

Environmental Impact Assessment

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PAK: Balochistan Water Resources Development Sector Project

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Part 1 of 5

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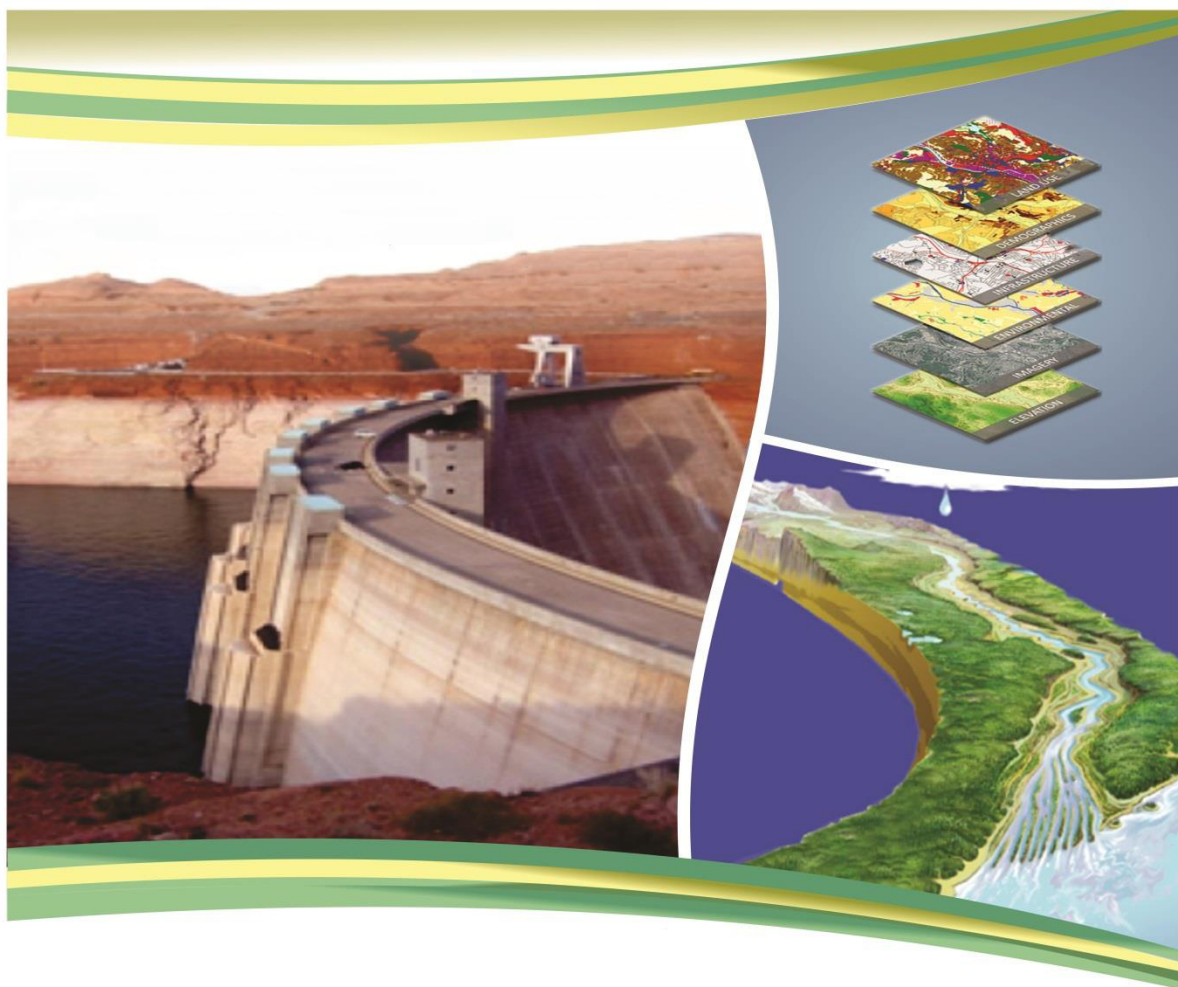
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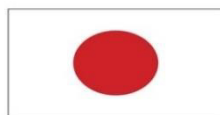
The Government of Balochistan

Balochistan Water Resources Development
Project (BWRDP)
(ADB TA 8800-PAK)

ENVIRONMENTAL IMPACT ASSESSMENT
BWRDP - Sri Toi Irrigation Project in Zhob River Basin



Japan
Fund for
Poverty
Reduction



From
the People of Japan



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ACRONYMS

AB	Acquiring Body
AP	Aggrieved Party
AN	Ammonium Nitrate
ADB	Asian Development Bank
AJK	Azad Jammu Kashmir
BEPA	Balochistan Environmental Protection Agency
BOD	Biochemical Oxygen Demands
BRSP	Balochistan Rural Support Program
BWRDP	Balochistan Water Resources Development Project
CAN	Calcium Ammonium Nitrate
CCR	Community Complaint Register
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
EA	Executing Agency
ESMMC	Environmental & Social Management Monitoring Cell
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EPC	Environmental Protection Council
EPRCP	Environmental Planning and Resource Conservation Project
FAO	Food & Agriculture Organization
FOs	Farmer Organizations
FFS	Famer Field School
GIS	Geographic Information System
GoB	Government of Balochistan
GRC	Grievance Redress Committee
GRM	Grievance Redressal Mechanism
H ₂ S	Hydrogen Sulphide
IEE	Initial Environmental Examination
IA	Impact Assessment
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
M&E	Monitoring and Evaluation
MCM	Million Cubic Meter
MSDS	Material Safety Data Sheet
MM	Modified Mercalli
MSK	Medvedev–Sponheuer–Karnik scale

NCS	National Conservation Strategy
NGO	Non-Governmental Organization
NEC	NEC Consultants
NEQS	National Environmental Quality Standards
NOC	No Objection Certificate
NOx	Oxides of Nitrogen
NTU	Nephelometric Turbidity Unit
NVP	Net Value Production
PEPA	Pakistan Environmental Protection Act
PEPO	Pakistan Environmental Protection Ordinance
PIS	Perennial Irrigation Schemes
PMD	Pakistan Meteorological Department
PMF	Probable Maximum Flood
PPC	Pakistan Penal Code
PPEs	Personal Protection Equipment
PPP	Public Private Partnership
PIU	Project Implementation Unit
BIPD	Balochistan Irrigation and Power Department
RB	Requiring Body
RCC	Reinforced Cement Concrete
REA	Rapid Environmental Assessment
SIEE	Summary Initial Environmental Examination
SMART	Self-Monitoring and Reporting Tools
SOx	Oxides of Sulfur
SPS	Safeguard Policies
TA	Technical Assistance
TCI	Techno Consult International
TDS	Total dissolved solids
TSS	Total Suspended Solids
VOCs	Volatile Organic Compounds
VECs	Valued Environmental Components
WHO	World Health Organization
WUA	Water User Association
WWF	Worldwide Fund for Nature

EXECUTIVE SUMMARY

A. INTRODUCTION

1. This report presents the findings of an Environmental Impact Assessment (EIA) study carried out by NEC Consultants (Pvt.) Limited for development of Sri Toi Water Storage Dam and Irrigation Project. The Project is expected to be funded by Asian Development Bank (ADB) with Balochistan Irrigation and Power Department (BIPD) acting as the Executive Agency (EA).

2. The proposed Sri Toi Water Storage Dam and Irrigation Project is located in Union Council Mir Ali Khel, Tehsil and District Zhob in Balochistan Province, approximately 62 km north-east of Zhob on Sri Toi River, the main tributary of Zhob River near Kili Gul Khan. The latitude and longitude of the scheme are 31° 35' 56.35" N, 69° 16' 8.86" E. The annual average availability of water is nearly 57 Million Cubic Meter (MCM) with a catchment area of 971 sq.km.

3. The proposed dam is an earth fill dam with clay core and in a total length of about 390 m and 70 m in height with freeboard of 2 m is proposed on Sri Toi River. A spillway in a length of 135 m is proposed from the left abutment of the dam. Furthermore, a steel pipeline of 3,500 km total length from intake structure of the dam up to start of the command area followed by irrigation left and right canals of a total length of 52 km is proposed also. Necessary cross drainage systems such as aqueducts, super-passages, RCC-pipe crossings, and other minor hydraulic structures are also proposed. project area map is shown in **Figure 1**.

4. The broader objective of Sri Toi Water Storage and Irrigation Project is aimed at:

- Increasing command area to 4,027 hectares out of total cultivable command area; and
- Sustained water supply to the present command area.

B LEGISLATIVE FRAMEWORK

5. The proposed project is governed by a host of national and provincial statutes and regulations. Furthermore, as the Asian Development Bank (ADB) is expected to be involved as a donor / financier, its relevant policies and guidelines will also govern the proposed project. Amongst the various rules and statutes, as summarized in Chapter-2 of this EIA Report, the most pertinent from an environmental perspective are as follows:

- National Policy on the Environment;
- National Biodiversity Strategy & Action Plan;
- The Land Acquisition (Balochistan Amendment) Act, 1985;
- National & Provincial Conservation Strategy;

- Pakistan Environmental Protection Act, 1997;
- Balochistan Environmental Protection Act, 2012;
- Pakistan EPA Review of IEE and EIA Regulations, 2000;
- Balochistan Forest Regulation 1890;
- The Balochistan Antiquities Act, 2014;
- The Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014; and
- ADB's Safeguard Policy Statement (2009).

C DESCRIPTION OF PROJECT

6. The Sri Toi water storage dam site is located in the Union Council of Mir Ali Khel, tehsil and district Zhob, about 62 km north-east of Zhob on Sri Toi river, the main tributary of Zhob river near Kili Gul Khan. The latitude and longitude of the sub-project are 31° 35' 52" North, 69° 15' 58" East and the mean altitude of the command area is 1,350 m above mean sea level. The location of the proposed dam and other interventions is shown as **Figure 3**.

7. Access from Zhob to the dam site is via Zhob-Wana road. Initially in the direction of north-east for a distance of 42 Km then turning to Samabza road in south-east direction up to Kili Hazrat Sahab by a link metaled road by travelling 10-kms, followed by *katcha* shingle/gravel track for a distance of another 10 Km up to the dam site. The journey takes about 2.25 hours from Zhob town.

8. Salient features of Sri Toi Water Storage Dam and Irrigation Project are shown in below Table A.

Table A: Salient Features of Proposed Project

Type of structure <i>[may change after Geotechnical investigation]</i>	Central Clay Core Earthfill Dam
Location	N 3496638.09, E 525794.05.96 Zone 42R
Dam Height (m)	66
Storage Capacity (MCM)	36.5
Catchment Area (sq.km)	961
Spillway Crest Length (m)	135
Spillway Type	Ogee ungated overflow
Spillway Design Flood	PMF/10,000 years return period
Dyke/Saddle (No.)	1
Main canal (km)	43.88
Right canal (km)	24.16
Left canal (km)	19.17
Intake Structure	Mu
Steel outlet Pipe (m)	1650
Khushkaba Area (Ha)	361
Design Command Area (Ha)	4,027
Watershed Development Area (Ha)	3750
Computed Average Annual Available Water (MCM)	57

D PROJECT ALTERNATIVES

a) No Project Alternative

9. The Project Area is considered as poor from an economic perspective. Subsistence farming is the economic mainstay. In case the proposed project is not implemented, the socio-economic conditions will not change as such. With the increasing population and scarcity of resources, residents are forced to abandon their homes in search of livelihood and grazing grounds for their cattle stock. From the environmental perspective, the project site comprising of dam pondage area as well as irrigation channel and proposed land for irrigation are arid in nature having little or no rain and too dry to support vegetation. Water availability is scarce in area hence the proposed project will contribute positively to the project area.

b) Sub-Projects Alternative

10. Based on the five stages selection process, the following five sub-projects, valued at US\$ 51.92 million were selected for pre-feasibility study:

- Ahmedzai Perennial and Floodwater Irrigation
- Sabakzai Dam Irrigation Project
- Sri Toi Water Storage Dam and Irrigation
- Killi Sardar Akhter - Perennial and Floodwater Irrigation

11. As per the alternative analysis carried out for the sub-projects the Sri Toi Water Storage Dam and Irrigation Project is qualified based on the following:

- The available water at the sub-project level (estimated using the catchment area) comes out to be 34.71 MCM for Sri Toi Dam Project. The water availability for Ahmedzai Perennial and Floodwater Irrigation (7.41 MCM), Sabakzai Dam Irrigation Project (18.1 MCM) and Killi Sardar Akhter - Perennial and Floodwater Irrigation (2.94 MCM) are much lower than the selected scheme.
- The proposed and existing command areas in the selected sub-projects comes out to be 4,027 hectares for Sri Toi Dam Project. The command areas for Ahmedzai Perennial and Floodwater Irrigation (859 hectares), Sabakzai Dam Irrigation Project (3,350 hectares) and Killi Sardar Akhter - Perennial and Floodwater Irrigation (252 hectares) are again much lower than the selected scheme.

c) Economic and Financial Justification

12. Among the selected sub-projects, **SRI TOI WATER STORAGE DAM** had highest annual Net Value Production (NVP) as compared to the other sub-projects in the Zhob river basin largely because of the larger command area. However, the beneficiaries are reduced by one-half to one-third due to higher unit cost per hectare.

d) Justification of Dam Design

Option	Reasons for selection/Rejection
Perennial and Flood Irrigation Scheme (PIS+FIS)	Since perennial flow is available at Sri Toi, initially a weir diverting water to a flood and perennial channel was considered as an economical option. However, the river has subsurface flow during few months which cannot be intercepted through construction of a weir during low flow seasons. Furthermore, flash floods occur frequently in this area and the floodwater cannot be reliably utilized for the design command area without proposing a storage structure. Therefore, this option was abandoned.

Infiltration Gallery	As a second design alternative, an infiltration gallery was considered. But the abundant surface water particularly during high flow seasons and in floods will pass un-utilized and the total command area would be significantly reduced. The topography of the area is very mild therefore; the conveyance conduit from the infiltration gallery would lose a huge patch of cultivable land till the daylight point. Therefore, this option was also not selected.
Cascade Dam	The option of three small cascade dams was also considered. Each dam was set 15 meters high. The combined area capacity curve of these dams was developed. It showed that the combined storage of only 1 MCM which is negligible as compared to the proposed dam of 36.5 MCM. Since, this option was not able to fulfil the requirements of command area, therefore, it was also not considered.
Dam	A storage dam was evaluated as the best option based on the project location hydrology, topography and available land. A dam will fulfill all the necessary requirements to utilize the potential of the area which include; storage of flood water for reliable perennial irrigation, protection of command area from severe floods, maximum utilization of area for command area development. Several options and axes were compared for the most optimum dam configuration which also included cascades of three 15-m high dam. However, the final selected option is a single 66-m high earthfill dam with one dyke and an overflow spillway. The details of the selected option are discussed below:

e) Justification with respect to Environment

13. An embankment dam is created by the placement and compaction of a complex semi-plastic mound of various compositions of soil, sand, clay, or rock. It has a semi-pervious waterproof natural covering for its surface and a dense, impervious core. This makes such a dam impervious to surface or seepage erosion.

14. Since the tributary is ephemeral in nature i.e. lasting for a short period after rains, the proposed project aims to elongate time frame and in due course the water storage dam would support ecology in longer time span. The construction of dam will change land use of the project site. Presently the project site is a barren land with low to no vegetation, shrubs or non-migratory ecology species. The terrain is laid with large sized boulders to fine silt. The provision of pondage area will store water and ensure water is available for irrigation purposes to the adjacent villages for a longer period of time in a year. The unlined irrigation canals would recharge ground water and there will not be any fragmentation / compartmentalization of environment up-stream or down-stream of the tributary.

f) Justification of Design as Earthen Dam

15. It has been estimated that the dead storage capacity that will deplete in the early 10 years which is computed as 6.49 MCM (5,216 acre-ft). The annual sediment load has been computed as 0.901 Million Short Tons (MST). The life of the dam has been estimated as approximately 80 years.

16. The provision of multi-level intakes for this dam is proposed. This design provision will allow inclusion of multiple gates at different levels. In case of silt deposition at the lower level, middle and higher-level intakes will be functional. The factor of silt deposition is considered during the dam life of 80 years.

17. The design life of the proposed Earth Dam is taken as 80 years with due considerations to reservoir sedimentation and provision of multi-level intakes for this dam. Provisions of chimney and horizontal filter are considered to counter the piping erosion effect of water through the dam embankment.

D BASELINE CONDITIONS**a) Area of Influence**

18. For the purpose of the Sri Toi Project EIA, the Area of Influence (AOI) has been divided into several specific sub-areas. The following are the main parts of the AOI:

- **Construction Site:** including dam, dykes, spillway, reservoir and canal, additional structures and immediate surroundings (construction camps, quarries, borrow and disposal areas, etc.);
- **Affected Structures:** The structure that may be physically affected due to project construction;
- **Project Foot Print Area:** this is the area directly related to Dam, Dykes, Spillways, Reservoir and Canal Right of Way (ROW), Canal, Outlets, command area etc.

b) Physical Environment

19. In Sri Toi area main rocks are covered in dam site area is mainly sedimentary in nature. The dam site is located in narrow gorge. The recent alluvium is present in the river bed and consists of rounded and sub-rounded gravels and boulders with some sand and fine particles. Abutments comprise of very steep slopes having 75 to 80 NW dip almost vertical in outcrop. The site having rock of Eocene, Oligocene and Miocene age prominent at that location.

20. Sri Toi has several narrow and steep canyons along the main river alignment. Some distance downstream of the proposed dam axis the valley opens wide to a relatively flat area

on both sides of the river banks having an average width of around 2-km. Several small and medium height mounds lie in this area that is excluded from the command area. In order to fulfil the irrigation requirement of 30 MCM for the design command area, a 66-m high dam was required. Therefore, primarily a location where abutment hills exceeding 66 m was identified. A suitable dam location that would require minimum number of dykes for the reservoir rim was sought which was identified few kilometers upstream of the proposed command area.

21. Sri Toi dam site is located in the northern part of the basin on an isolated tributary of the Zhob river. There is almost no existing sub-project diversion upstream of this location which indicates substantial potential for development of new sub-project. The annual average availability of water is nearly 57 MCM with a catchment area of 971 km². There is substantial ephemeral flow at this sub-project level with high flood peaks during high flow season. The overall water balance at basin level is carried out through hydrological modeling of the whole river basin. The results from the model were compared with measured flows during the site visit. During the site visit in November 2016, 0.71 cumecs flow was observed in the river. The ArcSWAT model for November estimates that the river will have 0.96 cusec flow. This shows that the order of magnitude estimated by the model is in close conformity with the actual flows. Groundwater quality as assessed from tubewell water, dugwells and water pumps was generally within permissible limits. However, Sri Toi Manda (surface) and tubewell (ground) waters showed high salinity. Although, no vast soil salinity was observed except in local patches, land levelling is essential to manage root zone salinity. In unlevelled field salts accumulate on high spots.

22. The seismic zoning map of Pakistan, indicates that the project area lies in the zone 3. This zone is classified as Moderate Damage Risk Zone which is liable to Medvedev–Sponheuer–Karnik scale (MSK) VII and also 7.8 on Modified Mercalli (MM) scale. The Medvedev–Sponheuer–Karnik scale, also known as the MSK or MSK-64, is a macro seismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence.

23. The climate of the sub-project is semi-arid and lies in monsoonal belt. Mean annual rainfall varies between 250-400 mm per year. It receives most of its rainfall from July to September. The region observes cold winters and hot summers with temperatures soaring as high as 38 °C in summers. Approximately 40% of average rainfall in eastern and southern Balochistan occurs in the months of July and August (monsoon dominated environments). However, less than 10% of average rainfall occurs in monsoon.

24. The soil of the Sri Toi Dam project area is alluvium material i.e. piedmont alluvium. The piedmont alluvium is nearly level to gently sloping. The top soil is dark brown, moist, silt loam to silty clay loam, slightly sticky, slightly plastic, friable, slightly hard, fine tubular pores, few scattered gravels, and has a clear smooth boundary.

25. Ambient air and noise conditions in the Project Area, is generally clean and quiet, because only a few houses were visible in the project areas. There are no industrial setups within the area of influence of the Project Area. Vehicular traffic is absent as well as road infrastructure.

c) Biological and Natural Environment

26. The proposed project does not interfere with any ecological parameters, however, can be seen as a positive contributor in improving the carrying capacity and overall improvement of the ecosystem.

27. Sri Toi like the whole district geography is typical of a mountain eco-system represents a typical pastoral dependence and rain fed agriculture. The habitat of the project area and its surroundings are broadly categorized as Hills, Foothills, plains and stream beds. Sri Toi specifically represents dry arid alpine terrain, with marginal vegetation cover, mainly comprising of shrubs, no tree species was recorded during the field visit.

28. Vegetation zones of the district consist mainly of following:

Vegetation Zone	Floristic composition
Hills	Olive (<i>Olea ferrugenea</i>), Blue pine (<i>Pinus gerardiana</i>), Shina (<i>Pistacia khinjik</i>), Uzhgai (<i>Pistachia cabulica</i>), Gurgura (<i>Reptonia buxifolia</i>), Shang/ Wild Ash (<i>Fraxinus xanthoxyloides</i>), Wild almond (<i>Prunus eburnean</i>), etc.
Foothills	Olive (<i>Olea ferrugenea</i>), Phulai (<i>Acacia modesta</i>), Sanatha (<i>Dodonea viscosa</i>), Gymnosporia spinosa, Ber (<i>Zizyphus nummularia</i>), Khamazurgae (<i>Withania cougularans</i>), Khatol (<i>Malcolmia africana</i>), Makhi (<i>Caragana ambigua</i>), Shezgae (<i>Eremurus aucheriana</i>), shkanpara (<i>Plantago ovata</i>), Shorea (<i>Haloxylon grifithii</i>), Tarkha (<i>Artimesia merittima</i>), Urgalama (<i>Rhzya stricta</i>), Zawala (<i>Achillea santolina</i>), Pamangi (<i>Bouce rosia aucheriana</i>), Raghbolae (<i>Peucedanum sp.</i>), Rakhpatti (<i>Panicum colonum</i>), Sanda (<i>Tillipa stellata</i>), Sandreza (<i>Lactuca sp.</i>), Malaghunae (<i>Daphne oleoides</i>), and Mazari (<i>Nannorrhops ritchiana</i>).
Plains and Stream beds	Commonly found in the entire district where <i>Tamarix sp.</i> and <i>Saccharam sp.</i> are commonly found.

29. The type of rangeland present in the district is classified as Suleiman Mountain Ranges. It has species like: *Stipa pennata*, *Pennisetum orientalis*, *Chrysopogon aucheri*, and *Cymbopogon sp.* etc. The productivity is good with average productive capacity of 250 kg /hectare. The rangelands in the district belong to communities living around them. Due to

communal ownership, usually these are accessible to all members of the community and also to nomads passing through the area on their traditional routes of migration to new areas.

30. Wildlife habitat type is Steppic Forest in Intermediate Latitude. There are no historical bench marks to determine the status of wildlife in the area. However, according to the community the number of wildlife species has declined; which could aptly be attributed to casual attitude for hunting and habitat degradation.

31. Sri Toi represents an ephemeral system; therefore, it does not offer a consistent condition (with flowing water during flood season only) for aquatic life to flourish, therefore no aquatic fauna (e.g. fish) was listed and observed during the field visit. However, during the post-BWRDP scenario, the storage dam will act as a storage pond for aquatic life to sustain.

32. In the post-BWRDP scenario, estimated surface water availability in the basin will be around **457 MCM**. With the proposed Sri Toi water storage dam and irrigation system the net withdrawal will be around **179 MCM**; therefore, balance water available will be around **278 MCM**. As per hydrology study these is sufficient for maintaining **environmental flows** and continue to contribute inflows to the **Gomal Zam Dam** without causing any ecological problems.

33. Baseline faunal survey recorded the occurrence of a total Seven (7) mammal species, of which confirmed the occurrence of 3 species fox, wolf and Hyena through direct evidences like pug marks, pelts, faces, territory marking signs and interviews with local residents. The Balochistan Black Bear, Suleiman Markhor and Afghan Urial, which was reported to occur in the past, are now apparently extinct. Cape hare was found very common in the entire area during survey. A total 07 Cape hare were counted during the survey. For the determination of population status of carnivores, nights walks were arranged. In the plains the survey team used vehicle and search lights. After seeing the eyes of carnivores in high powerful lights, noted the eye colors and consulted the literatures. In foothills, search lights were used in the same way. One (1) Indian grey wolf, two (2) red fox, three (3) Asiatic jackals and one Indian Crested Porcupine were sighted. While indirect observations were made on the droppings, foot prints of several carnivore species such as striped hyena, Jungle cat, afghan hedgehog, Caracal and Indian grey wolf. Skin of Panther observed in a house, using for prayers.

34. Direct sight techniques like ground nests searching and stand watch techniques were used for birds survey. Sixteen (16) species of birds were observed in the area. Chakoor and Seesee partridges were found very common throughout the area. The birds were mostly observed near water points. Two (2) small flocks of Chakoor and see partridges were observed in the area. Hunters to trap eagles were observed on three different locations with hunting materials.

35. The survey team observed lizards in six (6) different locations. At one location hunted Afghan Tortoise shell was also observed. Many snake species are reported from the area. Due to hibernation period, no snake species observed in the present survey while 2 lizard species observed in the survey, Clif racer (*Coluber rhodoracus*) and Agama (*Agama spp.*) are available everywhere.

36. No species with endangered or threatened status (as per IUCN red list) were observed in the project area during the faunal survey.

37. There are no notified protected areas present in the project vicinity. Approximately more than 200 km south of the project area is Tor Ghar Community Game Reserve in District Qila Saifullah game reserve.

c) Demographic and Socio-economic Environment

38. The total population of Zhob District according to 1998 census was 193,458 persons (105,319 males 54.44% and 88,139 females 45.56%) whereby; its projected population as of 2010 was 240,486 (132,267 male and 108,219 female) based on the 2.28% growth rate (Census 1998).

39. The major portion of the population earns their livelihood from Agriculture and livestock husbandry owing to diverse agro-climate. Though only 6-8% of the geographical area of the district is being used for Agriculture, still the crop yields are far higher than rest of the province. Agriculture Crops are sown both in Rabi and Kharif seasons. Crops cultivated during Rabi season include: Wheat, Barley, Vegetables and Fodder whereas in Kharif Sorghum, Maize, onion, potato vegetables and Fodder are sown. Besides the field crops, farmers in the district also grow fruit crops. Major fruits grown in the district include Apple, Almond, Apricot, pomegranates and grapes.

40. The main tribe living in the sub-project area belongs to the Arabzai clan of Mandokhail, list of the main villages is given in **Table 31**. These are ultimate beneficiaries of the project. Pushto is spoken as the major language in the area while small number of the people can speak Urdu. The communities belong to Muslim religion group. No issue of resettlement was observed.

41. Houses are mainly constructed of locally available impermanent materials, typically mud or sub-baked bricks fused with baked mud strengthened with chopped straw. These materials make poorer households susceptible to invasion of vermin and seasonally unstable, needing reconstruction after heavy rainy season. The houses made of impermanent materials, generally do not have border walls.

42. The upstream command area of the sub-project, (located on left bank of the river) is presently being sown as khushkaba during the Rabi season, and some 16 ha are being cultivated using groundwater abstracted from open wells/tubewells. The remaining command area is lying barren due to lack of access to surface water. The water table in the area varies from 37 to 46 m. In the command area of the dam some 4 Karezes/springs and around 180 open wells/tubewells are functional and providing water for irrigation.

43. According to the demographic survey, the total households of the villages is 12,861. The average family size was found as 15.

44. Traditional joint family system characterizes the social fabric of the area. Major castes are Arabzai clan of Mandokhail.

45. There is no group of people that could be termed as "Indigenous Community", under the definition of ADB.

46. No resettlement is envisioned, however, land distribution among the tribe members at individual basis of ownership need to be done.

E ENVIRONMENTAL IMPACTS & MITIGATIONS

47. The project is expected to cause few environmental and social impacts, both positive and negative. Positive impacts due to project interventions are:

- Employment opportunities to some locals for design phase surveys.
- An anticipated positive impact on socio-economic conditions during construction phase is the creation of limited-time employment opportunity for the local population. Since the project interventions will require substantial input from manual labor, even people with relatively lower levels of education or skills could get short term employment.
- A substantial land will be irrigated under the proposed scheme.
- Household income will increase substantially with irrigation improvement measures owing to availability of water for irrigation, crop yields, increase in the number of animals, and availability of other occupational opportunities.
- The Project will positively contribute in improving the carrying capacity of biological environment and overall improvement of the ecosystem.
- Availability of irrigation and agriculture would support livestock growth and in due course of time would enable farmers to diversify in areas of dairy production.
- Water storage in the dam body will attract water birds especially those migrating from Siberia to warm area during winter. Depending upon the size of the water body, it serves the purpose of a wetland.
- Availability of water for cultivation of crops will support cropping during Rabi as well as Kharif season over the entire command area. During due course of time, availability of

water will support agriculture and other production system and will help in converging into an integrated system wherein all the components of the ecosystem will be producing at their optimal level including the human element; and

- Positive change in the soil characteristics due to water availability on a continuous basis. Moreover, the cropping intensity will also increase to 120%.

48. Phase wise negative impacts due to Project interventions are provided below:

a) Design & Planning Phase

- **Assessment of Water Availability:** Improper assessment of water availability and failure of design. This impact would be of moderate significance.

Mitigation: Design works will ensure the proper assessment of water availability. BIPD will ensure the annual average available water of 57 MCM for irrigation water from tributary of Zhob River.

- **Water Right Issues:** Water being the most precious commodity in the area, its usage rights have been established traditionally. Any perceived or real disturbance to these water rights will almost certainly lead to social disturbance in the area. This impact would be of moderate significance.

Mitigation: Proper water distribution through warabandi system and consider traditional water rights of the area at design stage.

- **Permanent Land Acquisition:** The project involves permanent acquisition of various categories of land. This impact would be of moderate significance.

Mitigation: This impact can be mitigated by ensuring compliance of Land Acquisition Act, 1894, addressing community grievances on priority basis and timely compensation to affectees.

- **Design of Dam, Canals and Associated Structures:** Absence of any design provision (e.g. seismic consideration) may lead to design failure thus resulting in system collapse. The impact significance has therefore been categorized as 'High'.

Mitigation: The project needs to be designed as per applicable national / international engineering standards. Moreover, the project should also be reviewed by the design consultant at the detail design stage. By adopting the aforementioned measure, the impact would be of low significance.

- **Dam Reservoir Sedimentation:** Storage capacity of dam will be reduced. This impact would be of moderate significance.

Mitigation: Watershed management and erosion control measures have been included as an integral component of the project to control the reservoir sedimentation. These interventions include; structural measures like earthen micro-catchments (eyebrow terraces), digging of pit, addition of compost, termite treatment, plantation of trees, seeding of native grasses, small check dams and water storage ponds.

- **Risk Due to Natural Hazards:** Sri Toi Dam Project area lies in zone 3 as per seismic map of Pakistan which clearly shows that the area is in moderate to high risk zone. Hence, due

to earthquake the breaching of dam, canal and other irrigation structures is possible. This impact would be of high significance. The other natural hazard which can affect the area is flooding which would be of moderate significance.

Mitigation: Design engineer should ensure that seismic considerations are incorporated during design of dam, spillways, reservoir and other allied and irrigation structure. Moreover, the design should also be carried out as per international engineering standards. By adopting the above measure, the impact would be of low significance. Flood protection bunds has been included as an integral component of the project to control the damages occurred by floods. By adopting the above measure, the impact would be of low significance

b) Construction Phase

- **Social Issues:** Social issues arise due to improper dissemination of project progress. This would generate moderate significant impact.

Mitigation: An Environmental & Social Management and Monitoring Cell (ESMMC) will be established by EA (BIPD) who will also be responsible for stakeholder engagement and timely information dissemination.

- **Public Utilities:** Due to the proposed project in construction phase, public utilities affected may create disruption of public services and economics. This impact is however temporary and moderate in significance.

Mitigation: Incorporate technical design features to minimize affects on public utilities; and all public utilities likely to be affected by the proposed project need to be relocated well ahead of the commencement of construction work and Contractor to obtain NOCs from concerned Departments.

- **Water Pollution:** Water pollution will be of moderate significance which will be caused during construction phase of the Project.

Mitigation: Proper sewage disposal arrangements for camp sites and compliance of NEQS will result in decrease in water pollution. Periodic monitoring as mentioned in EMP, will result in decrease in water pollution

- **Soil Stability & Erosion:** Significant excavation and slope cutting is expected for the project to negotiate level differences. The cut and fill volume of the proposed project is about 2,662,000 cubic meter. This impact would be of moderate significance.

Mitigation: Provison of erosion control measures, no construction works during heavy monsoon rains, material borrowing and disposal plan, photographic record during various project phases etc. will ensure the impact significance is reduced to low significance.

- **Soil Contamination:** Soil may be contaminated as a result of fuel/oils/chemicals spillage and leakage, and inappropriate disposal. The waste would be generated from site clearance, excavation, concrete batching, concrete conveyance and construction of substructures and superstructures. This impact would be of moderate significance.

Mitigation: Provision of waste management plan, avoidance of vehicular traffic on unpaved roads, use of impervious sheathing beneath construction machinery and equipment will result in impact being reduced to low significance.

- **Deterioration of Air Quality:** The emissions from diesel generator sets, construction equipment and vehicles may deteriorate the air quality in immediate vicinity of the project area.

Mitigation: Regular maintenance of vehicles and equipments, water sprinkling on unpaved roads and stock piles after regular intervals, vehicles and machinery exhausts monitoring, and provision of a blasting management plan will ensure the impact significance remains low.

- **Increase in Ambient Noise:** The major sources of noise pollution during construction activities would be during slope cutting, excavation, loading, transportation, loading/unloading of materials and operation of construction equipment etc. The vibrators used for concreting also produce noise. The amplified noise levels will be temporary in nature and easily mitigated. At most of the construction sites, there are no major sensitive receptors except for some native reptiles that may inhabit the proposed sites will be temporarily affected by noise.

Mitigation: Use of low noise equipments, provision of noise mufflers in equipment and machinery producing high noise levels, and provision of earplugs for construction workers will ensure the impact significance remains low.

- **Water Availability:** Water is available through Karaiz at nearby villages. Labor influx will stress water consumption temporarily. However, it should be ensured that contractor will not use village Karaiz for construction and drinking purposes. In case of water usage from domestic sources (Karaiz), may cause impact of moderate significance.

Mitigation: Procurement of water through bowsers with water storage facility at site will reduce the impact to low significance.

- **Health & Safety:** Various activities during the construction phase of the Project could have health & safety impacts on workers and the people living in the nearby vicinity.

Mitigation: By adopting the following measures the impact would be finally of low significance:

- Provisions of proper signboards and informing the local people about the activity;
- Provision of Personal Protection Equipment (PPEs) to workers;
- Adequate water supply and sanitation facilities will be provided in the labor camps;
- First aid facility should be in place and an ambulance should be available at site for 24 hrs;

- **Blockage of Access:** Blockage of access will be of moderate significance which may arise due to movement of heavy vehicles from the communities.

Mitigation: Provision of a bypass route for safe and continuous flow of traffic.

c) Operation & Maintenance Phase

- **Unavailability or Improper Distribution of Irrigation Water in the Area:** As per the feasibility calculations, sufficient water will be available for the project and if not, social issues will arise. This impact would be of moderate significance

Mitigation: By adopting following measures impact would be finally of low significance:

- It is obvious that more consistent and regulated availability of water will be a beneficial outcome. To further improve the situation, BIPD could play a key role to involve the local staff of agriculture department to ensure the best utilization of available water;
 - As previously mentioned, many area people mentioned the need for potable water supply arrangements for the area. Once the consistent availability of water is assured, the Local Government could make potable water supply arrangements for the nearby villages;
 - Agreements between different communities;
 - Water management rules and regulations must incorporate ways to tackle such issues as water scarcity and surplus flows;
 - Local water user associations and groups need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures;
 - Compensate downstream Farmers in case of any water rights losses; and
 - Discourage Spate agriculture.
 - Desilting of irrigation channel on regular intervals.
- **Fatal Accidents and System Sustainability:** Breaching of canal, dam and structures will decrease system sustainability. Fatal accidents like flooding of settlements. Due to seismic conditions of the area as mentioned in chapter 3 of this report the probability of breaching of dam can occur if seismic considerations are not incorporated into the design. The impact will be of high significance.
Mitigation: To ensure system sustainability following steps need to be taken:
 - Design review in operational phase by panel of experts
 - Monitor the system regularly
 - Liaison with the communities to identify potential weaknesses in the system that could cause breaches.
 - Follow emergency response plan
 - **Health Issues:** Disposal of waste in the canal and waste streams may cause serious health issues. The impact would be of moderate significance.
Mitigation: Disconnect the entire waste stream falling in the system.
 - **Solid Waste:** Periodic cleaning of canal and distributaries will generate solid waste. This impact would be of moderate significance if not managed properly.
Mitigation: Solid waste needs to be properly disposed of in a designated dump site.
 - **Health and Safety:** During the operational stage of project significant human safety issues will arise due to the impounding of the reservoir. These include the need to raise awareness of the dangers of drowning in the reservoir, especially due to the rapid changes

in water level that will be experienced. This issue is particularly important for children. The impact may lead to safety issues and would be of moderate significance.

The proposed project can also result in an increase in the vector borne diseases (e.g. malaria) due to presence of a large water body.

Mitigation: A training program will be organized by BIPD at community level for health and safety practices adoption and ensure the community participation. This program should be instigated through the local schools to warn about the dangers of water borne diseases to children. Proper medication to treat the water borne diseases should also be available in nearby Basic Health Units (BHUs). By adopting the aforementioned training on health and safety, the impact would be finally of low significance.

- **Risk due to Natural Hazard i.e. Flooding and Earthquakes:** Occurrence of natural hazard i.e. flooding and earthquakes can damage even destroy the dam, canals and irrigation structures and will be a threat of system sustainability and impact would be of moderate significance.

Mitigation: Following the provision of Emergency Response Plan for Flood Protection Bund will reduce the impact significance to low level.

- **Disruption to Public and Wildlife:** Expected changing behavior of the wildlife for movement and drinking water due to canal is envisaged. It is also envisaged that during the operational phase the construction of canals would give problems to local community especially in terms of crossing the canals to reach the other side. The impact may also lead to wildlife conservation issues and would be of moderate significance.

Mitigation: Design has already provided cattle drinking troughs at different intervals and pedestrian bridge for canal crossing approximately at 500 m interval. Watershed management activities on the catchment and stream bank will be afforested. Agricultural advisory services will be started to grow organic vegetables and crops. Biological control of pests will be adopted through agriculture department support. As dam will be constructed, with the coordination of Forest and wild life and conservation organization, environmental awareness regarding hunting control will be raised. By adopting the aforementioned measures, the impact would be finally of low significance.

- **Social Issues over Community Participation:** The impact may lead to social and system sustainability issues and would be of moderate significance.

Mitigation: By adopting the following measures the impact would be finally of low significance:

- Ensure community participation in management and operation of the irrigation system
- Training of related communities

F CUMULATIVE IMPACTS

49. The best definition of Cumulative Impact Assessment (CIA) is defined by The US Council on Environmental Quality as “the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably

foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions”

50. The purpose is to assess the impacts of Sri Toi Dam Project cumulatively with those of other proposed projects within AOI limits and this chapter has been prepared in accordance with TOR.

a) Identification of Current and Proposed Projects

51. CIA is a challenging task as its analysis builds upon information derived from direct and indirect impacts due to present and future interventions in a defined geographical area including the current and proposed project. Therefore, cumulative impacts on the projects are, in concept, related to (i) existing projects located within AOI of Sri Toi; and (ii) proposed developments planned within and nearby to AOI of Sri Toi. As a first step, an effort was made to identify the projects within the AOI through various sources such as district level departments, Government of Balochistan planned programs and information through locals. These projects will be considered along with Sri Toi Irrigation Project for direct and indirect effects as part of CIA. However, no planned projects were found within the AOI of Sri Toi Dam. Moreover, the following projects are planned under Balochistan Water Resources Development Project (BWRDP) Preparatory Technical Assistance by ADB:

- Ahmedzai Perennial and Floodwater Irrigation – Sub Project
- Sabakzai Dam Irrigation Project – Sub Project
- Killi Sardar Akhter Perennial Irrigation – Sub Project

52. Again, there will be no cumulative impact due to Sri Toi Irrigation Project and the above-mentioned projects as these are planned on different tributaries of Zhob River and are at considerable distance (70 – 100 kms) from the Sri Toi Project site.

G ENVIRONMENTAL MANAGEMENT PLAN

53. The EMP sets out mitigation actions, monitoring actions, responsibilities, and schedules for impact mitigation and monitoring. Environmental monitoring has to be undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures.

54. EMP also provides its implementation mechanism during construction and operational phases

- **Implementation during Construction Phase:** The executing agency for this Project is Balochistan Irrigation and Power Department (BIPD) having core implementation responsibility. The immediate requirement considering the existing institutional setup of

EA (BIPD) is the establishment of Environmental & Social Management and Monitoring Cell (ESMMC). The ESMMC will overall monitor the environment related activities of Supervision Consultant and Construction Contractor and report to EPA-Balochistan regarding implementation status of EMP. Construction Contractor will be in direct coordination with Supervision Consultant through its HSE Department. Contractor's HSE Department is highly recommended to be on-board before mobilization.

- **Implementation during O&M:** The key players involved during operation of the proposed project are BIPD, District Environmental Officers of Zhob, Water User Associations (WUA) & Farmer Organizations (FOs) Chairman and Vice Chairman. BIPD will get input from WUA and FOs, randomly check the project operation in context of EMP and report to BEPA annually.

55. The EMP is prepared taking into account environmental consequences of the proposed action. Mitigation measures are suggested in Environmental Mitigation Plan at different stages of activities with performance indicators to mitigate the potential impacts. Environmental Monitoring Plan has also been prepared as a part of EMP which details about monitoring mechanism of a specific receptor /item, its frequency and parameters to be considered. The designer has carefully considered all recommendations related to the design. Though construction impacts are not severe, proper mitigation measures are needed. A suitable training program is proposed to train the Contractor(s) staff who will be involved in the Construction Phase and the professional staff from the proponent involved at the operational phase of the project. All required permits shall be obtained from the concerned departments before starting the related activity. Grievances should be addressed promptly, as suggested in the EMP.

EMP Budget

56. The EMP budget for construction period of Project is PKRs. 10,600,000/annum which covers cost of laboratory analysis, supervision consultant, third party monitoring, and trainings. For operation and maintenance phase, the cost is estimated for initial three years of operation which is PKRs 1,300,000/annum covering costs of laboratory analysis, third party monitoring, trainings and community engagement.

H CONCLUSION

57. The report provides conclusion based on the impacts assessed and the mitigation measures suggested. The report recommends that EA (BIPD) on priority basis shall initiate the establishment of ESMMC within its existing institutional structure. It is also recommended that EMP will be made a part of all bidding/tender document. Contractor will be bound to completely implement relevant mitigation measures set out in the EMP. Also, the cost related

to these mitigation measures has to be borne by the Contractor. Contractor shall prepare detailed Burrow, Quarrying and Disposal Plan, site specific HSE Plan as mentioned in EMP.

58. Local WUA and FOs need to be trained and involved to operate the canals, channels, gates, inlets, outlets and other structures. A study to be conducted to prepare a Pest Management Plan in coordination with Agricultural Department. If there are any changes in Project layout during execution, or any other changes in project description then change should be carried out through Change Management Plan included in EMP of this EIA report.

59. Some activities under this project have been identified to cause low to high environmental negative impacts and their mitigation measures have been prescribed. Proper and timely execution of these measures will reverse most of the negative impacts in the long term. Overall, the project causes higher positive impacts under the physical, ecological and socio-economic criteria and should therefore be approved for implementation.

1. INTRODUCTION AND BACKGROUND

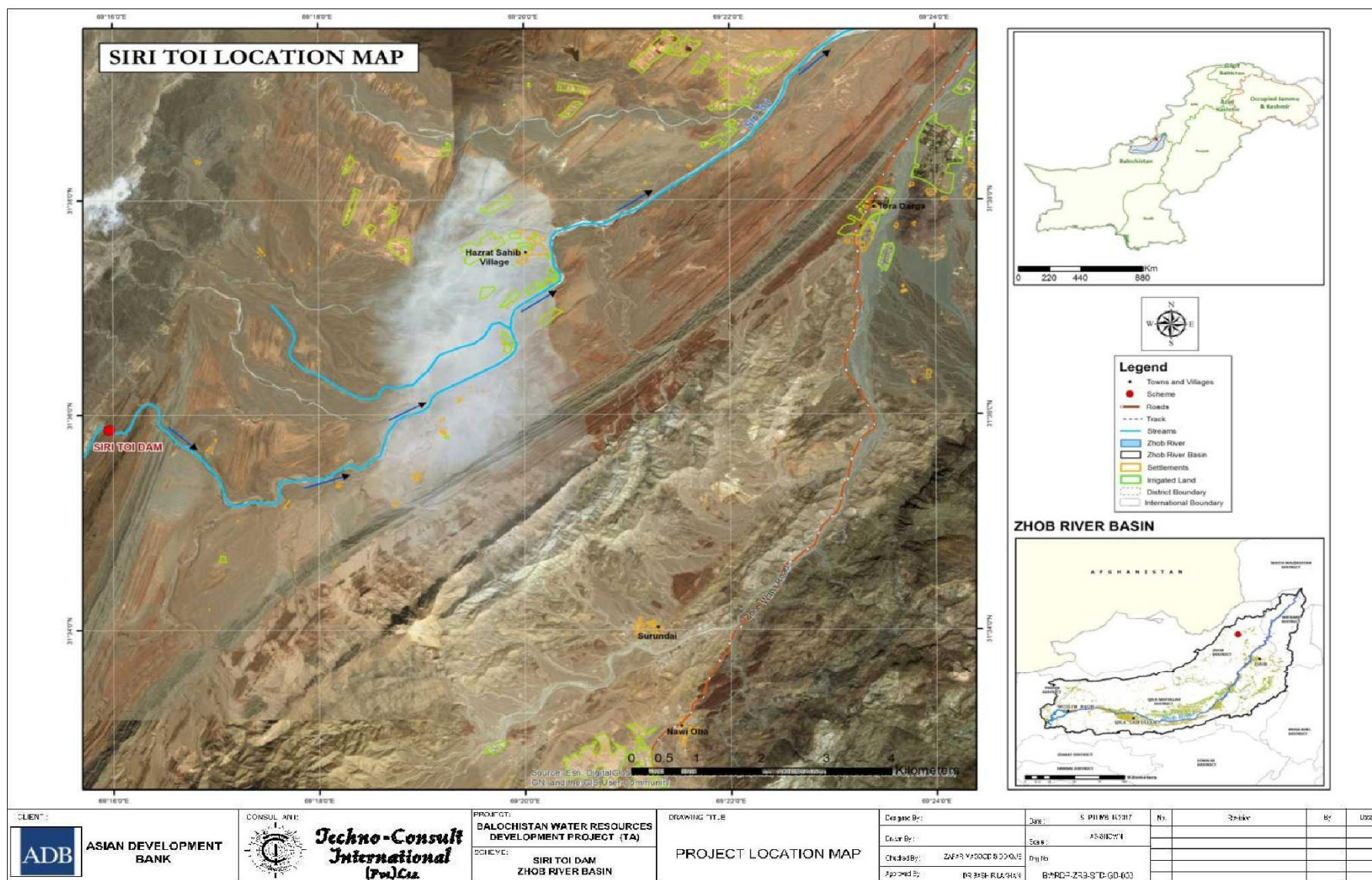
60. This report presents the findings of an Environmental Impact Assessment (EIA) study carried out by NEC Consultants (Pvt.) Limited for development of Sri Toi Water Storage Dam and Irrigation Project. The Project is expected to be funded by Asian Development Bank (ADB) with Balochistan Irrigation and Power Department (BIPD) acting as the Executive Agency (EA).

1.1. Overview of Sri Toi Water Storage Dam and Irrigation Project

61. The proposed Sri Toi Water Storage Dam and Irrigation Project is located in Union Council Mir Ali Khel, Tehsil and District Zhob in Balochistan Province, approximately 62 km north-east of Zhob on Sri Toi River, the main tributary of Zhob River near Kili Gul Khan. The latitude and longitude of the scheme are 31° 35' 56.35" N, 69° 16' 8.86" E. The annual average availability of water is nearly 57 Million Cubic Meter (MCM) with a catchment area of 971 sq.km.

62. The proposed dam is an earth fill dam with clay core and in a total length of about 390 m and 70 m in height with freeboard of 2 m is proposed on Sri Toi River. A spillway in a length of 135 m is proposed from the left abutment of the dam. Furthermore, a steel pipeline of 3,500 km total length from intake structure of the dam up to start of the command area followed by irrigation left and right canals of a total length of 52 km is proposed also. Necessary cross drainage systems such as aqueducts, super-passages, RCC-pipe crossings, and other minor hydraulic structures are also proposed. project area map is shown in **Figure 1**.

Figure 1: Project Area Map



63. The contract for preparing EIA of this assignment was signed between Asian Development Bank (ADB) and Techno Consult International (TCI) who JV hired the services of third party NEC Consultants (Private) Limited as per Terms of Reference to conduct EIA under its detailed supervision.

64. Balochistan Irrigation & Power Department, is the Executing Agency (EA) and implementing partner of the institutional component of the Project.

65. The detailed description of the project and its components is given in **Chapter-3** of this document.

1.2. Project Objective

66. The broader objective of Sri Toi Water Storage and Irrigation Project is aimed at:

- Increasing command area to 4,027 hectares out of total cultivable command area,
- Sustained water supply to the present command area.

1.3. Nature and Size of the Project

67. Salient features of Sri Toi Water Storage Dam and Irrigation Project are following:

Table 1: Salient Features of the Project

No.	Sub-project	Design Features of Sub-Projects
1	Sri Toi Water Storage Dam Irrigation	<ul style="list-style-type: none"> – Earth core rock fill dam 70 m high Spillway 2,782 m³/sec capacity Channel dimensions = 1.75m x 1.5m – Length of irrigation network = 52 km

1.4. Necessity of the EIA

68. The apex Pakistani law governing the subject of environment is the Pakistan Environmental Protection Act – 1997 (PEPA-97). Under Section 12 of the Act, it is mandatory for the proponents of the projects¹ to execute the IEE and / or EIA (where warranted), and get

¹ The Act defines a Project as: “Any activity, plan, scheme, proposal or understanding involving any change in the environment and includes:

- Construction or use of buildings or other works;
- Construction or use of roads or other transport systems;
- Construction or operation of factories or other installations;
- Mineral prospecting, mining, quarrying, stone-crushing, drilling, and the like;
- Any change of land use or water use; and

the approval from federal agency (i.e. Pak-EPA). This function has been delegated under Section 26 to provincial EPAs.

69. After the 18th amendment to the constitution of Pakistan, environment became a provincial subject, and the environmental law governing the Sri Toi Water Storage Dam Irrigation project is now the Balochistan Environmental Protection Act 2012. This act also provides for IEE or EIA (as the case maybe) for projects under its clause 15.

70. The EIA / IEE regulations of 2000 provide categories of projects for which IEE or EIA needs to be conducted. The proposed project falls under the category of "Water management, dams, irrigation & flood protection". Due to cumulative nature of the proposed project, an EIA is being conducted.

71. According to the Asian Development Bank Policy, all loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) and requires the completion of the environmental categorization form. REA has been conducted and attached as **Annexure 1**.

72. Accordingly, a proposed project is classified as 'Category A' if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. EIA for Category A project examines the project's potential impacts, evaluates all possible alternatives (including the "without project" situation), and recommends measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance. For Category 'A' project, the borrower is responsible for preparing a report and normally an Environmental Impact Assessment (EIA) report would suffice this purpose.

73. Based on the above requirements of national and provincial regulations, as well as the ADB policy, an Environmental Impact Assessment of the proposed project is being carried out.

1.5. Objectives of the EIA

74. The overall objective of EIA study is to study the interaction of project components among each other & the environment and to access anticipated environmental impacts in order to propose necessary mitigation measures against adverse impacts. To achieve this objective, an assessment of the existing environmental status of the project site is a prerequisite and, therefore, included in this study by collecting and reviewing the baseline data of various environmental attributes.

-
- *Alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations."*

75. This EIA is being prepared to ensure adequate environmental and social management during development and implementation of **Sri Toi Water Storage Dam Irrigation Project**. It will provide mechanisms for ensuring that potential environmental and social impacts of the current program are identified, assessed and mitigated as appropriate, through an environmental and social screening process. The EIA will, therefore, comply with the Pakistani EIA procedures for meeting the environmental and social management requirements, as outlined in EIA Guidelines. The EIA will also comply with the ADB Safeguard Policies SPS – 2009 for environmental management of projects.

1.5.1. More Specific Objectives of this EIA Report

- Meet the statutory requirements set forth by the Pakistan Environmental Protection Act (PEPA) 1997 and the Balochistan Environmental Protection Act 2012.
- Comply with ADB policies and safeguards for environmental and social management of projects
- Facilitate proponents and financiers of the project in ensuring environmental and social acceptability of the project
- Establish a baseline of existing environmental status at the project site prior to project initiation by collecting secondary and primary data/information on physical, biological and socio-economic environment of the project area.
- Help the project proponents to incorporate necessary measures for legally compliant and socially acceptable environmental performance of their project.
- Identify significant environmental impacts (both positive and negative) during all stages of the project implementation and propose mitigation measures for negative impacts.

76. The scope of the assignment is derived from the PEPA guidelines. As per scope of work reflected in the PEPA guidelines, the EIA report will consist of the sections as described in section 1.9 of this report.

1.6. The Consultants

77. As mentioned before, TCI hired NEC Consultants, as an independent third party, for conducting the above-mentioned EIA. NEC is one of the largest and well known environmental consultancy companies of Pakistan. It has to its credit a number of similar assignments carried out for various Government and private entities as well as for bilateral and multilateral donor agencies.

78. The Core Team deputed for the successful completion of the assignment belongs to different subject areas. The consulting team comprises the following members:

Mr. Tufail Ali	Team Leader / Environmental Engineer
Mr. Ayaz Ahsan, Syed	EIA Expert

Mr. Rafi UIHaq	Ecologist
Mr. Ghulam Mohammad	Agro-Economist
Ms. Rukhsana Shahid	Socio-Economist

79. The third-party activities for preparation of EIA were undertaken under the detailed supervision of Mr. Kashif Masud – Environmental Specialist of Techno-Consult International.

1.7. Study Approach and Methodology

80. The following methodology was adopted:

1.8. Scoping

81. Before formally initiating the study, the EIA team carried out internal scoping of the assignment, in consultation with the design team. The scoping was meant to avoid duplication of effort by using the information and knowledge base already available within the design consortium.

82. The scoping exercise included the following steps:

1.8.1. Desk Review

83. TCI has conducted many studies in the project area for the purpose of preliminary design. All these documents can be classified as Primary Data for the EIA study. The EIA team has been provided with the following documents:

- Pre-feasibility Report - Zhob River Basin-Sri Toi Dam (EIA)
- Land suitability assessment and soil-water quality report
- Climate Risk and Vulnerability Analysis Report (March 02 2017)
- DFR Agriculture in Zhob and Mula River Basins SA (April 2017)
- Detail Socio-economic Report (Sri Toi Dam) - Draft

84. Data obtained from the above-mentioned documents has been utilized extensively in the preparation of this EIA report. Simultaneously, the EIA team will revalidate most of this information during its field surveys, which will help in finalizing these documents as well.

1.8.2. Orientation Session

85. The EIA team held meetings and discussions with relevant key officials of the design team (TCI) on Apr 26, 2017. This meeting was geared towards introducing all team members with each other and bringing uniformity of expectations amongst all.

86. NEC shared their plan for conducting the reconnaissance survey.

1.8.3. Reconnaissance Survey

87. A comprehensive reconnaissance survey of the project area was conducted from May 12-14, 2017. Key potential environmental issues, sampling points for environmental parameter, and important landmarks in the project area were identified during the reconnaissance survey. This activity was aimed at achieving a common ground of understanding on various issues of the EIA study.

88. During these visits, team members took photographs and observed existing environmental conditions. The visits also helped in verifying various pieces of information available in the secondary sources. A photographic record is attached as **Annexure 2** of this report.

1.8.4. Delineation of Area of Influence

89. The basis for determining the areas covered under the Projects Area of Influence is the ADB Environmental Safeguards Good Practice Sourcebook (Dec 2012)² which states:

90. "The area of influence may span:

- *Primary project site and ancillary facility sites that will be owned, developed, operated or managed by the borrower/client or its contractors. Examples of ancillary facilities include access roads, borrow pits, spoil disposal areas, pipelines, canals, tunnels, depots and construction camps.*
- *Associated facilities not funded by the project but whose existence and viability are entirely dependent on the project and whose services are essential to project operation.*
- *Areas and communities potentially affected by cumulative impacts from further planned development of the project, other sources of similar impacts in the geographical area, any existing project or condition, and other project-related developments that are realistically defined at the time the assessment is undertaken.*
- *Area and communities potentially affected by induced impacts from unplanned but predictable developments or activities caused by the project, which may occur later or at*

² These guidelines are broadly followed by IFC Performance Standard 1 criteria for establishing Area of Influence

a different location. For example, a new road constructed through an intact forest provides access to a gas field. The road improves access to previously difficult to reach forest resources, resulting in illegal logging, local settlement and agricultural activities.”

91. Accordingly, for the purpose of the Sri Toi Project EIA, the AOI has been divided into several specific sub-areas, based on the fact that not all sub AOIs need to be studied. The following are the main parts of the AOI:

- **Construction Site:** including dam, dykes, spillway, reservoir and canal, additional structures and immediate surroundings (construction camps, quarries, borrow and disposal areas, etc.);
- **Affected Structures:** The structure that may be physically affected due to project construction;
- **Project Foot Print Area:** this is the area directly related to Dam, Dykes, Spillways, Reservoir and Canal Right of Way (ROW), Canal, Outlets, command area etc; and

92. Resettlement in the form of physical dislocation of people or their homes is not envisioned for this project. The project site has been used as grazing fields for many decades and has been in the protective custody of the Arabzai clan. Some land owners have demanded that this land should be properly distributed to individuals of the tribe. Land distribution among the tribe members at individual basis of ownership has been done. The project proponent will need to acquire land from these private land owners for the said Project.

1.8.5. Major Significant Impacts

93. Based on the initial impression formed after preliminary data review and the reconnaissance, following issues seemed to be pertinent for the proposed project:

- Issues pertaining to land acquisition are most pressing as the land need to be distributed among the Arabzai clan before the same is acquired for the project.
- Social and environmental issues due to construction activity (involvement of external labor force may face resistance, security concerns)
- Environmental issues related to biodiversity, especially in terms of flyway for migratory birds that migrate during winter from Siberia to Pakistan for wintering and return to their areas of origin during February/March every year.
- Environmental flows to (HDF delay action dam maroofzai (42R 549288.42mE 3509252.52mN)) to Gomal Zam Dam (42S 583195.95mE 3551738.40mN) which is a wetland and a wildlife sanctuary
- Impact on soil erosion is anticipated during project construction stage as huge amount of earth work will be involved.
- Siltation will be a major impact for the Sri Toi Dam that will reduce the pondage capacity of the dam and its delivery system.

- Water quality is primarily intended for use as agriculture. Water for drinking will continue to be extracted from ground as presently being done.

1.8.6. Data Acquisition

□ Data Acquisition Planning:

94. Following the concept clarification and understanding, detailed data acquisition planning was carried out for the internal use of the consulting team.

95. The consultants have segregated the project area into two zones based on topographic regimes, attached as **Annexure 3**. This segregation will help in providing very pertinent and specific information in the EIA report, thereby ensuring that all impacts and their mitigations are covered.

96. Following are the two zones of the proposed project area based on the existing topographic regimes:

- Pondage area, which is edaphically azonal and
- Catchment area, with frequent undulation and relatively well-developed soil profile.

97. The data acquisition planning included consideration for the following:

- Specific requirements of the primary and secondary data and their sources;
- Time schedules and responsibilities for their collection;
- Logistics and facilitation needs for the execution of the data acquisition.

1.8.7. Types of Data Required

98. The EIA study made extensive use of both secondary and primary data.

99. Secondary data will comprise data sets that are existing and available through reliable sources, such as climate data, water availability data, flow data, agriculture statistical data etc. The secondary data will help in establishing the baseline environmental conditions, and verify the primary survey findings.

100. Primary data will comprise those documents and information that have either been already collected for the specific purposes of project, or that needs to be collected directly from the project area. For example, project feasibility study will be used as a primary data source. Similarly, monitoring and laboratory analyses of various environmental parameters will be carried out to generate project specific primary data.

1.8.8. Secondary Data Collection and Review

101. The secondary data about the physical, technical, and institutional aspects of similar projects available with NEC and TCI will be also reviewed. Additional data will be collected from the following departments:

- Pakistan Meteorological Department,
- Geological Survey of Pakistan,
- Population Census Organization,
- NGOs/CBOs, and
- Related Studies and Research Articles.

1.8.9. Primary Data Collection and Review

□ Environmental Surveys:

102. The baseline data on the relevant environmental characteristics of the study area has been assembled, evaluated and presented. This section will include the detailed description of the following environmental attributes within the project area.

□ Physical Environment:

103. Locations and surroundings, site plans and layout, geography, polar coordinates, soils and geology, topography and drainage system, water resources, air and water quality, public water supplies, climate and ambient noise.

104. Most of this information is available through reliable secondary data sources as well as existing primary data. The EIA team will mostly revalidate this data before using it in the report. Monitoring and testing of major environmental parameters will be carried out as described later in this report.

□ Biotic and Natural Environment:

105. Data pertaining to Flora and fauna of the ecosystem/s, presence of rare or endangered species and sensitive habitat/s (National park, Wildlife sanctuary, Game reserve and Protected Forest) will be collected and assessed. Baseline faunal survey was also conducted in the Project Area to verify the data collected from relevant departments and to finalize the impacts on faunal attributes within the Project Area.

□ Environmental Laboratory Analysis

106. The environmental laboratory analysis shall be conducted at different locations of Project area. The locations of sampling points are marked in the attached maps as **Annexure 4** of this report. Following table presents the description of laboratory analysis and number of samples collected during the field visit.

Table 2: Description of Laboratory Analysis

S. No.	Description	Number of Samples	Parameters to be Analyzed
1	Water Quality Testing	01 at each option and Ground water	The parameters are based on current and future use and legal compliance requirement and given as Annexure 5 .
2	Ambient Air Monitoring	01 at each option	
3	Noise Monitoring	01 at each option	

1.8.10. Stakeholder Consultation

107. Due to the extensive nature of the proposed project, it is imperative to take all the stakeholders on board, and gather information about their concerns and perceptions at an early stage of the project cycle. The consulting team conducted internal meetings to identify and list all important stakeholders.

108. The primary stakeholder of the project is the community at large. People of the area have already been consulted once during the development of socio-economic profile document. It is envisaged that the second level of public consultation will be carried out during the detailed design stage.

109. The secondary stakeholders of the project comprise of the various Government departments and private entities operative in the area. A list of such direct stakeholders is given below:

- Irrigation and Power Department, Government of Balochistan
- Balochistan Environmental Protection Agency (BEPA)
- Agriculture and Cooperative Department
- Balochistan Forest and Wildlife Department (North)
- Livestock and Dairy Development Department
- International Union for Conservation of Nature (IUCN)
- Balochistan Rural Support Program (BRSP)
- Academia

110. All these entities will be contacted with brief project introduction for meetings and soliciting feedbacks on the proposed project. The collected information has been documented as a separate chapter 06 in this EIA report.

1.8.11. Impact Evaluation

□ Impact Prediction and Assessment

111. "Impact prediction" basically refers to the quantification, where possible (or, at least, the qualitative description) of the anticipated impacts of the proposed project on various environmental factors. It is desirable to quantify as many impacts as possible, because in so doing, it has been frequently determined that the concerns related to anticipated changes are not as great as would be supposed, in the event of non-quantification.

112. The next stage of the EIA process is a detailed assessment to forecast the characteristics of the main potential impacts. Known as impact analysis. Impact identification and prediction are undertaken against an environmental baseline, often through indicators e.g. air/water, noise, ecological sensitivity, biodiversity. The aim is to take account of all of the important environmental/project impacts and interactions, making sure that indirect and cumulative effects, which may be potentially significant, are taken into consideration

113. Environmental impact studies represent a blend of technical information and analysis along with value judgments. To assess an environmental threat posed by an aspect, the principal factors to be considered are:

- the likelihood that the threat may be realised; and
- in the event of realisation of the threat, the nature and extent of the consequences.

114. A qualitative risk assessment methodology has been adopted for this project, comprising the Likelihood and Consequence values detailed in **Table 3** and **Table 4**.

Table 3: Qualitative Likelihood Values

Likelihood Indicator	Likelihood Description	Explanation
A	Almost Certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur at some time
D	Unlikely	Could occur at some time
E	Rare	May only occur in exceptional circumstances

Table 4: Qualitative Consequence Values

Consequence Indicator	Consequence Description	
1	Insignificant	Negligible, reversible, requires very minor or no remediation / minor injury with slight negative health impact
2	Minor	Reversible, requires minor remediation / major, non-fatal health impact to one or more individuals
3	Moderate	Reversible, short-term effect, requires moderate remediation / severe, non-fatal health impact to one or more individuals
4	Major	Serious impact, medium term effect, requires significant remediation / single fatality or severe irreversible disability or impairment
5	Catastrophic	Disastrous impact, long term effect, requires major remediation / multiple fatalities, major permanent health impacts on a large number of individuals

115. On the basis of a likelihood and consequence matrix (**Table 5**), each hazard may be categorised into broad 'risk categories' and the required management approach for each risk category can be defined.

Table 5: Risk Matrix – Risk Categories and Management Response

		Consequence				
		1	2	3	4	5
Likelihood	A	M	M	H	H	H
	B	L	M	H	H	H
	C	L	L	M	H	H
	D	L	L	L	M	H
	E	L	L	L	M	M

H = High Risk – Proposed works methods not acceptable and must be altered.

M = Moderate Risk – Detailed management action plan to be prepared, including monitoring program.

L = Low Risk – Routine management procedures to be defined and monitoring requirements

116. Residual impacts after implementation of mitigation measures have also been provided.

❑ Cumulative Impacts

117. EIA of Sri Toi project requires a cumulative assessment of the proposed project. According to the 1997 CEQ handbook on the consideration of cumulative effects (CEQ, 1997) states that “the most devastating environmental effects may result not from the direct effects of a particular action, but from the combination of individually minor effects of multiple actions over time.”

118. Considering above, EIA will also look into the potential impacts from existing and future planned developments and reasonably located within a geographical scope where potential environmental and social interactions could act to create any significant impact. Cumulative impacts analysis will be done under five steps:

- Identification of Valued Environmental Components (VECs)
- Baseline of VECs.
- Assessment of VECs.
- Assess significance of impacts and
- Management of impacts.

❑ Impact Mitigation, Management and Monitoring Plan

119. Mitigation measures include:

- Avoiding the impact altogether by not taking a certain action or parts of an action;
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- Compensating for the impact by replacing or providing substitute resources or environments.

120. Mitigation measures would be developed for the elimination of identified and potential problems which may affect the environment. Recommendation for design, construction and operation phases would be separately presented in this plan. This plan will be prepared with the aim to monitor the efficiency of recommended mitigation measures. Residual impact significance will also be provided after implementation of mitigation measures.

Table 6: Environmental Management Plan - Activity based

Activity	Mitigation Measures(s)	Monitoring Indicator (s)	Monitoring and Reporting Frequency	Party (ies) Responsible
All activities in EIA that received a “negative determination with conditions”.	If mitigation measures are well specified in the EIA, quote directly from EIA	Specify indicators to (1) determine if mitigation is in place and (2) successful.	For example: “Monitor weekly and report in quarterly reports. If XXXX occurs, immediately inform activity manager”.	If appropriate, separately specify the parties responsible for mitigation, for monitoring and for reporting.

1.9. Organization of Report

121. This report contains a total of eight chapters. Besides **Chapter 1**, which contains introduction and background of the report, other chapters are described as under:

- **Chapter 2** – “Policy, Legal and Administrative Framework” elucidates the current legal framework which is applicable on the proposed project in context of environment and sustainable development;
- **Chapter 3** – “Description of Project” furnishes an overall description of the Project, including its background and key components for design, construction and O&M phases;
- **Chapter 4** – “Project Need and Alternatives” provides details on alternatives considered for the proposed interventions, location and design;
- **Chapter 5** – “Baseline Conditions” comprises a detailed documentation of the existing (baseline) conditions of the Project Area, with respect to its physical, ecological and socio-economic environment;
- **Chapter 6** – “Stakeholder Consultation” provides details of consultative sessions with the local community as well as with other stakeholders including local politicians, local government officials, policy makers and NGOs for their opinions and suggestions on the Project;
- **Chapter 7** – “Potential Environmental Impacts & Mitigations” documents the likely impacts of the Project on the physical, ecological and socio-economic environment during the construction and operation phases and lays down the proposed measures to mitigate the adverse impacts of the Project; and
- **Chapter 8** – “Environmental Management Plan” provides the proposals on mechanism to be adopted for the implementation and monitoring of the environmental measures.
- **Chapter 9** – “Conclusions and Recommendations” conclusions of the environmental impact assessment study and recommendations to be adopted.

2. LEGISLATION, GUIDELINES AND REGULATORY FRAMEWORK

2.1. General

123. This chapter elucidates the current legal framework which is applicable on the proposed project in context of environment and sustainable development. The institutional arrangement that exists in Pakistan and may influence the environmental management of the proposed project is also discussed in this chapter.

2.2. Background

124. The Government of Pakistan realized the importance of environmental preservation way back in the early 1980's. Until the 1980's development policies were formulated irrespective of environmental considerations. A variety of environment-related acts and ordinances existed, but the Pakistan Environmental Protection Ordinance 1983 (PEPO) was the first effort to deal with environmental concerns systematically. The ordinance created a legal basis for comprehensive environmental policy making, the establishment and enforcement of standards, environmental impact assessments and the inclusion of environmental considerations in development policies³. In 1984, the promulgation of this ordinance was followed by the establishment of the Pak-EPA, the primary government institution dealing with environmental issues. The PEPO 1983 was replaced with a new Act of Parliament in 1997 i.e. PEPA Act 1997.

125. The UN International Summit on Environment was held in 1992 in Rio de Janeiro, to highlight the importance of environment protection and to promote sustainable development. Pakistan also became a signatory of this summit, after which the Government of Pakistan developed a National Conservation Strategy (NCS), approved in March 1992. It was decided that all reports regarding strategies, policies and program for sustainable development will be drawn up on the basis of the NCS⁴. Another major environmental policy initiative formulated in 1999 was Environmental Planning and Resource Conservation Project (EPRCP)⁵.

126. The enactment of PEPA 1997 took up the key issues of PEPO and in addition provided for a considerable strengthening of institutions at the national and provincial level for the formulation, execution and enforcement of environmental policies and conferred broad-based enforcement powers to the EPA⁶. NEQS for municipal and liquid industrial effluent, industrial

³ *"Industrial policy and the Environment in Pakistan"*: United Nations industrial development organization;

⁴ *"A model process to develop a National Agenda"*: Pakistan National Conservation Strategy; pg.1.

⁵ *"Industrial policy and the Environment in Pakistan"*: United Nations industrial development organization; 11 December, 2000; pg.9.

⁶ *"Industrial policy and the Environment in Pakistan"*: United Nations industrial development organization; 11 December, 2000; pg.9

gaseous emissions and motor vehicle exhaust and noise, were issued by Pakistan EPA in 1994.

127. Pakistan EPA review of IEE and EIA Regulations, 2000 and Pakistan Environmental Assessment Procedures were published, to provide necessary guidelines for preparation, submission and review of IEE and EIA.

2.2.1. Applicable ADB & National Environmental Policies / Laws

128. Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process. ADB's safeguard policy (2009) framework consists of three OPs on the environment, involuntary resettlement and indigenous peoples. These are accompanied by Operations Manual sections on Environmental Considerations in ADB Operations; Involuntary Resettlement; and Indigenous Peoples. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address the adverse effects of projects throughout the project cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) AP are informed and consulted during project preparation and implementation.

129. The applicability of above policies considering the Project interventions and its responses are given in the **Table 7** below:

Table 7: Applicable Policies Related to Proposed Project

S. No.	Safeguard Policies	Key Requirements	Remarks
1.	Environment	Projects and subprojects need EIA to address important issues not covered by any applicable regional or sectoral EA.	Applicable to proposed project
2.	Involuntary Resettlement	Involuntary resettlement should be avoided where feasible, or minimized, exploring all viable alternative project designs. Where it is not feasible to avoid resettlement, resettlement activities should be conceived and executed as sustainable development programs,	No Resettlement is envisioned. Land distribution among the tribe members at individual basis of ownership has been done.

S. No.	Safeguard Policies	Key Requirements	Remarks
		providing sufficient investment resources to enable the persons displaced by the project to share in project benefits.	
3.	Indigenous Peoples	Measures to avoid potentially adverse effects on the Indigenous Peoples' communities; and when avoidance is not feasible, minimize, mitigate, or compensate for such effects. The projects are also designed to ensure that the Indigenous Peoples receive social and economic benefits that are culturally appropriate gender and intergenerationally inclusive.	There are no groups of people in the project area who could be categorized as indigenous people; therefore, this policy does not apply to the proposed project.

130. Besides the ADB policies, there are various legal provisions at the national or provincial level related to the design, construction and operation of the proposed project. This stems from a multitude of environmental laws, regulations, and / or policies or executive orders related to the physical-chemical, biological, cultural, and socioeconomic environments. Some of the statutes to be referred in the EIA are the following:

- National Policy on the Environment
- National Biodiversity Strategy & Action Plan
- The Land Acquisition (Balochistan Amendment) Act, 1985
- National & Provincial Conservation Strategy
- Pakistan Environmental Protection Act, 1997
- Balochistan Environmental Protection Act, 2012:
- Pakistan EPA Review of IEE and EIA Regulations, 2000
- Balochistan Forest Regulation 1890
- The Balochistan Antiquities Act, 2014
- The Balochistan Wildlife (Protection, Preservation, Conservation and Management) Act, 2014

2.3. National Policy on the Environment

131. The National Environment Policy aims to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development. The Policy provides broad guidelines for addressing environmental concerns and ensuring effective management of their environmental resources. The provincial, AJK,

Northern Areas and local governments, however may devise their own strategies, plans and programs in pursuit of this Policy.

132. Enforcement of the policy is being carried out through National Environmental Quality Standard (NEQS) and Self-Monitoring & Reporting Tools (SMART) in order to optimize energy and environmental resource consumption within the industries; encourage reduction, recycling and reuse of municipal and industrial solid and liquid wastes; introduce discharge licensing system for industry; devise and implement master plans for treatment of municipal and industrial wastewater in urban and rural areas. The policy has not been revised since 2005.

2.4. IWRM Policy

133. The Integrated Water Resources Management (IWRM) Policy in Balochistan was approved in 2006 which highlighted the reforms needed for water resources monitoring and planning in the province. The policy also enforces the adoption of IWRM approach for basin sustainability.

134. As per Draft Balochistan Comprehensive Development Strategy 2013 -2020 the water sector development will be as under:

135. “For the irrigation water, the strategy is clear that evolving Water Resource Management System and Institutional Framework will be central to sustainable water use in the province. The theme is pillared on undertaking river basin wide management of water with greater focus on the flood irrigation Sailaba and creating water storages on all strategic locations in the river basins and handling the Sailaba irrigation and dams command area in an integrated manner. Under the Strategy, GoB will support establishment of Drip Irrigation Manufacturing Plants in the province under PPP mode for providing either front- end or back-end subsidy to get a system introduced with full institutional support. There is emphasis that water supply and sanitation require a dedicated attention and given the massive gap, it is planned to undertake integrated water supply and sanitation system in partnership with the local communities especially women through a community infrastructure program for a minimum of 5000 settlements “.

2.5. Balochistan Acquisition of Land Act 1974 & (Amendment) Ordinance 1976

136. The primary law for acquisition of land for public purposes in Pakistan is the “Land Acquisition Act, 1894” (hereinafter referred as the Act). The land acquired under the Act vests in the Province and it is only thereafter that the Province may transfer it to someone else.

137. The Balochistan Acquisition of Land Act allows the government to acquire private land for housing or development schemes. Initially, the law specifically mentioned “in rural areas”, but this was deleted subsequently through the Ordinance in 1976. “Land Acquisition” literally means acquiring of land for some public purpose by government/government agency, as

authorized by the law, from the individual landowner(s) after paying a government fixed compensation in lieu of losses incurred by land owner(s) due to surrendering of his/their land to the concerned government agency. The laws essentially are developments on the land acquisition act of 1894 which was created with the purpose of facilitating acquisition by the government of privately held land for public purposes. The word "public purpose", as defined in the act, refers to the acquisition of land for constructing educational institutions or schemes such as housing, health or slum clearance, as well as for projects concerned with rural planning or formation of sites. It is not necessary that all the acquisition has to be initiated by the government alone. Local authorities, societies registered under the societies registration act, 1860 and co-operative societies established under the co-operative societies act can also acquire the land for developmental activities through the government.

138. Land acquisition requires interaction between the Requiring Body (RB), which is normally a government agency that requires the land for certain national development project, and the Acquiring Body (AB), which is normally the Provincial Revenue Board, since land is a provincial subject according to the Constitution. The division of responsibility between the Requiring Body and the Acquiring Body in broad terms is that the Requiring Body provides the technical input and the Acquiring Body provides the legal input in the land acquisition process. It is the Requiring Body which must ensure that the project, for which the acquisition of land is required, is approved by the authorities and that funds are available. The Requiring Body must also justify the need for land and other property on the basis of field surveys including detailed engineering design and prepare all necessary documents required for decision making.

139. The project site has been used as grazing fields for many decades and has been in the protective custody of the Arabzai clan. This land is now a barren land due to absence of water. Resettlement in the form of physical dislocation of people or their homes is not envisioned for this project. Some land owners have demanded that this land should be properly distributed to individuals of the tribe. Recently the Balochistan Irrigation and Power Department, the project proponent, involved Commissioner / Deputy Commissioner Zhob to resolve this matter. The matter has been resolved and the land has been handed over to its rightful owner. The project proponent will acquire land from these private land owners for the said Project.

2.6. Environmental Legislations

140. The key environmental regulations and legislations which are applicable to the proposed project is discussed below.

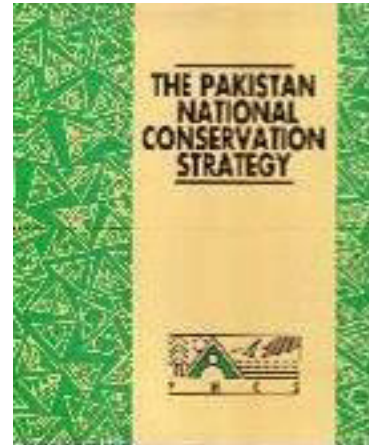
2.6.1. National Regulations

141. The environmental policy framework, which will govern the project, is the NCS of Pakistan. The Pakistan NCS is a broad-based policy statement aimed at achieving environmentally sustainable social and economic development in Pakistan. The three overriding objectives of the NCS are:

- Conservation of natural resources
- Sustainable development
- Improved efficiency in the use and management of resources

142. Three operating principles are identified to achieve these objectives. These are:

- Greater public participation in development and environmental management
- A merging of environmental and economic decision making
- Lasting improvements in the quality of life



143. The NCS specifies the basic guidelines for an integrated effort aimed at protecting the environment and the natural resources of the country. This broad framework provides a comprehensive point of reference for all agencies, departments, private sector companies, financial institutions, and donor agencies for undertaking systematic efforts to bring about an effective change for sustainable development⁷.

2.6.2. Pakistan Environmental Protection Act, 1997

144. The PEPA 1997 is the apex environmental law of the country. Under section 12 of the Act, it is mandatory for the proponents of the projects⁸ to execute the IEE and / or EIA (where warranted), and get the approval from provincial EPA. A copy of PEPA 1997 is attached as **Annexure 6** of this report.

145. The following rules and regulations have been issued under the Pakistan Environmental Protection Act, 1997.

⁷ Qadar S., and Dogar A. R., *Pakistan's Environmental Laws & Their Compliance*, Lahore Law Times Publications, 2002.

⁸ The Act defines a Project as: "Any activity, plan, scheme, proposal or understanding involving any change in the environment and includes:

- Construction or use of buildings or other works;
- Construction or use of roads or other transport systems;
- Construction or operation of factories or other installations;
- Mineral prospecting, mining, quarrying, stone-crushing, drilling, and the like;
- Any change of land use or water use; and
- Alteration, expansion, repair, decommissioning or abandonment of existing buildings or other works, roads or other transport systems, factories or other installations."

Rules:

- National Environmental Quality Standards (Self-monitoring and Reporting by Industries) Rules, 2001.
- Provincial Sustainable Development Fund (Procedure) Rules, 2001.
- Pakistan Sustainable Development Fund (Utilization) Rules, 2001.
- Pollution Charge for Industry (Calculation and Collection) Rules, 2001.
- Environmental Tribunal Procedures and Qualifications Rules, 2000.
- Environmental Samples Rules, 2001.
- Hazardous Substance Rules, 2000.

**Regulations:**

- Review of IEE / EIA Regulations, 2000.
- National Environmental Quality Standards (Certification of Environmental Laboratories) Regulations, 2000.

2.6.3. Balochistan Environmental Protection Act, 2012

146. After the 18th Constitutional amendments the subject of environment vide Notification No.4-9/2011-Min dated 29th June, 2011 stand devolved to the provinces with effect from 1st July, 2011. Even after the deletion of the subject of environment from the concurrent list, the Pakistan Environmental Protection Act 1997 remained intact as per Article 270-AA, Sub Article (6). However, there is provision that the province, through an appropriate legislature / competent authority, may alter, repeal and amend the laws related to the subject.

147. To regulate and effectively address the peculiar environmental issues of the province of Balochistan this act namely “Balochistan Environmental Protection Act 2012” is submitted as per provisions of the Article 270-AA, Sub-Article (6) of 18th Constitutional amendments.

148. In terms of requirements of EIA / IEE, the provincial Act contains, in its section 15, similar provisions as given in the PEPA section 12. The PEPA has entrusted the authority of review and to approve environmental assessments to the provincial EPA. The proposed project falls under the jurisdiction of the Balochistan Environmental Protection Agency (BEPA). This EIA report will need to be submitted to EPA (B) for grant of environmental NOC.

149. An interesting provision of the provincial Act, which is relevant for the proposed project, is given in its section 20. Sub-section 2 of Section 20 states that “When preparing water resource management plans, Departments and other relevant institutions shall at least take the following into account:

- provisions for integrated watershed management;
- regulation of sustainable abstraction of groundwater;
- regulation of the use of ground or surface water for agricultural, industrial, mining, and urban purposes;
- measures to protect human health and ecosystems;
- measures to protect wetlands and their associated ecosystems;
- any other provision necessary for the sustainable use and management of water resources.

2.6.4. Pakistan EPA Review of IEE and EIA Regulations, 2000

150. Two types of environmental assessments can be carried out i.e. IEE and EIA. EIAs are carried out for the projects that have a potentially significant environmental impact, and IEEs are conducted for relatively smaller projects with some relatively lesser significant impacts.

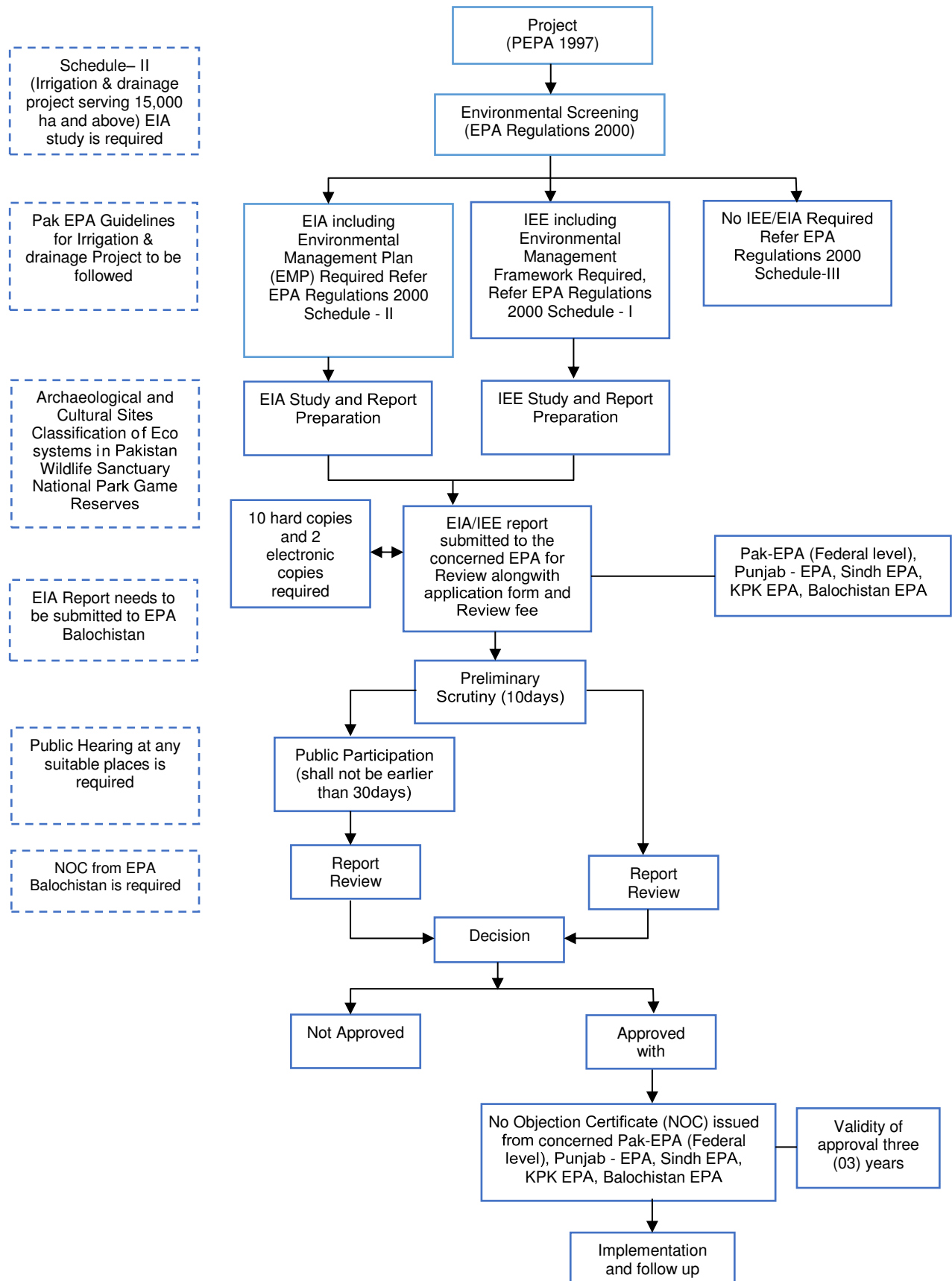
151. The Review of IEE and EIA Regulations 2000, prepared by Pak-EPA under the powers conferred upon it by PEPA-97, categorizes projects for IEE and EIA, respectively⁹. The proposed interventions under Sri-Toi Water Storage Dam and Irrigation Project are likely to fall under the Category B as defined in Schedule – I of Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000, attached as **Annexure 7**. According to these guidelines, the proposed project would require an EIA to be conducted.

152. According to the details provided in the regulations regarding preparation, submission, and review of IEE's and EIA's, following is a brief description of the approval process.

- a. A project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations i.e. Schedule I and II attached as (Annexure – 7) at the end of this report.
- b. An EIA or IEE is conducted as required and following the Pak-EPA guidelines.
- c. The EIA or IEE is submitted to the concerned EPA: provincial EPAs if the project is located in the provinces or Pak-EPA if it is located in the Federal administered area.
- d. A non-refundable review fee, depending on the cost of the project and the type of the report, is submitted along with the document as per the rates shown in Schedule III.
- e. The submittal is also accompanied by an application in the format prescribed in Schedule IV of the regulations.
- f. The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, (i) confirming completeness, or (ii) asking for additional information, if needed, or (iii) returning the report requiring additional studies, if necessary.

⁹ "PEPA Review of IEE and EIA Regulations, 2000", pg-2

- g. The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, for the issue of confirmation of completeness.
- h. When the EPA accord their approval subject to certain conditions:
 - i. Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions.
 - j. Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- k. An environmental management plan (EMP) is to be submitted with a request for obtaining confirmation of compliance.
- l. The EPA is required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- m. The EIA approval is valid for three years from the date of accord. The proponents are required to complete the construction and installation within this time period and start operations. In case of any delays, the proponents are required to obtain extension from EPA.

Figure 2: Procedure for Submitting the EIA Report**Note:**

1. EPA = Environmental Protection

2.6.5. Forest Act 1927

153. The Forest Act, 1927 was largely based on previous Indian Forest Acts implemented under the British. The first and most famous was the Indian Forest Act of 1878. Both the 1878 act and the 1927 one sought to consolidate and reserve the areas having forest cover, or significant wildlife, to regulate movement and transit of forest produce, and duty leviable on timber and other forest produce. It also defines the procedure to be followed for declaring an area to be a Reserved Forest, a Protected Forest or a Village Forest.

154. This Act is not relevant as the project does not lie in any of the notified forest land of Balochistan.

2.6.6. The Antiquities Act, 1975

155. This act basically defines how to repeal and re-enact the law relating to the preservation and protection of antiquities. The Federal Government may, by notification in the official Gazette, declare any antiquity to be a protected antiquity for the purposes of this Act. No person shall put any neon signs or other kinds of advertisement, including bill posting, commercial signs, poles or pylons, electricity or telephone cables and television aerials, on or near any protected immovable antiquity. No person shall, for any commercial purpose, make a cinematograph film of any protected antiquity or any part thereof except under, and in accordance with, a license granted by the Director. A contravention of any provision of this Act or the rules shall, where no punishment has been specification provided, be punishable with rigorous imprisonment for a term which may extend to six months, or with fine which may extend to five thousand rupees, or with both.

2.6.7. Pakistan Penal Code 1860

156. The Pakistan Penal Code usually called PPC is a penal code for all offences charged in Pakistan. It was originally prepared on the behalf of the Government of British India. After the partition of India in 1947, Pakistan inherited the same code and subsequently after several amendments by different governments, it is now a mixture of Islamic and English Law. Presently, the Pakistan Penal Code is still in effect and can be amended by the Senate of Pakistan.

2.6.8. The Balochistan Wildlife Protection (Amendment) Ordinance, 2001

157. The Wildlife Protection Ordinance empowers the government to declare certain areas reserved for the protection of wildlife and control activities within these areas. It also provides protection to endangered species of wildlife. As no activities are planned in notified protected areas, no provision of this law is applicable to the proposed project.

2.6.9. Balochistan Goats (Restriction) Ordinance 1959

158. This law may come into play, if any of the proposed intervention falls in any informal grazing pasture, as livestock rearing is an important occupation in the project area. The ordinance empowers the Government to restrict movement and / or grazing etc. of livestock in certain areas.

2.6.10. Balochistan Ground Water Rights Administration Ordinance 1978

159. This law was promulgated to ensure efficient and site-specific management of scarce water resources in Balochistan. The background to the law suggests admission that hydrological conditions in the entire Balochistan vary a great deal from place to place. Hence this Ordinance requires establishment of a Provincial Water Board and District Level Water Committees. The Provincial Water Board shall have representation from the Planning & Development Department, Revenue Department, and Irrigation Department etc., thereby clearly identifying major stakeholders. The Ordinance also calls for registration of all water sources, and establishes protocols for grant of permits by water committees for use of such sources. The statement of objectives for the Ordinance stipulates that the Provincial Water Board shall identify areas with ground water resources and declare them as Designated Ground Water Basins. It also calls for establishment of suitable laws for all designated ground water basins.

2.6.11. The Canal and Drainage Act, 1873

160. This is an act to regulate Irrigation, navigation and drainage. The Provincial Government is entitled to use and control for public purposes the water of all rivers and streams flowing in natural channels, and of all lakes, sub-soil water and other natural collections of still water.

2.6.12. Explosive Substance (Amendment) Act 2016

161. This act replaces Explosive Substance Act 1908 and regulates the use of explosive substances in the province of Balochistan.

2.7. Institutional Setup for Environmental Management

162. The structural setup of agencies/departments in the environmental sector is such that the Provincial Ministry of Environment governs and regulates environment-related work at the government level. The BEPA works directly under the control of ministry.

2.7.1. Provincial Environmental Protection Council (Provincial EPC) and the Balochistan Environmental Protection Agency (BEPA)

163. After devolution of the subject environment to provincial level under 18th amendment, these two organizations are primarily responsible for administering the provisions of the Balochistan Environmental Protection Act 2012. The EPC oversees the functioning of the BEPA. Its members include the representatives of the government, industry, non-governmental organizations and the private sector. The EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to, as well as initiate legislation whenever necessary. It is thus the primary implementing agency in the hierarchy. One of the functions of the provincial EPA is the review and approval of environmental assessment reports.

2.8. Asian Development Bank Safeguard Policies

2.8.1. ADB Requirements for Preparation of Environmental Assessments of Projects

164. Asian Development Bank in its Safeguard Policy Statement (June 2009) affirms that “environmental and social sustainability is a cornerstone of economic growth and poverty reduction in Asia and the Pacific” (p 14). Furthermore, the document underlines the ADB’s Strategy 2020, promoting the “sustainability of project outcomes by protecting the environment and people from project’s potential adverse impacts”.

165. The Environmental Impact Assessment study in hand is fully committed to the requirements determined in the “ADB Safeguard Policy Statement”. The environmental works carried out by NEC on behalf of project proponents have been essentially guided by these rules as enunciated in the “Outline of an Environmental Impact Assessment Report”.

166. In the light of significance attached by ADB to various environmental impacts, Project is Category A, wherein an Environmental Impact Assessment is required.

167. Main reasons behind assigning category A is due to the size of Sri Toi Dam and its associated irrigation canals which would require a significant quantity of material movement to and from the project site. Furthermore, as per Review of Initial Environmental Examination and Environmental Impact Assessment Regulations, 2000 the project requires an **EIA**.

3 DESCRIPTION OF PROJECT

3.1 Introduction

168. This chapter provides details of Sri Toi Water Storage Dam and Irrigation Project including location and footprints, salient features and land requirements, project components, construction and operation stage interventions and project implementation schedule & cost.

169. Sri Toi Water Storage Dam and Irrigation Project is an Asian Development Bank funded project, aimed to improve the agricultural productivity of rain fed agriculture area on the tributary of Zhob River.

170. The Sri Toi water storage dam site is located in the Union Council of Mir Ali Khel, tehsil and district Zhob, about 62 km north-east of Zhob on Sri Toi river, the main tributary of Zhob river near Kili Gul Khan. The latitude and longitude of the sub-project are 31° 35' 52" North, 69° 15' 58" East and the mean altitude of the command area is 1350 m above mean sea level. The location of the proposed dam, shown on the Location Map.

3.2 Objective of the Project

171. The main objective of this project is supply of irrigation water to the project area. Most of the area can be considered as poor, subsistence farming is the economic mainstay, so the project will have a major impact on the welfare of local people. Agriculture and livestock are main sources of income of local people. The community of the sub-project area is composed mainly of Mando-Khel tribe of Pashtoons. However, the sub-project will have a, significant impact on a relatively remote community with a very low level of income. There are significant markets within reach and the area has potential for wheat and vegetables which are able to offer good rates in the market.

3.3 Location and Footprint

3.3.1 Location

172. The Sri Toi water storage dam site is located in the Union Council of Mir Ali Khel, tehsil and district Zhob, about 62 km north-east of Zhob on Sri Toi river, the main tributary of Zhob river near Kili Gul Khan. The latitude and longitude of the sub-project are 31° 35' 52" North, 69° 15' 58" East and the mean altitude of the command area is 1350 m above mean sea level. The location of the proposed dam and other interventions is shown as **Figure 3**.

173. Access from Zhob to the dam site is via Zhob-Wana road. Initially in the direction of north-east for a distance of 42 Km then turning to Samabza road in south-east direction up to Kili Hazrat Sahab by a link metaled road by travelling 10-kms, followed by katcha

shingle/gravel track for a distance of another 10 Km up to the dam site. The journey takes about 2.25 hours from Zhob town.

3.3.2 Footprint

174. The canal traverses a plain comprising flat and mountainous terrain. Layout Plan of Proposed Dam and other Proposed Intervention are shown in **Figure 4 and Figure 5** respectively.

Figure 1: Location of Proposed Dam and Other Interventions

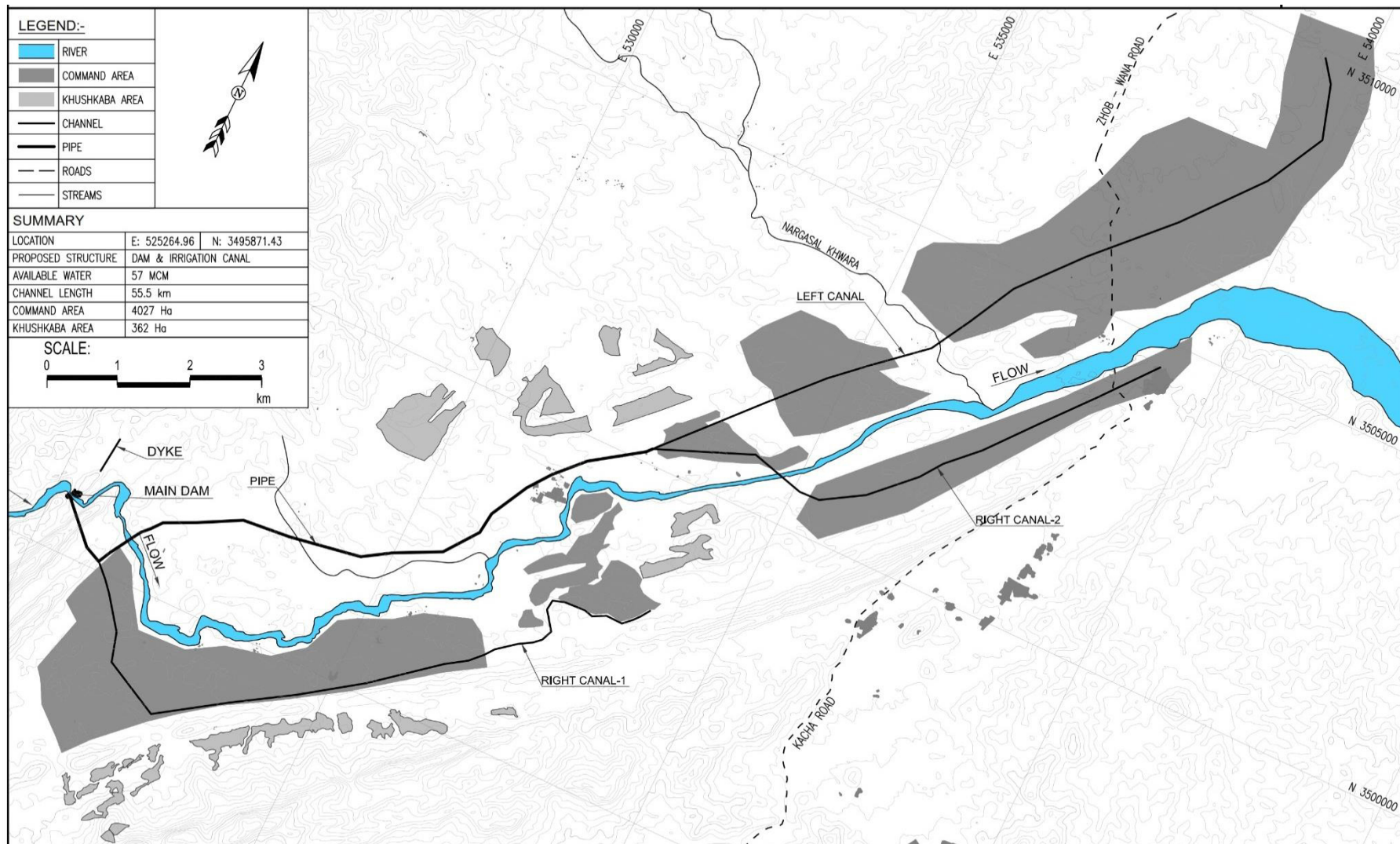


Figure 2: Layout Plan Model of Proposed Dam

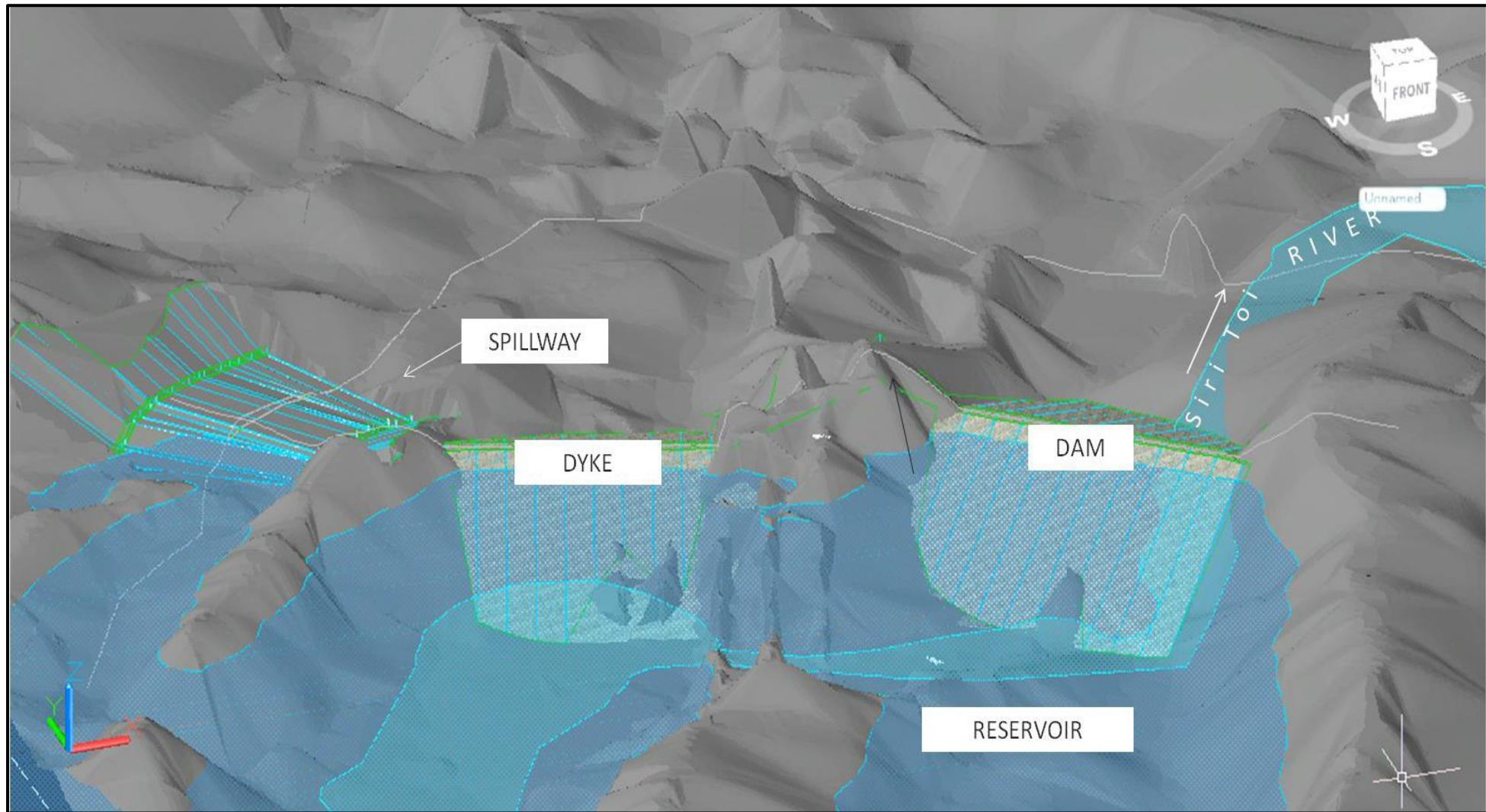
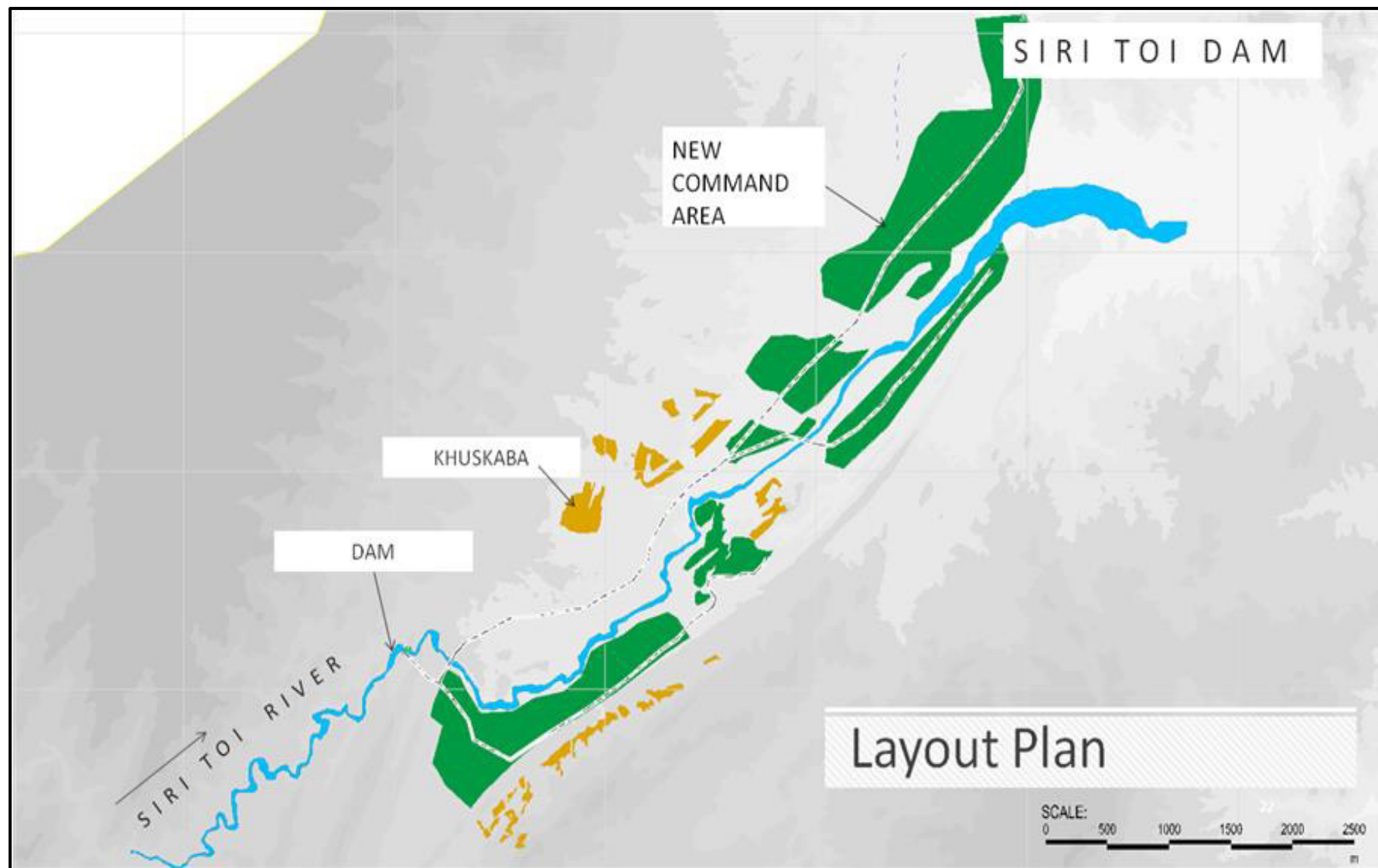


Figure 3: Layout Plan of Proposed Project Interventions



3.4 Salient Features and Land Requirements of the Project

3.4.1 Salient Features

175. Salient features of Sri Toi Water Storage Dam and Irrigation Project are shown in below Table 8.

Table 1: Salient Features of Proposed Project

Type of structure <i>[may change after Geotechnical investigation]</i>	Central Clay Core Earthfill Dam
Location	N 3496638.09, E 525794.05.96 Zone 42R
Dam Height (m)	66
Storage Capacity (MCM)	36.5
Catchment Area (sq.km)	961
Spillway Crest Length (m)	135
Spillway Type	Ogee ungated overflow
Spillway Design Flood	PMF/10,000 years return period
Dyke/Saddle (No.)	1
Main canal (km)	43.88
Right canal (km)	24.16
Left canal (km)	19.17
Intake Structure	Mu
Steel outlet Pipe (m)	1650
Khushkaba Area (Ha)	361
Design Command Area (Ha)	4,027
Watershed Development Area (Ha)	3750
Computed Average Annual Available Water (MCM)	57

3.4.2 Land Acquisition

176. The project involves permanent acquisition of land which belonged to the Arabzai tribe in common. During field visit, some stakeholders had demanded proper distribution of land before the commencement of project. This matter was duly discussed with Chief Engineer, Balochistan Irrigation department.

177. Chief Engineer, Balochistan Irrigation department moved Commissioner Zhob who in turn delegated the responsibility to Deputy Commissioner Zhob to investigate and resolve this matter. DC Zhob amicably resolve the issue the “Letter of Resolution of Land Acquisition Issue” is attached as **Annexure 8**.

3.5 Components of the Project

178. The following works are proposed under Sri Toi multi-purpose water storage dam sub-project:

- In the earth fill dam with clay core and 66 m in height on Sri Toi river.
- A spillway in a length of 135 m from the left abutment of the dam.
- A total length of 1,650 m steel pipeline from intake structure of the dam up to start of the command area followed by irrigation main canal, left, right canals of a total length of 87.2 km for the design command area
- Necessary cross drainage works including aqueducts, super-passages, RCC-pipe crossings, and other minor hydraulic structures

179. The salient features of the Sri Toi water storage dam are presented in **Table 8** above. Typical section of the proposed project components is given as **Annexure 9**.

180. **Selection of dam axis:** The dam axis has been selected after reviewing the general topography of the area through site visits and analysis of satellite based imagery and terrain. The selected dam axis has sound rock on both abutments and the foundation geology has to be confirmed through boreholes along the axis to verify the selection.

181. **Reservoir characteristics:** The reservoir Area-Elevation-Capacity curve has been developed. Terrain of the area is very steep and narrow and the storage volume at lower elevation is quite insignificant. This necessitates the design of a dam with a height of 66 m in order to store 36.5 MCM, required to fulfil the needs of the design command area. The river downstream of the dam location opens to vast flat lands about 1.5 kms downstream of the proposed dam, where sporadic human settlements exist.

182. **Spillway design discharge:** The spillway design flood will be estimated for Probable Maximum Flood (PMF or 10,000 year) for Sri Toi river. Flood discharges for 10, 25 and 50 years return period will be computed for diversion arrangements during construction.

183. **Spillway location:** The proposed spillway is located towards the left abutment. The spillway width will be about 130-150 m, at which it will carry out at least 10,000 years design flood with 3-4 m head. The spillway will have a USBR Type-II/Type-III stilling basin which will be adequately sized to dissipate the erosive energy. An earthen channel from the stilling basin will convey the flood water back to the river and away from the dam.

3.5.1 Command Area

184. It is expected that construction of the proposed dam will cover the command area up to 4,027 ha, beside of sustained water supply to the present command area being cultivated

on seasonal basis by growing vegetables and grains. The proposed reservoir would recharge the subsurface flow of karezes, shallow wells and tubewells, protect the agriculture land and human settlements from devastation of floods during flood seasons and develop grazing zones for livestock. The stored water will support drinking, agriculture purpose and other domestic uses.

185. The initial cost estimates for the sub-project are presented in **Table 9**.

Table 2: Initial cost estimate for Sri Toi Water Storage Dam Irrigation Sub-project

#	Title	Amount (Million PKR)
1	Main dam	1,086
2	Dyke	513
3	Spillway	1,173
4	Intake structure and outlet works	602
5	Main canal	890
6	Offtake structure (31 no.)	8
7	Fall structure (98 no.)	21
8	Aqueduct (9 no.)	275
9	Siphon (3 no.)	88
10	Drainage culvert (5 no.)	3
11	Road culvert (2 no.)	24
12	Washing structure (5 no.)	1.75
13	Cattle drinking trough (5 no.)	0.250
14	Drinking water supply system	9
15	Parapet wall	63
16	Command area development	417
17	Watershed management works	271
Total		5,445

3.6 Access to Site

186. Access from Zhob to the dam site is via Zhob-Wana road. initially in the direction of north-east for a distance of 42 km then turning to Samabza road in south-east direction up to Kili Hazrat Sahab by a link metaled road by travelling 10-kms, followed by katcha shingle/gravel track for a distance of another 16 km up to the dam site. The journey takes about 2.25 hours from Zhob town. **Figure 6** shows the access road to project site.