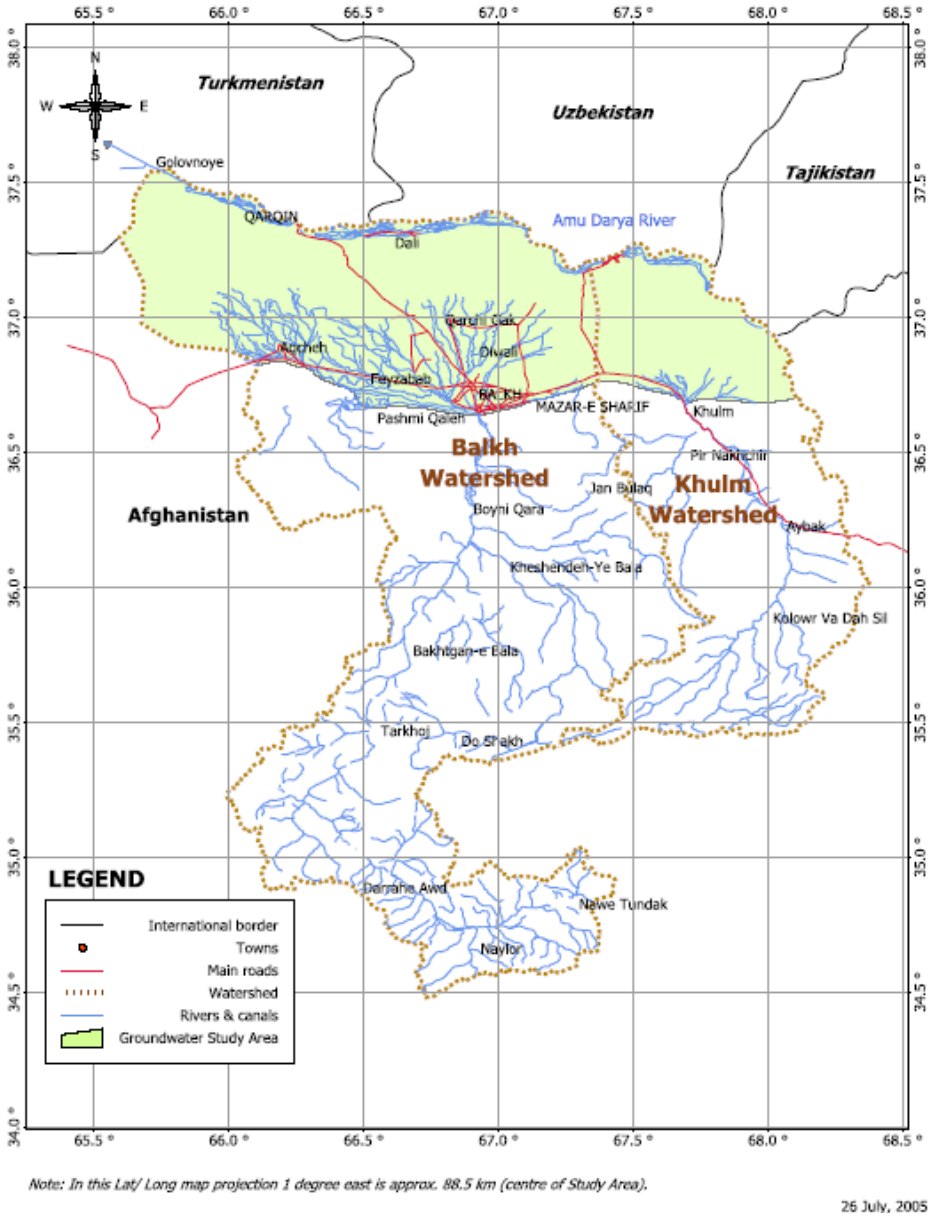

Figure 10. Map showing the location of the groundwater study area

Groundwater Assessment of the Downstream Sections of the Balkh and Khulm Watersheds Inception Report J.M. Ashworth, Web Address: www.aqua3000.com, e-mail: start@aqua3000.com, August, 2005, PCI Asia NEC HAFO.

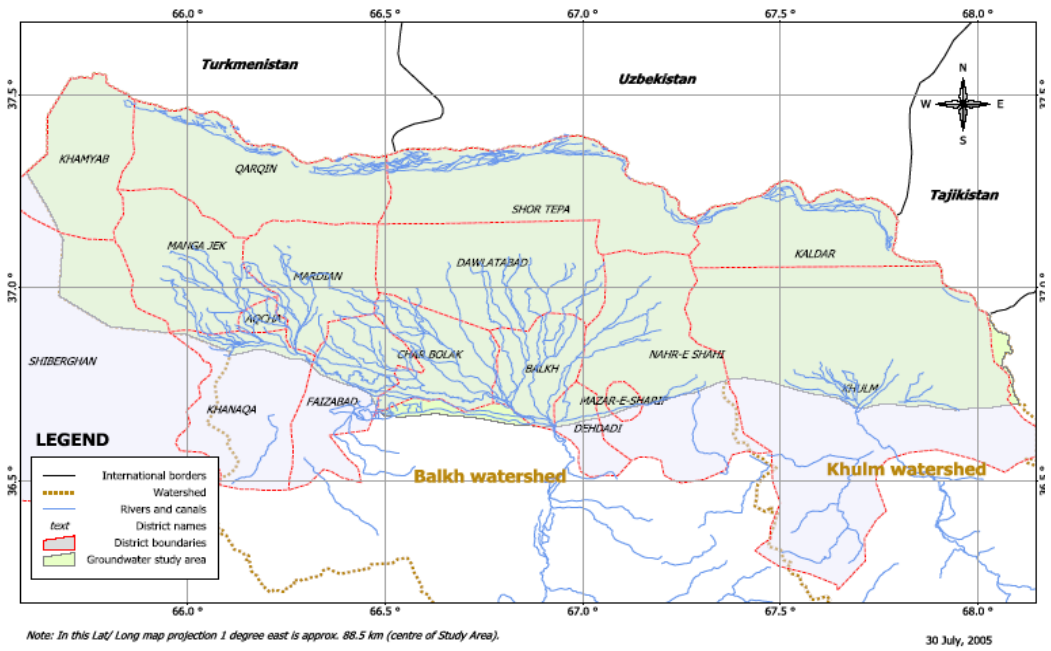

Figure 11. Map showing the location of Administrative Districts in the Study Area
Groundwater Assessment of the Downstream Sections of the Balkh and Khulm Watersheds Inception Report J.M. Ashworth, Web Address: www.aqua3000.com, e-mail: start@aqua3000.com, August, 2005, PCI Asia NEC HAFO.

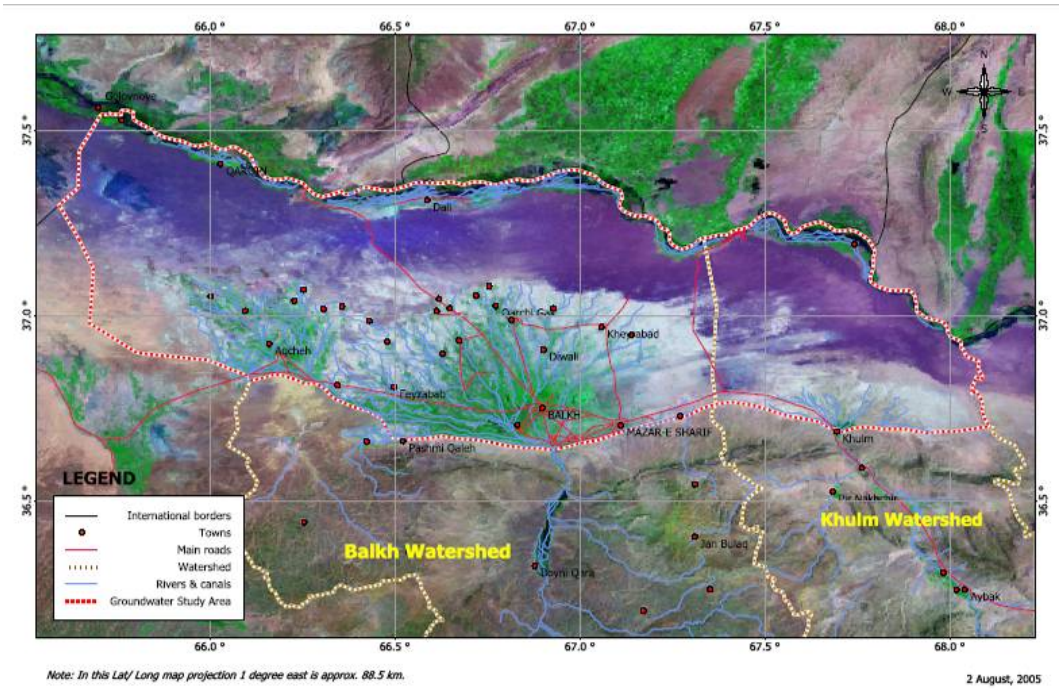

Figure 12. Landsat ETM Image of the Study Area
Groundwater Assessment of the Downstream Sections of the Balkh and Khulm Watersheds Inception Report J.M. Ashworth, Web Address: www.aqua3000.com, e-mail: start@aqua3000.com, August, 2005, PCI Asia NEC HAFO.

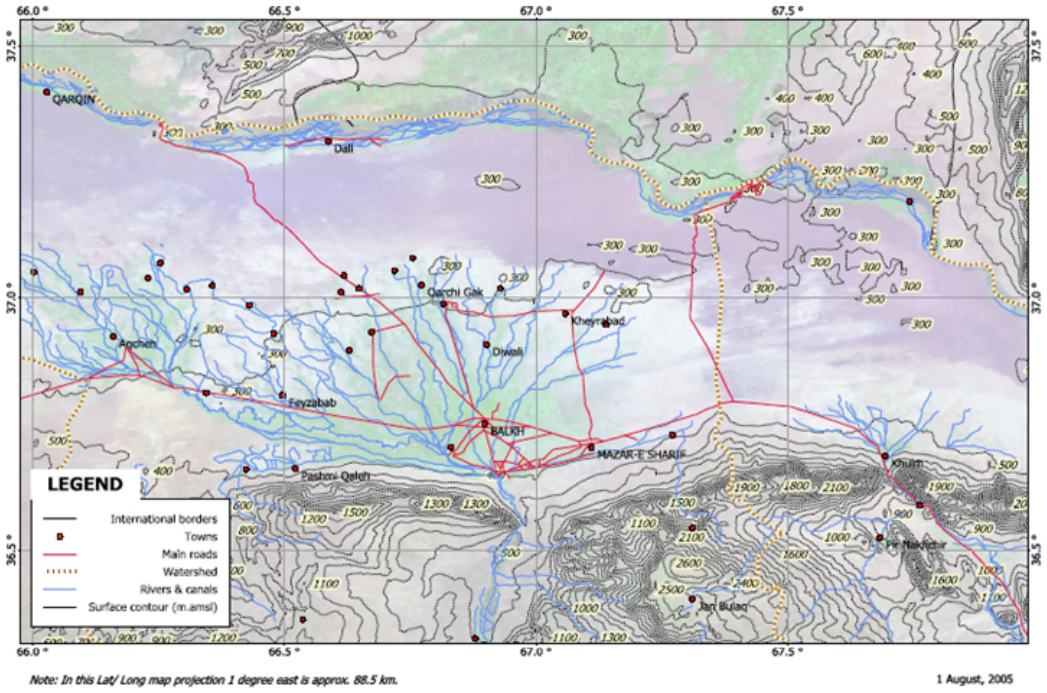

Figure 13. Topographic Map of the Study Area

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