

PHASE II
ENVIRONMENTAL ASSESSMENT
GADOON-AMAZAI INDUSTRIAL ESTATE

PREPARED FOR:

UNITED STATES AGENCY FOR
INTERNATIONAL DEVELOPMENT
SARHAD DEVELOPMENT AUTHORITY
NORTHWEST FRONTIER PROVINCE, PAKISTAN



SUBMITTED BY:

GEO-MARINE, INC.

1316 14th Street
Plano, Texas 75074



MARCH, 1989

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ABBREVIATIONS AND ACRONYMS

Avifauna - Birds

BOD - Biochemical Oxygen Demand

Boom - Period of High Activity or Productivity

CFR - Code of Federal Regulations

EA - Environmental Assessment

Fauna - Animals

Flora - Plants

GOP - Government of Pakistan

Nullahs - Stream beds

NWFAD - Northwest Frontier Area Development Project

POL - Petroleum, oils, lubricants

SDA - Sarhad Development Authority

TDS - Total Dissolved Solids

Totalizer - Device to Record Accumulated Water Consumption

TSS - Total Suspended Solids

USAID - United States Agency for International Development

WAPDA - Water and Power Development Authority

Environmental Assessment
Gadoon-Amazai Industrial Estate - Phase-II

I. Background

Prior to development of this Phase II document, a Phase-I Environmental Assessment (EA) was developed to provide The United States Agency for International Development (USAID) and the Government of Pakistan with a comprehensive understanding of the reasonably foreseeable environmental impacts of constructing the infrastructure for the planned Gadoon-Amazai Industrial Estate and to specify required mitigation measures. The Phase-I study served as the starting point for preparation of this Phase-II EA. Local experts were consulted concerning specific potential environmental impacts of the proposed project. Traditional land use in the project area, soil characteristics, erosion potential and impacts on agriculture and forestry were reviewed. Potential impacts on wildlife and endangered species were discussed. A preliminary archaeological site survey was conducted. Potential impacts of constructing the infrastructure for the proposed project were identified and evaluated using a modification of the information matrix system developed in USAID's Environmental Design Consideration for Rural Development Projects. The World Bank's Environmental Health and Human Ecologic Considerations in Economic Development Projects was also used to identify potential impacts resulting from construction of the infrastructure for the industrial estate.

The Government of the Northwest Frontier Province is developing an industrial estate at Gadoon-Amazai, Tehsil Swabi. The implementing agency is the Sarhad Development Authority (SDA) which has designed, is presently constructing, and will provide management for the estate. Prior to government acquisition of the land during 1984, land use at the project site had been traditionally poppy cultivation. The primary purpose of the development is to provide employment opportunities for residents of the project area and to supplement the agricultural incomes of residents now that poppy cultivation has been terminated.

USAID has provided funding under the Northwest Frontier Area Development Project (NWFAD) for constructing the necessary infrastructure including service roads, drainage networks, administrative facilities, and a permanent water supply. An EA has been completed for the first stage of the development project (USAID, 1987). Individual industrial unit plots have been leased by the SDA to private firms. Each firm will then construct and operate manufacturing, processing, fabrication or other facilities within their plot in the estate. The SDA has responsibility for operation of the estate, lease administration, and ensuring compliance with SDA by-laws concerning construction and operation of individual units (Sarhad Development Authority, 1987).

Approximately 170 acres have been set-aside for the current construction phase. A site visit of January 7, 1989, revealed that access and internal roads are under construction or have been completed, power poles within the project have been emplaced, two administration buildings have been constructed, two water wells have been completed, and construction is proceeding on a water storage tank and drainage network.

II. Applicable Environmental Procedures and Guidelines

Environmental consequences of USAID-financed activities and projects must be considered by USAID and the host country prior to any decision to proceed. This policy is defined and legal requirements are set forth in 22 CFR Part 216, "A.I.D. Environmental Procedures." This assessment, a Phase-II assessment of the Gadoon-Amazai project, was undertaken to satisfy these regulations, to further define and assess any environmental impacts, and to describe mitigational techniques that can moderate those impacts. The United States Agency for International Development Environmental Procedures in 22 CFR 216.3(a) (4) describe the scoping process used to identify significant development or environmental issues related to a specific proposed project as well as the procedures for responding to those issues. The required scoping session was held on January 16, 1989 in conjunction with preparation of the Phase-II EA. A presentation of preliminary assessment findings was given and responses were noted. A detailed record and list of participants are provided in Appendix A.

This EA also includes a plan which details mitigation activities and/or procedures for identified impacts. The plan specifies mitigation activities, priority, duration, approximate cost, and the organization responsible for implementation. Included in Appendix D is a suggested "Environmental Criteria Checklist." This checklist will assist the SDA in screening applicants for leases at this and future developments.

The Government of Pakistan (GOP) has promulgated the requirements for the submission of environmental documentation for major projects in paragraph 8 of Ordinance No. XXXVII of 1983 entitled, "Control of Pollution and Preservation of Living Environment." The Environment and Urban Affairs Division of the Ministry of Housing and Works employs a standardized "pro forma" questionnaire to assess potential impacts of proposed projects. The "pro forma" for the Gadoon-Amazai Industrial Estate Project, encompassing both the infrastructure and industrial components of this project, is included in Appendix B.

III. Project Description and Location

The project has been described in detail in the Phase-I EA, (USAID,1987), available at the Office of Energy and Environment, USAID Pakistan. The purpose and output, the design and construction, and the listing of the USAID financed infrastructure are detailed in the same document. A series of Figures, Figures 3-1, 3-2, and 3-3, show the location of the project site. Figure 3-1 is the sub-regional setting for the development. Figure 3-2 details the project's local area and relation to neighboring towns. This figure also illustrates local road networks. Figure 3-3 is a plan of the industrial estate itself which demonstrates the allocation of land amounts to individual plots. The Phase-I EA (USAID 1987) provides descriptions of the access and service roads, electrical power, water supply, distribution, wastewater handling, drainage for the housing colony, and administrative/service facilities.

Information provided by the SDA (1988) lists applicants that: 1) indicated an interest in locating at the development or, 2) have actually invested in the project. To date (January 1989), 123 firms have applied and submitted a feasibility study for permission to locate at the site. At this time, the following categories of industry have been selected for this analysis: textiles; steel; chemical-related (plastic, soaps, batteries, ink); food, tannery, and similar-related (cottonseed oil, animal products, etc.); marble cutting (including ceramics and gem cutting); wood and wood-related products (fiber board and prefab housing); and miscellaneous manufacturing (including tape, appliances, cycles, shoes, glass, etc.). Figures 3-4 and 3-5 illustrate numbers and percentages of applicants, respectively, by category. Figure 3-6 illustrates water use by industrial categories.

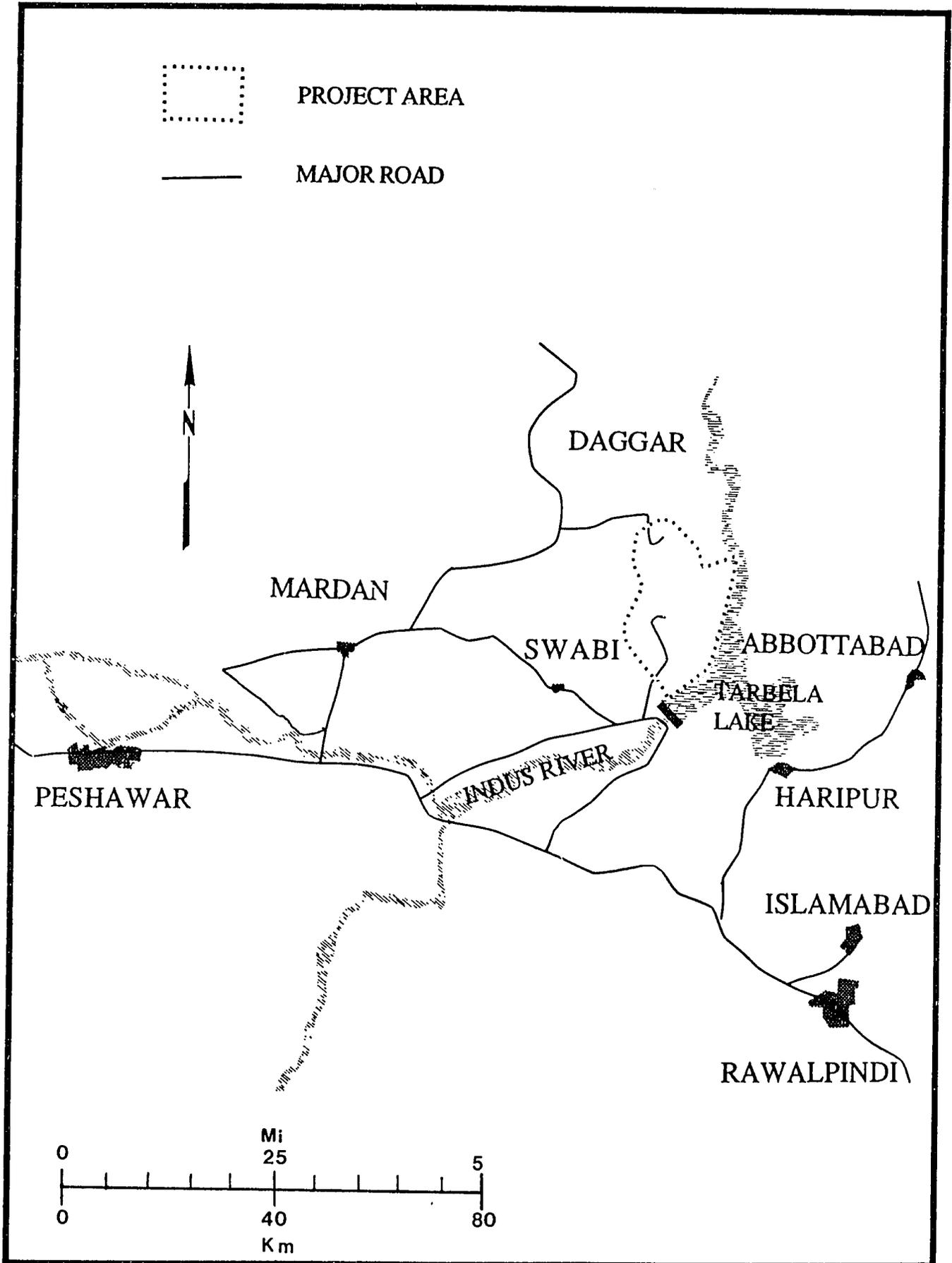


FIGURE 3.1 GADOON-AMAZAI AREA DEVELOPMENT PROJECT
 SUB-REGIONAL SETTING (SOURCE: USAID 1987)

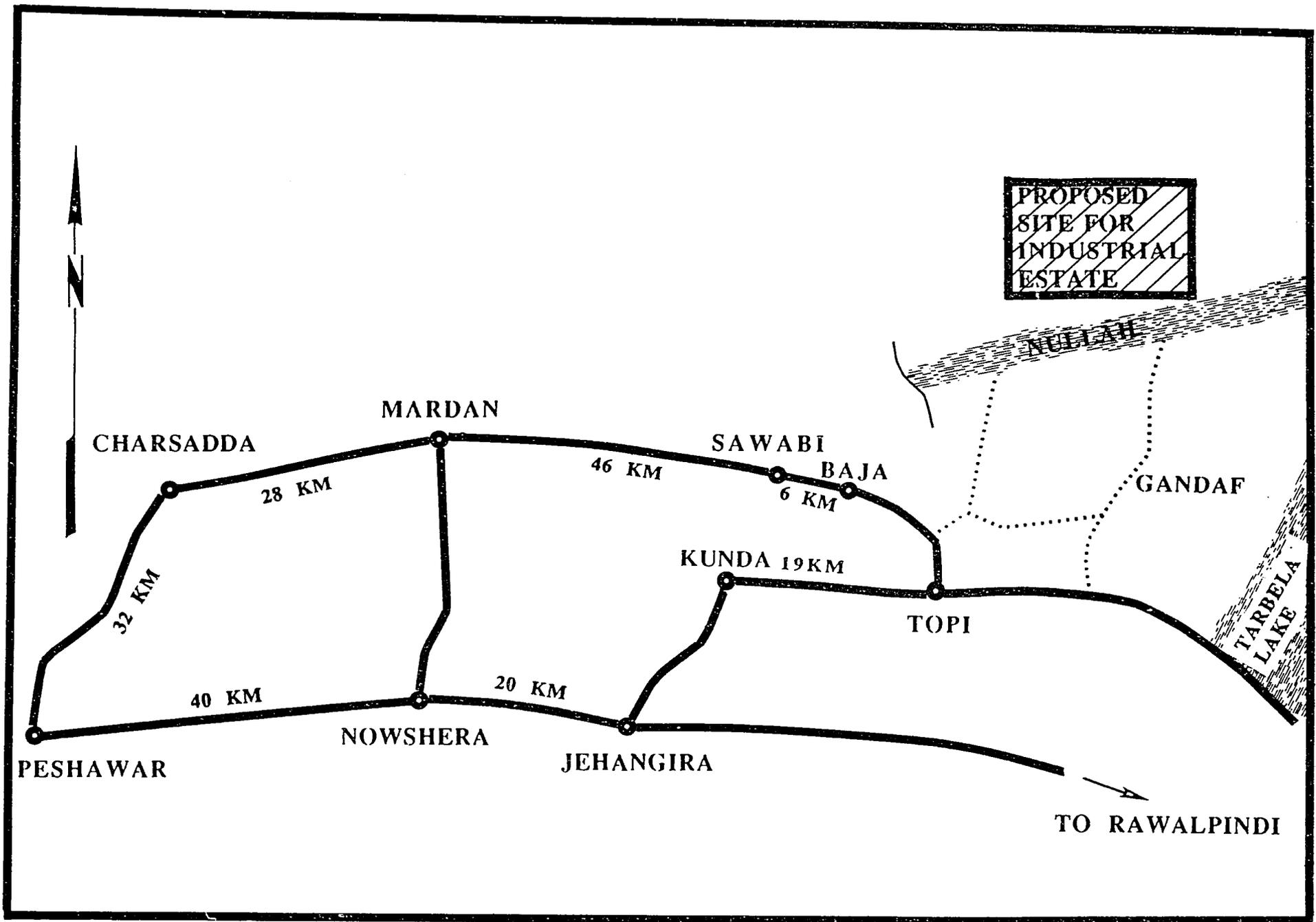


FIGURE 3.2

LOCATION MAP OF GADOON-AMAZAI INDUSTRIAL ESTATE (SOURCE: USAID 1987)

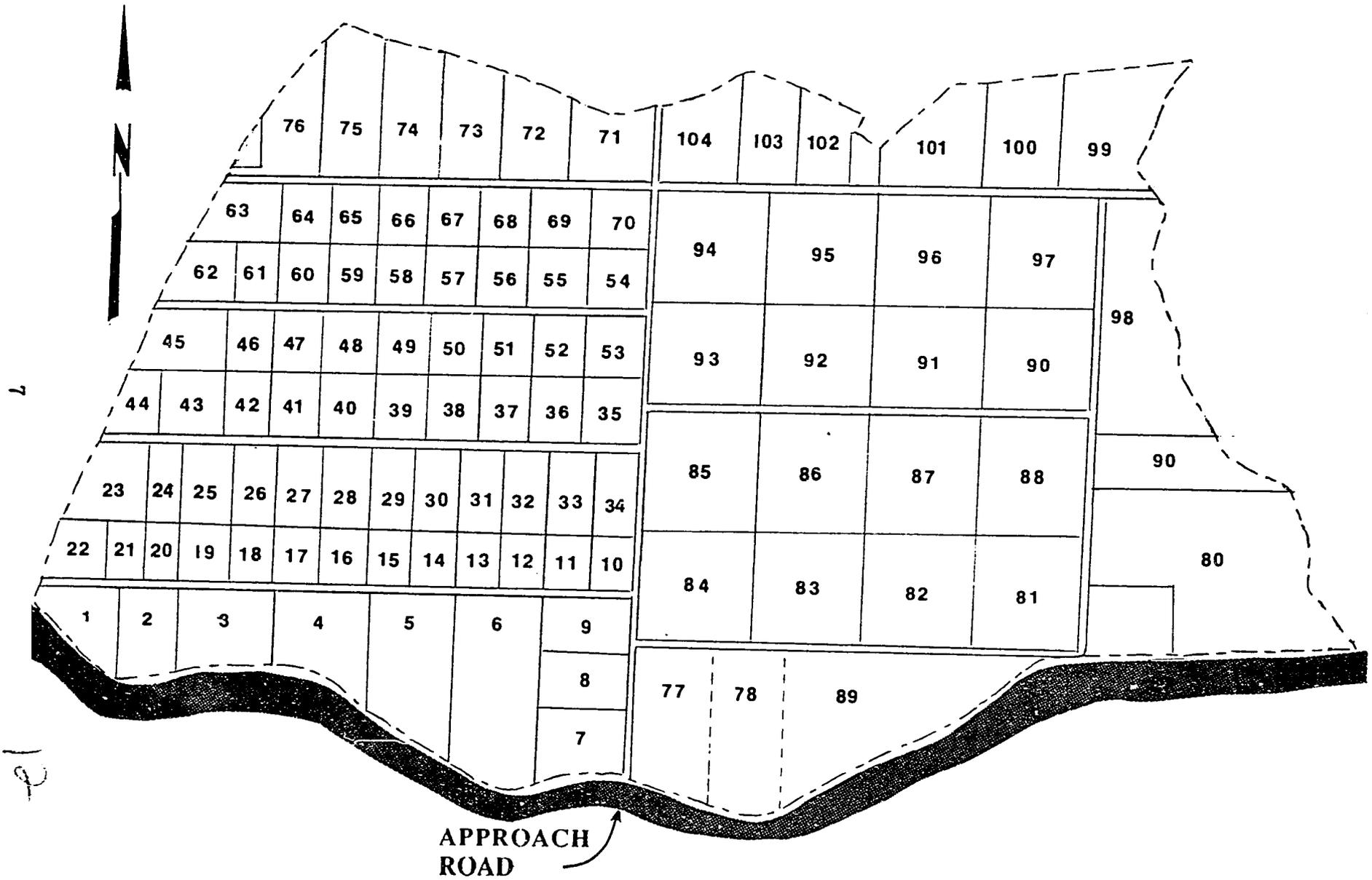
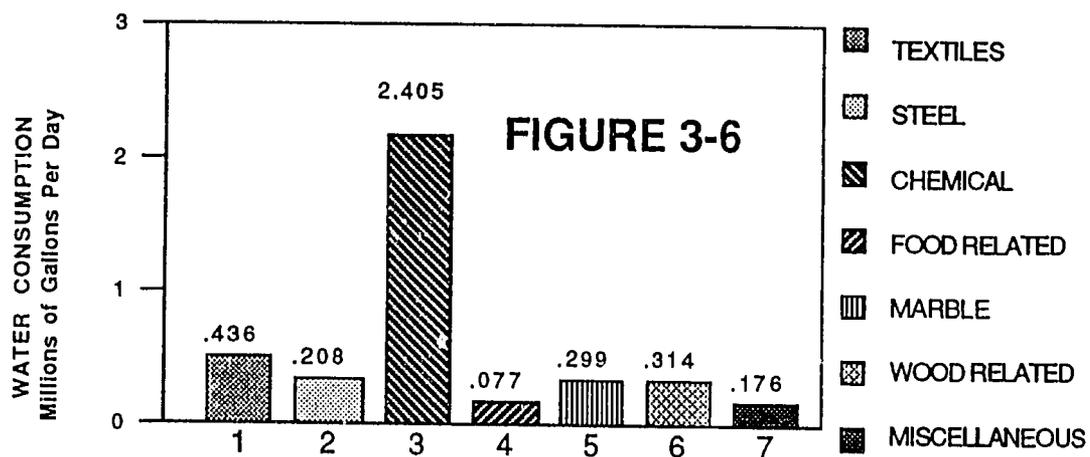
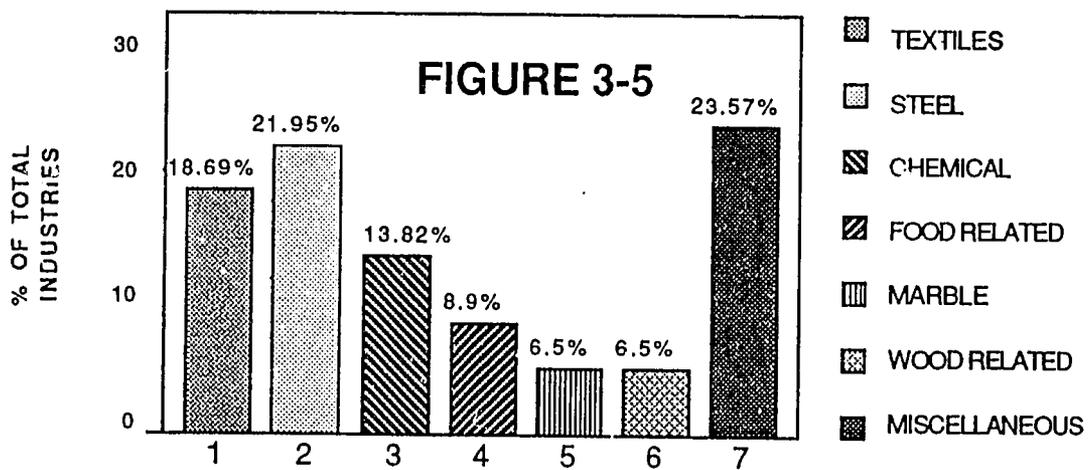
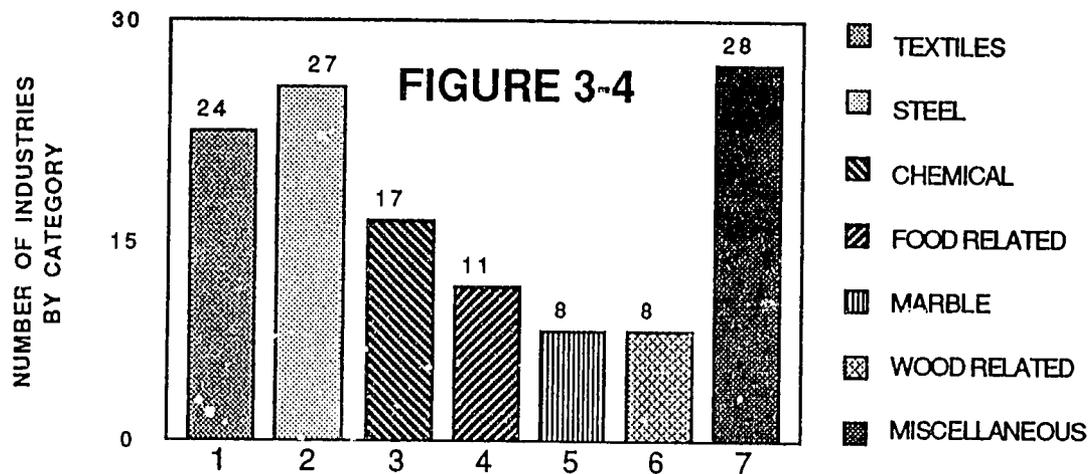


FIGURE 3.3 PLAN OF GADOON-AMAZAI INDUSTRIAL ESTATE, TOPI, MARDAN (SOURCE: USAID 1987)



IV. Affected Environment

Specific detailed information is provided in the Phase-I EA (USAID 1987) for physical features, land utilization, agricultural/mineral resources, forestry and wildlife resources, the social setting, and cultural/archaeological resources. A site visit was conducted by assessment personnel on January 7, 1989. The project site is located in a remote area. Land use patterns are predominantly agricultural, with small plots of winter wheat. Some grazing by small groups of cattle and goats was also observed. The project area is drained by stream beds, or "nullahs" composed largely of a boulder/cobble matrix. Stream flow was intermittent and rainfall-dependent to approximately 3 kilometers below the project discharge point. At that point, a spring was discharging. This spring system increased in discharge to a point 6 kilometers below the project discharge point, where there is a confluence with another nullah. This combined flow proceeds approximately another 6 kilometers to a confluence. The water flow ultimately discharges into the Indus River. There is increasing streamside human habitation as one proceeds downstream. The settlements, most within several hundred meters of the nullahs, contain small orchards indicating the existence of water wells. Stock use the nullahs for watering and people were observed washing clothes in the stream. Six kilometers below the project discharge point, at the confluence, a group of fishermen were observed attempting to net fish from the stream.

V. Environmental Consequences

This section summarizes the potential impacts of construction and operation of industries that have identified an interest in locating at the industrial development. Impacts inside and outside the complex are considered. Impacts are defined in terms of extent, or areal distribution of an impact; duration, or the period of time an impact will last; and the significance, or magnitude of the impact. Resource categories consist of physical resources, biological resources, and socio-economic/cultural resources.

A. General Construction Impacts

Impacts from construction of individual units, broadly defined, could consist of change in land use and drainage patterns, increases in soil erosion and runoff, change in surface and groundwater quality/quantity, air emissions from construction activities and increased vehicular traffic, vegetation removal/loss of wildlife habitat, noise and vibrations, fire and chemical spills, loss of cultural resources, changes in economic/employment patterns, and increased demand upon existing facilities and services. Each of these effects will be analyzed by resource category and are summarized in Tables 5.1, 5.2, and 5.3.

B. General Operational Impacts

Impacts from operation of industrial units, broadly defined, include discharges to air and water, accumulation of solid waste, changes in surface water and groundwater quality and quantity, noise and vibrations, avian hazards, increased vehicular traffic, hazardous materials and waste accumulation, and socio-economic impacts similar to those of construction. It should be noted that cumulative effects may be significant and may increase in severity as the development grows.

RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
LAND WITHDRAWAL	SITE SPECIFIC	LONG TERM/PERMANENT	NOT SIGNIFICANT
AIR EMISSIONS, DUST, VEHICLES	SITE SPECIFIC	LONG TERM/DURING CONSTRUCTION	MODERATELY SIGNIFICANT AT SITE
NOISE/VIBRATIONAL IMPACTS	SITE SPECIFIC	LONG TERM/DURING CONSTRUCTION	MODERATELY SIGNIFICANT AT SITE, NOT SIGNIFICANT OFF SITE
SPIILLS FROM CHEMICAL USE	SITE SPECIFIC	SHORT TERM	NOT SIGNIFICANT IF CLEANED RAPIDLY

TABLE 5.1 CONSTRUCTION IMPACT TO PHYSICAL RESOURCES

RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
HABITAT WITHDRAWAL	SITE SPECIFIC	LONG TERM/ PERMANENT	NOT SIGNIFICANT
INCREASED ROAD KILLS OF WILDLIFE	SITE/AREA SPECIFIC	LONG TERM	NOT SIGNIFICANT

TABLE 5.2 CONSTRUCTION IMPACT TO BIOLOGICAL RESOURCES

RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
CHANGE IN EMPLOYMENT	AREA SPECIFIC	LONG TERM/DURING CONSTRUCTION	MODERATE, POSITIVE IMPACT
AIR EMISSIONS	SITE SPECIFIC	LONG TERM/DURING CONSTRUCTION	SIGNIFICANT TO SOME WORKERS
NOISE AND VIBRATION	SITE SPECIFIC	LONG TERM/DURING CONSTRUCTION	SIGNIFICANT TO SOME WORKERS
INCREASED TRAFFIC	AREA SPECIFIC	LONG TERM/DURING CONSTRUCTION	MODERATE
PRIMARY INFRASTRUCTURE	AREA/SITE SPECIFIC	LONG TERM/DURING CONSTRUCTION	MODERATE

TABLE 5.3 CONSTRUCTION IMPACT TO SOCIO-ECONOMIC AND CULTURAL RESOURCES

C. Construction Impacts

1. Physical Resources

The project will permanently remove, once development is complete, up to 272 acres of the Gandaf Union Council's 4,500 acres of currently cultivable land. The construction impacts effect is site specific and is long term. It is not considered significant and is mitigated to some extent by the access roads opening up more arable land (USAID, 1987). Construction activities will not conflict with existing or known proposed land use, nor will the project degrade the capability of the surrounding land to be used for agriculture, or other developments. The project is located on a level, relatively stable site. It is expected that no significant alterations to local drainage patterns or increases in soil erosion and runoff will occur. There will not be a substantial loss of soil due to construction and wind and water erosion will not be a factor. Project construction requirements will not affect soil structures or slope stability. There appears to be little opportunity for structures to settle or heave and the topography is not being altered. Geological resources will not be impacted since there are no known unique or special geological resources or mineral deposits of potential value close to the project.

Impacts to groundwater and surface water quality and quantity during construction of individual industrial units will be minimal. The project site has wells that are adequate to support the construction efforts.

Major construction activities generate air pollutant emissions from fugitive dust emissions, open burning of construction waste, and vehicular exhaust emissions. These effects are site-specific and will be of a long term duration since the project will be in a development stage for a long period of time. Construction air impacts can be moderately significant at the site; however, they will dissipate rapidly. Amounts of emissions will vary frequently as the levels of ongoing construction and traffic loads change.

Construction activities will not impact the local climatology or produce undesirable odors.

Noise and vibrational impacts from construction will be nominal, temporary, and restricted to daytime hours when construction occurs. Impacts will be site specific, and will occur during the construction phase of the project. Specific equipment that may be operated during construction phases has been previously listed (USAID, 1987). Distances to the nearby settlements are at least 2,000 meters from the project site so that noise will be attenuated to levels that are not harmful to the public. Noise impacts are not significant; particularly since there are no parks, schools, or other noise sensitive facilities near the site. Noise on the site may be significant during construction and could pose potential hearing damage to machinery operators. Construction will not impact or cause any damage to structures from vibrations, nor is there a potential harm to workers inside the site. Construction of individual industrial units will not impact the visual content and coherence of the area, as the project is perceived by local residents as very necessary.

Various chemicals may be required during construction such as paints, diesel fuel, solvents, and degreasers, resulting in a need for storage. There is the potential for small spills. Any impact from chemical spills, specifically related to construction, will be site-specific, short term in effect, and would not be significant.

2. Biological Resources

A total of 272 acres will eventually be withdrawn from use by wildlife and any native vegetation will be removed permanently. This impact is site specific and of a long term duration. The project area is poor in non-domesticated flora and fauna, and therefore, biological impacts are not significant. Limited forage for domestic livestock in the area will not be impacted by its removal. It is unlikely that the project area contains critical habitat for any threatened and/or endangered species. The nearest area likely to contain

one or more of such resources is the Tarbela Lake area, approximately 25 kilometers northeast of the project site. There is an absence of surface water at the site, so the project site is unlikely to be visited by migrating waterfowl. Construction activities will keep most wildlife from approaching the site. Increased vehicular traffic may result in some road kills of solitary animals; however, as construction and operation proceed, and human settlement and activity increases, this possibility becomes more unlikely. Any road kill impacts are generally site specific, and are not significant.

There are no prime agricultural lands, forests, or wetland habitats in the project area. There are some riparian areas approximately three kilometers downstream from the site. Construction activities will not impact these areas, will not alter native plant communities, and will not affect the low species and spatial diversity of wildlife communities in the area.

3. Socio-Economic and Cultural Resources

A cursory ground survey of the industrial estate site was conducted on July 26-27, 1987 (USAID, 1987). No direct finds of artifacts, or other evidence of cultural resources, were indicated within the project site and approach corridor. There will be no construction impacts to cultural resources.

Impacts to local economies and social systems from the construction phases are positive. These impacts will be providing an increase of employment opportunities, particularly as large amounts of unskilled workers may be utilized during project construction. The potential for "squatter" settlements during the construction phase of this project is a site specific impact and may occur periodically during the construction phase. Social systems, service facilities, and related institutions should be capable of absorbing the influx of temporary construction workers. There will be a loss of agricultural productivity from removed land. This impact is site specific, of a long term duration, and is not significant. Population patterns, as illustrated in Figure 5-1, should not be altered significantly. The primary infrastructure contains sufficient housing to absorb immigrants to the area

POPULATION

- 0-1000
- 1000-5000
- 5000 +

SOURCE: USAID, 1987

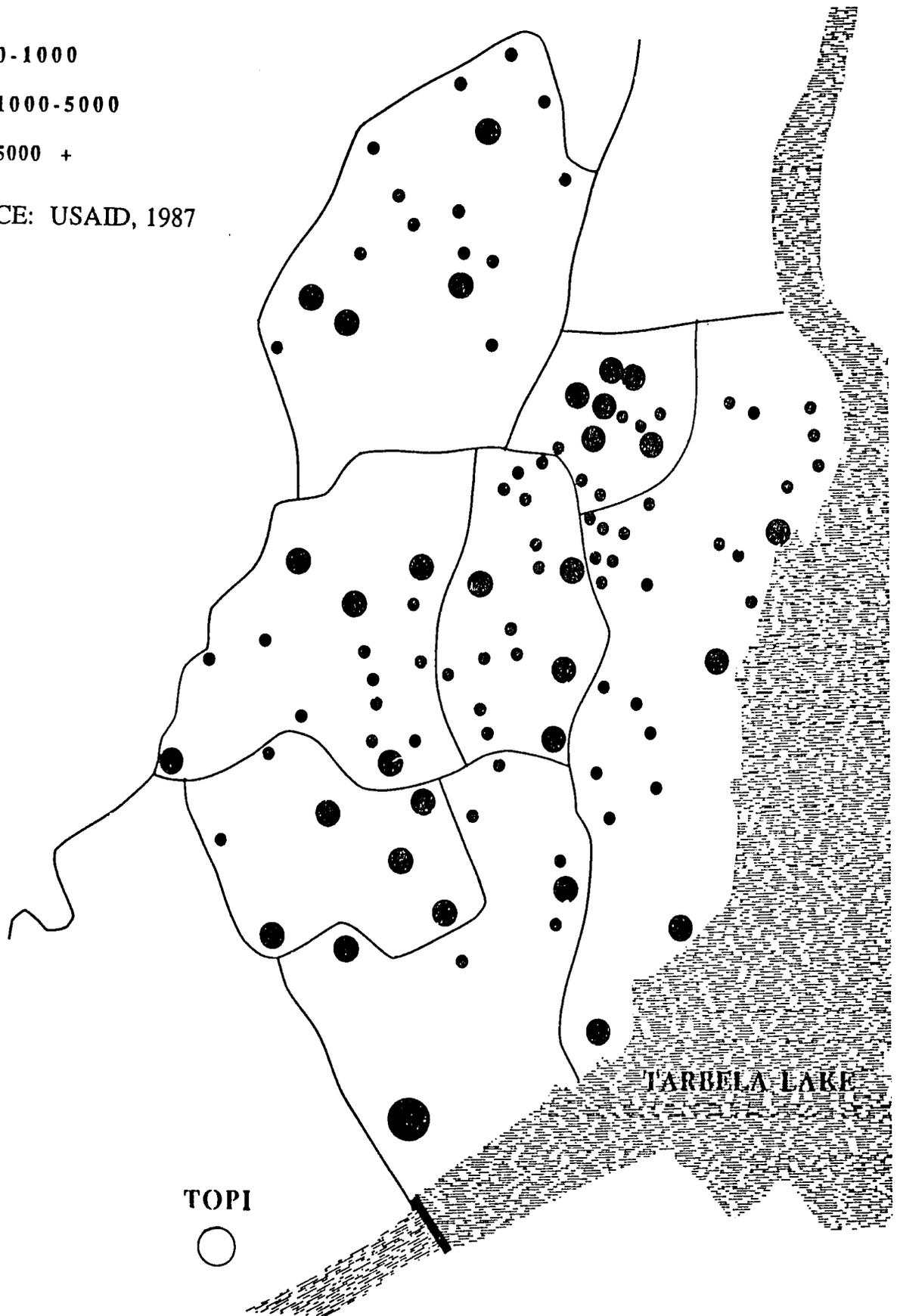


FIGURE 5.1

GADOON-AMAZAI AREA DEVELOPMENT PROJECT
SETTLEMENT PATTERN

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during construction. There is additional housing available near the Tarbela Lake project that was used for that activity. Increases in traffic will be a continuous impact and will last during the entire period of construction. This may be of moderate impact significance to the road infrastructure.

Any air emissions associated with construction will directly impact those workers within the site, as will noise and vibrational effects from machinery operation. These impacts are site specific. Duration will be for the construction period. Severity of the impact may be significant to some individuals. After construction, infrastructures should begin to stabilize, especially after the boom period during the early construction periods. These changes and impacts are considered an overall, positive economic benefit to the area. Long term benefits are of more importance to the area than short term economic disruptions. During construction of individual units, and afterwards during operation, the area may require additional housing, health care, education, police and fire/emergency facilities, and public services. Individual contractors should be tasked, to the extent possible, to provide basic amenities for those in construction camps.

D. Operational Impacts

1. Physical Resources

Impacts from operational activities at the site, as the development enlarges, nears completion, and operates at full capacity, may have significant (positive and negative) impacts, to the Gadoon-Amazai area. Discharges to air, land, and water have the potential to create adverse impacts upon a rural, agricultural, underdeveloped area. The development may cause detrimental changes in the project area's ground and surface water quantity and quality. It is expected that significant amounts of solid waste will be generated by the operation of the site, and some individuals will use a variety of chemicals and other hazardous materials. Identified impacts to physical resources of the site and area will be considered in this section, and are summarized in Tables 5.4, 5.5, and 5.6.

RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
AIR RESOURCE	SITE/AREA	LONG TERM	NEGATIVE IMPACT SITE MINOR NEGATIVE AREA
WATER RESOURCE/ QUANTITY	SITE/AREA	LONG TERM	SIGNIFIGANT NEGATIVE IMPACT
WATER RESOURCE/ GROUNDWATER QUALITY	SITE/AREA	LONG TERM	MINOR NEGATIVE SITE MINOR NEGATIVE AREA
WATER RESOURCE/SURFACE WATER QUALITY	AREA	LONG TERM	MINOR NEGATIVE IMPACT
HAZARDOUS MATERIALS/ CHEMICALS	SITE	SHORT TERM	MINOR NEGATIVE IMPACT IF AN INCIDENT OCCURS
SOLID WASTES DISPOSAL	SITE	LONG TERM	MINOR NEGATIVE IMPACT

TABLE 5.4 OPERATIONAL IMPACTS TO PHYSICAL RESOURCES

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RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
LOSS OF BIOLOGICAL PRODUCTIVITY	SITE	LONG TERM	MINOR NEGATIVE IMPACT
AVIAN HAZARDOUS	SITE	LONG TERM	MINOR NEGATIVE IMPACT

TABLE 5.5 OPERATIONAL IMPACT TO BIOLOGICAL RESOURCES

RESOURCE	IMPACT LOCATION	IMPACT DURATION	IMPACT SEVERITY
EMPLOYMENT/ECONOMIC	AREA	SHORT TERM	IMMEDIATE
AREA SERVICES/FACILITIES	AREA	LONG TERM	NEGATIVE IMPACT

TABLE 5.6 OPERATIONAL IMPACT TO SOCIO-ECONOMIC RESOURCES

Discharges to the air around the project site will consist of particulate emissions, some carbon, nitrogen and sulphur emissions, and some localized thermal discharges. In addition, there will be continual fugitive dust from related construction activities, and vehicular emissions will also contribute to air pollution at the site and on access roads. Specific industries that have contributed to atmospheric contamination situations in Pakistan have been identified in the "Environmental Profile of Pakistan" (GOP, 1988). Four of those types of industries have chosen to locate at the Gadoon-Amazai development and are presented in Table 5-7. There have been situations in Pakistan where serious public health problems have been associated with air pollution (GOP, 1988).

Air emissions from the Gadoon-Amazai project, especially when cumulative and synergistic effects are considered, will have a negative impact at the site, and a minor negative impact in the area. The duration of these effects will be long term. In addition to impacts upon humans and animals, air emissions may also impact vegetation and crops directly around the site.

Operational impacts to water resources of the project area may be severe, particularly to groundwater quantity. In addition, groundwater quality, and surface water quantity and quality may be impacted to a lesser extent. Groundwater resources have been studied for the eastern areas of the Gadoon-Amazai district (Mohammad and Wazir 1988). The hydrologic balance in the area is nearly equal; however, storage capacity of this aquifer is not defined. Mohammad and Wazir, 1988, do feel a volume of groundwater equal to annual recharge can be safely exploited. Their calculations do not include any amounts for this industrial development. Present groundwater potential has been estimated at approximately $19 \text{ m}^3/\text{sec.}$, of which about $8 \text{ m}^3/\text{sec.}$, is expected to be used for irrigation. If the development project, once it is fully operational, requires up to 5 or more $\text{m}^3/\text{sec.}$, aquifer depletion may begin. These figures do not include a safety yield factor. A period of several years of less than average recharge may result in water shortages from overpumping. Downstream users of the groundwater would then see a lowering of

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water table elevation in their wells. In addition, discharge to the spring system below the project would also be reduced, impacting surface flows in the nullahs. Present water requirements and/or requests from 123 industrialists who have indicated their interest in locating at Gadoon-Amazai are 3,900,739 gallons per day (USAID 1988). This impact to water resources quantity should be considered a significant, negative impact to the site, and the area. The duration would be long term. Realistically, it may be several years before the full impact is noticed, particularly if the pace of development at the project is slow.

Water quality impacts, indicated by the presence of contaminants in downstream wells, and in surface waters, may also require a long period of time to be noticed. Additionally, dilution, time, and geo-chemical processes may lessen the impacts. If an impacted well downstream is used for drinking or irrigation, the severity of the impact is increased. This is a minor negative impact; however, it will be of a long term duration as some contaminants may remain in the subsurface environment for a long period. The impact is site and area specific. Contamination from metals and cyanides are of most concern as they have the ability to remain unaltered and unabsorbed in the groundwater and soils for long periods of time. Domestic waste discharges are a minor negative impact, of a long term duration, and are site specific.

Several industries will use hazardous materials for manufacturing processes. Individually, each operation's contribution to the potential for a chemical spill or storage related incident is small. Cumulatively, there may be a large amount of hazardous materials and wastes stored at the project site. Some of the materials that may be present at the site, and the industry they are associated with, are listed in Table 5-8. Impacts to the immediate environment of the workplace from improper use and storage are site specific, of a minor impact, and of a short duration, providing the leaking situation is corrected. Chemical spills of larger amounts of hazardous materials, or continual exposure from improper storage to an environmental pathway would remain site specific and of a short duration. Dependent upon type and amount, and risks to the exposed environment, the impact would be moderate to severe.

Solid waste from this project, if not properly disposed, will contribute pollution during surface runoff from rainfall, and present an unsightly appearance to the project and could attract insect vectors. Disposal at a landfill site is required. Operators will store their own wastes temporarily on their facility, and if no attempts are made at disposal, this accumulation of waste will spill over into common areas of the project. In addition, industries processing foods, leather and organic products have odors associated with their waste. These impacts are site specific, of a long term duration, and are a minor negative impact.

2. Biological Resources

Operational impacts to biological resources are the loss of any future biological productivity and avifauna hazards from stacks and transmission lines. These impacts are minor, site specific, and of long term duration.

3. Socio-Economic Impacts

There are significant, positive impacts to the Gadoon-Amazai area. These positive impacts consist of increased employment opportunities for the population, improvement of the local infrastructure, supplemented income into the area's agricultural economy, the opportunity for "spin-off" or secondary business development in the area of material supply and support services, and growth in the local economy as the supporting, secondary infrastructure is completed. These impacts are a significant positive impact, and are of a long duration.

Negative impacts associated with project operation are varied in magnitude and extent. While changes in employment and local economies are positive, they will be cyclical in nature, resulting in a "boom" period during initial construction and operation of the first few units, followed by a reduced rate in employment increases. This impact is a minor, negative impact and is of a short duration. It is specific to the area. Increased vehicular traffic from

operations will also pose a minor, negative impact, both from increased amounts of traffic loads on the area's road networks, and increased vehicular air emissions. No other significant impacts to the area transportation system will occur. These are minor, negative impacts, of a long duration, and are area specific. They will be lessened somewhat as the development of the secondary infrastructure proceeds.

As cultural patterns in the area are agricultural, there may be some disruption of individual life styles. This is a minor impact, as the consensus is that most local residents are highly supportive of the project. There will be increased demand placed on existing facilities and public services that may be significant. This is a negative impact, area specific, and will be of a relatively short duration. Mr. Umer Mohammad, USAID, Project Agronomist (Personal Communication, 1989) has indicated that some secondary development, primarily support services and facilities, is occurring in the Topi village area. Indications are that any impacts to the agricultural sector of the area economy are not significant.

A question was raised at the scoping session conducted on 16 January 1989, concerning the high rate of esophageal and related cancers in the Swabi area. Increased dust, particulate, and vehicular emissions may agitate those individuals with this particular health situation. A specific effect is highly dependent upon the health and susceptibility of the individual effected. If this health problem is aggravated by air emissions from the project, that would be considered a negative effect to the area.

VI. Environmental Impact Mitigation Plan

The purpose of an environmental impact mitigation and monitoring plan is to suggest activities and programs that could be taken to avoid, reduce, and ameliorate adverse impacts resulting from a project. Individual industrialists should be tasked to filter, contain, and treat their wastes and by-products to the extent practicable. It is vital that the Government of Pakistan and the provincial government undertake attempts to formulate and implement environmental regulations and standards. Following this, an institutional structure must be provided for enforcement of regulations and provisions made for training of technical and enforcement personnel. Without enforced compliance of standard regulations, it is doubtful that the private sector will voluntarily comply, or seek to improve environmental quality within and without their own operation. The SDA should take the role of environmental advocate and insist upon compliance with what existing statutes there are. Within SDA's by-laws, it is clear that noxious discharges of any type are prohibited. An on-going, continuous effort by the SDA to conduct an awareness of the potential consequences of pollution may convince some of the operators to take steps to mitigate impacts from their own facility.

Environmental monitoring programs which assess the magnitude and extent of environmental impacts should be implemented. It is, of course, necessary to evaluate the results of the program, and to take appropriate steps to isolate and remediate effects that are indicated by the monitoring program. Specific, suggested monitoring activities are detailed below, and then summarized in Table 6-1. Mitigation activities are then described and summarized in Table 6-2.

Monitoring for impacts to physical resources, particularly air and water, can be completed easily, requires little training, and is not prohibitively expensive. Air emissions testing should be conducted semi-annually, and then annually after the project development phase is completed. Testing should be conducted at each identified source within the development. In general, particulate SO_2 and NO_x emissions should be monitored. Air quality of the

RESOURCE	DURATION	PARAMETER	PRIORITY	RESPONSIBLE PARTY	ESTIMATED COST
PHYSICAL RESOURCES					
GROUNDWATER QUALITY	QUARTERLY (AT MONITORING WELLS)	WATER LEVELS, TSS, TDS, pH, COMMON METALS, COMMON ORGANICS (SEE TEXT)	1	SDA	\$3,000-\$4,000 A YEAR \$15,000 ONCE TO INSTALL WELLS
GROUNDWATER QUANTITY	MONTHLY (AT SUPPLY WELLS)	DISCHARGE/TOTALIZER	2	SDA	INSIGNIFICANT, PROJECT WORKERS CAN CHECK
AIR QUALITY	QUARTERLY	PARTICULATE, SO ₂ , NO _X	3	SDA	\$1,600 ANNUALLY
WATER QUALITY, DISCHARGE POINT	QUARTERLY	TSS, TDS, pH, COMMON METALS COMMON ORGANICS	4	- - -	\$3,000-\$4,000 A YEAR
SURFACE WATER QUALITY	ANNUALLY (AT STREAM BELOW PROJECT)	TSS, TDS, pH, COMMON METALS, COMMON ORGANICS	5	SDA	\$1,000 A YEAR
AIR EMISSIONS	SEMI-ANNUAL THEN ANNUAL	PARTICULATE, SO ₂ , NO _X	6	INDUSTRY (INDIVIDUAL)	\$600-\$800 ANNUALLY
BIOLOGICAL RESOURCES					
AGRICULTURAL VEGETATION	SEMI-ANNUALLY	SITE CHECKS FOR AIR CONTAMINANT RESIDUES	- - -	SDA	\$500 ANNUALLY
SOCIO-ECONOMIC RESOURCES					
COMMUNITY DISCUSSIONS	ANNUALLY	DISCUSSIONS WITH LOCAL AND AREA OFFICIALS AND OTHER INTERESTED PARTIES	1	SDA	\$1,000 ANNUALLY
CHECKING ENROLLMENTS, HOSPITAL VISITATIONS, ETC.	ANNUALLY	DETERMINE POPULATION INFLUX, ASSIST PLANNING OF SECONDARY INFRASTRUCTURE	2	SDA	DONE ON CONTENT WITH ABOVE

TABLE 6.1 SUGGESTED ENVIRONMENTAL MONITORING PLAN

RESOURCE	DURATION	ACTIVITY OR PROCEDURES	IMPACT OR REQUIREMENTS	RESPONSIBLE PARTY	PRIORITY	ESTIMATED COST
PHYSICAL RESOURCES						
AIR AND WATER RESOURCES	LONG TERM	ENVIRONMENTAL MONITORING	DETECTION OF ADVERSE IMPACTS	SDA	1	\$12,900 (PRIMARILY ANALYTICAL COSTS)
WATER RESOURCES	LONG TERM, ONGOING	REDUCE WATER CONSUMPTION, DEVELOP CONSERVATION PLANS	PREVENT DEPLETION OF SUPPLY	INDUSTRIALISTS	2	PLAN DEVELOPMENT, METHODS COMPLETED BY FIRMS IN ENGINEERING/OPERATIONS
SOLID WASTE	SHORT TERM DEVELOPMENTS: LONG TERM IMPLEMENTATION	DISPOSAL PLAN SITE DEVELOPMENT, ENFORCEMENT OF BY-LAWS	POTENTIAL IMPORTS FROM DEVELOPED WASTES	SDA	3	PROJECT MANAGEMENT ACTIVITY
OCCUPATIONAL SAFETY AND HEALTH	SHORT TERM DEVELOPMENT LONG TERM IMPLEMENTATION	DEVELOP SAFETY AND HEALTH AREAS, REDUCE WORKER EXPOSURE TO HAZARDOUS SITUATIONS	POTENTIAL FOR ACCIDENTS, INDIVIDUAL HEALTH HAZARD TO EXPOSURE TO HAZARDOUS SITUATIONS	INDUSTRIALISTS, SDA TO MONITOR	4	COST ABSORBED IN OPERATION OF THE FIRM, RESPONSIBILITY OF FIRMS MANAGEMENT
EMERGENCY PLANNING	SHORT TERM DEVELOPMENT; LONG TERM IMPLEMENTATION	DEVELOP EMERGENCY MANAGEMENT PLAN	RESPOND TO INDUSTRIAL EMERGENCIES	INDUSTRIALISTS AND SDA	5	COMPLETED AS A MANAGEMENT ACTIVITY, SMALL COST FOR TRAINING, SOME EMERGENCY EQUIPMENT
SOCIO-ECONOMIC RESOURCES						
SKILLED WORKFORCE	LONG TERM	IMPLEMENT TRAINING PROGRAM FOR AREA RESIDENTS	PROVIDE A SKILLED WORKFORCE, NECESSARY TO COMPLETE PROJECT OBJECTIVES	SDA AND INDUSTRIALISTS	1	VARIED, REQUIRES TRAINING FACILITIES AND INSTRUCTORS
POPULATION INCREASES PUBLIC PERCEPTION OF THE PROCESS	LONG TERM	MONITORING	POTENTIAL IMPACTS TO PUBLIC INFRASTRUCTURE AND SERVICES	SDA	2	MINIMAL, REQUIRES SOME TRAVEL AND MANAGEMENT TIME
SECONDARY INFRASTRUCTURE	LONG TERM	PLANNING AND MANAGEMENT OF SECONDARY INFRASTRUCTURE	POTENTIAL IMPACTS TO PRIMARY AND SECONDARY INFRASTRUCTURE	SDA, LOCAL OFFICIALS	3	MINIMAL, REQUIRES SOME TRAVEL AND MANAGEMENT TIME
CULTURAL RESOURCES	SHORT TERM, DURING CONSTRUCTION PHASES	"CHANCE FIND" PROCEDURES	POTENTIAL LOSS OF ARCHEOLOGICAL/HISTORICAL SITES	INDUSTRIALISTS	4	MINIMAL, COULD VARY DEPENDENT UPON A POTENTIAL FIND

TABLE 6.2 SUGGESTED MITIGATION ACTIVITIES

area should be monitored quarterly, and should consist of the same constituents. A station should be located two to five kilometers downwind from prevailing winds.

Water quantity and quality should be monitored quarterly throughout the development. Pumping records, both rate and totalizer, should be monitored to properly assess the impacts of groundwater withdrawal. Three monitoring wells should be placed downstream of the project at approximately one, three and six kilometers and monitored quarterly for water level and quality. Potential constituents of discharges from this project will be extremely diverse, and require complex and detailed analysis. As a minimum, the following parameters should be monitored:

- o Total suspended solids and total dissolved solids
- o pH
- o Common metals, primarily arsenic, chromium and selenium
- o Common organic solvents, including phenols and cyanides

Guidelines for standards of potable water, as promulgated by the World Health Organization are presented in USAID, 1974. These could serve as preliminary guidelines. The spring-fed stream system below the project should be sampled on an annual basis for the same parameters as the waterwells. The discharge from the project should also be monitored at least quarterly, at the discharge point. Analysis for BOD and other specific parameters associated with sewerage should be made at this point. If possible, all of the aforementioned parameters should be sampled at least twice prior to beginning operation, so that thorough background quality can be determined. If contaminants show up in the monitoring data, it would be possible to trace the contaminant to a location.

Monitoring for biological impacts, at this project, should consist of a semi-annual survey of agricultural crops in the area to check for possible impacts from air pollution. If no air pollution accumulations are observed, this procedure could be terminated. Monitoring for social-economic impacts should consist of annual discussions with local and area community

representatives. Their inputs should be solicited to assist planning and controlled development of the area's secondary infrastructure development. Periodic checks for increases in school enrollment and hospital registrations will indicate to planners the general rates of population increases in the area. A trend analysis of this data may also assist planning for the secondary infrastructure development.

Mitigation activities typically consist of planning and engineering designs taken to lessen environmental impacts. Specific environmental design features the industrialists should be encouraged to implement standard and good engineering practices for stack heights, scrubbers, and gutter traps where appropriate, and the use of filtration units to trap particulate emissions. Carbon bed absorption units are useful for the removal of odors. Lagoons and evaporation ponds should be used within each individual unit if harmful wastes result from a particular process. This permits the opportunity for individual firms to treat their waste physically or chemically within their own property.

If a landfill is selected as a method for solid waste disposal, the following design criteria should be considered as a minimum:

- o Analysis of site geo-hydrology
- o Determination of wastes from different operations to prevent mixing effects
- o Prevention of degradation products that are flammable, explosive, or toxic in nature
- o Fencing to prevent unauthorized dumping or removal of waste
- o Location away from settlements or worker colonies

Attempts should be made to encourage re-use or recycling of wastes or by-products. Such attempts reduce energy consumption and waste accumulation disposal problems. In some cases, production costs may be lessened by a re-use/recycling program.

Socio-economic impacts are mitigated to a significant extent by prior planning. Provisions should be made for the location and construction of workers' colonies. It will be necessary to implement a training program so as

to provide a source of skilled labor to the industrialists. This program should receive a high priority as the area is primarily agricultural and rural, and there may not be a satisfactory pool of skilled and semi-skilled labor available.

Specific impact and associated mitigation activity are described below. In addition, a responsible party, or implementing organization is identified. For the detection and evaluation of potential environmental impacts a monitoring program should be developed, primarily for air and water resources. SDA should assume initial responsibility. The SDA has the authority to access individual plots and sample for discharges and emissions to air and water. The potential for adverse effects from the storage and accumulation of solid wastes will require development of a plan to site and maintain a solid waste facility. This plan should be developed by SDA. SDA has the authority to prevent unauthorized dumping and storage of any hazardous waste, and should be vigorous in enforcing these stipulations of the lease agreement (SDA, 1988).

Serious attempts must be made to reduce water consumption, and to re-use water in closed loop or temporary storage systems where appropriate. A water conservation plan should be developed by each industry that requires, or has requested, large amounts of water. The SDA should investigate the possibility of a detailed, hydrologic analysis of the development's water supply. This will insure a reliable, adequate source. It is recommended that the supplying aquifer be modeled for a variety of discharge, infiltration, and pumping rates under a variety of project development requirements.

There is the potential for periodic accidents within the project site related to industrial operations. Specific accident rates for the variety of industries that may occur at the site are not known. In general, accidents at the site, or health problems to long term exposure to a work place could include the following:

- o Accidents from operating machinery
- o Permanent or temporary loss of hearing due to noise
- o Burns, slips and falls
- o Fires and explosives

- o Respiratory and associated health complications
- o Exposure to hazardous materials
- o Heat stress difficulty

Individual industries should be tasked to present to SDA an Occupational Health and Safety Plan they will implement within their operation. Guidelines for plan developments are described by the Office of Environmental Affairs, The World Bank (1985). SDA should establish a safety and health advisor or monitor. His specific tasks should include, as a minimum:

- o Routine monitoring visits to individual units
- o Assist industrialists in developing their own plans
- o Assist in developing an "Emergency Management Plan"

Periodic monitoring by an outside, third party should be completed. There are several industries where simple protective procedures and equipment can easily be implemented to improve workers' safety. In the textile group, respiratory protection should be provided to all employees, throughout their shift. Personal protective clothing and eye protection should be provided to all employees exposed to chemicals, and facilities for showering and personal decontamination should be maintained. Workers exposed to intense heat, particularly around steel mill furnaces, should receive frequent rest and watering breaks. Adequate lighting and ventilation structures should be a mandatory requirement for each industry's Occupational Health and Safety Plan. SDA should advocate and constantly inquire about and suggest measures to improve safety at their facility.

The SDA, in association with individual industries, should formulate an Emergency Management Plan. Steps involved in this plan are to first develop a list of all potential emergencies. Different plans for each emergency situation would be required. As a minimum, an Emergency Management Plan would include:

- o Emergency shutdown procedures
- o Evacuation procedures
- o Specialized equipment, its location and operation
- o Alert signals

- o Transportation procedure to health care facilities
- o A chain of command

Employees should be periodically instructed and acquainted with the plan. Efforts should be made to coordinate with any emergency officials outside the site, so that they could assist in emergency efforts if required. Both occupational health and safety planning, and emergency management planning should be instigated by the SDA. This type of planning should be a requirement for future development, and should be submitted prior to allotment of space within the industrial plant.

Most of the industries will use electrical power, which is being supplied by the Water and Power Development Authority (WAPDA), through transmission lines. There may be some small boilers or generators that require fossil fuels located within the estate. Any impact would be minor, and very insignificant in terms of reduction of fuels. All the firms are small and will employ an average of 113 workers at each unit. Any impacts to the raw materials base of Pakistan would not be noticeable. Indeed, concessions have been granted to relax import duties for the use of imported raw-materials. Transportation and storage facilities in the surrounding infrastructure, and at the site, are adequate to support this development. No underground or above ground POL (petroleum, oils, lubricants) storage will be required.

VII. Permitting Requirements

Industrialists who intend to locate at the project are subject to existent Pakistan laws and regulations concerning the environment. Those broad regulations are listed in Table 7-1. The Sarhad Development Authority building by-laws and Deed of Lease detail the specific environmental stipulations and requirements that are necessary for an industry to locate at the project. Those of most importance to environmental protection are listed below:

- o Operations are not to allow any dangerous, poisonous, or objectionable effluent or matter to be discharged into the drains or sewers, but to take all such measures as may be necessary to ensure that any effluent or matter so discharged will not be corrosive or otherwise harmful to the drains or sewers or cause obstruction or deposit therein.
- o To maintain effective and workmanlike agreement for the disposal of debris and other waste matter arising out of the aforesaid manufacture or conduct of trade.
- o To maintain every furnace, engine, or other machine, or continuance upon the devised land so as to conserve the smoke resulting from its use and not to use or suffer the same to be used negligently or without the smoke being substantially consumed and not to cause or permit any grit or noxious or offensive effluent to be emitted from any furnace, engine or continuance upon the desired land without using the best practicable means for preventing or counter-acting such emissions.
- o To install and maintain in effective use and operation such latrines and septic tanks and to adopt such measures against the commission of nuisance as may be necessary in the opinion of the Lessor to keep the demised land and the factory buildings and structure thereon in a completely sanitary condition.
- o The applicant should comply with all the requirements of the appendix relating to sanitation, latrines, and disposal of refuse or debris.

While these stipulations are broad, and perhaps vague in nature, it is clear that the SDA has the authority to enforce those agreements, and maintain a moderate amount of control over environmental hazards and contamination at the

TYPE	AUTHORITY	AGENCY	REQUIREMENTS
COMPREHENSIVE ENVIRONMENTAL PROTECTION	ORDINANCE NO. XXVII, 1983	MINISTRY OF HOUSING AND WORKS	ENVIRONMENTAL PRO FORMA
PROTECTION OF ANTIQUITIES	ACT NO. VI OF 1977	MINISTRY OF CULTURE, ARCHEOLOGY, SPORTS, AND TOURISM	PROTECTION FOR HISTORIC/ ARCHEOLOGICAL SITE
WATER RESOURCES	WEST PAKISTAN ACT OF 1958	WAPDA	MANAGEMENT/PROTECTION OF WATER RESOURCES
WILDLIFE	WEST PAKISTAN WILDLIFE PROTECTION ORDINANCE OF 1959	ZOOLOGICAL SURVEY, MINISTRY OF FOOD, AGRICULTURE, AND COOPERATIVES	PRIVATE CONSERVATION, HUNTING REGULATIONS

TABLE 7.1 ENVIRONMENTAL LEGISLATION AND REGULATION FOR PAKISTAN

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site. By signing a lease, the industrialists agree to abide by these terms. There are no other required permits to operate a plant at the Gadoon-Amazai project.

VIII. LIST OF PREPARERS

Waldamar Albertin, Ph.D., Mission Environmental Advisor, USAID Pakistan

Choudhary Laiq Alé, M.S., Environmental Engineer, USAID Pakistan

Rick Billings, M.S., Senior Biologist, Geo-Marine, Inc.

John Hoffmann, B.S., Professional Engineer, Geo-Marine, Inc.

M. Akbar Minhas, Program Assistant, USAID Pakistan

John R. Morgan, B.S., Mission Environmental Officer, USAID Pakistan

Glen Whaley, M.S., Environmental Officer, USAID Pakistan

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APPENDIX A
SCOPING SESSION

RECORD OF THE SCOPING SESSION FOR THE
GADOON AMAZAI INDUSTRIAL ESTATE, NORTHWEST FRONTIER
AREA DEVELOPMENT PROJECT ENVIRONMENTAL
AND SOCIAL SOUNDNESS ASSESSMENT

I. INTRODUCTION

The following is a formal record of the scoping session for the Environmental and Social Soundness Assessment of the Gadoon Amazai Industrial Estate, Northwest Frontier Area Development Project. This scoping session was held by the Sarhad Development Authority (SDA) from 10:30 to 12:30 on January 16, 1989 at the Khazana Sugar Mills Guest House, NWFP Province, Islamic Republic of Pakistan. The scoping session was conducted in English.

II. SUMMARY OF THE SCOPING SESSION

A. Agenda

1.	Seating of guests		1030
2.	Recitation from the Holy Quran	Mr. Habibullah	1030-1040
3.	Opening Address and Overview of Gadoon Industrial Estate Project	Mr. Fayyaz-ur-Rehman Director Planning & Implementation, SDA	1040-1050
4.	USAID Environmental Program and Procedures as related to the Gadoon Industrial Estate	Dr. Waldemar Albertin Environmental Advisor USAID/Islamabad	1050-1110
5.	Preliminary findings of the Gadoon Industrial Estate Environmental Assessment Study	Mr. Rick Billings Geo-Marine, Inc.	1110-1135
6.	Questions, Comments, Proposals from the floor		1135-1230

B. Synopsis of the Formal Presentation

1. Opening Address and Overview of Gadoon Industrial Estate

Mr. Fayyaz opened the scoping session with a word of thanks to all the participants. He briefly provided an overview of the project. He informed the participants that Topi by-pass approach road to the Industrial Estate will be ready by March 1989; electricity will be available by May 1989; and finally, the Estate will be ready for occupation by July 1989. He highlighted the importance of environmental protection and said that in Pakistan little attention has been paid to this requirement. He stated that the purpose of the scoping session is to discuss environmental hazards and their preventive measures, and USAID experts would present preliminary findings of the environmental assessment of the industrial estate and answer the related questions.

2. USAID Environmental Program and Procedures as related to the Gadoon-Industrial Estate Project

Dr. Wally Albertin, Environmental Advisor, USAID/Islamabad, thanked the participants for their interest in attending the scoping session. He also thanked the SDA for arranging the meeting. Dr. Albertin assured the participants that the purpose of this scoping session is not to impose any restrictions on the industrialists but to help mitigate negative impacts and find solutions for environmental problems. He provided a background of USAID involvement in the Estate Project and explained USAID policies and procedures in the field of environmental program and procedures.

3. Preliminary Findings of the Gadoon Industrial Estate Environmental Assessment Study

Mr. Rick Billings of Geo-Marine, Inc., Plano, Texas, USA, presented briefly the preliminary findings of the Gadoon Industrial Estate Environmental Assessment Study. The presentation was supported by visual aids. He highlighted the impact on the following resource categories:

a. Air Resources

- b. Land Surface Resources
- c. Water Resources
- d. Socio-Economics Resources

C. Question and Answer Session

Mr. Fayyaz-ur-Rehman, Director Planning & Implementation, SDA, invited the participants to ask questions and/or make comments regarding the environmental aspects of the project.

- 1. Mr. Nauman Wazir, Frontier Foundry (Pvt) Ltd raised the following questions:
 - a. The Estate is close to Tarbela Dam. Will there be any environmental impact on the dam and reservoir?
 - b. Has SDA previously analyzed environmental impacts in its other industrial Estates?

Questions (a) was answered by Mr. Rick Billings of Geo-Marine, Inc. He informed the participants that there will be no impact on the Tarbela dam and/or reservoir as a result of operating the Estate at Gadoon. The Estate is approximately 25 kilometer from Tarbela. The only possible impact could be some deterioration in air quality, but atmospheric dispersions will lesson this potential.

Question (b) was answered by Mr. Fayyaz-ur-Rehman of SDA. He stated that SDA had not performed environmental assessments for its other Estates.

Mr. Niza Ahmad from Peshawar raised the following question:

Will the Environmental Assessment take into account the specific impacts of each industrial unit for which applications have been submitted to SDA? What about industries for which no application has been submitted but which might eventually locate on the estate?

The questions were answered by Mr. Rick Billings of Geo-Marine, Inc. He stated that the EA will examine groups of industries (source categories) on the basis of their

emission and effluent characteristics and will make generally applicable recommendations from that standpoint.

Mr. Sharifullah of North West Fuses questioned that the Swabi area shows a significant incidence of carcinoma of the esophagus. He questioned whether the environmental assessment would examine the implications of this on operation of the estate.

Questions was noted. The environmental assessment will recommend further studies of this problem by the concerned authorities. Data on esophageal cancer incidence are available from Professor Mohibullah of Lady Reading Hospital, Peshawar.

Mr. Gulzar Khan of Mufti Marbles (Pvt) Ltd. inquired regarding the types of toxic waste which will be generated by the industrial estate.

The question was answered by Mr. Rick Billings of Geo-Marine, Inc. He stated that all likely pollutants released from the industrial estate will be identified in the environmental assessment report.

Mr. Saleem-uz-Zaman of Shewa Marble Industries Mardan asked the following questions:

- a. Will recommendations be made for lessening environmental impacts?
- b. Will the assessment provide specific advice for each industry on how to take remedial steps?

The question was answered by Mr. Rick Billings of Geo-Marine, Inc. He replied to question (a) that a mitigation plan and general guidelines will be developed.

Question (b) was addressed as follows: Facility-specific information will not be developed, as this is beyond the scope of the assessment. Guidelines and recommendations for categories of industries will be provided however.

Mr. Sharifullah of North West Fuses inquired as to whether the water quality in the area had been measured.

The question was answered by Mr. Rick Billings of Geo-Marine, Inc. He stated that very little water quality data exists for the area, but that the environmental assessment would recommend acquisition of baseline data followed by periodic monitoring of both surface and ground water.

The audience posed no further environmental questions regarding the Gadoon Industrial Estate.

E&E: MAMinhas

Gadoon Amazai Scoping Session

PARTICIPANT REGISTER
 ENVIRONMENTAL SCOPING SESSION - GADDOON-AMAZAI INDUSTRIAL ESTATE
 HELD AT KHAZANA SUGAR MILLS GUEST HOUSE, PESHAWAR
January 16, 1989

SR.#	NAME	ADDRESS	RES	TELEPHONE	
				OFC	SIG.
1.	Nehmatullah Khan	General Manager (Tech), SDA		73616	
2.	Mohammad Haroon Khan	Project Manager, Industrial Estate Gadood	44274	73616	
3.	Habibullah	Superintendent, Industrial Estate Gadood		73616	
4.	Zawar Ahmad	Ferozsons Steel Company, Rawalpindi, NSR	2305	2305	
5.	Noor Mohammad Khan	Kohinoor Silk Mills, Mingora, Swat	2478	2479	
6.	Haji Khushi Mohammad	Obaida Engineering Co., Gujranwala	82519	82023	
7.	Malik Gul Bahadar	46-E, S.T. Afghan Road, University Town, Peshawar	42122	30566	
8.	M. Akbar	46-E, S.T. Afghan Road, University Town, Peshawar	42122	30566	
9.	Inayatt Khan	34, Dil Jan Plaza, Peshawar Cantt.	63886	78544	
10.	Dr. Athaullah	USAID/Peshawar	50564	43211	
11.	John Javed	USAID/Peshawar		43211	
12.	Munawar Husain	Project Engineer, RAO/P/Eng., Peshawar	44457	43211	
13.	Dost Mohammad	Premier Marble (Pvt.) Limited	3162	91421	
14.	Mohammad Zahid	DZ/67, Hayatabad, Jamrood, Peshawar	48209		
15.	Inam-ud-Din	Khaltal House, University Road, Peshawar	42882		
16.	Kh. Mohammad Saleh	D-C Road, Gujranwala	82263	80501	
17.	Ejaz Durrani	8-B, Street 63, F-7/3, Islamabad	811125	411165	
18.	Gulzar Khan	Mufti Marbles (Pvt.) Limited, Opp. University, Peshawar	30522		
19.	M. Kh.	Book Agency, Khyber Bazar, Peshawar	30522		
20.	M. Khalid Siddiqui	1-Sharif Pura, G.T. Road, Gujranwala	82583	84762	
21.	Rick M. Billings	Geo-Marine, Inc., USA			
22.	Waldemar Albertin	USAID/Islamabad	822459	824071	
23.	M. Azeem	Zamindara Tobacco Industry Limited	2673	2176	
24.	M. Ayaz Khan	Pakistan International Polyttopyleni		981/961	
25.	Mohammad Nawaz Khan	Mloodna Shoes Company		981/961	
26.	Haleem Hussain	70-DA, Afghani Road, University Town, Peshawar	40710		
27.	Mohammad Akbar Khan	P/o Bahrain, District Mardan		2495	
28.	Inayat Ali Khan	Cinema Road, Ejhazi, District Abbottabad		14	
29.	Habibullah Khan	Shewa House, Canal Road, Mardan	3332	2377	
30.	Zarbehdl	Tehsil Swabi, District Swabi, P/o Gandaf	3	77	
31.	Niaz Ahmad	3-Chinar Road, University Town, Peshawar	40426	44065	
32.	Saleem-uz-Zaman	Shewa Marble Industries, Canal Road, Mardan	3332	2377	
33.	R. Baz	Gulbahar	63066	41638	
34.	Shamsur Rahman	Rahman Oils, Faqir Abad, Swabi		280	
35.	Syed Liaquat Hayatt	Frontier Woolen Mills, Peshawar	4165	50639	

36.	Haji Abdul Ali	Sarhad Chamber of Commerce	211464	61059
37.	M. Afzal Zia	Zeb Textile Mills	76130	50549
38.	Nayar Zawar	70-Murgazar Road, DI, Hayat Abad	48464	
39.	A. Durrani	Frontier Mining Co.		50761
40.	S.M. Yunas	NAMCO Peshawar		43430
41.	Fazle Khaliq	General Manager Technical Frontier Centre		50903
42.	S. Iqbal Yunas	NAMCO Peshawar	42004	43430
43.	Jehan Zeb	Khazana Sugar Mills		
44.	M. Arshad	110-P Gulbert 2, Lahore	875230	
45.	Khushi Mohammad	Sarhad Steels Pvt. Ltd. 236-B Ravi Park, Lahore	210837	
46.	Mohammad Iftikhar	KSM Peshawar	74625	78659
47.	Faiz Tora	P.O. Box 62 Mardan	2417	
48.	Faiz-ur-Rehman Khan	Director (P&I) SDA		75356
49.	Wazir Mohammad Khan	Chairman Frontier Foundry Pvt. Ltd.	74548	50807
50.	Lt. Col. M. Safdar Khan (Retd.)	Abasin Pipe Mills	48221	50504
51.	Nauman Wazir	Frontier Foundry Pvt. Ltd. 4-B Sir Syed Road, PESH	48290	50807
52.	Dr. Arshad Khan	International Taper Ltd.	79995	50593
53.	Inayat-ur-Rehman	Frontier Chemical Ltd. Ibd.	856885	852262
54.	Fazlur Rehman	Frontier Chemical Ltd. Ibd.	856885	852262
55.	Mohsin Aziz	Mohsin Match Factory Ltd.	74001	50687
56.	Jamshed Sarwar	Premier Formica	23615	50557
57.	Mohammad Aslam Khan	Chairman, Dept. of Environmental Mining	43667	43248/41015
58.	Sharif Ullah	Northe West Fuses	74347	212320
59.	M. Glenn Rutanen-Whaley	USAID - Washington		
60.	Ch. Laiq Ali	USAID - Islamabad		824071
61.	A. Azia	USAID - Islamabad	845438	824071
62.	Akbar Minhas	USAID - Islamabad		824071

APPENDIX B

PRO FORMA FOR ENVIRONMENTAL IMPACT ASSESSMENT

PRO FORMA FOR ENVIRONMENTAL
IMPACT ASSESSMENT

Types of Information	Information or Sections of Environmental Assessments, Phase I and Phase II
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1. General

- | | | |
|-------|---|---|
| 1.1 | Name of the Project: | Gadoon-Amazai Industrial
Estate |
| 1.2 | Official address at which
correspondence can be made: | Sarhad Development Authority
The Industrial Estate, Gadoon-
Amazai, Topi-Ganduf road,
Swabi. N.W.F.P., Pakistan |
| 1.3 | Name & address of consultant
appointed, if any: | |
| 1.4 | Name, designation and address
of official authorized to deal
with this Questionnaire/Pro forma: | Mr. Fayyaz-up-Rehman, Director
Planning and Implementation
SDA or Mr. Mohammad Haroon
Kkan, Project Manager |
| 1.5 | Date on which letter of intent
was issued: | |
| 2. | <u>Process Details</u> | See: USAID. 1988. Sarhad
Development Authority-Gadoon
Industrial Estate-Industry
Information Sheet.
USAID/Islamabad |
| 2.1 | Production Schedule: | |
| 2.1.1 | List of main products proposed
to be produced with designed
daily production or capacity: | |
| 2.1.2 | List of by-products
produced with designed
daily product capacity: | |
| 2.1.3 | Time phasing for
achieving full
production capacity: | |

Types of Information

- 2.2 Raw Materials Consumption: See: USAID 1988. Sarhad Development Authority-Gadoon Industrial Estate-Industry Information Sheet. USAID/Islamabad
- 2.2.1 List of all raw materials with daily consumption at full production capacity:
- 2.2.2 List of all process chemicals/materials consumed with approximate quantities:
- 2.2.3 Is any recycled material from the waste of your project or any other project used in the process? If so, please specify quantities and source:
- 2.2.4 Is any material salvaged from your waste stream re-usable economically for any other?
- 2.3 Manufacturing Process: See: USAID 1988. Sarhad Development Authority-Gadoon Industrial Estate-Industry Information Sheet. USAID/Islamabad.
- 2.3.1 Source of process know-how:
- 2.3.2 Give a brief description of the process technology utilized with a flow-chart. (Flow-chart of the process should be attached).
- 2.3.3 Have you any foreign collaboration?

Types of Information

- 2.4 Energy Consumption: See: USAID 1988. Sarhad Development Authority-Gadoon Industrial Estate. Industry Information Sheet. USAID/Islamabad
- 2.4.1 Source of energy:
(a) In-plant generation.
(b) Public supply.
- 2.4.2 If energy is generated in-plant, type and quantity of fuel daily consumed:
3. General Environment
(Site climate settlement): See: USAID 1987. Environmental Assessment of the Gadoon-Amazai Industrial Estate Project, Northwest Frontier Province, Pakistan. Phase I. Construction of Infrastructure.
- 3.1 Site
- 3.1.1 Where is the plant proposed to be cited:

Attach map showing topographical features of the area.
- 3.1.2 Elevation above mean sea level:
- 3.1.3 Area of land proposed to be acquired:
- 3.1.4 Area proposed to be built up or developed:
- 3.1.5 Present use of the land: agriculture/forest/grazing/settlement/fallow:

Types of Information

- 3.1.6 Indicate the nature of topography near the site:
plains/valley/hilly
- 3.1.7 Specify site character:
river basin/coastal/
estuarine/land-locked
- 3.1.8 Is the land situated within any municipal or corporation jurisdiction?
- 3.1.9 Is the land situated in an approved industrial zone or estate? If so, please specify.
- 3.1.10 What, of the following features, exist within 30 km of the site?
- i) Human settlements:
Specify population.
 - ii) Agricultural land:
Specify crops.
 - iii) Grazing land:
 - iv) Fisheries:
 - v) Forest/sanctuary/
natural park:
 - vi) Nullahs/streams/
rivers:
 - vii) Ponds/lakes/dams:
 - viii) Estuary/sea:
 - ix) Hills/mountains:
 - x) Archaeological/Historic/
Cultural/Scenic sites/
Scientific Institutions/
Hospitals/Sanatoria/
Religious importance:
 - xi) Industries:

Types of Information

- 3.1.11 Type of flora and fauna, especially wildlife, endangered species:
- 3.1.12 Present employment or occupational pattern in the area:
- 3.1.13 Prominent Endemic Disease (Fluorosis, Malaria, Filaria, Malnutrition, etc.)
- 3.1.14 Mortality rates: (Crude, Infant, Maternal):
- 3.1.15 Any other observation regarding state of environment?
- 3.2 Climate:
 - 3.2.1 Indicate the climatic conditions at the site (e.g. arid, semi-arid, etc.)
 - 3.2.2 Rainfall yearly average:
Range:
 - 3.2.3 Temperature seasonal:
Range:
 - 3.2.4 Provide information on speed and direction of wind:

Types of Information

3.3 Settlement:

3.3.1 Total number of persons proposed to be employed:

(a) During construction:

(b) After completion:

3.3.2 Do you propose to build a township/housing quarters for your employees?

3.3.3 Area allocated for above:

3.3.4 Population to be accommodated:

3.3.5 Distance from township to plant site:

3.3.6 Services provided in township:

- i) Water - daily consumption:
- ii) Sewer system:
- iii) Sewage treatment:
- iv) Garbage disposal:
- v) Drainage:
- vi) Any other:

4. Water Requirements:

See: USAID 1988.
Development Authority-Gadoon
Industrial Estate. Industry
Information Sheet.
USAID/Islamabad.

4.1 What treatment is given before use, if any?

Types of Information

4.2 Average daily quantities and characteristics of water consumed:

- i) Process and wash:
- ii) Cooling:
- iii) Sanitary:
- iv) Total:

4.3 Are adequate quantities of water available:

- i) At present:
- ii) For future expansion:

5. Wastewater Discharge:

See: USAID 1989.
Environmental Assessment,
Gadoon-Amazai: Industrial
Estate, Phase II. Section
5.0. See: USAID 1987.
Environmental Assessment,
Gadoon-Amazai Industrial
Estate, Phase I.

5.1 Total quantity of wastewater discharged from the project per day:

5.2 Wastewater discharge per day from:

- i) Process and wash (with break-up, where possible):
- ii) Cooling:
- iii) Sanitary:
- iv) Total:

5.3 How do you propose to discharge the wastewater?

- i) Separate streams/combined:
- ii) Continuous/intermittent:

5.4 Type of treatment proposed to be adopted:
Give details and flow chart:

Types of Information

- 5.5 What standards for treatment effluent do you propose to adopt?
- Does it conform to standards prescribed by State/General Water Pollution Board, Local Authority, or other statutory authority?
- 5.6 Mode of final discharge: (open channel/pipeline/covered drains):
- 5.7 Point of final discharge: fallow land/agricultural land/sewer/river/lake/bay/estuary/sea. Give details of outfall design:
- 5.8 Is any portion of the wastewater proposed to be recycled? If so, give details:
- 5.9 What methods do you propose to adopt for handling and disposal of sludge from treatment plants?
- 5.10 Indicate available information on wastewater characteristics before treatment as below:
- a) Physical Parameters: temperature, pH, color, turbidity, odor, total solids, total suspended solids, and total volatile solids.

Types of Information

b) Chemical Parameters:
acidity, total, and pH;
alkalinity, total and pH;
hardness, total; BOD;
COD; oil and grease;
total N; phosphate,
total; chlorides;
sulphates; sodium;
potassium; calcium; and
magnesium.

5.11 What other specific toxic
substances are discharged?

Please specify nature and
concentration:
inorganics, organics,
including pesticides and
organic chlorine compounds,
phenols, lignin, mercaptans,
heavy metals, and radioactive
substances.

6. Solid Wastes: Process and
Treatment Plants

See: USAID 1989.
Environmental Assessment,
Gadoon-Amazai Industrial
Estate, Phase II. Section 5.0

6.1 Total quantity of solid
wastes in tons per day:

6.2 Nature of wastes: lumps/
granules/dust/slurry/sludge

6.3 Type of waste (organic, inorganic,
ash, glass, metal, etc.)

6.4 Method proposed for disposal,
including treatment plant:

Landfill/dumping/sea/
lagoon/marsh/composting/
incineration/sold

Types of Information

- 6.4.1 If landfill, possibility of leaching of toxic compounds into soil, ground water, or surface water:
- 6.4.2 If incinerated, details of incineration plant and procedures:
- 6.6 Do you anticipate any problems regarding collection, handling, and transport of solid wastes?
- 6.7 Are there any problems of subsequent pollution of air, water, or soil likely at the place of disposal of solid wastes?
- 7. Atmospheric Emissions
- 7.1 Emission from fuel burning:
 - 7.1.1 Anticipated quantity of stack emissions:
 - 7.1.2 Temperature of emission:
 - 7.1.3 Composition of emission:
 - (a) Particulates and smoke nature and quantity:
 - (b) Gases: sulphur dioxide, nitrogen oxide hydrocarbon, carbon monoxide moisture, others, specify

See: USAID 1989.
Environmental Assessment,
Gadocn-Amazai Industrial
Estate, Phase II. Section 5.0

Types of Information

- 7.2 Emissions from process:
 - 7.2.1 Anticipated emissions, quantity:
 - 7.2.2 Temperature:
 - 7.2.3 Composition of emissions:
 - (a) Particulates, nature and quantity:
 - (b) Gases:
sulphur dioxide, nitrogen oxides
carbon monoxide, ammonia
acid mists, halogens
hydrocarbons, mercaptans,
others, specify
- 7.3 Height of stack(s), for atmospheric emissions:
- 7.4 Proposed air pollution control system:
- 7.5 Proposed method of handling and disposal of wastes trapped by pollution arresting equipment:
- 7.6 Are any standards of emission prescribed for or adopted by your industry?

Types of Information

8.6.2 Describe the industrial hygienic measures you propose to adopt.

8.6.3 What provision have you made to conform to health and safety requirements as per Factories Act?

9. Management of Pollution Control:

See: USAID 1989.
Environmental Assessment,
Gadoon-Amazai Industrial
Estate, Phase II. Section 6.0

9.1 Give details of the organizational set-up you propose to have for pollution control.

9.2 What is the level of expertise of the person in charge of pollution control?

9.3 Do you propose to monitor the pollution from your industry?

If yes, give details:

9.4 What laboratory facilities do you propose to have for the above?

9.5 Give details of operation and maintenance of facilities you propose to have for treatment plants and pollution monitoring and control equipment.

Types of Information

- ii) Will the project affect the ground water required in terms of quality/quantity, depth, and direction of flow?
- iii) Will dewatering methods be necessary to undertake excavation?
- iv) Will the project induce a major sediment influx into area water bodies?
- v) Will the project impede the natural drainage pattern and/or induce alteration of channel form?
- vi) Will the project impair existing surface waters through filling, dredging, water extraction, or other detrimental practices?
- vii) Will recreation or aesthetic values be endangered?

Types of Information

11.3 Geotechnical:

See: USAID 1989.
Environmental Assessment.
Gadoon-Amazai Industrial
Estate. Phase II. Section
5.3.1 and 5.4.1.

- i) Is there risk of damage or loss resulting from tectonic/seismic activity and/or volcanic activity?
- ii) Are there mineral resources of potential value close to the project?
- iii) Will there be an increase in rock deposition/degradation as a result of the project?
- iv) Are there potential dangers related to slow failure or falling rock?
- v) Is there risk of major ground subsidence associated with the project?

11.4 Soil:

See: USAID 1989.
Environmental Assessment.
Gadoon-Amazai Industrial
Estate. Phase II. Section
5.3.1.

- i) Will there be a substantial loss of soil due to construction or operational practices?
- ii) Will there be a risk of losses due to instability?
- iii) Will project cause or be exposed to liquefaction of soils in slopes or foundations?
- iv) In case of settlement/heave, will there be a risk of damage of structure or services?
- v) Will the project modify the property of impacted soil?

Types of Information

11.5 Ecology:

See: USAID 1987.
Environmental Assessment of
the Gadoon-Amazai Industrial
Estate Project, Northwest
Frontier Province. Phase I.
Construction of
Infrastructure.

- i) Are there rare/endangered species which require protection?
- ii) Are there species which are particularly susceptible to human activities?
- iii) Would the loss of certain plant species deny food or habitat to wildlife species?
- iv) Are there any unusual population communities of plants that may be of scientific value?
- v) Will project activities impair natural productivity?

11.6 Land Use and Land Capability:

See: USAID 1987.
Environmental Assessment of
the Gadoon-Amazai Industrial
Estate Project, Northwest
Frontier Province. Phase I.
Construction of
Infrastructure.

- i) Will the project conflict with existing or proposed land use?
- ii) Will the project degrade land capability types?

11.7 Noise and Vibration:

See: USAID 1989.
Environmental Assessment
Gadoon-Amazai: Industrial
Estate, Phase II. Section
5.3.1

- i) Will the internal noise level present a potential risk to the hearing of workers?

Types of Information

- ii) Will the safe operation of the project be affected?
- iii) Will the project create noise levels which will cause annoyance or discomfort to nearby properties?
- iv) Will the project cause damage to structures, both natural and manmade, due to vibration?
- v) Will the vibration levels within the plant be such that there is a risk to employees' safety?

11.8 Visual Quality:

See: USAID 1989.
Environmental Assessment.
Gadoon-Amazai Industrial
Estate. Phase II. Section
5.3.1.

- i) Will the content of the scene perceived by the residents of the surrounding area be adversely affected by the project?
- ii) Will the coherence of the surrounding area be impaired by the project?

APPENDIX C
"CHANCE FIND"
ARCHAEOLOGICAL PROCEDURES

APPENDIX-G

Gadoon-Amazai "Archaeological Chance Find Procedures"

I. Introduction

The following "Archaeological Chance Find Procedures" are intended to support implementation of the provisions of the Antiquities (Amendment) Act, 1976 of the Islamic Republic of Pakistan. The development of industrial plants are often subject to surveys for archaeological and/or historical sites. An archaeological survey was performed by the Department of Archaeology of the U. of Peshawar. This survey determined that there are no known sites of archaeological and/or historical significance in the project area.

However, sites which are buried or were not located by the survey may be discovered during the course of project implementation. Such sites are protected under the provisions of the Antiquities (Amendment) Act, 1976. The granting of an archaeological clearance for the Project by the Department of Archaeology has been made contingent on the development and implementation of "Archaeological Chance Find Procedures" to support the provisions of Article 5A "Accidental discovery of antiquity to be reported to Director." These procedures address steps which shall be taken when archaeological and/or historical materials are encountered in the course of construction or industrial operating activities.

It should be noted that implementation of the "Archaeological Chance Find Procedures" is both legally required by the Government of Pakistan and consistent with long standing concerns for archaeological and/or historical sites of a number of international development organizations.

II. Implementation

Implementation of the "Archaeological Chance Find Procedures" will be the responsibility of the management and environmental staff of each organization responsible for a construction or operational activity. The SDA will have primary long-term responsibility to assure implementation of the procedures. Implementation of the procedures may be periodically monitored by the Department of Archaeology and representatives of international development organizations.

III. Archaeological Chance Find Procedures

A. Definition of an Archaeological Chance Find

An archaeological chance find is the unanticipated discovery of material remains of an archaeological and/or historical nature. Most frequently such finds are found within zero to three meters of the present surface and often are characterized by concentrations of pottery, worked stone, human and animal bones, and in some cases the remains of mud-brick structures. These materials are often of no commercial value, however, they may be of significant importance to archaeologists, historians and others who are involved in studying the people, culture and environment of ancient Pakistan.

B. Notification of the Department of Archaeology

When a discovery has been made of archaeological and/or historical materials, or it is believed that such material may exist in an area to be disturbed, the Department of Archaeology, Government of Pakistan should be notified immediately and requested to send a representative to make a site inspection. The request should be made both in writing and by telephone to the Department of Archaeology, University of Peshawar. All work should immediately cease in the vicinity of the find and not be resumed until a Department of Archaeology representative has visited the site. The Department should be advised of any materials that have been observed and any support which might be available from the contractor or operating organization to assist in examination of the material.

C. Response Period for the Department of Archaeology

The Department of Archaeology has a maximum of 72 hours from being notified by telephone to provide a representative to inspect the chance find, to determine the significance of the material and to make recommendations concerning what steps should be taken to salvage or formally excavate the material. If at the end of the 72 hour period the Department of Archeology has not responded to the request for field assistance any observed materials will be removed from their archaeological context and placed in storage for later collection by the Department.

D. Archaeological Salvage Procedures

The Department of Archaeology has the authority to conduct formal archaeological excavations and/or salvage any materials discovered as the result of "chance finds." It should be noted that all Pakistani costs for the planning, management, and conduct of such actions will be the responsibility of the Government of Pakistan. Potential support from international development organizations participating in implementation of the Project will be restricted to the provision of expert technical assistance to assist the Government of Pakistan funded personnel in the planning, excavation, and evaluation of archaeological and/or historical materials located as the result of Project implementation.

IV. Penalties for Violations of the Procedures

It should be noted that the provisions of Article 5A., (4) state that "If any person who discovers or finds any moveable antiquity contravenes the provisions of sub-section (1) or subsection (2), he shall be punishable with imprisonment for a term which may extend to three years, or with a fine, or with both, and the court shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to the Federal Government."

V. Other Archaeological Concerns

It is important that all contractors and operators note and advise their personnel of the provisions of the following articles:

Article 26. "Export of Antiquities"

This article prohibits the export of any antiquity except under a license granted by the Director of Antiquities.

Article 29. "Prohibition of archaeological excavation or exploration without licenses"

This article prohibits the conduct of archaeological excavation or exploration without a license issued by the Director of Antiquities.

All contractor and operator personnel should be strongly discouraged by their management from engaging in the illegal excavation, collection, and/or export of antiquities.

APPENDIX D
"ENVIRONMENTAL CRITERIA CHECKLIST"

The following is submitted as a potential checklist, or screening criteria for use by the SDA for assistance in determining suitable applicants for SDA developments. This document could be prepared prior to submission of the "Pro Forma for Environmental Impact Assessment."

Manufacturing Details

- o Description of main and secondary products.
- o Known waste material(s) from manufacturing processes.
- o Provide a flow chart of manufacturing process.
- o Description of raw materials and consumption rates.
- o Description of chemicals used in processes.
- o Energy generating or using industry?

Socio-Economic Details

- o Number of persons to be employed?
- o Will you provide quarters for employees?
- o Do you have an Emergency Management Plan?
- o Will you provide training for local persons?
- o Do you have an Occupational Health and Safety Plan?

Water Requirements and Discharge

- o Average daily quantities of water required (spd) and proposed source.
- o Average daily wastewater discharge (spd), and composition of wastewater.
- o Proposed treatment of wastewater?
- o Point of final discharge and outfall design?

Solid Wastes

- o Average daily quantity of solid waste generated.
- o Methods for storage and/or treatment for disposal.

Air Emissions

- o Anticipated quantity of stack emissions, including temperature and composition.
- o Anticipated quantity of process emissions, including temperature and composition.
- o Proposed air pollution equipment and operations.

Miscellaneous Considerations

- o Levels of noise and any vibrational effects.
- o Any potential for odors?
- o What hazardous materials are used in your process, list any radioactive, explosive, toxic or inflammatory materials (amounts and type).
- o Provide any details of proposed monitoring of discharges, both air and water.
- o Provide any details of proposed pollution abatement equipment or technology.