

MULTI ENERGY DEVELOPMENT PVT. LTD.
LANGTANG KHOLA HYDROELECTRIC PROJECT
(20 MW)
PROGRESS REPORT



SUBMITTED TO
Department of Electricity Development
Gyaneshwor, Kathmandu

October 2023

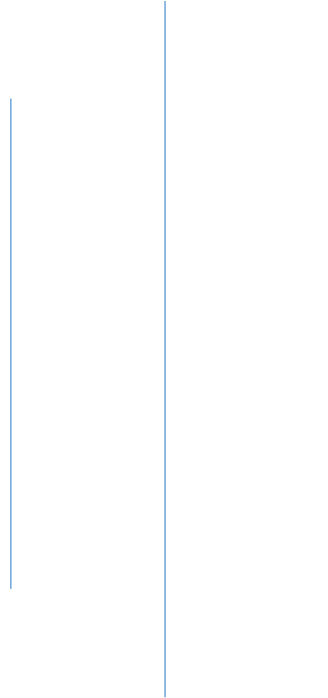
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Langtang Khola Hydroelectric Project (20 MW)



Progress Report

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LIST OF ABBREVIATIONS

BDR	Basic Design Report
B/C	Benefit-to-Cost
CWTW	Chongqing Water Turbine Works Co. Ltd.
DFO	District Forest Office
DoED	Department of Electricity Development
EIA	Environmental Impact Assessment
EPC-F	Engineering Procurement Construction & Financing
FC	Financial Closure
HEP	Hydroelectric Project
IEE	Initial Environmental Examination
IRR	Internal Rate of Return
KV	Kilo Volt
LKHEP	Langtang Khola Hydroelectric Project
MoFE	Ministry of Forest and Environment
MoU	Memorandum of Understanding
MW	Mega Watts
NEA	Nepal Electricity Authority
PH	Power House
PPA	Power Purchase Agreement
RCOD	Required Commercial Operation Date
RoE	Return on Equity
SD10	Survey and Design Institute of Sinohydro Bureau 10
TOR	Term of Reference

1 CHAPTER – 1 PREAMBLE

1.1 Background

Langtang Khola hydroelectric Project (LKHEP) area is located in Gosainkunda Rural Municipality ward no. 5 (Previous Syaphru VDC), Rasuwa District, State no. 3 Nepal. The proposed headworks site is decided about 20 m below the confluence of Langtang and Chopche Khola with principal headrace tunnel alignment passing through the left bank and powerhouse being located on the left bank of the Bhotekhosi River. Geographically, the headworks is located at latitude of 28°09'06.55"N and 85°22'7.07"E, whereas the powerhouse is located just downstream of the confluence of Langtang Khola with Bhotekhosi River with latitude as 28°09'49.58"N and Longitude as 85°20'26.86" E.

1.2 The Employer

Multi Energy Development Pvt. Ltd. is the developer of Langtang Hydroelectric Project (20 MW), situated at Rasuwa district. Multi Energy Development Pvt. Ltd. obtained the survey license for the project on 2069/12/09. After, feasibility level investigation was concluded and the Power Purchase Agreement (PPA) was signed with Nepal Electricity Authority (NEA) on 2072/09/29 for 10 MW and on 2074/07/16 for additional 10 MW.

The inhouse technical team of Multi Energy Development Pvt. Ltd. are responsible for detailed engineering and design as well as procurement of works and construction supervision.

1.3 The EPC-F Contractor

The Employer has identified Chongqing Water Turbine Works (CWTW) as the Contractor appropriate party to execute and implement Langtang Khola HEP in an EPC-F modality. LKHEP and CWTW have signed a contract agreement in EPC-F modality on 5th May 2017. The contract has been terminated by the Employer under the clause 15.2 of Condition of Contract.

1.4 Civil Contractor

After the termination of EPC-F contract with CWTW, the Employer has completed the Civil Construction Contract. The elected Civil contractor is M/S Waiba Infratech Pvt. Ltd.

1.5 Contractors for Site Infrastructures

LKHEP has engaged several local contractors for pre-construction activities such as track opening and slope protection works for Access Road, excavator and tractor hire, stone soling and improvement of Access Road, construction of motorable bridge, etc. Some of the local contractors employed at site are:

- **Bridge Construction**
 - Laligurans/Waiba/Ganapati J/V

- **Road Access and Gabion Works**
 - Shrinkhala Nirman Sewa Pvt. Ltd.
 - Suresh Nirman Sewa
 - Suryakunda Nirman Sewa
 - L.I.K. Engineering Services Pvt. Ltd.
 - Gupche Nirman Sewa
 - Ganapati Nirman sewa
 - Talkharka Nirman Sewa
 - Rasuwa Construction P. Ltd.

- Construction of Semi-Permanent Camp Facilities
 - Laharepauwa/ Bhotekoshi Nirman Sewa

1.6 Key Dates and Milestones

S/N	Activity	Status
1.	Survey License from DoED for 10MW	2069 Chaitra 9
2.	EIA Report Approval (10 MW)	2072 Chaitra 5
3.	Generation License obtained for 10 MW	2072 Ashwin 19
4.	Registration in Department of Industry for 10MW	2070 Chaitra 17
5.	Power Purchase Agreement (PPA) signed for 10 MW	2072 Poush 29
6.	Theoretical Consent from DoED for 20 MW	2073 Ashwin 5
7.	Financial Closure with Bank Consortium (10 MW)	2073 Mangsir 29
8.	Connection Agreement with NEA (20 MW)	2073 Falgun 20
9.	Power Purchase Agreement (PPA) signed for additional 10 MW	2074 Kartik 16
10.	Contract Agreement signed with CWTW in EPC-F modality	2074 Baisakh 22
11.	S-EIA Report Approval (20 MW)	2074 Chaitra 22
12.	EPC-F Contractor's Site Mobilization	2075 Ashwin 15
13.	Project Completion	2077 Chaitra 31
14.	Required Commercial Operation Date (RCOD)	2076 Chaitra 30 (10 MW) 2078 Shrawan 3 (+10 MW)
15.	Financial Closure with Bank Consortium for additional 10MW	2075 Bhadra 20.
16.	Generation License for Additional 10MW	2075 Aswin 04
17.	Approval Final Basic Design Report	19 th December 2018
18.	Advance Payment Guarantee	5 th May 2019
19.	Contractor Mobilization	12th August 2019
20.	Survey License for Transmission line	2076 Poush 11
21.	Contract Termination with CWTW	14 th January 2021
22.	Civil Construction Contract (ITEM Rate Contract)	26 th Feb 2021
23.	EM contract	22th Feb 2022
24.	Transmission line contract	11th August 2023

1.7 Access to the Site

There are two principal access to the project area from Kathmandu.

- I. Kathmandu-Galchhi-Bidur-Betrawati-Dhunche-Syaphrubesi-Project site (134 km)
- II. Kathmandu-Kakani-Bidur-Betrawati-Dhunche-Syaphrubesi-Project site (127 km)

2 CHAPTER – 2 TECHNICAL FEATURES OF THE PROJECT

2.1 Salient Features of the Project

General

- Name of Project **Langtang Khola Hydroelectric Project**
- Installed Capacity **20.0 MW**
- Location **Syaphrubesi ward no.5, Rasuwa District**

1	Project Location	
	Development Region	Central Development Region
	Province	Bagmati
	District	Rasuwa
1.1	Intake Site	Syaphrubesi VDC
		Goisaikunda Rural Municipality
1.2	Powerhouse Site	Syaphrubesi VDC
		Goisaikunda Rural Municipality
1.3	Geographical Co-ordinates	
	Latitude	28°6' N to 28°23' N
	Longitude	85°18' E to 85°48' E
2	General	
	Name of River	Langtang Khola
	Nearest Town	Syaphrubesi Bazar
	Type of Scheme	ROR Hydro
	Full Reservoir Level (FRL)	1615.50 masl
	Turbine Center Level	1409.70 masl
	Normal Tailwater Level	1410.67 masl
	Gross Head	204.83 m
	Net Rated Head	195.66 m
	Installed capacity	20 MW
	Average Annual Energy after Outage	119.15 GWh
3	Hydrology	
	Catchment Area	573 sq.km
	Catchment Area at Powerhouse	3554 sq.km
	Design Discharge (at 40% PoE)	11.5 m ³ /s
	Average Flow	29.24 m ³ /s
	Minimum monthly flow	6.25 m ³ /s

4	Weir	
	Type	WES Overflow Concrete Weir
	Crest Elevation	1615.50 masl
	Length of weir	31.76 m
	Width of weir	21.09 m
	U/S Slope	1V: 2H
	U/S Height	3 m
	U/S Apron Level	1612.50 masl
5	Intake	
	Type	Side Intake
	Number of Openings	2
	Size of Opening (W x H)	5.5 m x 2.75 m
	Invert Level	1612.25 masl
	Normal water level	1615.50 masl
6	Approach Culvert	
	Number	2 nos.
	Length	~59.8 m and ~43.6 m (considering only after expansion joint)
	Size (B x H)	3.4 m x 2.5 m and 3.0 x 2.5 m
	Slope	~1V: 38H and ~1V: 27.7H (considering only after expansion joint)
7	Gravel Trap	
	Type	Hopper, Intermittent flushing
	Length	7.5 m
	Width	13.0 m
	Flushing Gate	Vertical Gate (2 nos. 1.2m x 1.2m)
8	Undersluice	
	Gate Type	Radial Gate
	Width	3 m
	Height	3 m
	Invert Level of Undersluice Gate	1608.00 masl

	Number of openings	2 nos.
9	Settling Basin	
	Type	Hopper, Open surface
	Number of Basins	2 nos.
	Effective Length	70.0 m
	Total width of basin (Internal)	18.0 m
	Width of one compartment	8.5 m
	Height in rectangular section	8 m
	Side slope of compartment	1V: 1.07H
	Flushing System	Intermittent
	Longitudinal slope of Flushing Channel	1:50
	Flushing Culvert (L x H)	1.2 m x 1.0 m
10	Trash Passage	
	No. of Openings	1 nos.
	Width	2.0 m
	Height	1.25 m
	Gate type	Vertical Gate
	Invert level of Trash Passage Gate	1614.75 masl
11	Headrace Tunnel	
	Type	Inverted D-shape
	Finish Size (W x H)	3.4 m x 3.5 m
	Start Invert Level	1604.5 masl
	Length	2900 m
	Thickness of concrete lining	0.25 m
12	Surge Tank	
	Type	Underground inclined surge tunnel
	Inner Diameter	4 m
	Effective Depth	36.92 m
	Upsurge Level	1626.75 masl

	Down surge Level	1600.52 masl
13	Adit Tunnel	
	Type	Inverted D-Shape
	Finish Size (W x H)	4 m x 4 m
	No. of Adit Tunnel	1 Nos
	Length of Adit 1	147.00 m
14	Upper Penstock Tunnel	
	Type	D-Shape
	Finish Size (W x H)	3.3 m x 3.3 m
	Length	57.60 m
	Penstock Pipe Diameter	2.0 m
	Slope	1V in 18H
15	Inclined Pressure Shaft	
	Type	Circular
	Finish Size (W x H)	3.3 m
	Length	191.20 m
	Penstock Pipe Diameter	2.0 m
	Slope	50° with horizontal
16	Lower Penstock Tunnel	
	Type	D-Shape
	Finish Size (W x H)	3.6 m x 3.2 m
	Length	174.83 m
	Penstock Pipe Diameter	2.0 m
	Slope	1 in 20
17	Powerhouse	
	Type	Surface
	Size (L x W)	35 m x 11.60 m
	Height	18.60 m
	Turbine Axis Level	1409.70 masl
	Length of Tail pool	25.83 m
	Tailrace Channel Type	Rectangular Box culvert

	Tailrace Channel Length	74.67 m
	Bottom Width	3 m
	Side Slope	Vertical
	Height of the Channel	2.93 m (normal water depth: 2m)
	End Tailrace Invert Level	1409.14 m
	Tailrace Water Level	1410.67 m
18	Turbine	
	Type	Francis, Horizontal
	Number	2
	Rated Output Capacity per Unit	10.356 MW
	Turbine Axis Level	1409.70 masl
	Net Head	195.66 m
	Discharge per Unit	5.75 m ³ /s
	Efficiency	91%
19	Governor	
	Type	Electronic with PID control
	Adjustment for Speed Drop	Between 0-5%
20	Generator	
	Type	Synchronous, 3 Phase
	Rated Output Capacity per unit	11940 kVA
	Power Factor	0.85
	Generation Voltage	11 kV
	Frequency	50 Hz
	No. of Units	2
	Excitation System	Brushless excitation system
	Efficiency	98%
21	Transformer	
	Type	Oil immersed, Single Phase, 50 Hz
	Rated Capacity	30 MVA
	Voltage ratio	11/132 kV
	Efficiency	99%

	No. of Units	2
	Vector Group	Ynd11
	Frequency	50 Hz
	Efficiency	99%
22	Transmission Line	
	Voltage Level	132 kV single circuit
	Length	4.5 km
	Conductor Type	Bear
	From	Langtang Khola HPP switchyard
	To	NEA's Chilime Hub

3 CHAPTER – 3 PROGRESS DETAILS

3.1 Progress Summary

S/N	Project Activity	Status/Progress	Remarks
	ACCESS ROAD		
1	Syaphrubesi to Powerhouse Site	<ul style="list-style-type: none"> • 500.0 m (Out of 500.0 m) track opening works – Completed. • Gabion works/Slope protection – Ongoing. 	
2	Powerhouse to Headworks site	<ul style="list-style-type: none"> • 3.0 Km (out of 3.0 Km) track opening works – Completed. • Gabion works/Slope protection – Ongoing. 	
3	Adit Portal access road	<ul style="list-style-type: none"> • Completed • Gabion works/Slope protection – Ongoing. • Repair and Maintenance: Ongoing 	
4	PROJECT CAMP	<ul style="list-style-type: none"> • Designing and Planning – Lot 1 Completed • Construction: Completed 	
5	BRIDGE OVER BHOTEKOSHI RIVER	<ul style="list-style-type: none"> • Civil works on Abutments – Completed. • Bailey Bridge superstructure installation – Completed. • River training and protection works at Abutments – Completed. 	
6	ADMINISTRATIVE WORKS	<ul style="list-style-type: none"> • Supplementary EIA - Approved from Ministry of Forest Environment (MOFE) • Power Purchase Agreement Signed for 20 MW • Explosive License - Process Initiated • Generation License - Completed • Forest Clearance - 100 % Completed • Land Acquisition – 100 % Completed 	
7	MAIN CONSTRUCTION ACTIVITIES	<ul style="list-style-type: none"> • Site Mobilization of Contractor- 17th March 2021 • Completed the Camping works for contractor. • Construction power electrical pole erection and wire stringing completed. • Connection Approval for Construction power - Completed • MoU with Kalikjung Brigade has been completed to start explosive work at site. • Adit Tunnel – 100% completed • Head Race Tunnel – Breakthrough on 13th August. • Head race tunnel Adit U/S- 1+091.10 chainage completed • Head race tunnel Adit D/S – 2+896.80 completed • Horizontal penstock outlet tunnel- 100% completed 	
8	OTHER ACTIVITIES	<ul style="list-style-type: none"> • River survey for Physical Hydraulic Modelling - Completed. • Agreement with Hydro Lab for Physical Hydraulic Modelling. • Final model run for Physical Hydraulic Modelling ongoing • Protection works ongoing near the Bailey Bridge area. 	

3.2 Active Contractors at Site

1.	Excavator hire for access road excavation	Gupche Nirman Sewa Syphru-8, Rasuwa.	Falgun 30,2073	Completed	
2.	Excavator hire for access road excavation	Rasuwa Constuction P. Ltd, Kathamandu	Falgun 2074	Completed	
3.	Excavator hire for access road excavation	Gupche Nirman Sewa Syphru-8, Rasuwa.	Falgun 2074	Completed	
4.	Excavator hire for access road excavation	Talkharka Nirman Sewa Baudha, Kathamandu	Jestha 2075	Completed	
5.	Damage Repair and Rehabilitation of Pasang Lyhmu Highway along the Access Road	Gupche Nirman Sewa Syphru-8, Rasuwa.	Jestha 2075	Completed	
6.	Construction of Semi-Permanent Camp facilities	Laharepauwa/ Bhotekoshi Nirman sewa Rasuwa	18 th Dec 2018	Completed	

3.3 Contract Status

S.N.	Contract Title	Contractor/Consultant	Date of Contract Signing	Status	Remarks
1.	Construction of Motorable Bridge over Bhotekoshi River	D Laligurans/Waiba/Ganapati J/V	July 4, 2017	Completed	
2.	Stone Masonry works for maintenance of access road	Shrinkhala Nrman Sewa Pvt. Ltd. Bidur-4, Battar, Nuwakot.	Ashwin 6, 2074	Completed	
3.	Gabion works for Maintenance of access road	Suresh Nirman Sewa Syphru-5, Rasuwa.	Sep 11, 2017	Completed	
4.	Gabion works for Maintenance of access road	Suryakunda Nirman Sewa Syphru-5, Rasuwa.	July 17, 2017	Completed	
5.	Stone Masonry works for maintenance of access road	L.I.K. Engineering Services Pvt. Ltd. Manmajju, Kathmandu.	August 17, 2017	Completed	
6.	Excavator hire for access road excavation	Gupche Nirman Sewa Syphru-8, Rasuwa.	Falgun 30,2073	Completed	
7.	Excavator hire for access road excavation	Rasuwa Constuction P. Ltd, Kathamandu	Falgun 2074	Completed	
8.	Excavator hire for access road excavation	Gupche Nirman Sewa Syphru-8, Rasuwa.	Falgun 2074	Completed	
9.	Excavator hire for access road excavation	Talkharka Nirman Sewa Baudha, Kathamandu	Jestha 2075	Completed	

S.N.	Contract Title	Contractor/Consultant	Date of Contract Signing	Status	Remarks
10.	Damage Repair and Rehabilitation of Pasang Lyhmu Highway along the Access Road	Gupche Nirman Sewa Syphru-8, Rasuwa.	Jestha 2075	Completed	
11.	Masonry Wall, manual rock cutting	Ganapti Nirman Sewa, Bidur, Nuwakot		Completed	
12.	Construction of Semi-Permanent Camp Facilities	Laharepauwa/ Bhotekoshi Nirman Sewa		Completed	

3.4 Major Activity on this month

3.4.1 Head Works: -

- Plum concreting completed at downstream floodwall- Left bank protection
- Sand flushing panel 1 and 2 completed
- Left bank panel 6 all complete
- Embedded plate installation in sand flushing gate



Figure Concreting at sand flushing



Figure: Headworks Site



Figure: Spillway



Figure: Undersluice portion

3.5.2 Tunnel works

- **Inclined tunnel:** Drilling for anchor completed on inclined section
- **Head Race Tunnel**
 - Face 2**
 - 187 nos rock bolts installation (50 nos approx Chainage 892- 870m and 137 nos approx Ch 1100 -1225m and invert cleaning
 - Face 3
 - 15 nos pullout test
 - Chainage 2097.9 to 2322.3
 - **Surge tunnel**
 - Excavation works going on.
 - Starting chainage: 235.9 m
 - Ending chainage: 247.5 m
 - Progress: 11.6 m



Figure: Rock bolts drilling at face 2



Figure: Surge Tunnel



Figure: Inclined tunnel channel fixing

3.5.4 Powerhouse

- Embedded plate for rail in tailrace side completed.
- Concreting in tailrace panel 1 left side wall.
- Concreting in tailrace side crane beam.
- Side plate installation in control room side
- Embedded plate in control room side crane beam level installed.
- Concreting in tailrace culvert panel 3 top slab
- Truss Roof work started.
- Tailrace pool top slab concreting.
- Tailrace panel 1 and panel 2 base slab concreting.



Figure: Powerhouse



Figure :Rebar work in tailrace pool



Figure: Embedded parts installation in tailrace

3.5.5 HM (Hydro Mechanical) Work

- Installation of Motorized screw hoist for both of the Undersluice Stoplog Gate.
- Installation of Rubber Seal of both of the radial Gate.
- Erection of Penstock Branch Pipe (1400 Internal diameter) of Length 17.5 m (Right to the flow direction).
- Welding performed from outside on eight joints of Penstock Branch Pipe. (Left to the flow direction)
- Installation of Rail line of total length 90 meter.



Figure: Assembly of motorized screw hoist with undersluice stoplog gate



Figure: Image of installation of rail line at inclined tunnel section



Figure: -Erection of Penstock Branch Pipe



Figure: - Assembly of motorized screw hoist with undersluice stoplog gate.

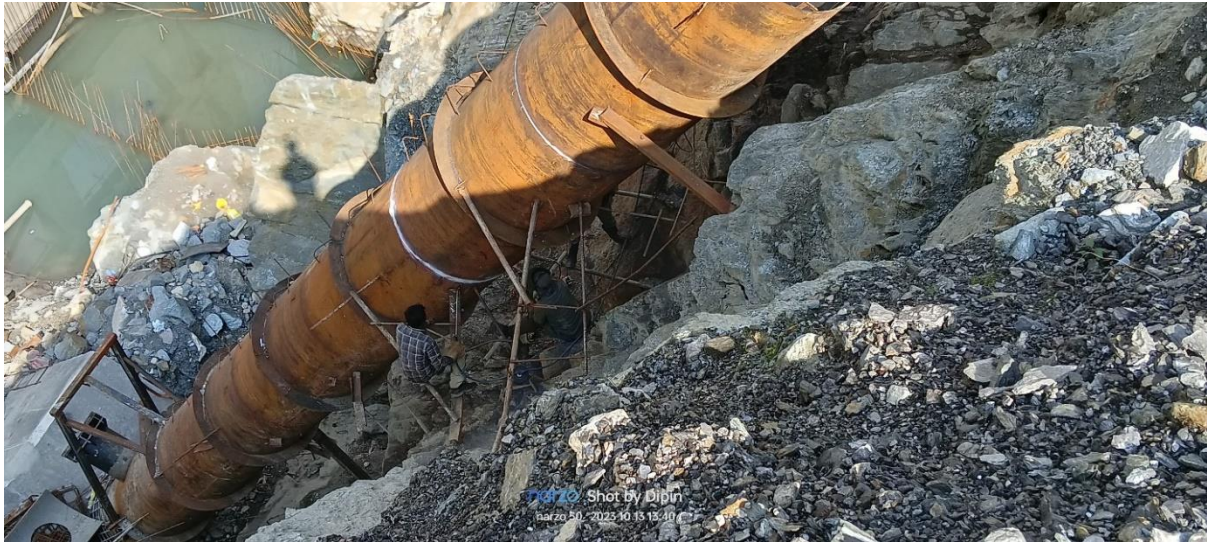


Figure: - Welding work of penstock branch pipe.

3.5.6 EM (Electro Mechanical) Works: -

1. Issued for Construction (IFC/EM-18)- Generator Lube Oil Unit.
2. Issued for Construction (IFC/EM-21)- Station Transformer, Distribution Transformer, Isolation Transformer
3. Issued for Construction (IFC/EM-24)- Switchyard Foundation Layout and Structural Drawing (Powerhouse End)
4. Material Dispatch Clearance Certificate (MDCC) provided for 132kV SF6 Circuit Breaker and 132kV Isolator.
5. Material Dispatch Clearance Certificate (MDCC) provided for 132kV Current Transformer, Potential transformer and Lightning Arrestor.
6. Factory Acceptance Test of Power Transformer completed.
7. Material Dispatch Clearance Certificate (MDCC) provided for Power Transformer and Battery & Battery charger.
8. EU Scope equipment's (Runner, MIV, Governor, Generator Excitation system, etc.) reached at site.



Figure Complete assembly of power transformer

Figure SFRA test of power transformer

3.5.7 132 KV Single Circuit Transmission line (From Langtang Khola Powerhouse (20MW) to Chilime Hub (GIS Substation))

- Request for Proposal (RFP) for Feasibility Study and Design of 132 kV Transmission line for Langtang Khola Hydroelectric Project (20MW) issued on July 2021.
- Evaluations of Bids.
- Contract agreement with Paramount Construction Pvt. Ltd. (“the Consultant”) for Feasibility study and design of 132kV Transmission line from Langtang Khola Powerhouse (20MW) to Chilime Hub (GIS Substation) on 10th August 2021.
- Desk Study report submitted by the Consultant with three alternative routes of 132kV SC Transmission line on 14th September 2021.
- Walkover survey conducted on proposed routes.
- Monumentation and Detail Topographical Survey work carried out on Proposed route.
- Contract signing of Transmission line works on 11th August 2023 with Royal Construction Company Pvt. Ltd
- Check Survey Completed.
- Land acquisition in progress.



Figure Check Survey along the alignment of transmission line

4 SITE PHOTOGRAPH



Figure Weir Section



Figure Shotcrete works at HPS



Figure Dowel bar installation at lower bend



Figure Rock Bolt Drilling at Upstream Face 2





Figure undersluice gate