No. BBMB/DRIP-II/BSL/04/2020

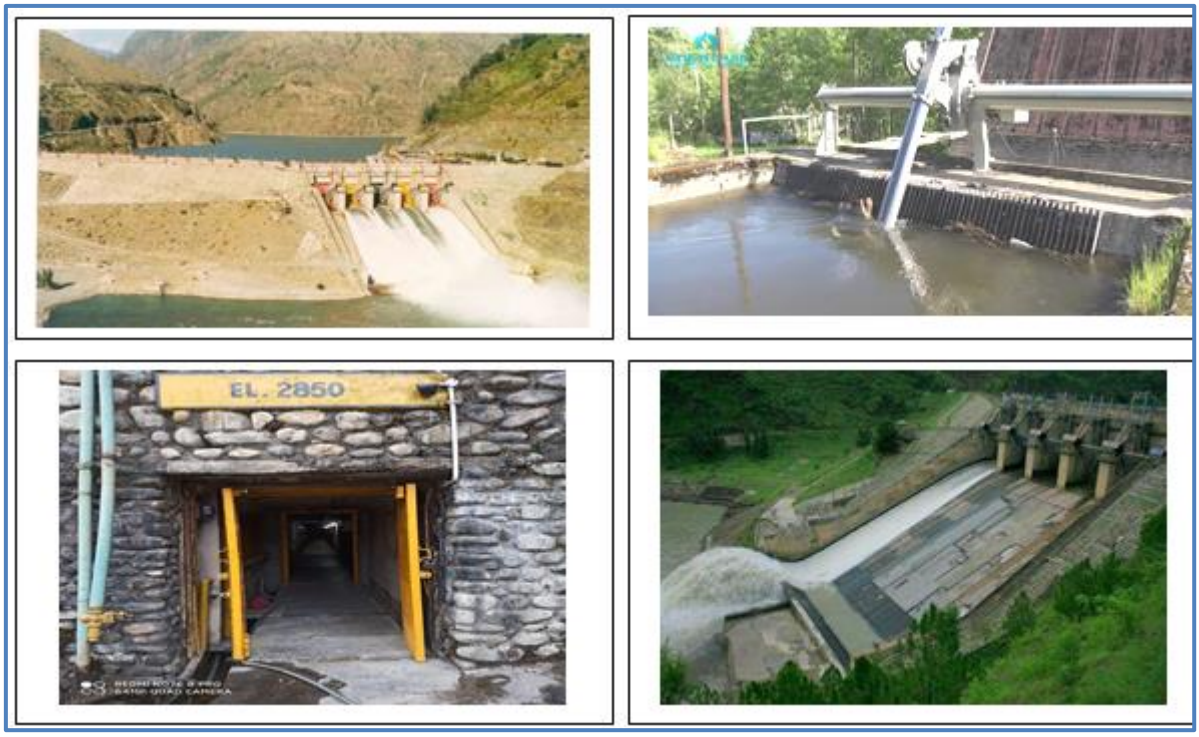
GOVERNMENT OF INDIA

BHAKRA BEAS MANAGENEMT BOARD

DAM REHABILITATION AND IMPROVEMENT PROJECT
PHASE- II & PHASE - III

PANDOH DAM

PROJECT SCREENING TEMPLATE



FEBRUARY/2020

OFFICE OF CHIEF ENGINEER
BEAS SUTLEJ LINK PROJECT
Sundernagar-175019
Tel: 01907-262333, **e-mail**: cebsl@bbmb.nic.in

Table of Contents

FORM-I: PROJECT DETAILS

1. Project Description:

a. Project Identification Code (PIC): **HP27HH0003**

(As given in National Register of Large Dams, if applicable)

b. Project Name: **Beas Sutlej Link**

c. River Basin **Indus**

d. Sub River Basin: **Beas**

e. River/Stream: **Beas**

2. Project Location:

a. State: **Himachal Pradesh**

b. District: **Mandi**

c. Earthquake Zone: **V**

d. Survey of India Topo Sheet No. Not Available

e. Nearest City: **Mandi**

f. Nearest Airport: **Bhuntar**

g. Nearest Railhead: **Kiratpur**

h. Name of Immediate u/s Project: **Larji Hydroelectric project**

i. Name of Immediate d/s Project: **BEAS DAM PROJECT**

j. Latitude/Longitude (in degrees, minutes, seconds):

Lat:	31°	35’	20”	N
Long:	77°	04’	10”	E

3. Project Benefits:

a. Type of Project: **Multipurpose River Project**

b. Irrigation Benefits, in hectares (ha):

(i) Gross Command Area (GCA): **NA**

(ii) Cultivable Command Area (CCA): **0.5261 x10^6**

(iii) Annual Irrigation Potential (AIP): **0.3263 x10^6**

c. Hydropower Benefits:

(i) Installed Capacity (MW): **990** (ii) Firm Power (MW): **412**

(iii) Average Annual Energy Generation (MU): **3350**

d. Domestic/Municipal/Industrial Water Supply:

(i) Annual Water Supply (MCM): **Benefits shared by Partner States**

(ii) Nos. of Population Benefitted (In Lakh): **Benefits shared by Partner States**

e. Flood Protection: **Benefits shared by Partner States**

(i) Flood Protected Area (ha): **NA**

(ii) Details of Area Benefitted (ha): **NA**

f. Details of Tourism/Recreational Facilities: **NA**

4. Project Ownership Details:

a. Dam Owning Agency: **Bhakra Beas Management Board**

b. Implementing Agency: **BBMB**

c. Details of Dam Incharge:

(i) Name: **Er. NITEESH JAIN**

(ii) Designation: **CHIEF ENGINEER**

(iii) Phone No. (With STD Code): **01905-282053**

(iv) Fax No. **01905-282026**

(v) E-mail: **cebsl@bbmb.nic.in**

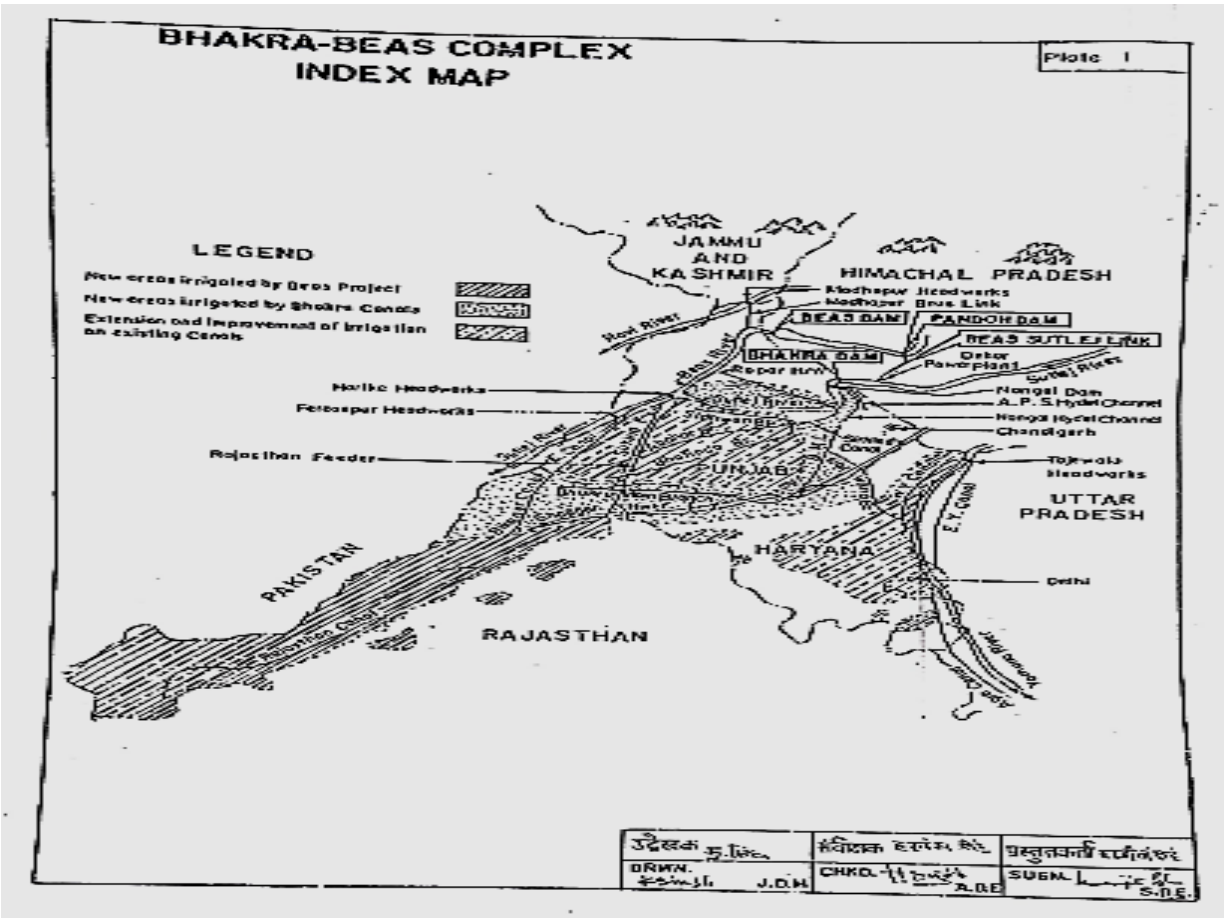
(vi) Contact Address: **CHIEF ENGINEER, BSL PROJECT, BBMB, SUNDERNAGAR HP**

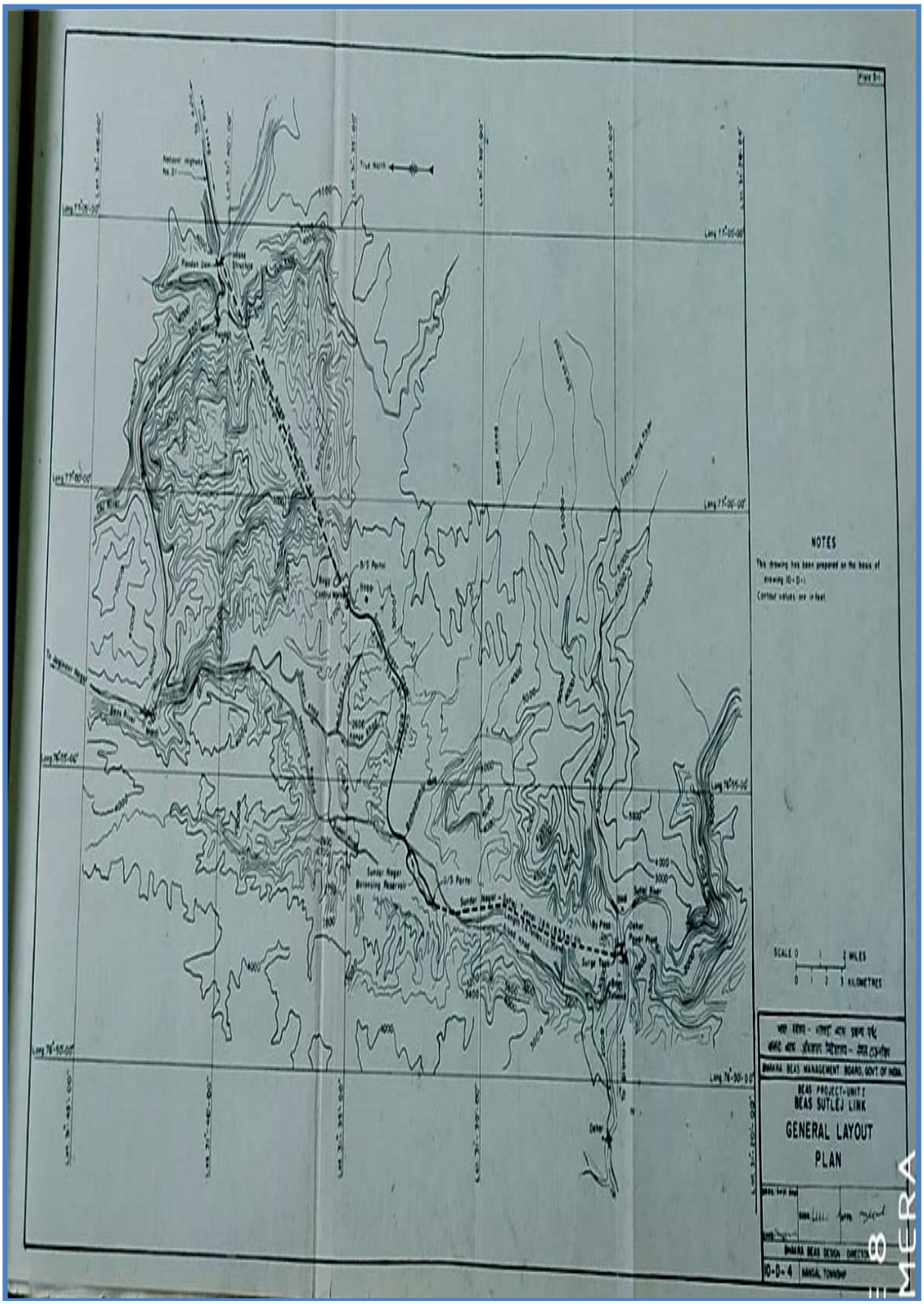
Appendix-I A

LOCATION /INDEX MAP OF PROJECT

Brief description of important features shown in map

Pandoh Dam is an earth cum rock fill dam on the river Beas located at Mandi-Kullu road (NH-21) near district Mandi of Himachal Pradesh.Length of River Beas up to Pandoh is 116 Km from its origin at Rohtang. With the construction of Pandoh dam a small reservoir was created which has a Gross Storage Capacity of 33240 Acre Feet. Pandoh Dam was commissioned in the year 1977. It diverts the water of the river Beas through a 38 km long system of tunnels and channel. The main objective of Pandoh dam is to feed the Pandoh Baggi Tunnel having capacity of 256 cumecs (9000 cusecs) of water for power generation at Dehar Power House (installed capacity of 990 MW) before being discharged into the Sutlej River and spill out the excess water after maintaining the required reservoir level in monsoon season.





GENERAL LAYOUT PLAN

Appendix-I B

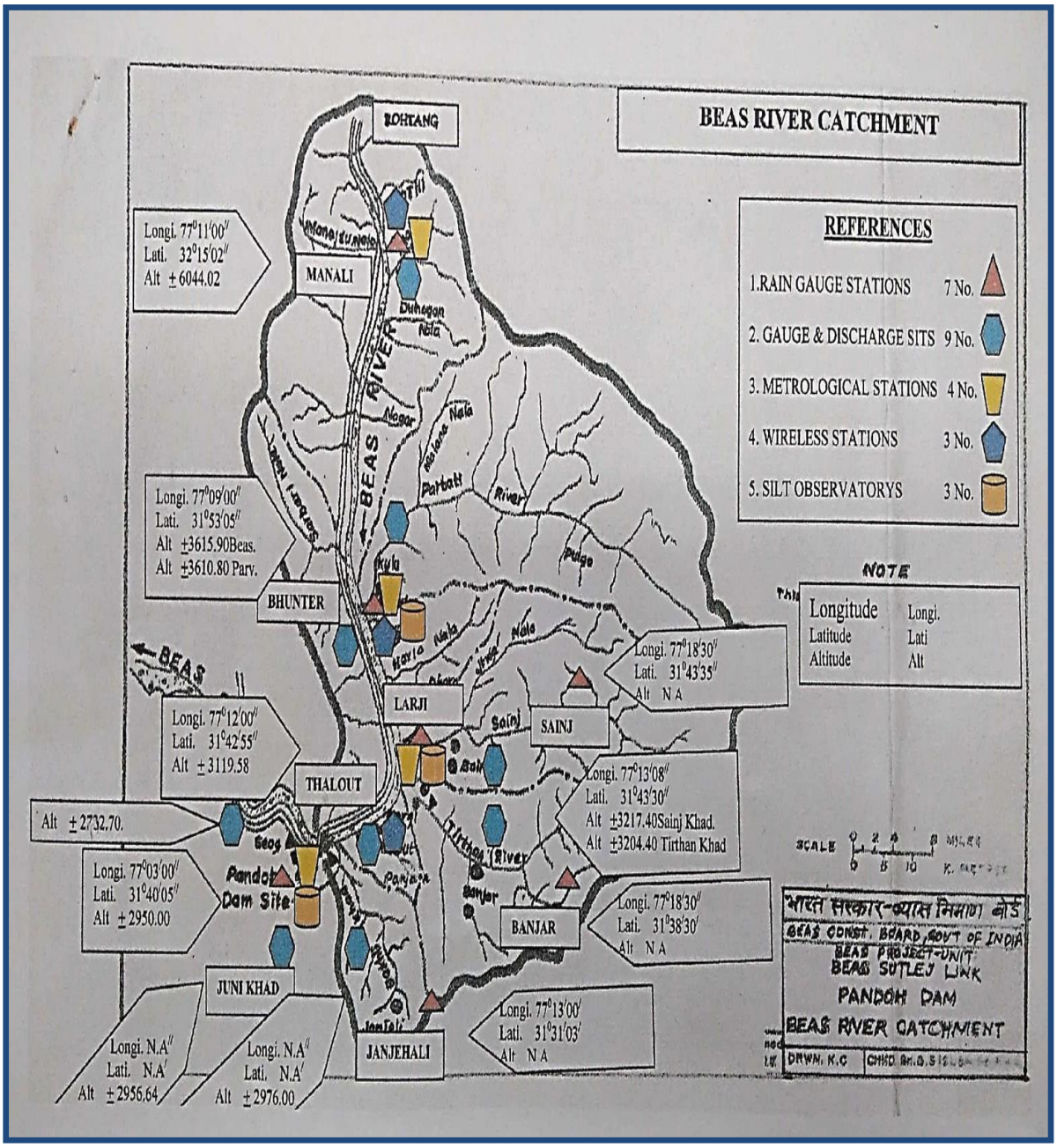
GOOGLE MAP OF DAM ATTACHED

GOOGLE MAP OF PANDOH DAM

Appendix-I C

CATCHMENT AREA MAP OF PROJECT

The Immediate upstream Project is Largi Hydro-Electric Project. G&D sites at Bakhli, Largi, Sainj, Bhunter (Beas and Parvati) are existing. Dam is constructed on Beas River and Sarbari nalla, Parvati, Sainj,Tirthan Bakhli etc are its Major tributaries. Kullu and Manali are important places. Weather Station is installed at Pandoh Dam under HP-II.



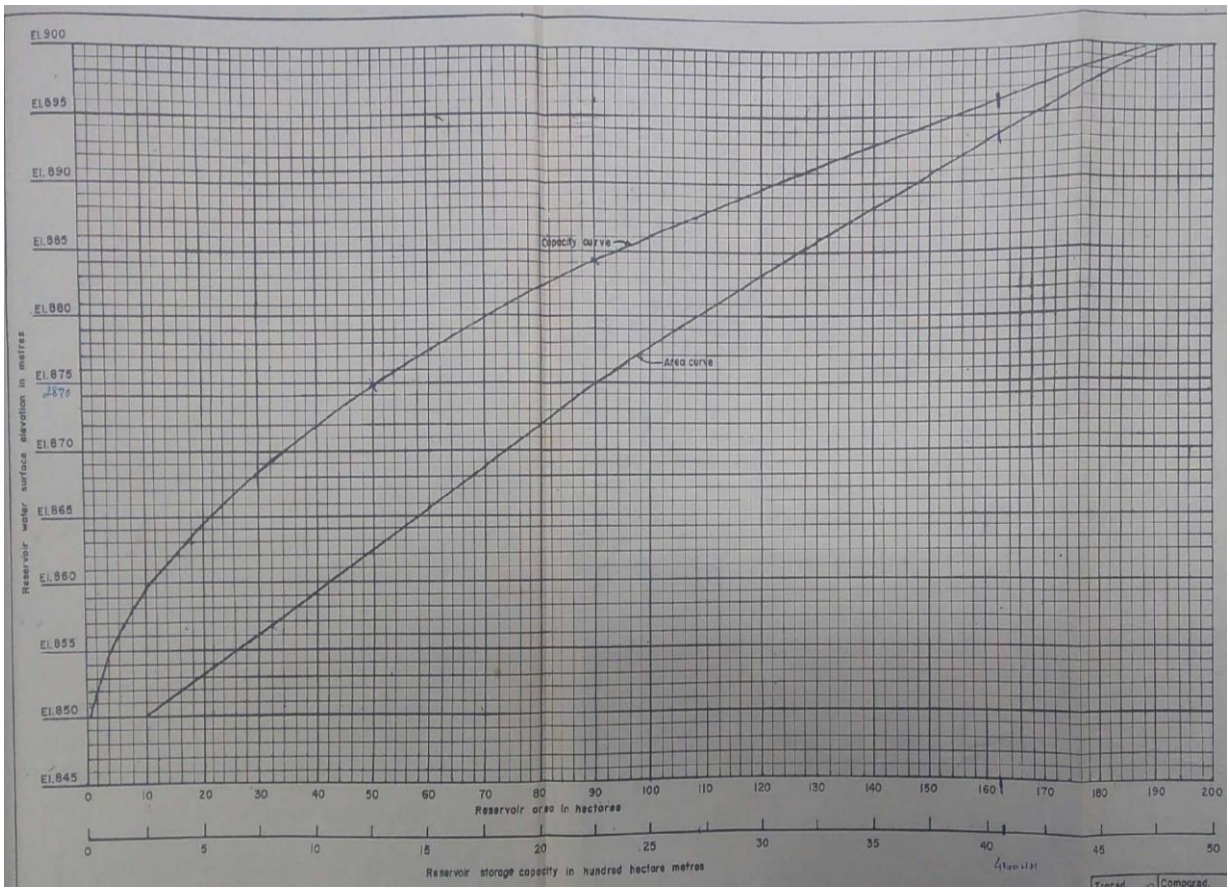
CATCHMENT AREA MAP OF PANDOH DAM

Appendix-I D

ELEVATION -AREA-CAPACITY CURVE

(ORIGINAL)

Elevation (m)	Water Spread Area (x1000 sq m)	Cumulative Capacity (In Million Cubic Meter)
883.31	1245	21.64
883.92	1257	22.37
891.54	1335	32.89
893.06	1402	35.30
894.59	1553	37.73
896.42	1683	40.93



ELEVATION- AREA- CAPACITY CURVE

Appendix-I E

RESERVOIR SUBMERGENCE MAP OF PROJECT

(SHOWING FRL & MWL CONTOURS FOR FREEBOARD STUDY)

Brief description may be given highlighting important issues in the reservoir rim area, as well as highlighting if any restriction exists as on date in filling the reservoir up to FRL/MWL Levels due to R&R issues or any modification of operating rule curves of reservoir due to any limitation of limited spillway design outflow, etc.

Attach the Reservoir Submergence Map showing FRL, MWL, Dam Top Elevation Contours clearly.

NOT AVAILABLE

FORM-II: DAM SPECIFIC DETAILS

1. Dam Features:

I. Main Dam

a. Type: **Earth - Cum - Rock Fill**

b.. Total length of the Main dam (m): **255**

c.. Length of Embankment dam (m): **255**

d. Length of Masonry/Concrete dam (m): **NA**

e. Top width of Embankment Dam (m): **12.19**

f. Top width of Masonry/Concrete Dam (m): **NA**

g. Elevation of top of Embankment Dam (m): **899.16**

h. Elevation of top of Masonry/Concrete Dam (m): NA

i. Elevation of top of Upstream Solid Parapet Wall (m): **899.40**

j. Height of Embankment Dam above Lowest River Bed Level (m): **60.97**

k. Height of Masonry/Concrete Dam above deepest foundation level (m): **NA**

l. Lowest River Bed Elevation (m): **838.41**

m. Deepest Foundation Elevation (m): **823.17**

II. Saddle Dam : NOT APPLICABLE

a. Type:

b. Length of the Saddle dam (m):

c. Top width of Saddle Dam (m):

d. Elevation of top of Saddle Dam (m):

e. Elevation of top of Upstream Solid Parapet Wall (m):

f. Height of Saddle Dam above Lowest Bed Level in case of embankment dam or above deepest foundation level in case of concrete / masonry dam (r

III Main Spillway:

(a) Type of Spillway: **Orifice shoot**

(b) Length of Spillway (m): **110.37**

(c) Location of Spillway: **Left flank**

(Central Spillway/Left Flank/Right Flank/Saddle, in addition Chainage may also be mentioned)

(d) Spillway Crest Level (m): **875**

(e) Number of Bays: **5**

(f) Number and thickness of Piers (m): **4, 3.5**

(g) Total Discharging Capacity at MWL (m^3/s): **9939**

(h) Design head used for working out spillway crest profile (m): **21.65**

(i) Type of Energy Dissipation Arrangement: **Flip Bucket**

(j) Type of Spillway Gate: **Radial**

(k) Size of Spillway Gate: Width (m) **12** Height (m) **13**

(l) Type of Hoist for Spillway Gates: **Hydraulic**
(Rope Drum/ Hydraulic)

(m) Hoist Capacity of Spillway Gates (MT): **100**

(n): Hoist Operation: **Electric**

(Manual / Electrical / Remote Control)

(o) Number of Sets of Stop-logs: **1**

(p) Number of Stop Log Units per Set & Size:

9 No's, 3 No of size (12.61m*1.31m*1.80m)
3 No of size (12.61m*1.31m*2.50m)
3 No of size (12.61m*1.31m*3.0m)

(q) Number of Gantry Crane(s) for Stop Log Gates: **Nil**

(r) Gantry Crane Capacity (MT): **N.A**

IV Auxiliary Spillway: NOT APPLICABLE

(a) Type of Spillway:

(b) Length of Spillway (m):

(c) Location of Spillway:

(Central Spillway/Left Flank/Right Flank/Saddle, in addition Chainage)

(d) Spillway Crest Level (m)

(e) Number of Bays:

(f) Number and Thickness of Piers: ----, --- m

(g) Total Discharging Capacity at MWL (m^3/s):

(h) Design head used for working out spillway crest profile (m):

(i) Type of Energy Dissipation Arrangement:

(j) Type of Spillway Gate:

(k) Size of Spillway Gate: Width (m) Height (m)

(l) Type of Hoist for Spillway Gates:

(m) Hoist Capacity of Spillway Gates (MT):

(n): Hoist Operation:
(Manual/Electrical/Remote Control)

(o) Number of sets of Stop-logs:

(p) Number of Stop Log Units per set & size:

(q) Number of Gantry Crane(s) for Stop Log Gates:

(r) Gantry Crane Capacity (MT):

V Fuse Plug:

(a) Location:

(b) Length (m):

(c) Crest Level (m):(d) Top Width (m):

(e) Discharging Capacity at MWL (m^3/s):

VI. Sluice Arrangement (In Concrete and Masonry Dams): NOT APPLICABLE

(a) No. of Sluices & Sill Level (m): _____ , _____

(b) Size of Sluice: Width (m): _____ Height (m): _____ Dia. (m): _____

(c) Discharging Capacity of Sluice at FRL (m^3/s):

(d) Type of Service Gate:

(e) Size of Service Gate: Width (m) Height (m)

(f) Type of Hoist for Service Gates:

(g) Hoist Capacity of Service Gates (M.T.):

(h): Hoist Operation:

(i) Type of Emergency Gate:

(j) Size of Emergency Gate: Width (m) Height (m)

(k) Type of Hoist for Emergency Gates:

(l) Hoist Capacity of Emergency Gates (M.T):

(m): Hoist Operation:

(Manual / Electrical)

VII. Outlet works (In Embankment, Concrete & Masonry Dams):

(a) Location:

(b) Number:

(c) Sill level (m)

(d) Size: Width (m) Height (m) Dia (m)

(e) Discharging Capacity (m^3/s

(f) Type of Service Gate:

(g) Size of Service Gate: Width (m) Height (m)

(h) Type of Hoist for Service Gates :

(i) Hoist Capacity of Service Gates (M.T):

(j) Hoist Operation:(Manual/Electrical/Both)

(k) Type of Emergency Gate:

(l) Size of Emergency Gate: Width (m) Height (m)

(m) Type of Hoist for Emergency Gates :

(n) Hoist Capacity of Emergency Gates (M.T):

(o) Hoist Operation:

(Manual / Electrical)

2. Reservoir Features:

a. Catchment Area at Dam site (km^2): **5278**

b. Maximum Water Level (m **896.64**

c. Full Reservoir Level (m): **896.64**

d. Minimum Draw down Level (m): **890.24** e. Dead Storage Level (m): **884.14**

f. Live Storage Capacity (Mm^3): **18.55**

g. Gross Storage Capacity (Mm^3) at FRL: **41**

h. Reservoir Spread Area (km^2) at FRL: **1.75**

3. Construction Aspects:

a. Date of Starting the Construction (DD/MM/YYYY): **01/01/1965**

b. Date of Completion (DD/MM/YYYY): **07/07/1977**

c. Designing Agency: **Beas Construction Board**

d. Construction Agency: **Beas Construction Board**

e. Construction Cost (Rupees in Lakh): **4543**

4. Operational Aspects:

a. Date of first full impoundment (MM/YYYY): **04/1977**

b. Whether Pre & Post monsoon inspection being carried out: **Yes**

c. Major recommendations of dam safety inspection, along with brief status on compliance:

Refer Chapter 5 and Para 5.2 & 5.3 Of DSRP Inspection Report Of Pandoh Dam

d. Any operational failure in the past: **No**

e. Any other past dam incident: **No**

f. Operation and Maintenance Manual: **Yes**

Year of publication: **09/1980**

g. Emergency Action Plan: **Yes**

Year of Publication: **06/2014**

5. Instrumentation Aspects: a. List of Instruments installed in the Dam:

Sr. No.	Name of Instrument	Working Status	Year of Installation	Nos of Year data available
1.	Water Level Sensor	**Not Installed**	-	-
2.	Plumb Bob	**Not Installed**	-	-
3.	Inclinometer	No	-	-
4.	Stress meters	**Not Installed**	-	-
5.	Strain meters	**Not Installed**	-	-
6.	Toe Drain	**Not Installed**	-	-
7.	Drain Wells	**Not Installed**	-	-
8.	V-Notches	**Not Installed**	-	-
9.	Pressure Gauges	**Not Installed**	-	-

Sr. No.	Name of Instrument	Working Status	Year of Installation	Nos of Year data available
10.	Accelerograph	Not Working	05/04/1997	Data not available
11.	SCADA	**Not Installed**	-	-
12.	Surveillance	**Not Installed**	-	-
13.	Rain Gauge ORG	Yes	03/1980	39 years
14.	Rain Gauge SRRG	**Not Installed**	-	-
15.	Pan Evaporimeter	Yes	09/1999	19 years
16.	Wet and dry bulb Thermometer	Yes	07/1977	39 years
17.	Thermometers (air & reservoir water Temprature)	Yes	03/1980	39 years
18	Piezometer	Yes	07/1977	39 Years
19	Uplift Pressure Cell	Yes	07/1977	39 Years

d. Summary on adequacy and justification for additional instrumentation:

Refer Chapter 10 of DSRP Inspection Report
DSRP RECOMMENDATION

Most of the instrumentation in the dam was installed during its construction about 42 years ago. With the age, the instruments have become old and there is advancement in the observation technology. Also, the needs for monitoring have also changed and the emphasis is now on the deformation, seepage, uplift and other transient behavior of the dam. A large database has been created out of systematic observations from beginning and is very valuable. In view of improved technologies, it is necessary that the required modernization of the selected observation programme may be carried out along with establishment of a computerized database for the historical observations and covering the current and future observations.

6. List of Past Rehabilitation Works: NIL

a. Name of Scheme (If any): **NO**

b. Period of Scheme: From **NA** to **NA**

c. Detail of Important Rehabilitation Works Carried Out (including by state funds):

Sl. No.	Brief Item description	Year of Work	Completion Cost (Cr)

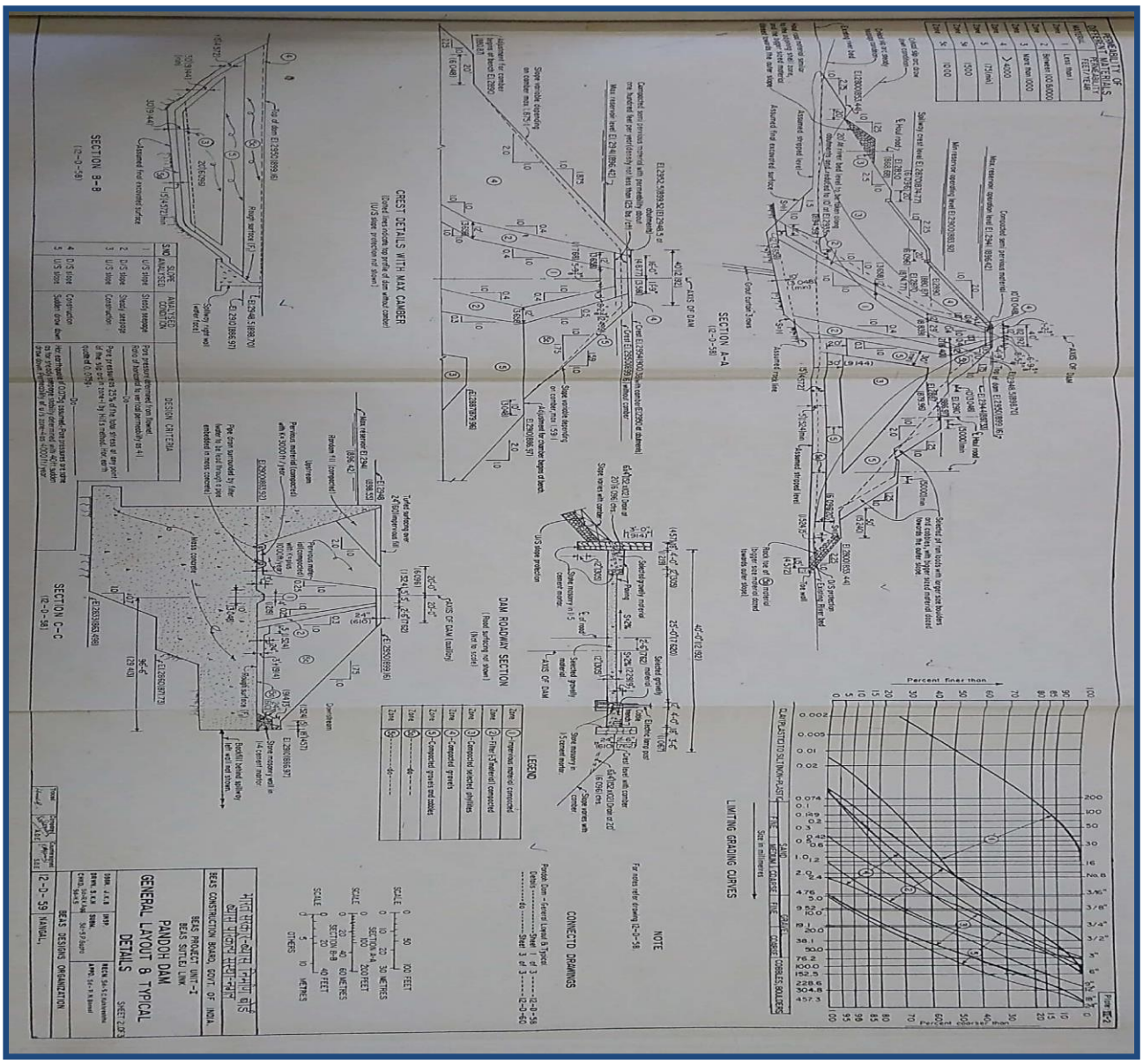
Appendix-II A

LAYOUT PLAN OF DAM

LAYOUT PLAN OF PANDOH DAM

Appendix-II C

TYPICAL CROSS SECTIONS OF THE DAM



CROSS SECTION OF PANDOH DAM

Appendix-II D

REPORT ON DAM INSTRUMENTATION

Enclosed: Yes

Please Refer Chapter 10 and Annexure 22 of DSRP Inspection Report for various instruments installed.

FORM-III: HEALTH STATUS OF DAMS

1. Design Flood Review (In case of PMF/SPF, as approved by CWC):

a. Original Inflow Design Peak Flood (m^3/s): **4927.78**

a.1. Original MWL (m): **896.64** a.2. Original Routed Outflow (m^3/s): **4475**

a.3. Maximum observed flood peak (m^3/s) and date: **4566.2** **04/09/1995**

b. Date of Latest Review (DD/MM/YYYY): **Under Consideration of CWC**

c. Revised Inflow Design Peak Flood (m^3/s): (PMF / SPF / 100 Year Flood) **Under Consideration with CWC**

c.1. Revised MWL (m): **Under Consideration of CWC**

c.2. Revised Routed Outflow (m^3/s): **Under Consideration of CWC**

Report of Design Flood Review is enclosed as Appendix III-A (along with copy of CWC approval, if applicable)

d. Flood Routing Conducted? **Yes**

e. Attach Free Board Calculations in Appendix-III C

f. Proposed measures to accommodate increase in design flood, attached in Appendix-III D **Design Flood Review is under Consideration**

g. If design flood review & flood routing is not yet done, tentative time frame for carrying out the same:

From: **DD/MM/YYYY** To: **DD/MM/YYYY**

2. Dam Safety Review Panel (DSRP) Review:

a. Date of Latest DSRP Inspection **19** / **12** / **2019**

b. Attach DSRP Report as in Appendix III E

c. Key Actionable Points for Rehabilitation:

3. Seismic Review:

a. Seismic Zone at the time of Design: **IV**

b. Revised Seismic Zone: **V**

c. Historical significant earthquake events in the near vicinity: NA If Yes,

Event 1: Date: Epicenter:

Magnitude:

Event 2: Date: Epicenter:

Magnitude:

d. Details of nearest project whose site specific seismic parameter study has been approved by National Committee on Seismic Design Parameter (NCSDP): **NA**

(i) Name of Project:

(ii) Date of Approval:

(iii) Approved Parameters:

(a). Peak Ground Acceleration (PGA)

(b). Maximum Credible Earthquake (MCE):

(c). Design Basis Earthquake (DBE):

(d). Seismic Design Coefficient (Horizontal):

e. Whether need for seismic design review: YES , If yes, attach in Appendix III-F

DSRP RECOMMENDATION

Examine Seismic safety of the dam with latest seismic parameter inputs. Seismic Analysis of the Dam as proposed at para 8.4 and para 17.6 of DSRP Inspection Report may be carried out.

4. Summary of Present Distress Condition:

Sr No.	Description	Earthen	Composite
1.	Leakage through dam body		**Nil**
2.	Excessive seepage through dam body		**No**
3.	Excessive seepage through foundation		**No**
4.	Leakage through contraction joints		**No**
5.	Excessive settlement of dam body?		**No**
6.	Clogging of Porous / Formed and foundation drains holes?		**No**
7.	Are Porous / Formed Drains Counter - sunk plug in place on top of dam?		**Yes**
8.	Are Water Seals in Place on Porous / Formed Drains in gallery?		**N.A**
9.	Undesirable vegetation?		**No**
10.	Deteriorated Concrete-Facing, Outlet, Spillway		**No**
11.	Erosion of surfaces, slides & signs of differential movement		**No**
12.	Are there any surface cracks?		**No**
13.	Adequate slope protection?		**Yes**
14.	Erosion of the upstream/downstream face?		**No**
15.	Animal Burrows?		**Nil**
16.	Any evidence of piping through dam body?		**No**
17.	Any evidence of piping through foundation		**No**
18.	Are there wet spots or areas on the downstream face, at the toe, or beyond the dam?		**No**
19.	Spillway glacis erosion?		**Nil**
20.	Can water flow into the principal spillway without difficulty, as intended when constructed?		**Yes**
21.	Is the primary spillway/waste weir structure in good condition?		**Yes**
22.	If there are drainage outlets, are they clear and flowing?		**Yes**
23.	Is the seepage water clear or muddy?		**N.A**
24.	Is there any unusual movement or cracking at or beyond the toe?		**No**
25.	Is there any evidence of instability on the slopes around the reservoir?		**No**
26.	Is a lot of sediment entering the reservoir, or has this happened in the		**Yes**

Sr No.	Description	Earthen	Composite
	past?		
27.	Are gates/stop logs/valves and other operating equipment in working condition?		**Yes**
28.	Is the drainage gallery easily accessible and does it have adequate lighting facilities and safety handrails on steps?		**Yes**
29.	Gate corrosion		**No**
30.	Are Gate Seals showing signs of weathering, cracking or tearing?		**No**
31.	Is the surface of gates and paint deteriorated?		**No**
32.	Is the alternative power system for gate operation working properly?		**Yes**
33.	Are the hydraulic hoists working satisfactorily?		**Yes**
34.	Are the decking, girders and structural supports of spillway bridge, hoist bridge and catwalks structurally sound?		**Yes**
35.	Is the floor of the bridge structurally sound and safe?		**Yes**
36.	Is there catwalk access to gate trunions?		**Yes**
37.	Is the concrete surface of the Energy Dissipation Arrangement (EDA) and d/s apron in good condition?		**Yes**
38.	Is access road to dam site well maintained?		**Yes**
39.	Are communication facilities available at dam site?		**Yes**
40.	Whether there is a standby power supply?		**Yes**
41.	Is fencing of project area required or needs to be strengthened?		**In Good Condition**
42.	Is sufficient stock of spare which needs frequent replacement maintained at the site?		**Yes**
43.	Are the instruments installed properly accessible?		**Yes**
44.	Are all the instruments in proper working condition?		**Most of them**
45.	Need for repair of instrument		**Slope Indicator**
46.	Need for replacing instruments		**Accelograph**

Sr No.	Description	Earthen	Composite
47.	Need for additional instruments		**Yes (Automatic silt recorder)**
48.	Need for Stability Analysis		**Not Required**
49.	Need for E/Q design review		**Yes**
50.	Need for operational review		**No**
51.	Need for sump/pumping arrangement to dewater Drainage Gallery		**Already in place**
52.	Inspection of Sluice / Outlets conducted?		**N.A**
53.	Seepage through outlets / interfaces?		**No**
54.	Is there evidence of Sluice / outlet scour?		**N.A**
55.	Settlement of outlet head works?		**N.A**
56.	Is there differential settlement in outlets?		**N.A**
57.	Is there siltation at sluice / outlet intake?		**N.A**
58.	Is there impact of siltation on discharge capacity of sluice / outlet?		**N.A**
59.	Is there seepage in outlet gate wells?		**N.A**

5. Any Other Distress Conditions, if any, noted other than above:

NIL

Photographs showing details of location and nature of distress conditions are attached in Appendix-III-G : NIL

Appendix-III-A

REPORT OF DESIGN FLOOD REVIEW

Design Flood Review Report Review is attached as Appendix-III-A.

Appendix III-B

FLOOD ROUTING STUDIES INCLUDING SPILLWAY OUTFLOW CALCULATIONS

Design Flood Review Report Review is attached as Appendix-III-A.

Accordingly, review of above study was referred to Central Water Commission by BBMB. The Central Water Commission vide their letter dated 28-05-2018 intimated the value of PMF is revised to 17173 Cumec on the basis of revised PMP values given by IMD. However the matter was again referred for review of PMF values on the basis of integrated studies for Larji, Pandoh and Pong Dam on river Beas. The matter is still under process with CWC.

Appendix III-C

FREE BOARD CALCULATIONS

In case the Revised Design Flood is significantly higher than the Original one, impacting MWL in case of impinging at FRL, please check for Free Board adequacy and attach the Calculations.

Revised free board calculations are not required as already freeboard of 9.00 feet exists and revised design flood is under review with CWC as explained above.

APPENDIX III-D

PROPOSED MEASURES TO ACCOMMODATE REVISED DESIGN FLOOD

a. Original design flood (m^3/s): **9939**

b. Revised design flood (m^3/s): **Under consideration with CWC**

c. Percentage increase (%): ---

Proposed Rehabilitation Measures: Will be decided after final review.

(a) Structural Measures : Final Review is under consideration with CWC

- Provision of U/S solid Parapet Wall
- Increasing dam height
- Additional spillway
- Fuse plug

(b) Non-structural Measures : Final Review is under consideration with CWC

- Lowering of FRL
- Modification in Operation Rule Curve
- Provision for Early Flood Warning System : RTDSS is already installed

APPENDIX III-E

LATEST INSPECTION REPORT OF DAM SAFETY REVIEW PANEL (DSRP)

DSRP Report is attached as Appendix III E

Brief description of proposed Rehabilitation and Improvement Works

S. No.	Description	Estimated Cost in Crores	Remarks
A	**Rehabilitation and Improvement Proposals for Pandoh Dam**		
1	SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works	3.30	Work is proposed to be undertaken in Phase-II.
2	**Purpose Driven Study:** Seismic Analysis of Pandoh Dam to examine seismic safety under revised seismic parameter inputs	1.00	Work is proposed to be undertaken in Phase-II after finalization of TOR by experts of DSRP.
	Total	**4.30**	

Appendix III-F

SEISMIC DESIGN REVIEW

In case seismic design review studies have not been completed, please leave the information blank.)

Enclosed (Yes/No): **No**

Brief description.

NIL

Appendix-III-G

PHOTOGRAPHS SHOWING DISTRESS CONDITION

No distress was observed in the dam. The information desired is NIL.

Sl No.	Date of Photograph	Description with details of location, nature of distress and other remarks

FORM-IV: REHABILITATION PROPOSALS

1. Structural Rehabilitation Works:

(List all the items identified for the structural rehabilitation: Civil/ HM/ Electrical)

S. No.	Description	Estimated Cost in Crores	Remarks
1	SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works	3.30	Work is proposed to be undertaken in Phase-II.

2. Structural Measures for Ensuring Hydrological Safety:

(List out proposed structural measures such provision of U/S solid Parapet Wall, Increasing dam height, Additional spillway, Fuse plug, etc. – Civil/ HM/ Electrical)

NIL

3. Non-structural Measures:

(List out such proposed non-structural measures as: Revision of Reservoir Operation Rules, Lowering of FRL, setting up of early flood warning system,

NIL

Note: EAP is not to be considered as a Non-structural Measure for accommodating the increase in design flood.

4. Basic Facilities Enhancement:

(List out such proposed basic facilities as: Construction and Improvement of approach roads, Construction and Improvement of Bridges and Culverts, Construction and Improvement of Fencing, Forest area / vegetation clearance, Improving office, housing and related accommodation, stockpiling of emergency materials, sirens in dam and flood plains, lighting arrangement, renovation of IB/ Guest house, public conveniences, etc.).

NIL

5. Instrumentation, SCADA, Surveillance system, etc.:

SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works

Main Components:

1. Starter Control Panel for Radial Gates and gates of Baggi Control Works
2. RTU(Remote Terminal Unit) Panels
3. Main PLC(Programmable Logic Controller) Panel
4. Control Room with SCADA (Supervisory Control and Data Acquisition) along with allied accessories
5. UPS

6. Tourism/Fisheries/Hydropower Development:

7. Others (Investigation, Design Studies, Consultancy):

S. No.	Description	Estimated Cost in Crores	Remarks
1	**Purpose Driven Study:** Seismic Analysis of Pandoh Dam to examine seismic safety under revised seismic parameter inputs	1.00	Work is proposed to be undertaken in Phase-II after finalization of TOR by experts of DSRP.

6. ITEM WISE DETAIL OF COST

Cost Estimate of Rehabilitation and Improvement proposals have been attached with the PST.

APPENDIX IV-A

Cost Estimates of Rehabilitation Proposal

NAME OF WORK: Rehabilitation and Improvement proposals		
GENERAL ABSTRACT		
SL NO	**DESCRIPTION OF WORK**	**AMOUNT IN CRORE**
1.	**Structural Rehabilitation Works**	
i		NIL
ii		
	Sub Total	
2.	**Structural Measures for Ensuring Hydrological Safety**	
i		
ii		
	Sub Total	
3.	**Non-structural Measures**	
i		NIL
ii		
	Sub Total	
4.	**Basic Facilities Improvement**	
i		NIL
ii		
5.	**Instrumentation, SCADA, Surveillance system, etc.**	
i	SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works	3.30
ii		
iii		
	SUB TOTAL	3.30
6.	**Tourism/Fisheries/Hydropower Development**	
i		
ii		
iii		
	SUB TOTAL	
7.	**Others (Investigation, Design Studies, Consultancy)**	
i	**Purpose Driven Study:** Seismic Analysis of Pandoh Dam to examine seismic safety under revised seismic parameter inputs	1.00
ii		
iii		
	SUB TOTAL	1.00
	GRAND AMOUNT	**4.30**

APPENDIX IV-B

(i) Item wise Detail of Costs

Name of Work : SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works

ABSTRACT OF COST

Sr. No.	Item	Specifications	Qty.	Unit	Rate	Total
PART A						
1	Gate position transmitters		5	No.	₹ 35,000	₹ 1,75,000
2	Proximity /limit switches		10	No.	₹ 5,000	₹ 50,000
3	Junction Boxes for items 1 and 2		5	No.	₹ 2,000	₹ 10,000
4	Main PLC System	2 Nos CPU with accessories, 2 Nos memory Flash Card, 2 No Fibre Optic Based Synchronization Module and Cables, with Battery Back-up, consisting of on-board Profibus and Profinet interface for communication.	1	Set	₹ 40,00,000	₹ 40,00,000
5	Remote Terminal Units	Fast communication with isochronous backplane bus as standard, Hot Swappable IO modules, reverse polarity protection, wire break detection and Hardware Diagnostics.	1	Set	₹ 2,00,000	₹ 2,00,000
6	SCADA System	Capable of remote monitoring at least 5 locations other than the Control room, at least 3 level Biometric/Access card level protection and possible to integrate Live and Recoding of CCTV footage.	1	Set	₹ 11,00,000	₹ 11,00,000
7	Starter Panel for River Outlet Gates	Each panel shall house gate moving up, down, Trip lamps; gate fully open/closed lamps; control supply healthy and trip lamps; Local/Remote selector switch, RAISE/LOWER / Emergency stop push buttons, SP MCB, door switch,	5	No.	₹ 40,000	₹ 2,00,000

Sr. No.	Item	Specifications	Qty.	Unit	Rate	Total
		illumination lamp; terminal blocks. Gate position digital indicator will also be installed on this LCP.				
8	Engineering Services	Detailed Engineering, Drawings, Documentation including making flow charts for application software development in PLC/SCADA and making operation and maintenance manuals for the entire packing	1	Set	₹ 10,00,000	₹ 10,00,000
9	Supervision Services	Erection, commissioning, trials, training for up to 90 man days	1	Set	₹ 7,50,000	₹ 7,50,000
10	Level transmitter	Range 70Meter ,Radar Type	1	No.	₹ 5,00,000	₹ 5,00,000
11	CCTV System	with Night Vision and Data Storage up to 30 Days for each Gate	1	Set	₹ 3,00,000	₹ 3,00,000
12	Control Cabin	Minimum 6x6x2 (WDH), Insulated with Complete office chair and Table for SCADA system and Air Conditioning Unit.	1	No.	₹ 10,00,000	₹ 10,00,000
13	Access Control System	Biometric or Card Based Access Control system Integra table with SCADA system enabling separate operations based on their level of access granted.	1	Set	₹ 5,00,000	₹ 5,00,000
14	Public Annunciatio n System	Located at 2 villages 2km and 4km down stream of Dam Integrated with SCADA, actuated whenever there Gates are operated.	2	No.	₹ 2,50,000	₹ 5,00,000
15	Mobile Application for Android and IOS	Mobile phone based application to be developed for monitoring of parameters and Alarms of Dam. Application should be built upon the leading cybersecurity standard International Organization for Standardization (ISO) 27001 Information Security Management System Framework and (IEC) 62443-4-1, secure development lifecycle (SDL).	1	Set	₹ 8,00,000	₹ 8,00,000
16	Miscellaneo us Items	such as mounting fixtures for sensors, cable trays and ducts	1	Set	₹ 2,50,000	₹ 2,50,000

Sr. No.	Item	Specifications	Qty.	Unit	Rate	Total
		etc.				
17	Communication Cable	Armoured Cat5	500	M	₹ 150	₹ 75,000
18	Communication Cable	Armoured Fibre Optic	500	M	₹ 175	₹ 87,500
19	Instrument Cable	6Pair 1Sq.mm Shielded	300	M	₹ 45	₹ 13,500
20	Operational Spares	1 of each IO Modules, CCTV, and Switchgear	1	Set	₹ 3,00,000	₹ 3,00,000
21	Annual Maintenance Contract	For 4 years, 4 visits in a year including 1 pre-monsoon and 1 post monsoon visits + 1 emergency visit.	1	Set	₹ 9,25,000	₹ 9,25,000
		TOTAL PART A				**1,27,36000**
	PART B					
22	Add GST @ 18% On Material in Part (A)		1	Set	18%	22,92,480
23	Miscellaneous Charges (include Packing, Forwarding & Freight charges		1	Set	LS	7,00,000
		TOTAL PART B				**29,92,480**
	PART C					
	UPS(for uninterrupted and redundant AC supply) Including GST		2	No	15000	**30,000**
	GRAND TOTAL					**1,57,58,480**
					Say	**1.58 Cr**

3. INSTALLATION TESTING SUPPLY AND COMMISSIONING OF AUTOMATION SYSTEM FOR BAGGI CONTROL WORKS REGUULATING & EMERGENCY GATES

PART - A

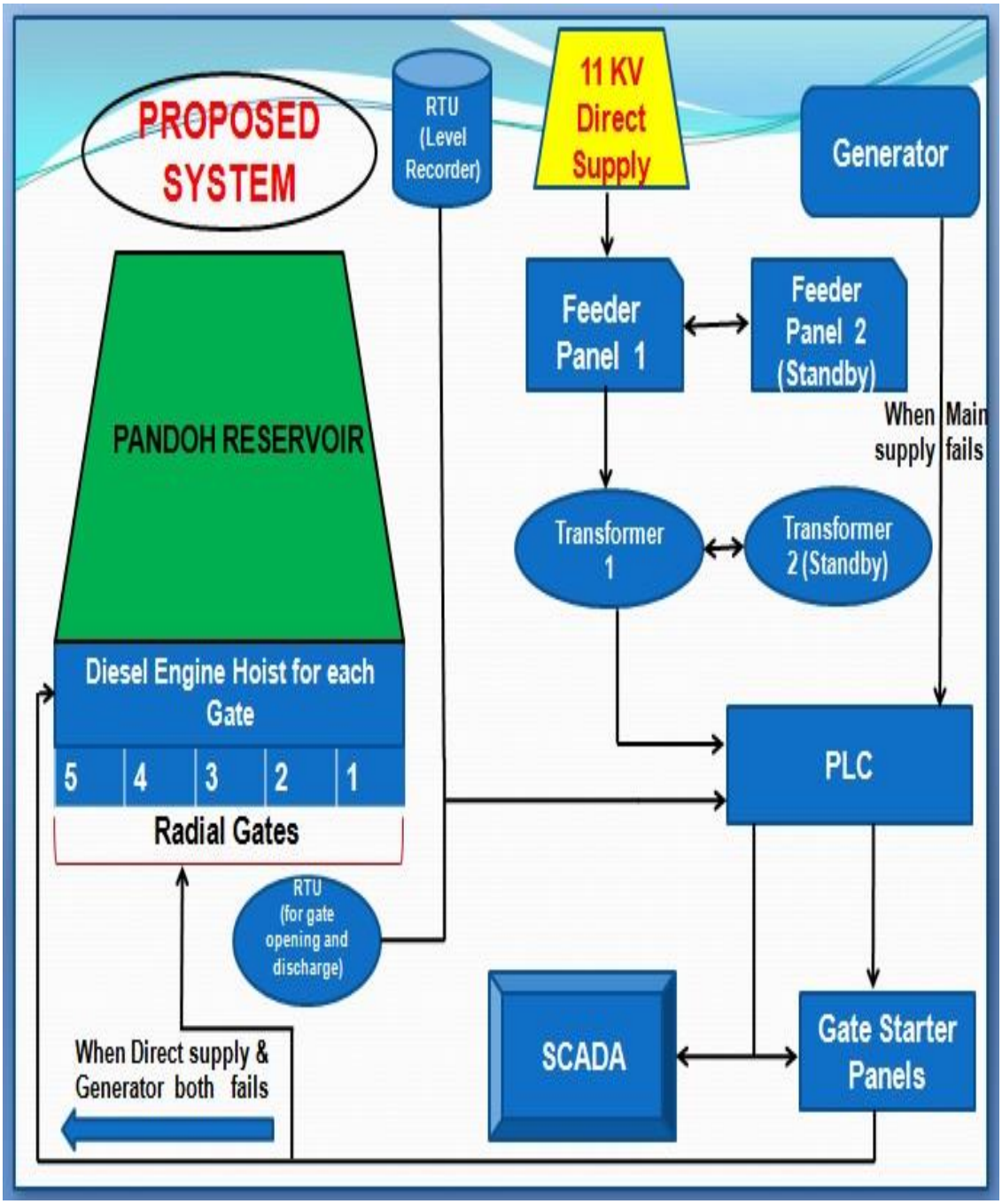
Sr. No.	Item	Specifications	Qty	Unit	Rate	Total
1	Gate position transmitter	IP67,4-20mA output	8	No.	₹ 35,000.00	₹ 2,80,000.00
2	Proximity/limit switches	IP67,PNP type	16	No.	₹ 5,000.00	₹ 80,000.00
3	IP65 JBs for items 1 & 2	IP67,with glands	8	No.	₹ 2,000.00	₹ 16,000.00
4	Main PLC System	Siemens S7-400based Main hot redundant PLC,2 No CPU with accessories,2 No memory flash card,2 No fibre optic based Synchronisation Module and cables, with Battery back-up, consisting of on board Profibus and Profinet interface for communication.	1	Set	₹ 45,00,000.00	₹ 45,00,000.00
5	Remote Terminal Units	With dual commuinication RJ45 Profinet ports,Fast communication with isochronous backplane bus as standard ,Hot swapable IO modules reverse polarity protection,wire break detectioin and hardware Diagnostics	1	Set	₹ 2,00,000.00	₹ 2,00,000.00
6	SCADA Systems	WINCC 7 based SCADA server system with SIMATIC IPC,Suitable for 19" Rack Installation,cqapable of remote monitoring at least 5 locations other than the control room capable of Microsoft SQL server 2016 connectivity,at least 3 level Biometric /Access card level protection ans possible to integreat Live and recording of CCTV footage.	1	Set	₹ 15,00,000.00	₹ 15,00,000.00
7	Starter Panel for River Outlet Gates	Supply of local RDOL started Control panel (LSP) for local control of each gate for 2x7.5 KW SQ. cage induction motor.The panel shall be made by 3 mm thick CRCA sheet with proper powder coating,containing door with proper locking arrangement.Each panel will houser 3 Phase SPD,63 A MCCB/MPCB with aux. and alarm switches,rotary handle,reversible DOL contactors ,short circuit and O/L protections,DP MCB wieth trip aux. switch control transformer cotrol fuses with bases.Each panel shall house gate moving up,down,tripe lamps; Gate fully	8	No.	₹ 40,000.00	₹ 3,20,000.00

		open/closed lamps;control supply healthy and trip lamps ;local remote selector switch,RAISELOWER/Emergency stop buttons,SP,MCB door switch illumination lamp ;Terminal blocks,gate position digital indication will also be installed on this LCP.				
8	Engineering Services	Detailed Engineering,Drawings,Documentation including making fllow charts for application software development in PLC/SCADA ang making operation and maintenace manuals for the entire packing	1	Set	₹ 10,00,000.00	₹ 10,00,000.00
9	Supervision Services	Eraction,commisioning ,teails trainging for upto 90 mandays	1	Set	₹ 7,50,000.00	₹ 7,50,000.00
10	Level transmitter	Range 70 mtr.Radar type	1	No.	₹ 5,00,000.00	₹ 5,00,000.00
11	CCTV System	For night vision and data storage upto 30 days for each gate	1	Set	₹ 3,00,000.00	₹ 3,00,000.00
12	Control cabin	Minimum 6x6x2(WDH),insulated with Complete Office chair and Table for SCADA system and AIR CONDITIONG UNIT.	1	No.	₹ 10,00,000.00	₹ 10,00,000.00
13	Access contro System	Boimetric or card based access control system integate table with SCADA system enabling separate operations based on their level of access granted.	1	Set	₹ 5,00,000.00	₹ 5,00,000.00
14	Public Annuciation System	Located at 2 villages2 KM and 4 KM downstream of Dam Intergrated with SCADA,actuated whenever there gates are operated	0	No.	₹ 2,50,000.00	₹ 0.00
15	Mobile Application for Andriod and IOS	Moblie phone based application to be developed for monitoring of parameters and Alarms of DAM,application sfhould be built upon the elading cybersecurity standard Internation Orgnistation for Stanardizatin(ISO)27001 Informatin Security Management System Frame work and (IEC 62443-4-1,Secure development lifecycle(SDL)	1	Set	₹ 8,00,000.00	₹ 8,00,000.00

16	Miscellaneous Items	Such as monitoring fixtures for sensors, cable trays and ducts etc.		Set	₹ 4,00,000.00	₹ 4,00,000.00
17	Communication Cable	Armoured CAT5	1000	M	₹ 150.00	₹ 1,50,000.00
18	Communication Cable	Armoured Fibre Optic	1000	M	₹ 175.00	₹ 1,75,000.00
19	Instrument cable	6 pair 1 Sq.mm Shielded	600	M	₹ 45.00	₹ 27,000.00
20	Operational spares	one of each IO modules, CCTV and Switchgear	1	Set	₹ 5,00,000.00	₹ 5,00,000.00
21	Annual Maintenance contact	For 4 years 4 visits in a year including 1 Pre -Monsoon and 1 Post-Monsoon visits+1 Emergency visit.	1	Set	₹ 9,25,000.00	₹ 9,25,000.00
		Total				₹ 1,39,23,000.00
	PART - B					
1		GST @18% on Part A				₹ 25,06,140.00
2		Miscellaneous(Including Packing, Forwarding & Fright Charges)				₹ 7,50,000.00
		Total				₹ 32,56,140.00
	PART - C					
1		2 No. UPS Including GST	2	Set	₹ 15,000.00	₹ 30,000.00
	Grand Total	PART-A + PART - B + PART - C				₹ 1,72,09,140.00

(ii) Design and Drawings of Rehabilitation Works

Name of Work: SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works



FORM-V: ENVIRONMENTAL AND SOCIAL MANAGEMENT FRAMEWORK (ESMF) COMPLIANCE

1. Project Siting

A. Is the Project adjacent to or within any of the following environmentally sensitive areas?

Environmentally Sensitive Area	Yes	No	Name/ Identify	Distance from the project area
• Wildlife Sanctuary/ Bird Sanctuary National Parks/ Ecologically Protected Area/ Tiger Reserves		No		
• Reserved Forest Area		No		
• Buffer zone of protected area		No		
• Elephant movement Corridor		No		
• Designated Wildlife Migratory Route		No		
• Eco-sensitive zone		No		
• Cultural Heritage Site/ Archaeological sites		No		
• Others		No		

B. Details of Clearances required for proposed rehabilitation activities as per the table given in Appendix V-C:

S. No.	Proposed Activity	Clearance Required
1	All rehabilitation and improvement works proposed in this report.	No Clearance from any agency is required now, as necessary Clearance were accorded for construction of Pandoh Dam at the start of construction during 1965 and before commissioning during 1977.

2. Identification of activities having potential environmental and social impact:

The activities taken in project are majorly rehabilitation and improvement activities for SCADA and Purpose Driven Studies and hence significant environment and social impacts are not expected.

The list of rehabilitation and improvement activities which are taken under this project are listed below:

S. No.	Description	Estimated Cost in Crores	Remarks
A	**Rehabilitation and Improvement Proposals for Pandoh Dam**		
1	SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works	3.30	Work is proposed to be undertaken in Phase-II.
2	**Purpose Driven Study:** Seismic Analysis of Pandoh Dam to examine seismic safety under revised seismic parameter inputs	1.00	Work is proposed to be undertaken in Phase-II after finalization of TOR by experts of DSRP.
	Total	**4.30**	

3. Whether Requirement for Specific Environment Management Plan (EMP) proposed: No

(a) If yes, tentative times frame of ESMF Study:

From: MM/DD/YYYY To: MM/DD/YYYY

4. Whether mitigation measures have been identified as per Attachment 1: No

, If yes Please attach as Appendix V-A

5. Whether mitigation measures are required to be implemented by Contractor: No

, If yes, Please attach as Appendix V-B

Attachment 1 – Abstract Screening for ESMF Activities and Categorization

S. N.	ESMF Activity/ Component	Diversion of Forest Land	Resettlement and Rehabilitation	Tree Felling	Borrow Area	Quarry Area	Blasting	Dredging/ Desilting of Reservoir	Labour Camps	Transportation of construction materials, manpower and Equipment through Protected areas/Reserve Forest	Heavy Machinery	Hot Mix Plant	Concrete Mixer and Heavy Pumps	Material Handling and Storage	Temporary Land Acquisition	Bush/ Vegetation Clearing	Haulage of Machinery	Debris Disposal	Transport of Materials	Small Tools and Pumps	Sheds to keep Machines and Tools	Others
1	Improving dam instrumentation and monitoring, SCADA and automation system of dams	Involves carriage of the instruments, cables etc to project site and their installation in the project area. Hence no clearances are applicable in the present case. D – No action is required.																				
2	Others Purpose Driven study : Seismic Analysis	D – No action is required.																				

- Fill with A/B/C/D (A-High Risk, B-Substantial Risk, C- Moderate Risk, D-Low Risk).
- For A & B – ESIA study including RAP & R&R shall be carried out by a third party. For C – Generic mitigation measures will be applicable. For D – No action is required beyond the above screening.

Appendix V-A

IDENTIFIED MITIGATION MEASURES

In case mitigation measures have not been identified, please leave the information blank.)

Enclosed : No

Summary on mitigation measures, if any:

NIL

Appendix V-B

MITIGATION MEASURES REQUIRED TO BE IMPLEMENTED BY THE CONTRACTOR

(In case Contractor mitigation measures have not been identified, please leave blank)

Enclosed: No

SPMU to provide a summary of mitigation measures to be implemented by contractor, if any:

Appendix V-C

ACTIVITY-WISE CLEARANCES

Activity-wise Applicability of Environmental, Forest and Wildlife Clearances for Dam Rehabilitation and Improvement Works

S.N.	Types of Rehabilitation Works	Nature of Activities	Environmental Clearance	Forest Clearance	Wildlife Clearance	Remarks
1.	**Improving dam instrumentation and monitoring, SCADA and automation system of dams**	Involves carriage of the instruments, cables etc to project site and their installation in the project area.	No	No	No	
2.	**Others** **Purpose Driven study :** **Seismic Analysis**	This work would be limited to project area only. It involves transportation of materials, carriage of the instruments, cables etc	No	No	No	

FORM-VI: IMPLEMENTATION ARRANGEMENT

1. Civil Works-Main Package:

(a) Work Components

a) SCADA Enabled Automation of Spillway radial gates of Pandoh Dam and gates at Baggi Control Works
Main Components are as under:

b) Starter Control Panel for Radial Gates

c) RTU(Remote Terminal Unit) Panels

d) Main PLC(Programmable Logic Controller) Panel

e) Control Room with SCADA (Supervisory Control and Data Acquisition) along with allied accessories

f) UPS

g) Purpose Driven Study: Seismic Analysis of Pandoh Dam to examine seismic safety under revised seismic parameter inputs

(b) Procurement Method: **NCB**

(C) Estimated Cost of Package (in Rupees): **4,30,000,00.00**

2. Other Packages

Sl. No.	Description	Procurement Method	Estimated Cost (Rs.in Lakhs)
1	NIL		

3. Procurement of Goods:

Sl No.	**Description**	**Procurement Method**	**Estimated Cost(Rs.in Lakhs)**
1	NIL		
2			

4. Consultancy Assignment(s):

Sl No.	Description	Procurement Method	Estimated Cost (Rs.)
1	NIL		

5. Implementation Timeline:

(a) Overall Phasing of Project Implementation: DRIP PHASE-II

Proposed Starting of implementation (MM/DD/YYYY): 01/04/2020

Proposed Ending of implementation (MM/DD/YYYY): 31/03/2026

Implementation Duration (months) (MM): _72___

Sl. No.	Description	From (Month/Year)	To (Month/Year)	Status of Procurement Process
1	Civil Work – Main Package **Installation of SCADA for gates**	01/04/2020	31/03/2022	Work will be undertaken after clearance of PST
2	Other Packages : Purpose Driven Study	01/10/2020	30/09/2022	Work will be undertaken after clearance of PST and after finalization of TOR by experts of DSRP.
3	Procurement of Goods (a) Provision for Instrumentation (b) Provision for the inspection vehicles			

FORM-VII: ADDITIONAL INFORMATION

This section contains information of all reports such as Emergency Action Plan (EAP), Dam Break Analysis (DBA), stability analyses, design drawings, geological report, geotechnical exploration logs, test results, geophysical results, underwater explorations, and other data that is pertinent and supports the PST work proposal.

1. Operation and Maintenance Manual

(a) Operation & Maintenance Manual: **Yes** if YES,

(b) Year of Publication: **09/1980**

2. Emergency Action Plan

(a) Emergency Action Plan: **Yes** if YES,

(b) Year of Study: **06/2014**

(c) Agency Conducting Study

BHAKRA BEAS MANAGEMENT BOARD, CHANDIGARH

3. Dam Break Analysis

(a) Dam Break Analysis**:** **No** if YES,

(b) Year of Study:

(c) Agency Conducting Study:

3. Geotechnical Investigation

No

(a) Year of Investigation:

(b) Agency Conducting Investigation:

5. Geophysical Investigation : **No**

(a) Area of Study:

(b) Year of Investigation:

(b) Agency Conducting Investigation:

6. Stability Analysis of Dam and any other studies ; **No**

(a) Area of Study:

(b) Year of Study:

(c) Agency Conducting Study

7. Others : **No**

(a) Area of Study:

(b) Year of Study:

(c) Agency conducting study: