

THE PREPARATORY SURVEY
ON
EXPANSION OF NAM NGUM 1 HYDROPOWER STATION
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
FINAL REPORT

Appendices

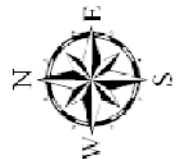
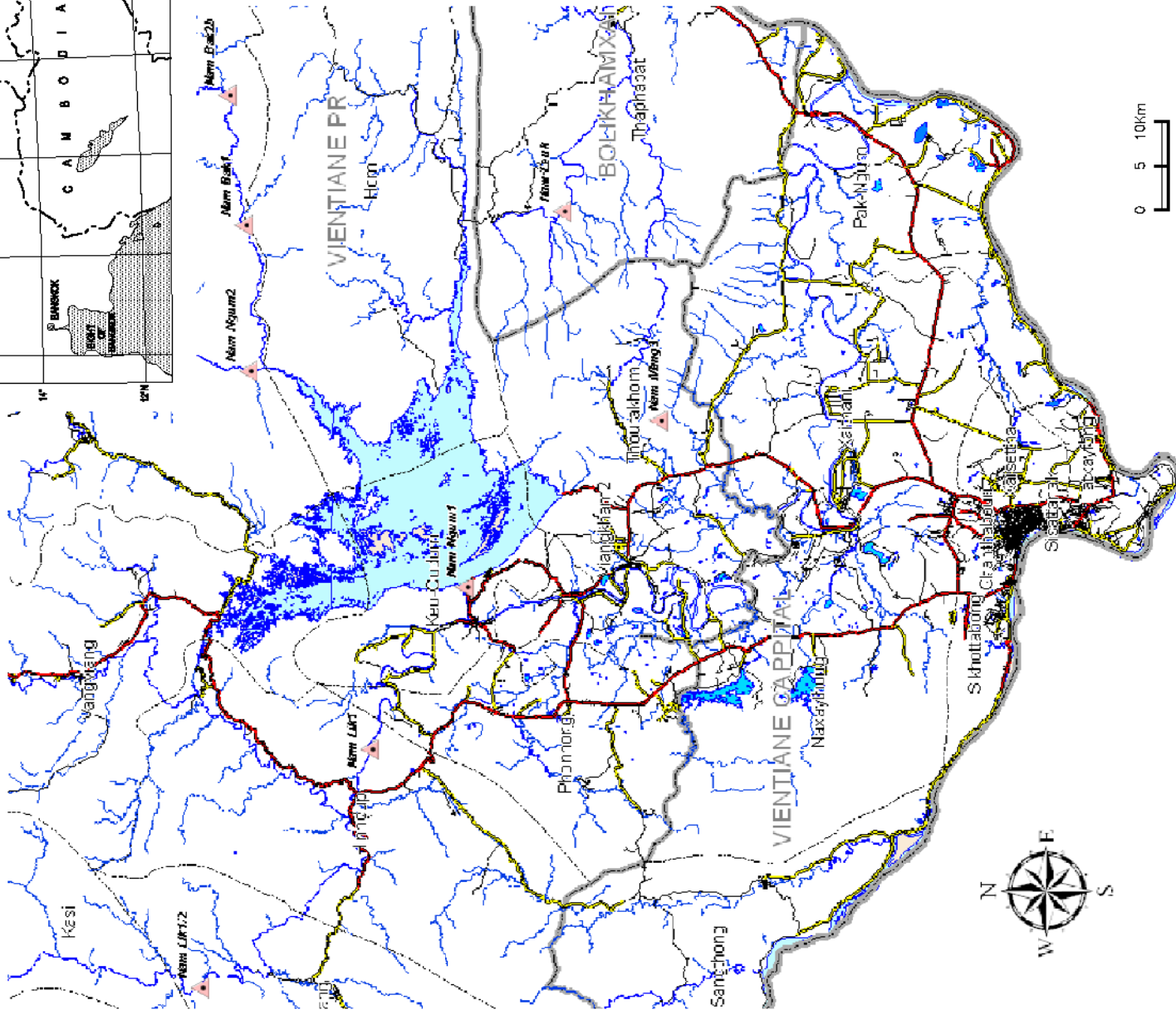
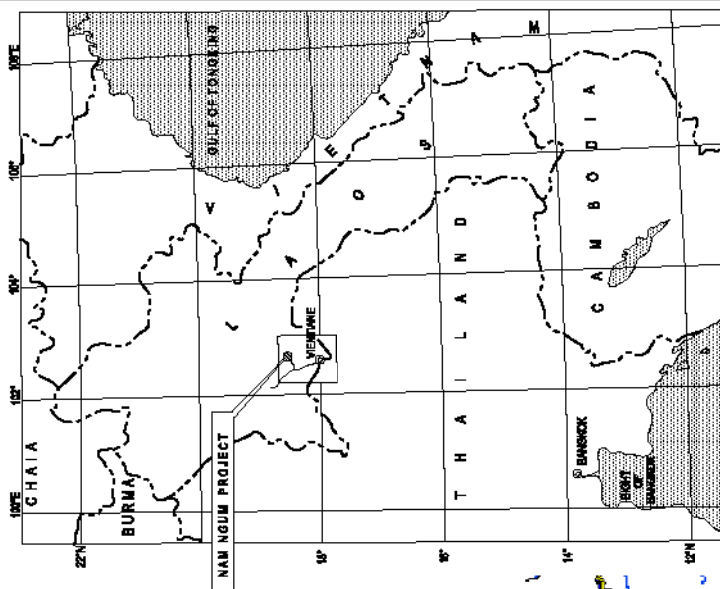
Appendix G Basic Design Drawings




Appendix G Basic Design Drawings

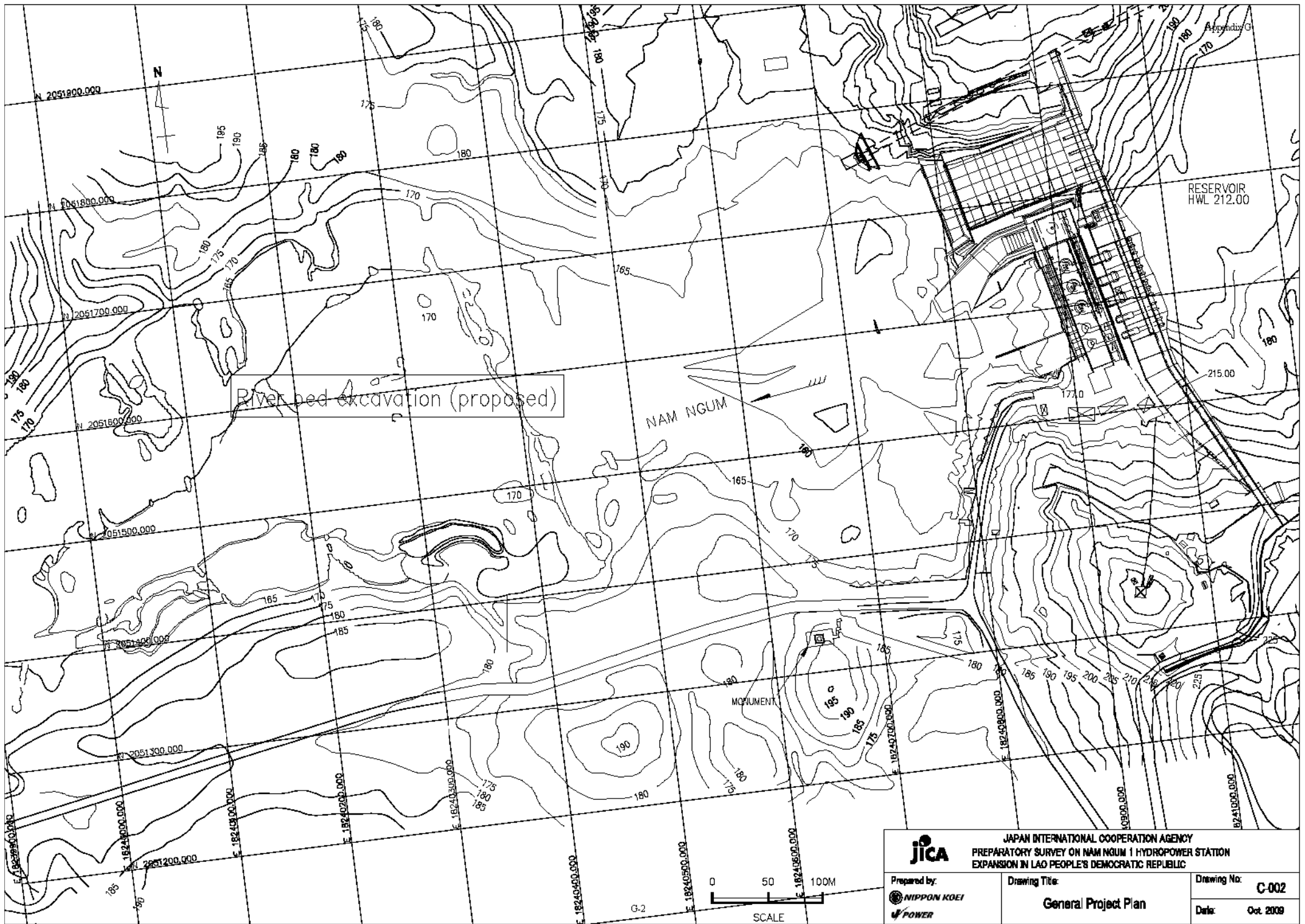
List of Drawings




Drawing size: A3

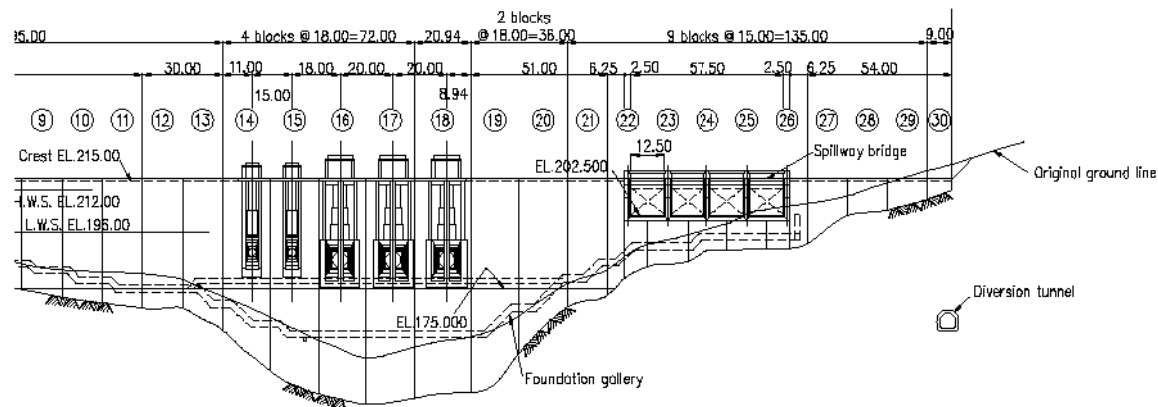
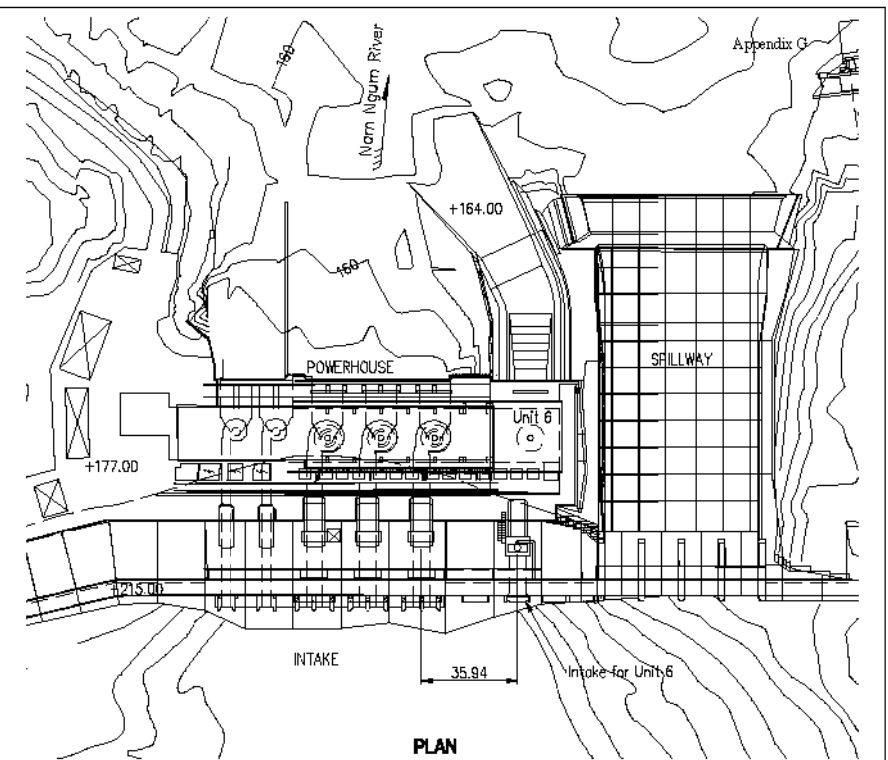
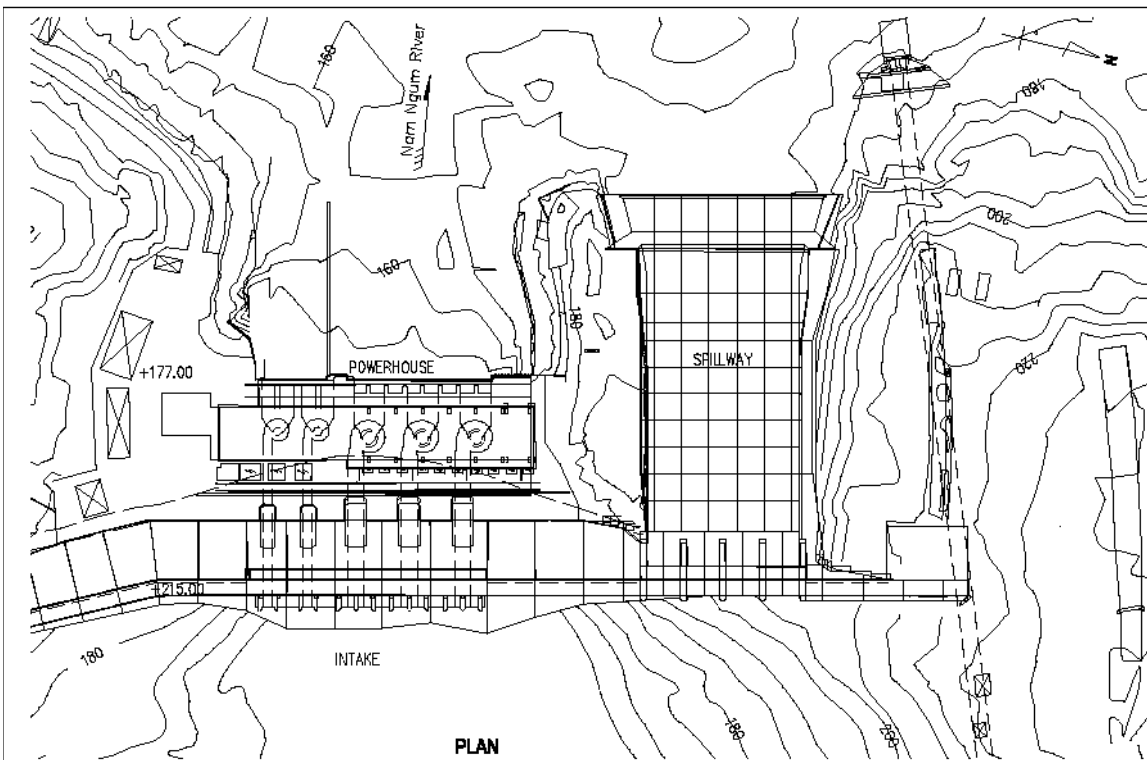
<u>Dwg. No.</u>	<u>Title</u>
1	C-001 Location Map (Laos map + Vientiane to dam site)
2	C-002 General Project Plan (dam to downstream river course)
3	C-003 General Arrangement, Before and After Expansion
4	C-004 General Arrangement, Plan, Profile & Sections (intake to tailrace)
5	C-011 Geological Plan
6	C-012 Geological Section
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10	C-211 Powerhouse, Floor Plan, El. 177.0 m
11	C-212 Powerhouse, Floor Plan, El. 172.5 m & El.168.5m
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30	E-012 Schematic Diagram (2), Cooling Water Supply and Drainage System
31	E-021 115kV Outdoor Switchyard, Equipment Layout Plan
32	E-022 115kV Outdoor Switchyard, Equipment Layout Section



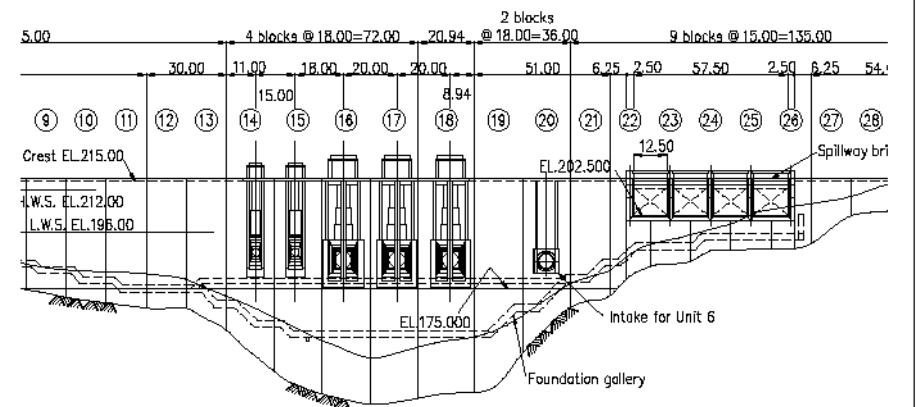
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Prepared by:  NIPPON KOEI  POWER	Drawing Title: Location Map	Drawing No.: C-001 Date: Oct. 2009



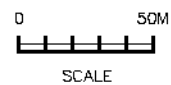
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Prepared by:  NIPPON KOEI  POWER	Drawing Title: General Project Plan	Drawing No.: C-002 Date: Oct. 2008






UPSTREAM ELEVATION
BEFORE EXPANSION

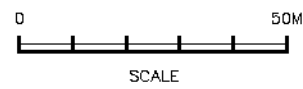
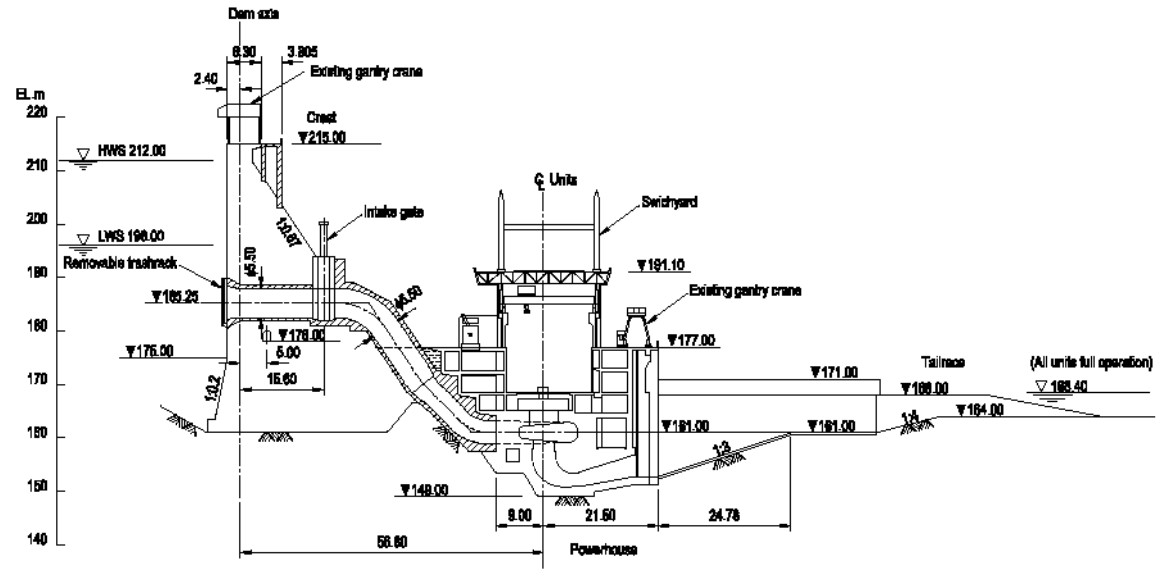
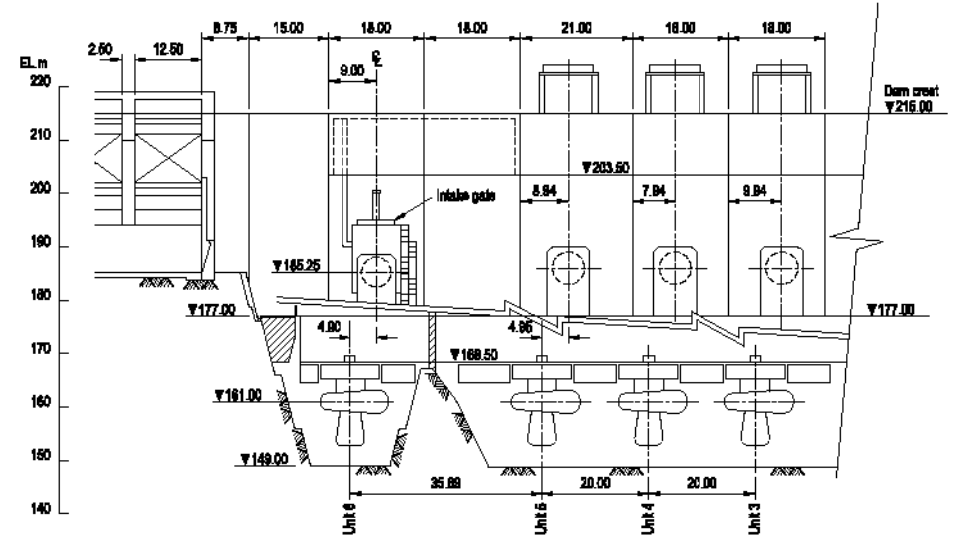
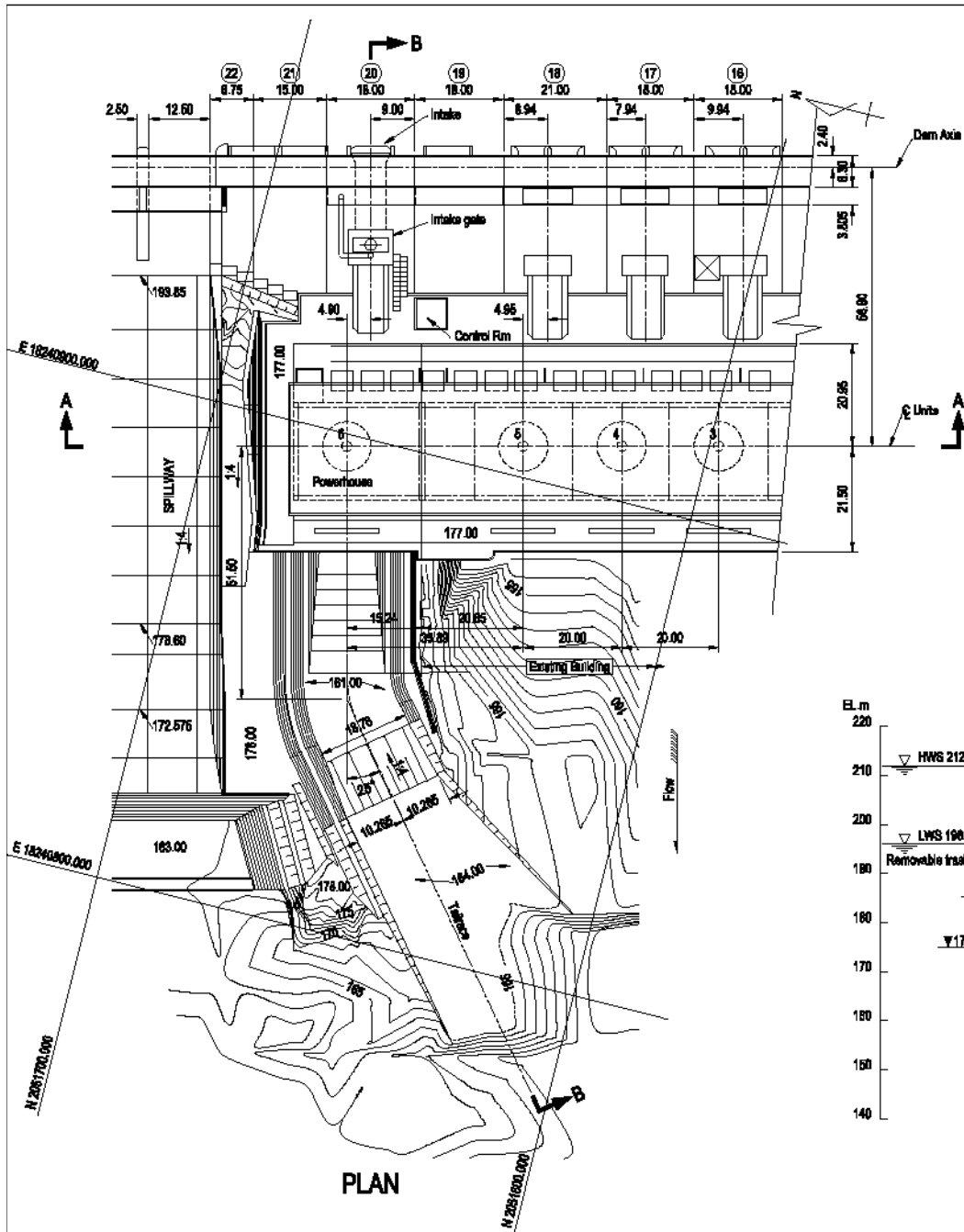



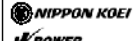

UPSTREAM ELEVATION
AFTER EXPANSION

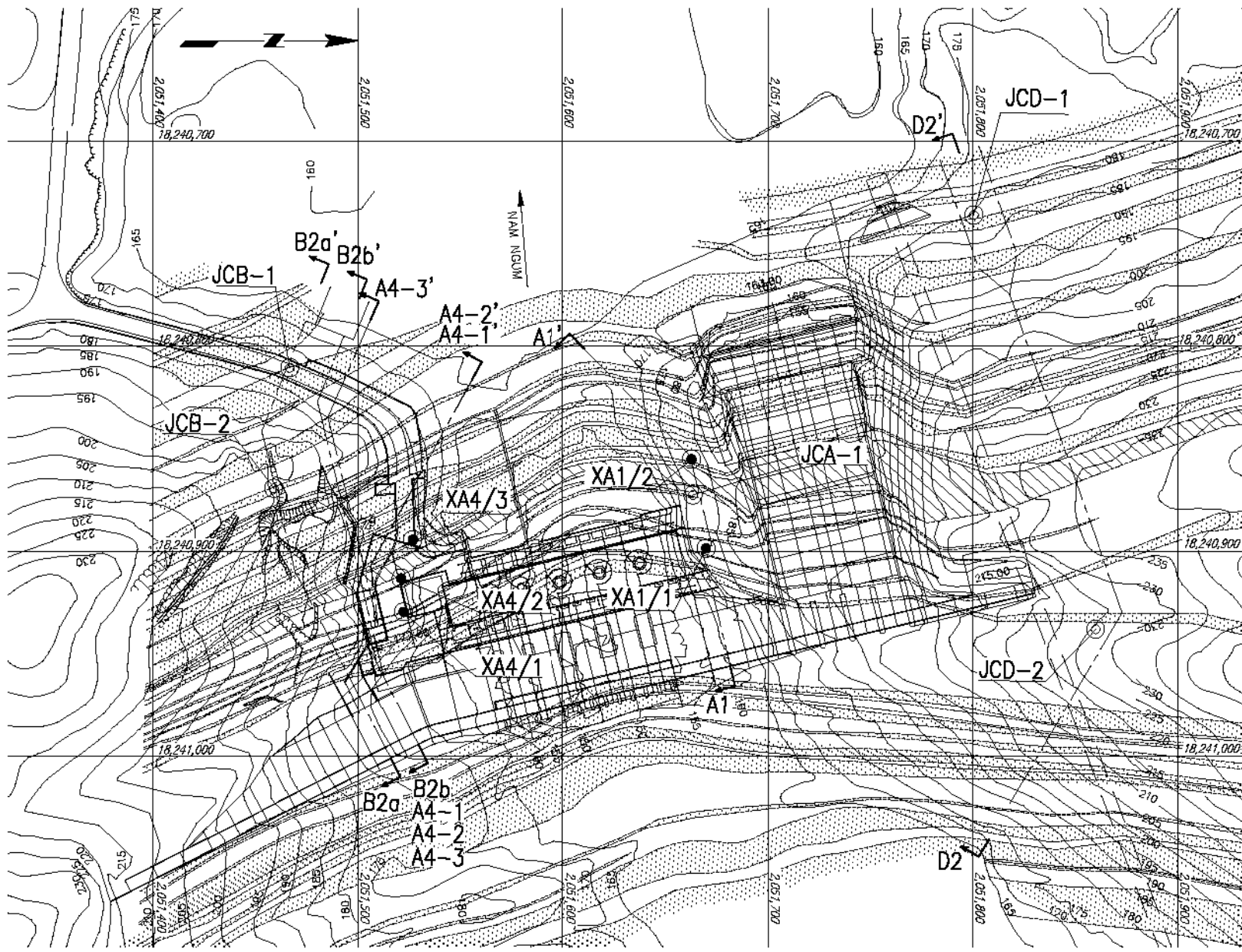


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Prepared by:  NIPPON KOEI 	Drawing Title: General Arrangement Before and After Expansion	Drawing No.: C-003 Date: Oct 2009



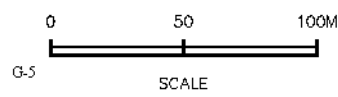
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Prepared by:  NIPPON KOEI  POWER	Drawing Title: General Arrangement Plan and Sections	Drawing No: C-004 Date: Oct. 2009






- LEGEND**
- XA1/2 Drilling Location
 - └┘ Section Location
 - Boundary of Geology
- Geology**
- Sandstone
 - ▨ Mudstone
 - ▧ Mudstone(weak zone)
- Weathering**
- ▩ Highly Weathered
 - ▨ Moderately Weathered
 - Fresh

Drilling by JICA Survey Team in 2009

JCA-1 JCD-1
 JCB-1 JCD-2
 JCB-2



 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:	Drawing Title:	Drawing No:
 NIPPON KOEI  POWER	Geological Plan	C-011
		Date: Oct. 2009

LEGEND

- ~ Boundary of Geology
- ~ Boundary of Weathering
- ↑ ↓ Section Location
- bend. Bending Point
- cut Omitting Point

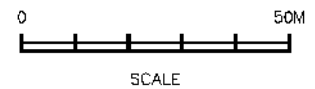
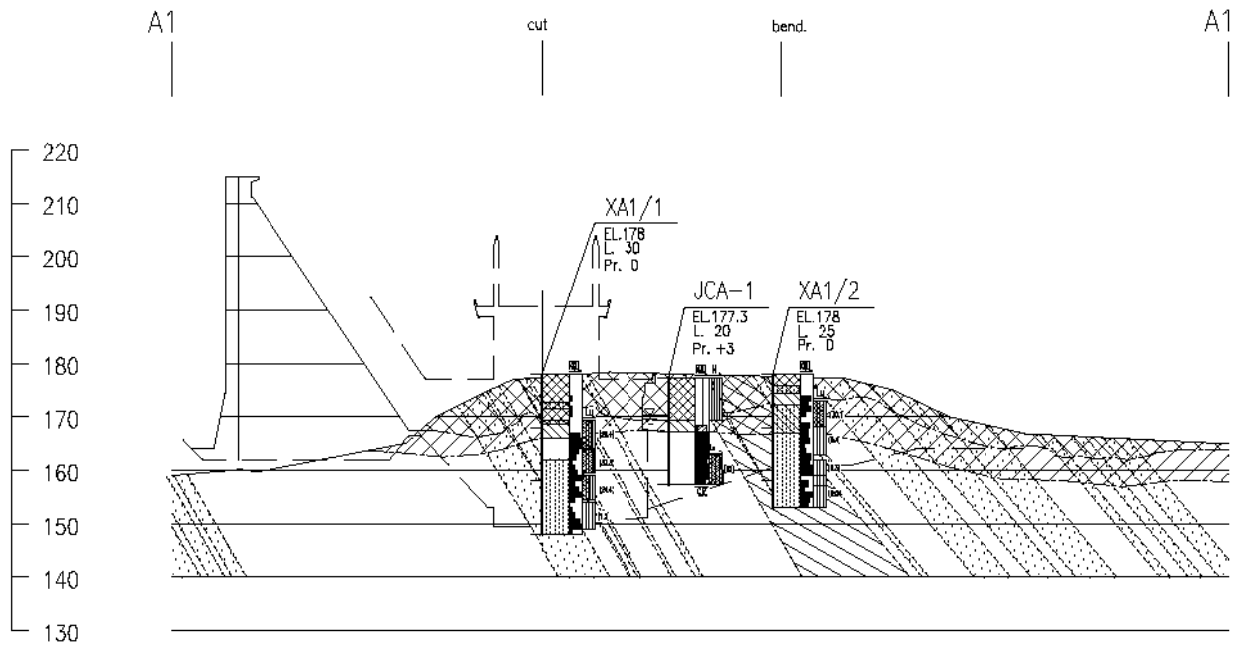
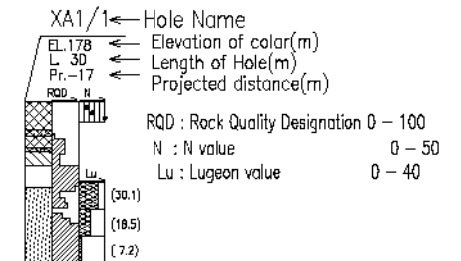
Geology

- Sandstone
- Mudstone
- Mudstone (weak)

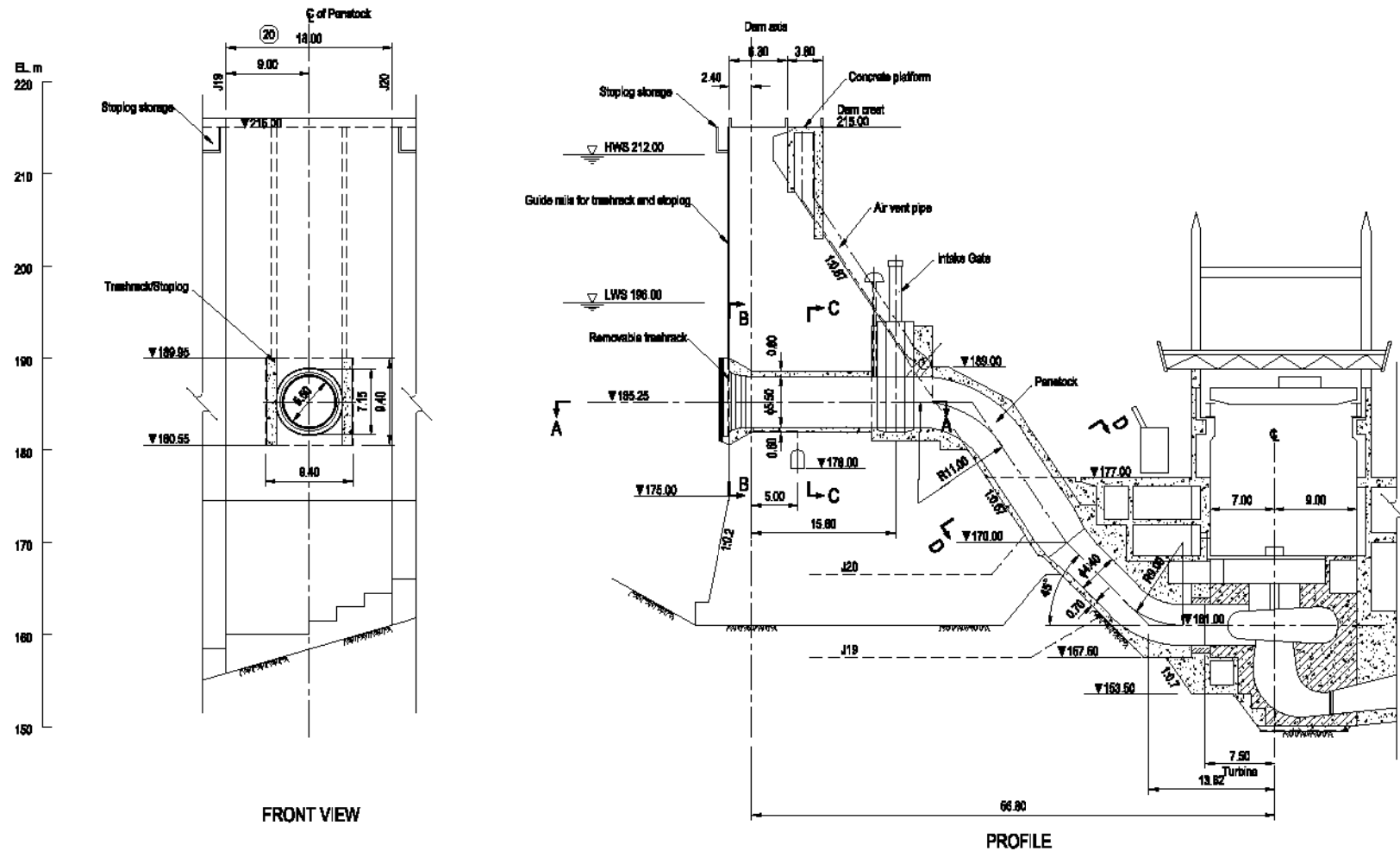
Weathering

- Highly Weathered
- Moderately Weathered
- Fresh

Geological Log of Drill Hole

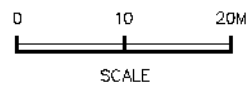


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Prepared by: NIPPON KOEI POWER	Drawing Title: Geological Section (A1-A1')	Drawing No.: C-012 Date: Oct. 2008






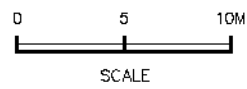
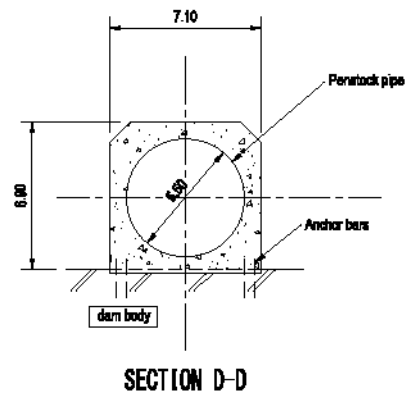
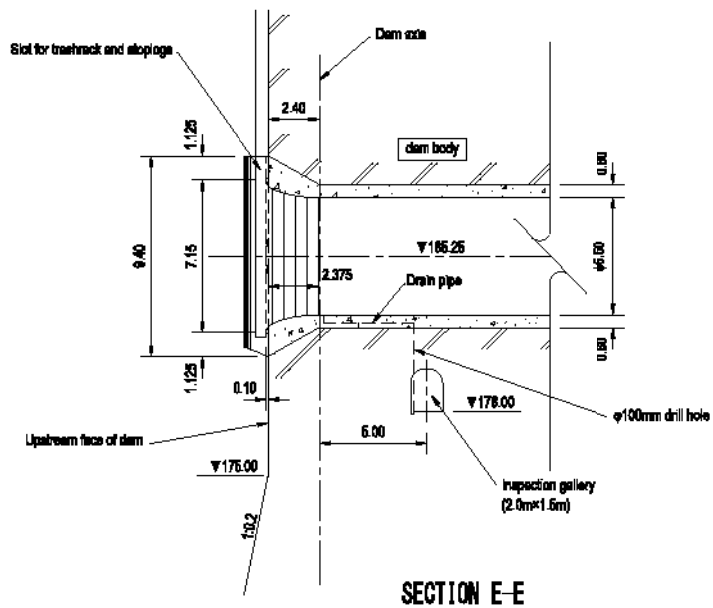
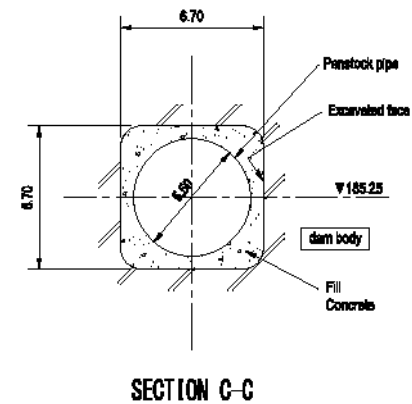
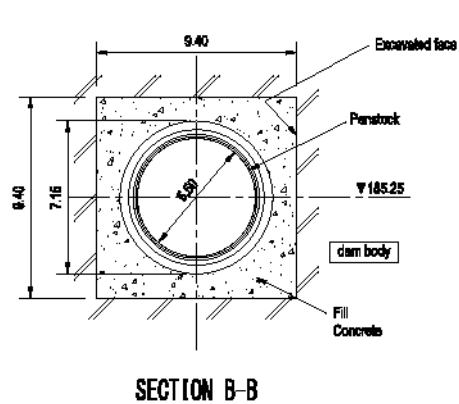
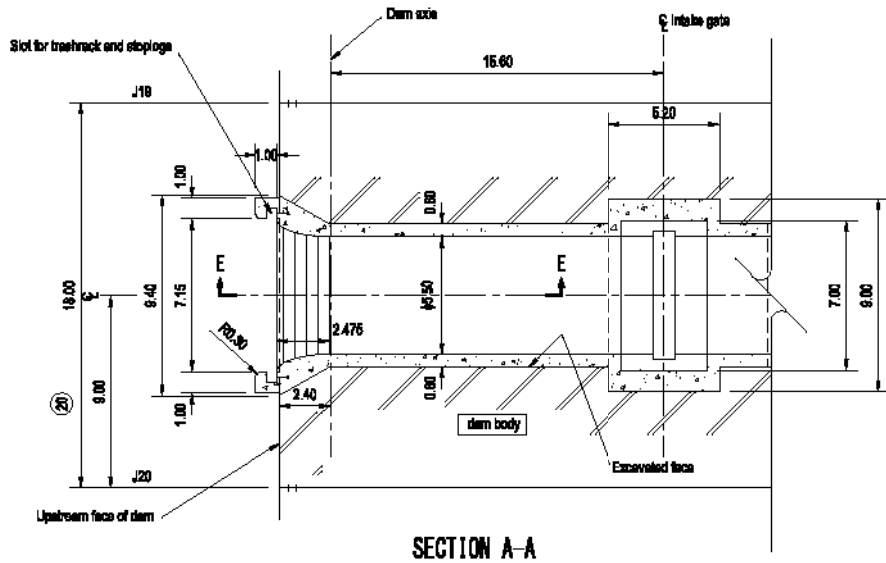
FRONT VIEW

PROFILE

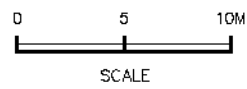
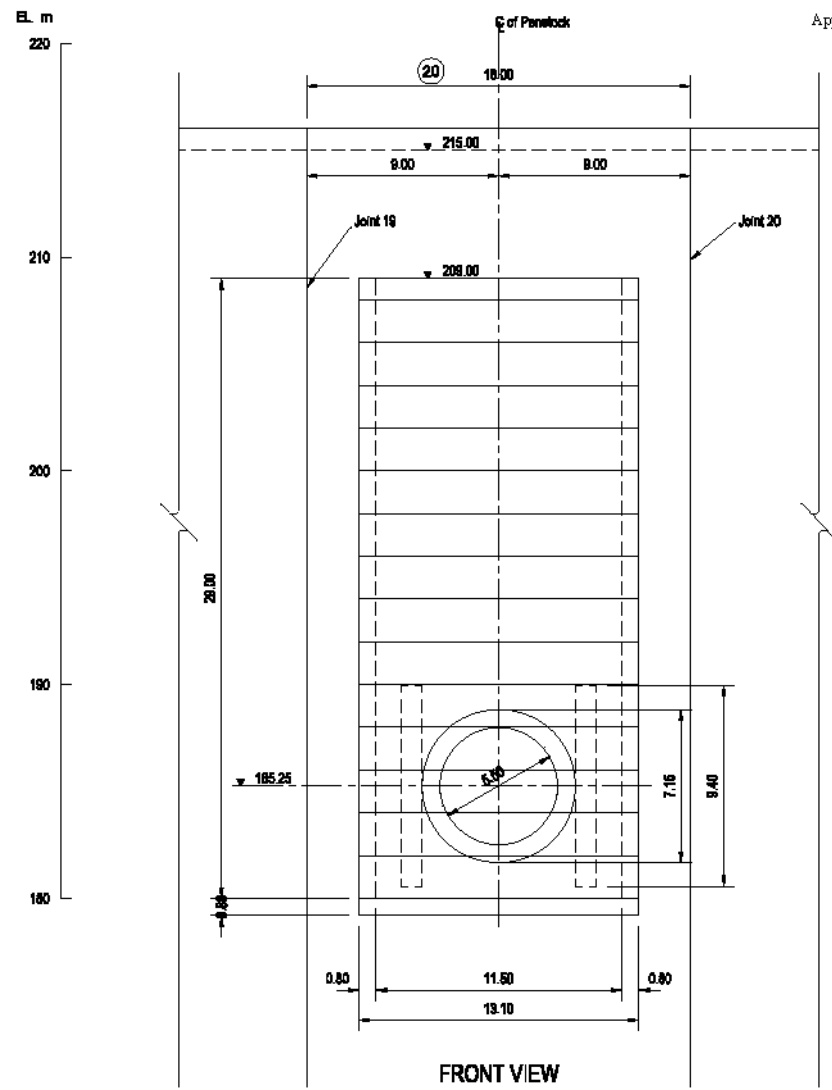
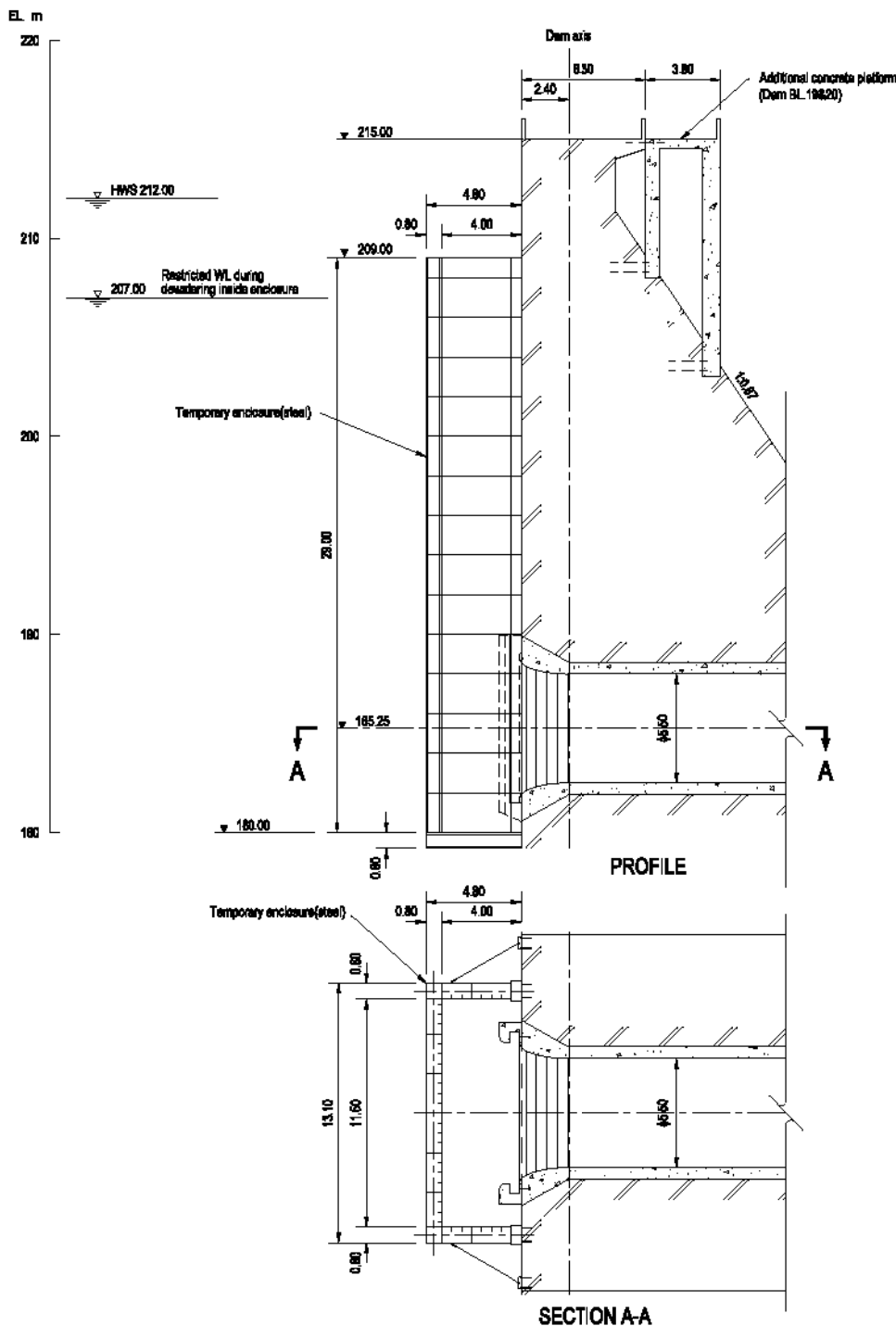


G-7

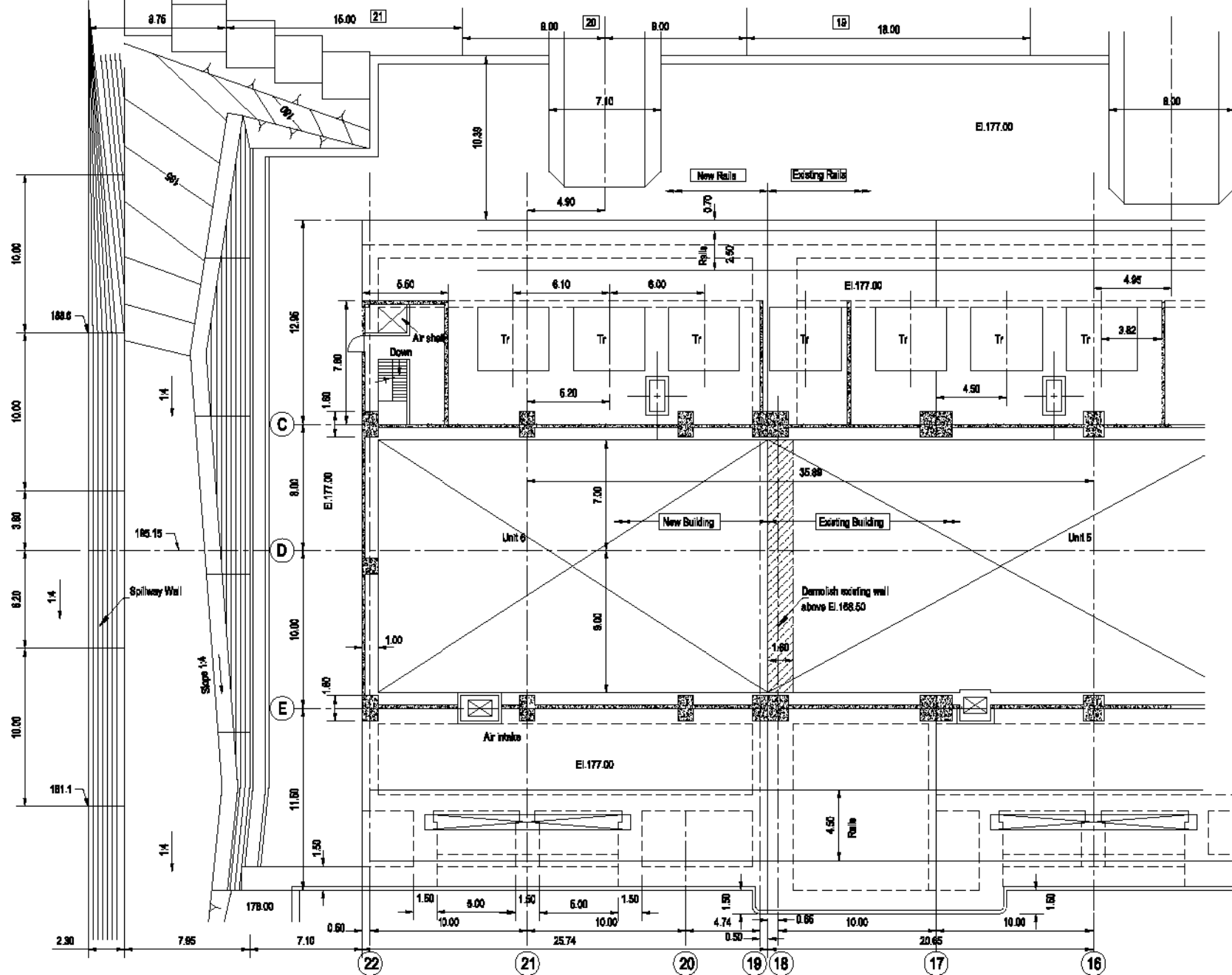
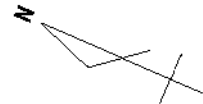
 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Intake and Penstock Profile and Front View	Drawing No.: C-101 Date: Oct. 2008




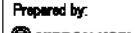

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Prepared by: NIPPON KOEI POWER	Drawing Title: Intake and Penstock Plan and Sections	Drawing No.: C-102 Date: Oct. 2008



JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by: NIPPON KOEI POWER	Drawing Title: Intake Temporary Enclosure for Construction	Drawing No.: C-103 Date: Oct. 2008



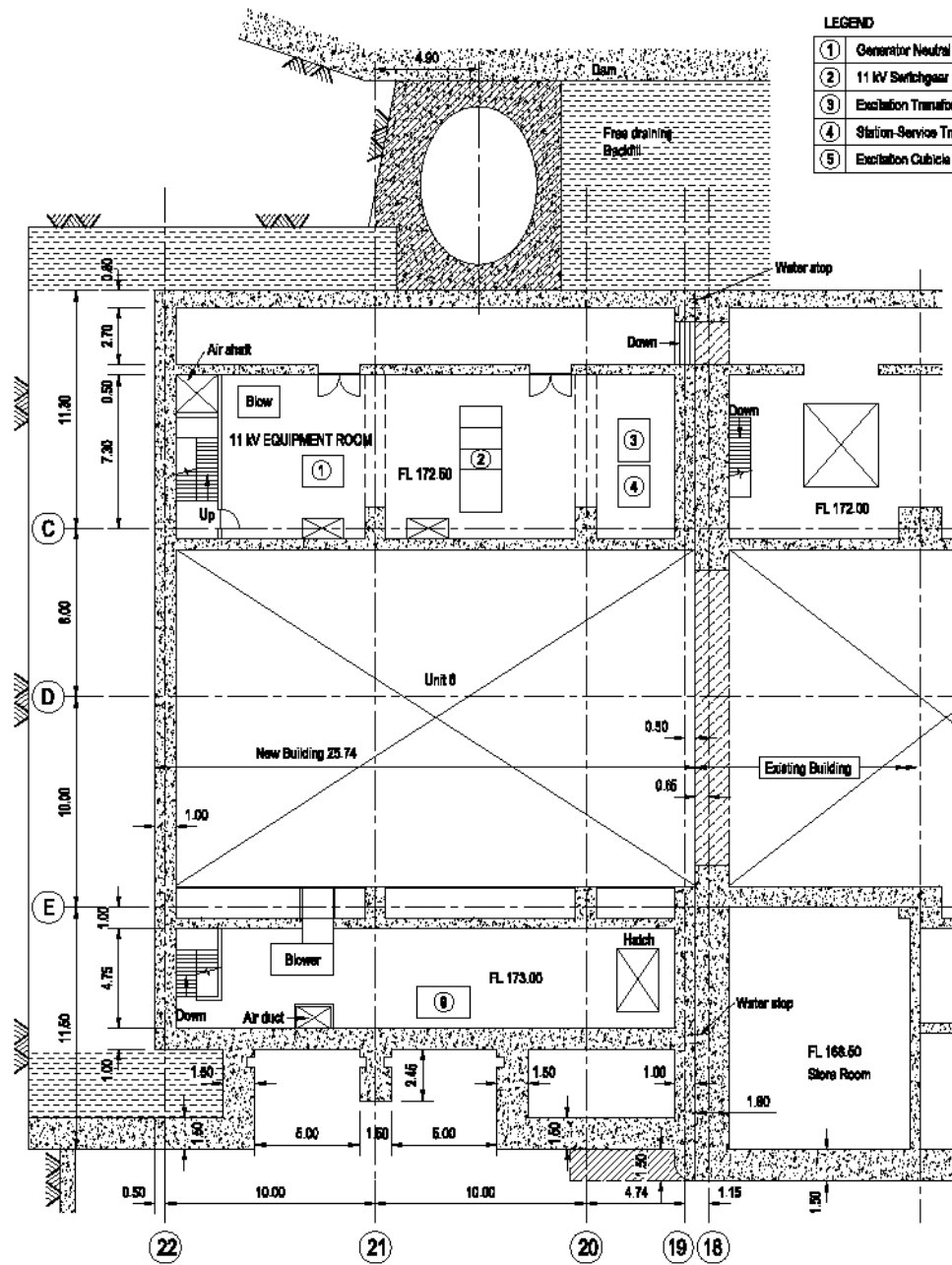
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 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Powerhouse Floor Plan, El. 177.0m	Drawing No.: C-211 Date: Oct. 2008

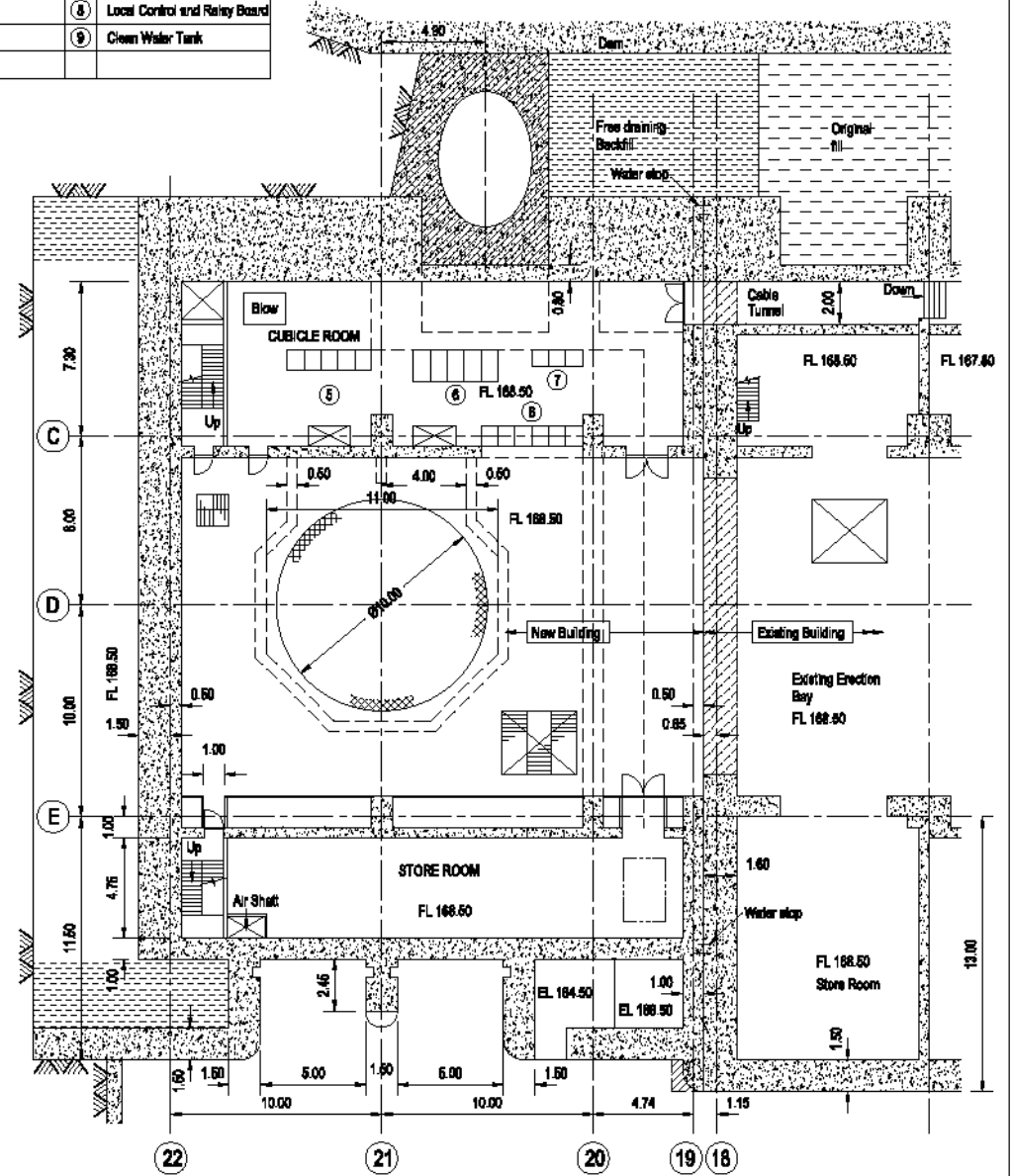
LEGEND

① Generator Neutral Grounding Transformer	⑥ Low Voltage Switchgear
② 11 kV Switchgear	⑦ AC/DC Distribution Panel
③ Excitation Transformer	⑧ Local Control and Relay Board
④ Station-Service Transformer	⑨ Clean Water Tank
⑤ Excitation Cubicle	

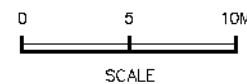
Demolition of Existing Concrete



FLOOR 172.5 & 173.0 M



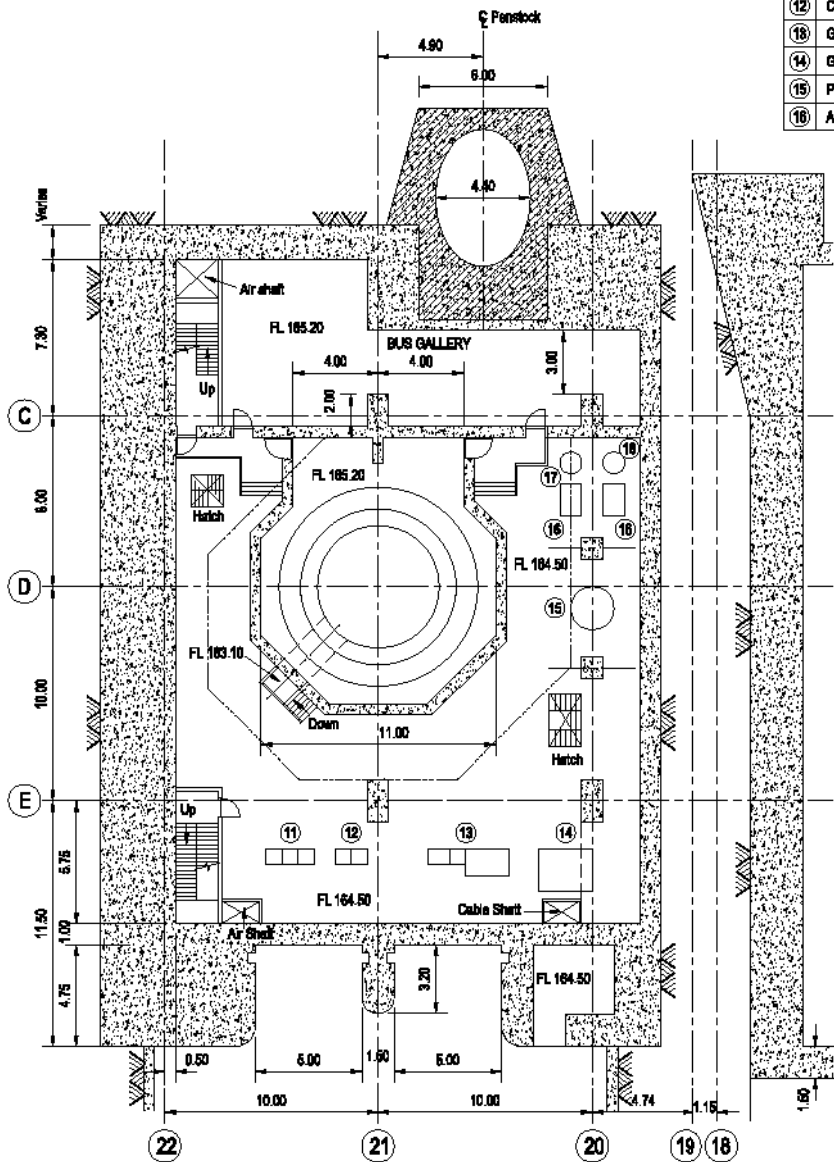
FLOOR 168.5 M



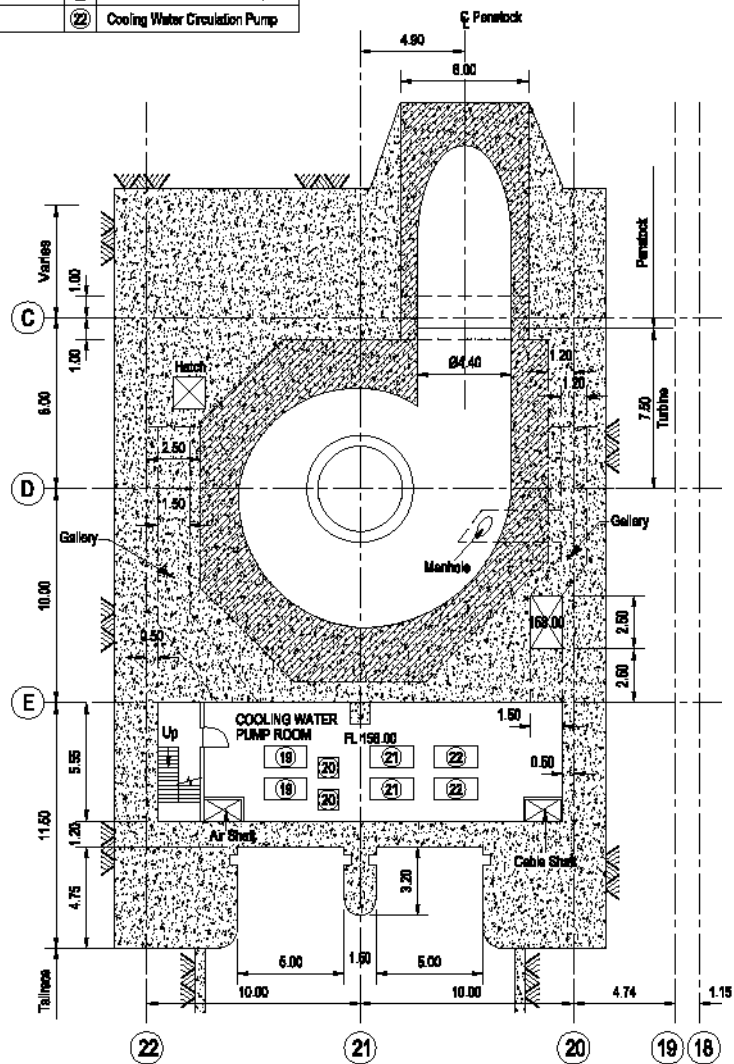
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Prepared by: NIPPON KOEI POWER	Drawing Title: Powerhouse Floor Plan, El.172.5m & El.168.5m	Drawing No.: C-212 Date: Oct. 2008

LEGEND

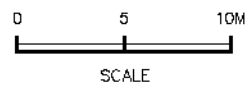
(11) Unit Motor Control Center	(17) Primary Air Tank
(12) Common Motor Control Center	(18) Brake Air Tank
(13) Governor and Turbine Control Panel	(19) Raw Water Pump
(14) Governor Oil Sump Tank with Pressure Oil Pumps	(20) Raw Water Strainer
(15) Pressure Oil Tank	(21) Water-to-Water Heat Exchanger
(16) Air Compressor	(22) Cooling Water Circulation Pump


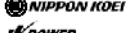



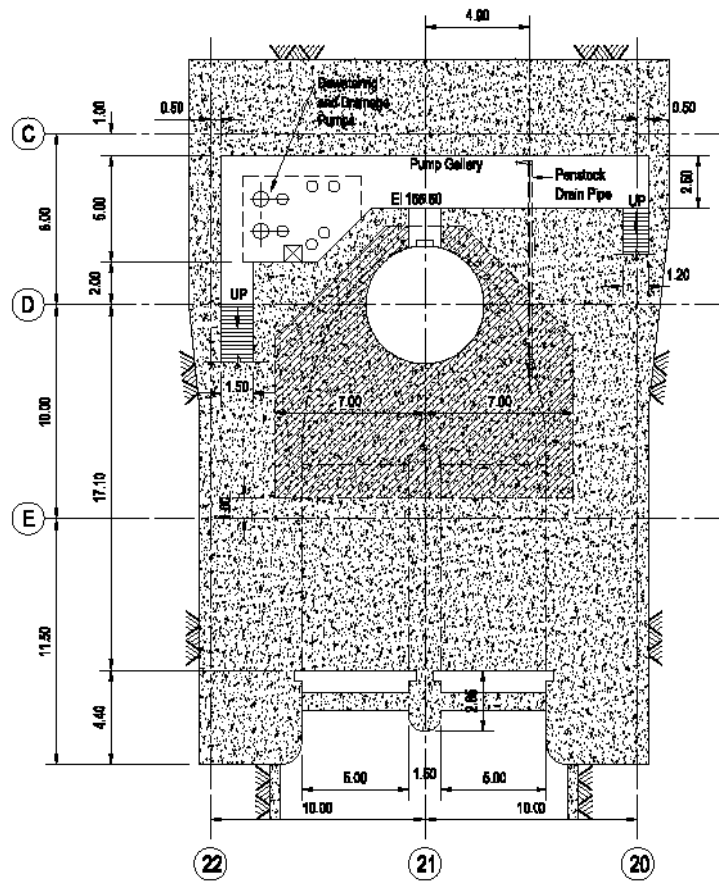
FLOOR 164.5 & 165.2 M



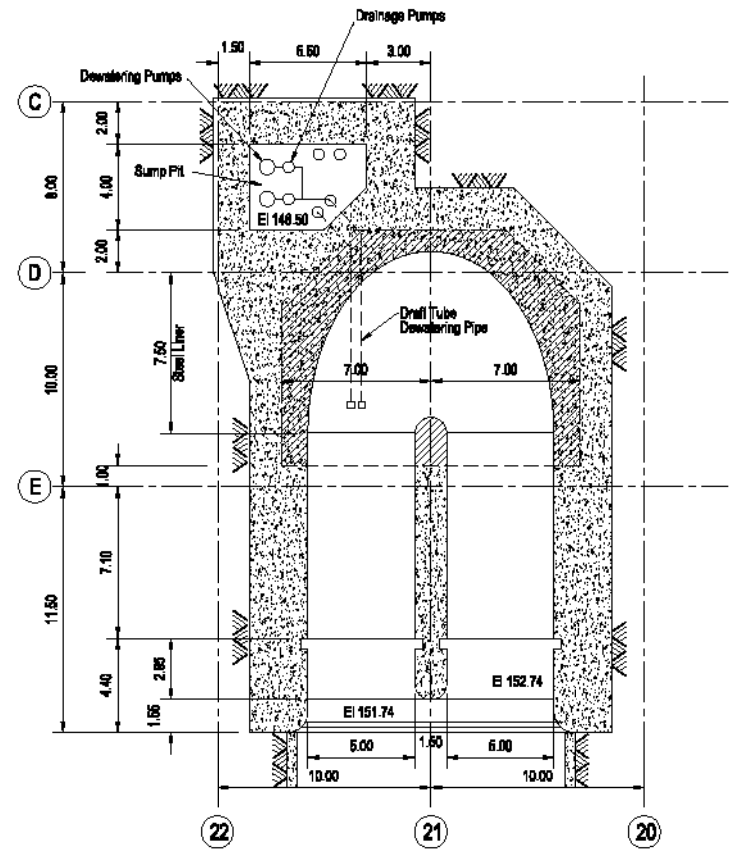
SECTION AT EL.161.0 M



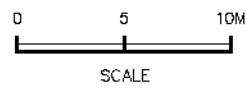
 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI 	Drawing Title: Powerhouse Floor Plan, El.164.5m & El.161.0m	Drawing No.: C-213 Date: Oct. 2008






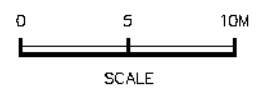
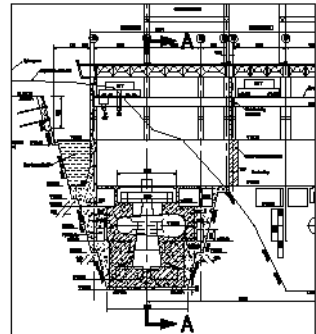
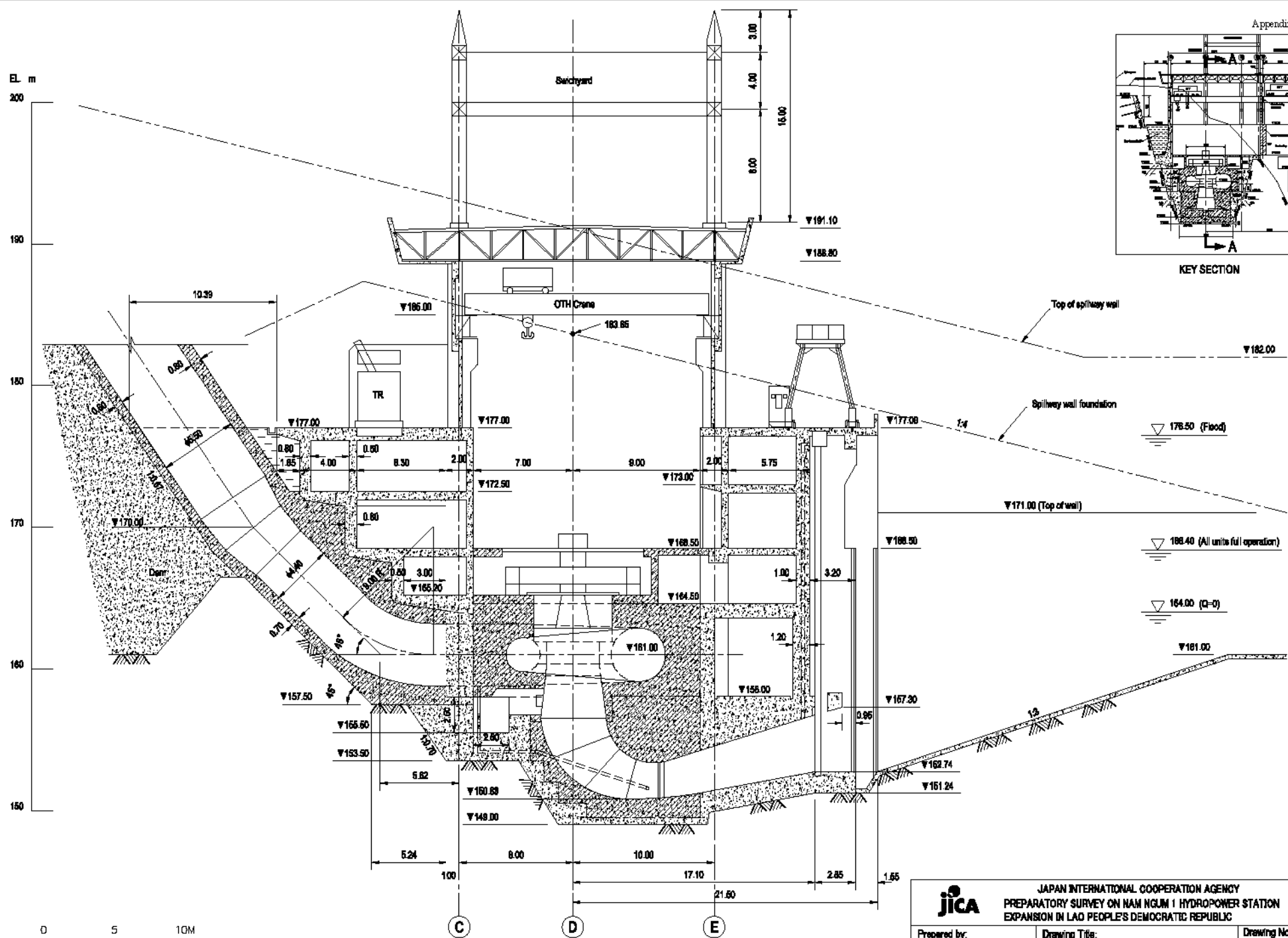
SECTION AT EL. 157 M



SECTION AT EL. 153 M

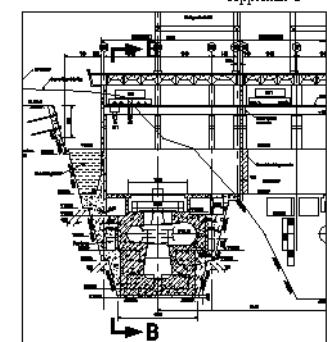
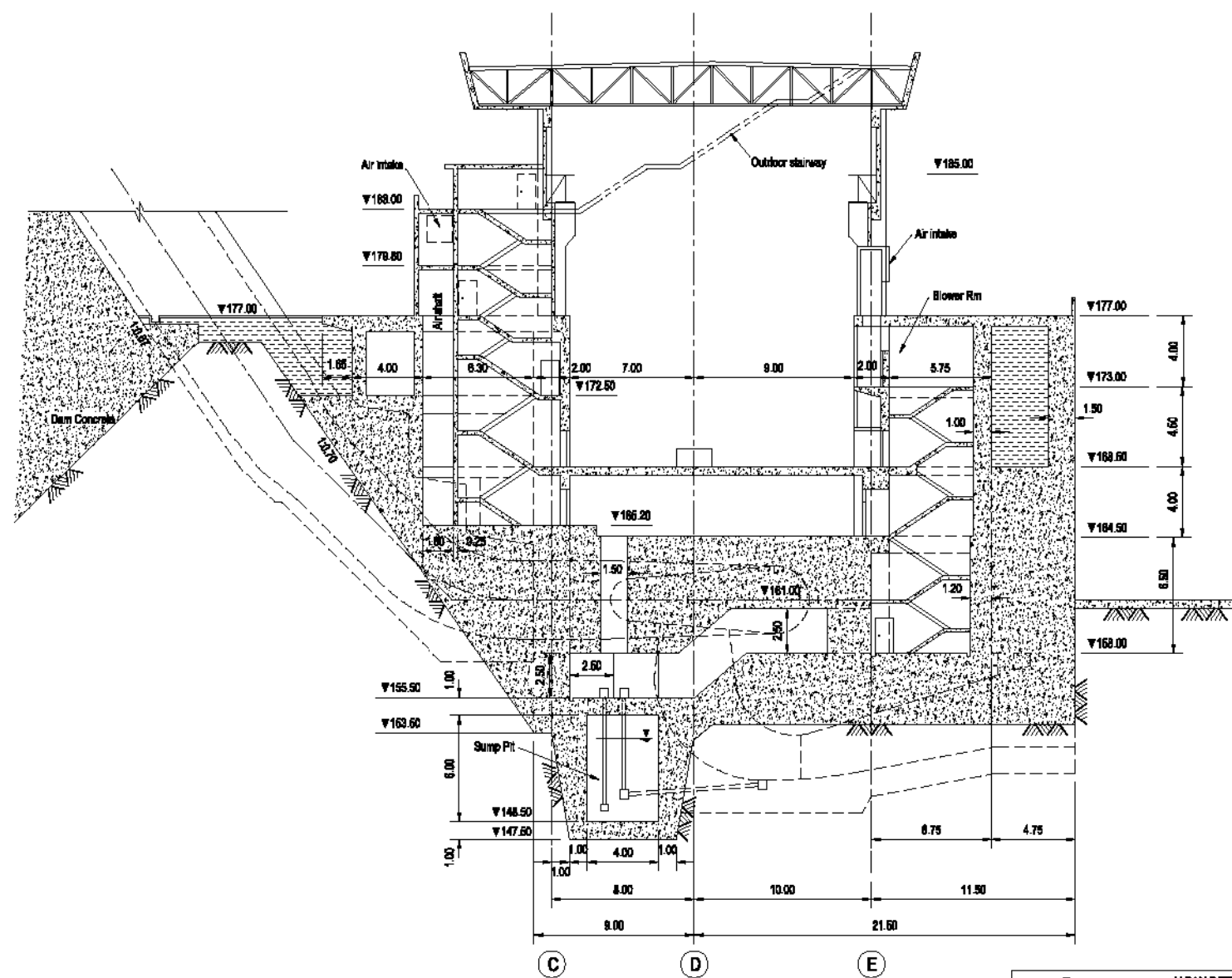


 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Powerhouse Floor Plan, El.157.0m & El.153.0m	Drawing No.: C-214 Date: Oct. 2008

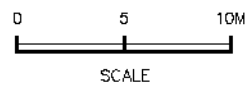


JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by: NIPPON KOEI POWER	Drawing Title: Powerhouse Cross Section A - A	Drawing No.: C-221 Date: Oct. 2008




El. m
200
190
180
170
160
150
140

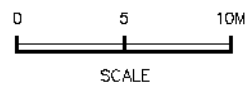
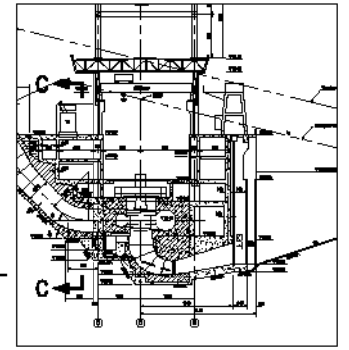
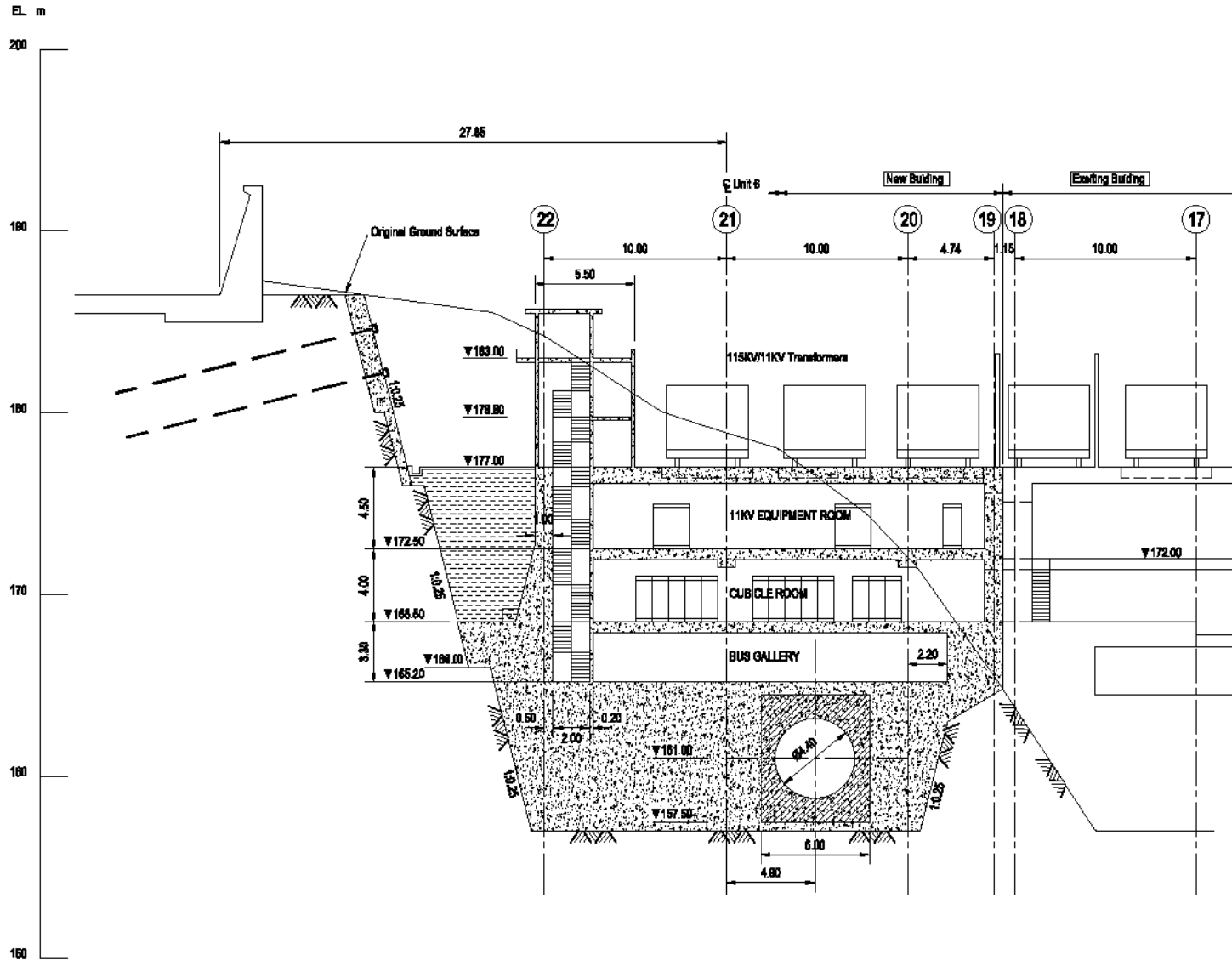


KEY SECTION


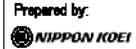



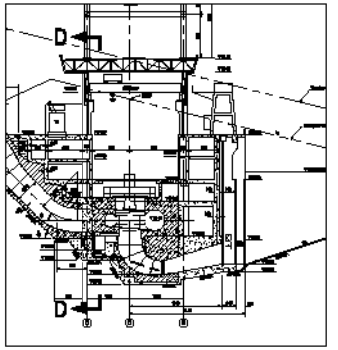
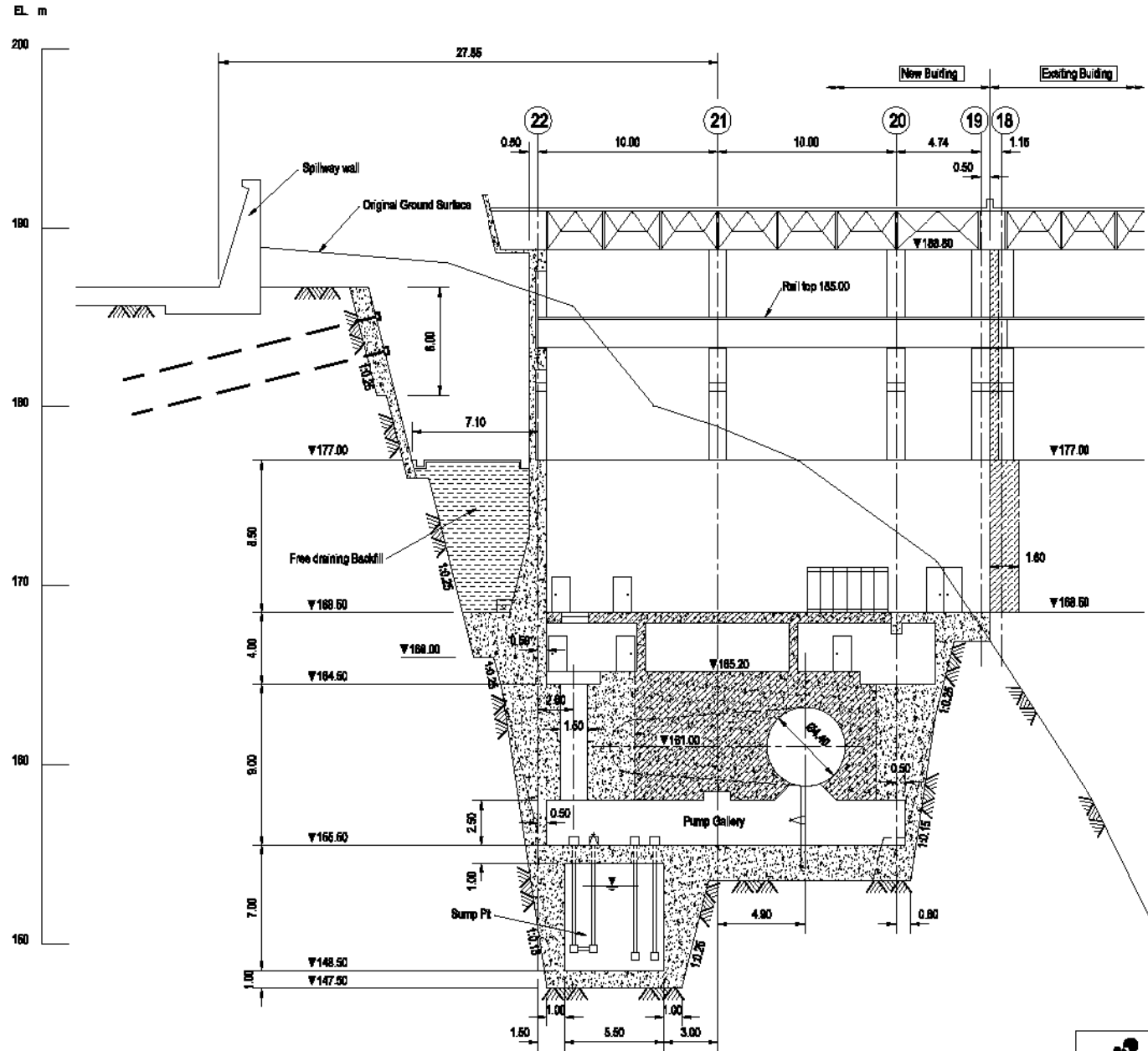
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 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI 	Drawing Title: Powerhouse Cross Section B - B	Drawing No.: C-222 Date: Oct. 2008

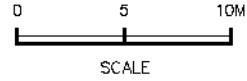


G-16




 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI 	Drawing Title: Powerhouse Longitudinal Section C - C	Drawing No.: C-223 Date: Oct. 2008

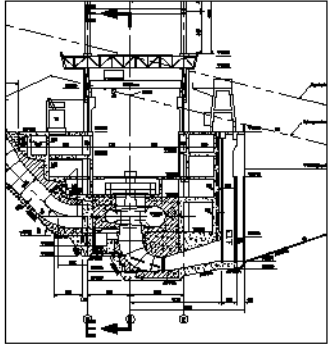
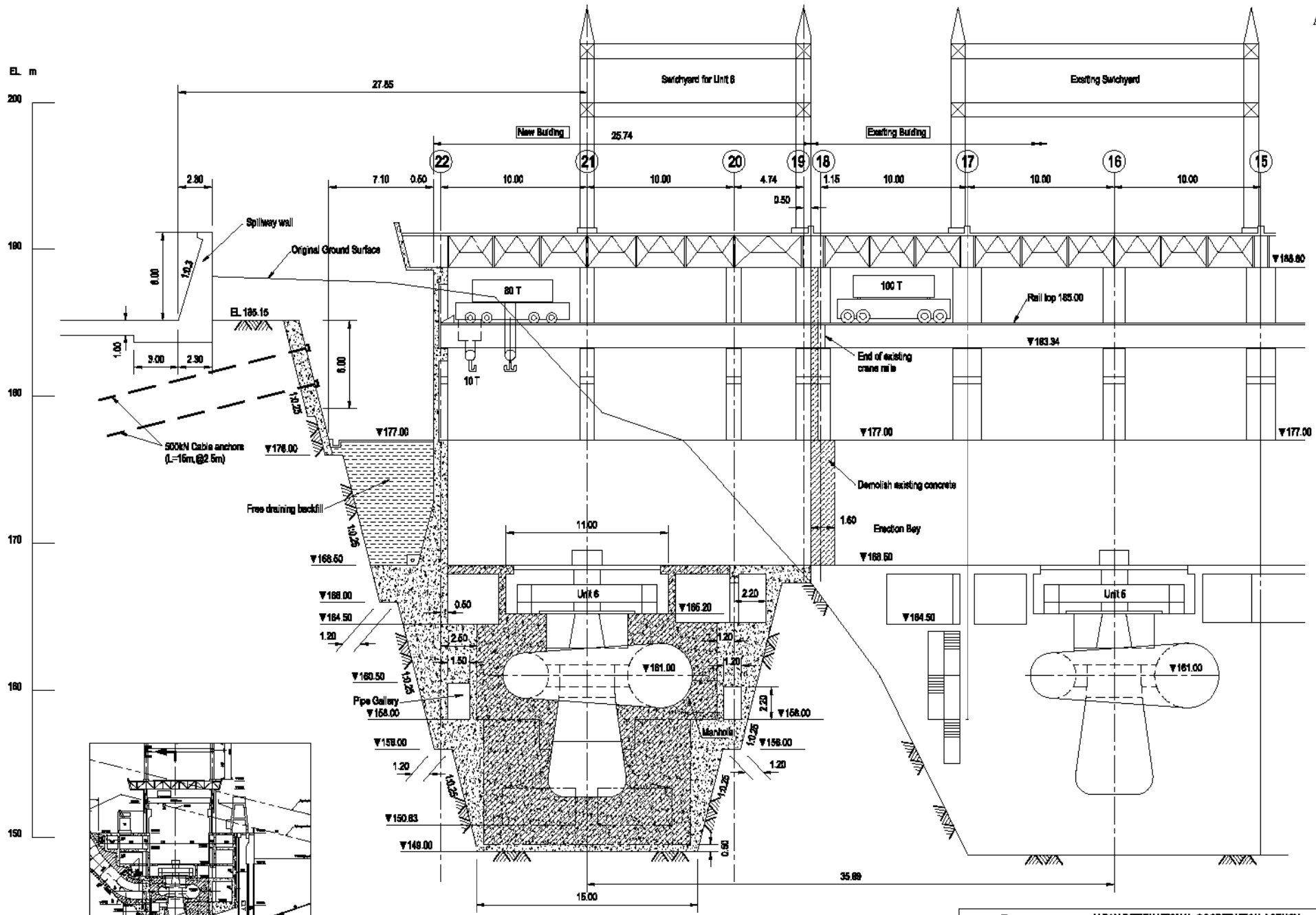


KEY SECTION



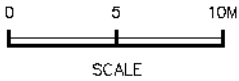
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 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Powerhouse Longitudinal Section D - D	Drawing No.: C-224 Date: Oct. 2008



KEY SECTION

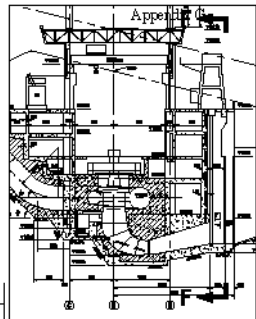
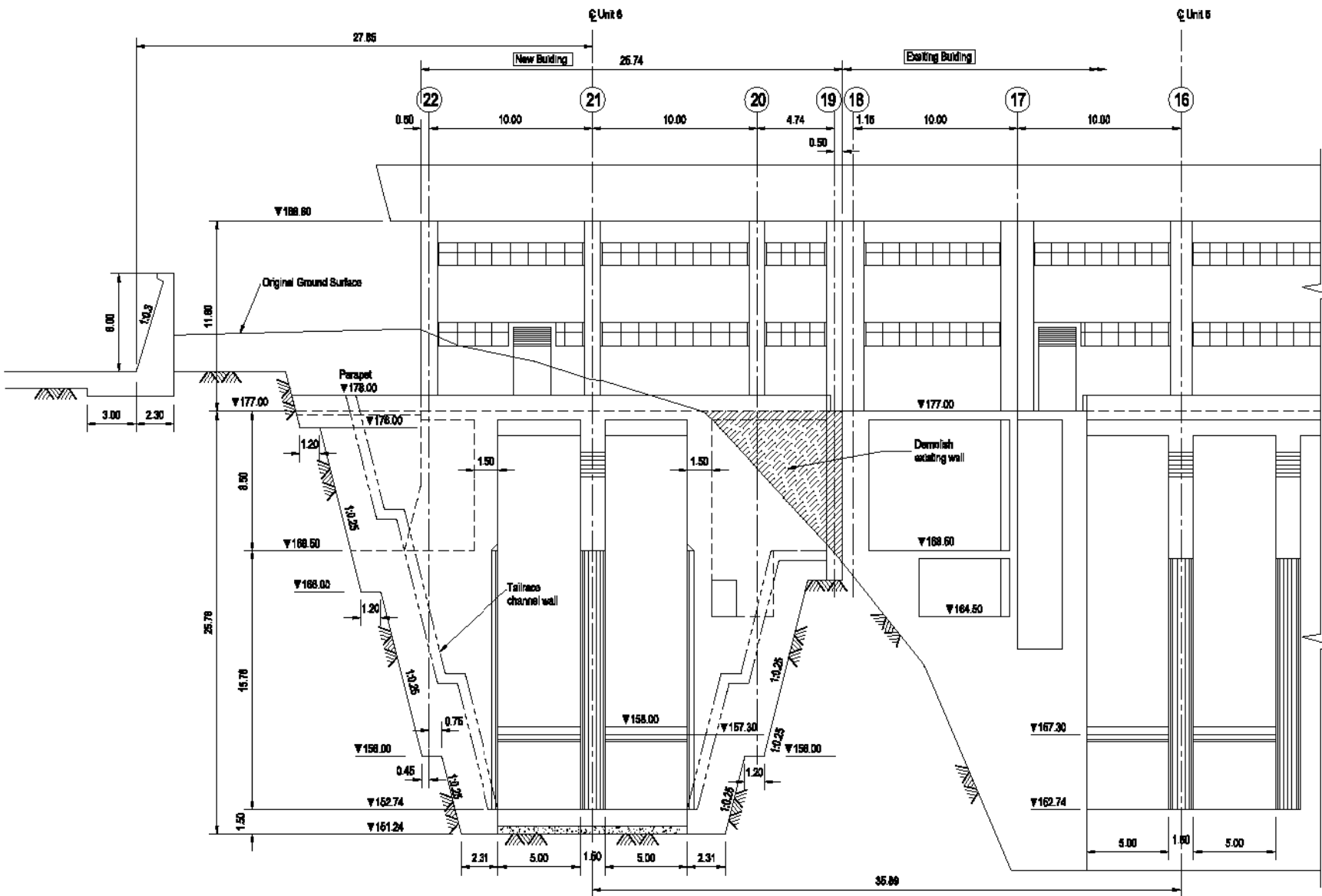
G-18




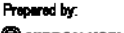

 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Powerhouse Longitudinal Section E - E	Drawing No.: C-225 Date: Oct. 2008

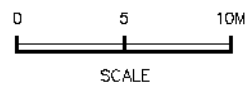
El. m

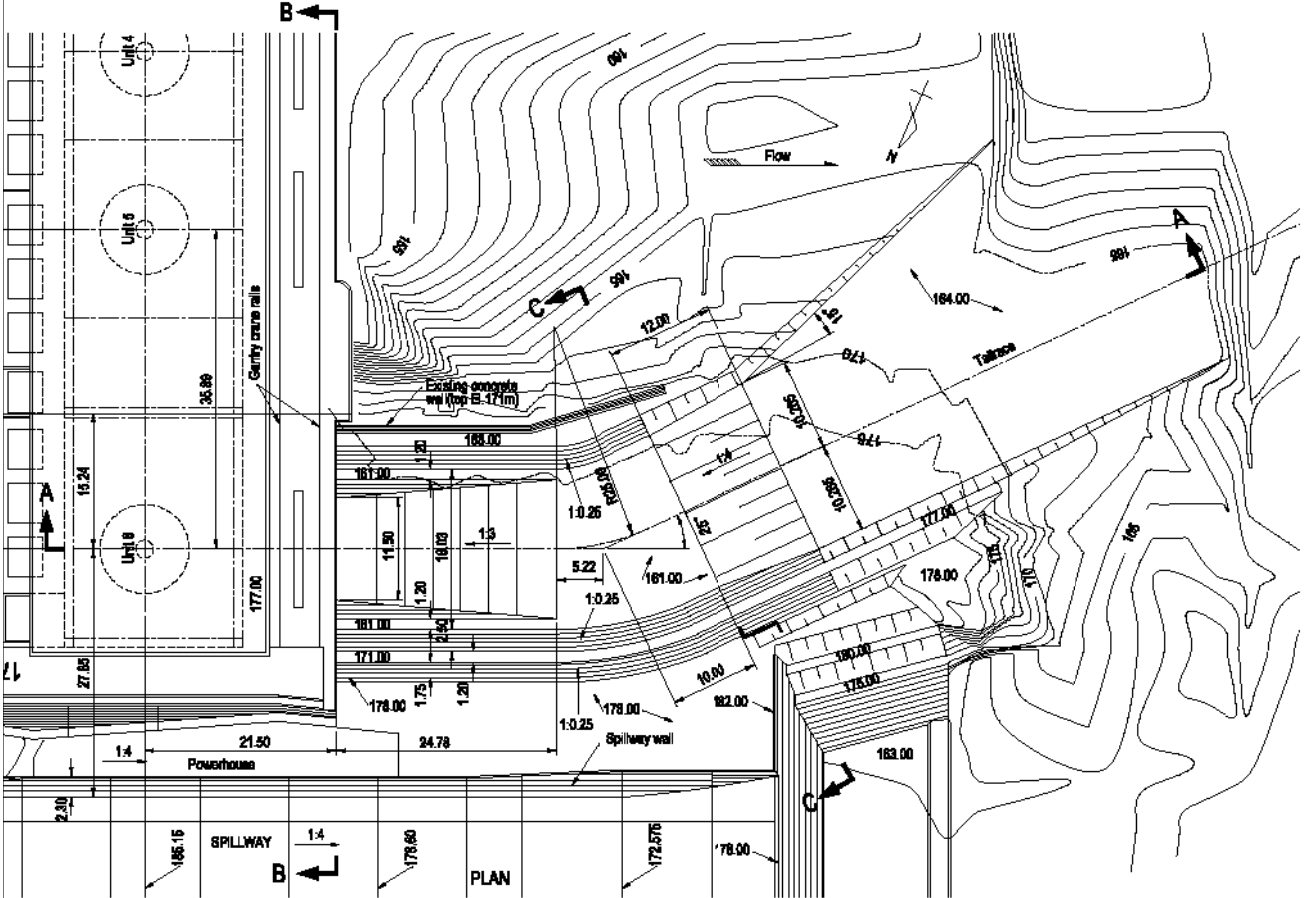
200
190
180
170
160
160



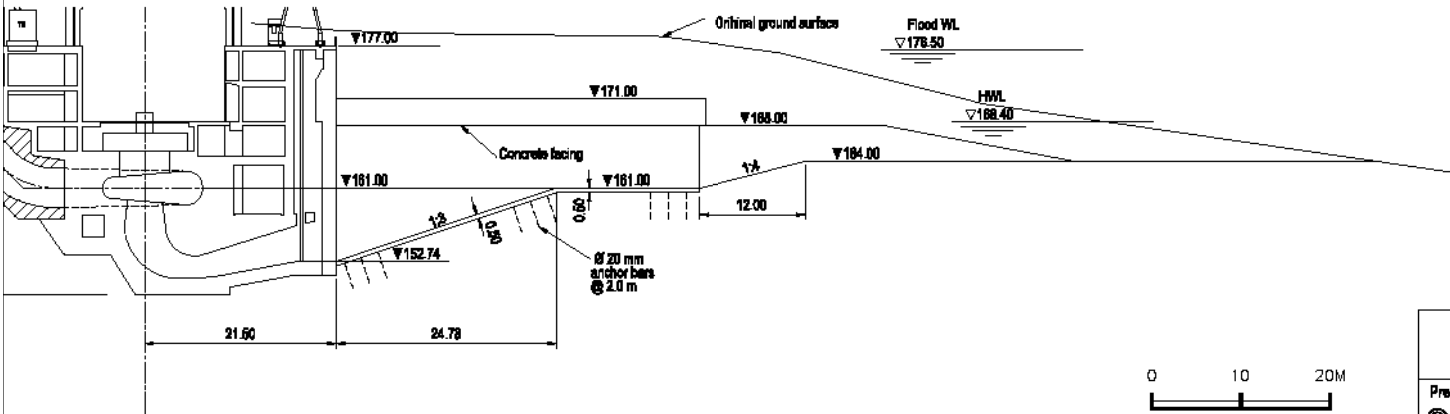
KEY SECTION

 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Powerhouse Longitudinal Section F - F	Drawing No.: C-226 Date: Oct. 2008

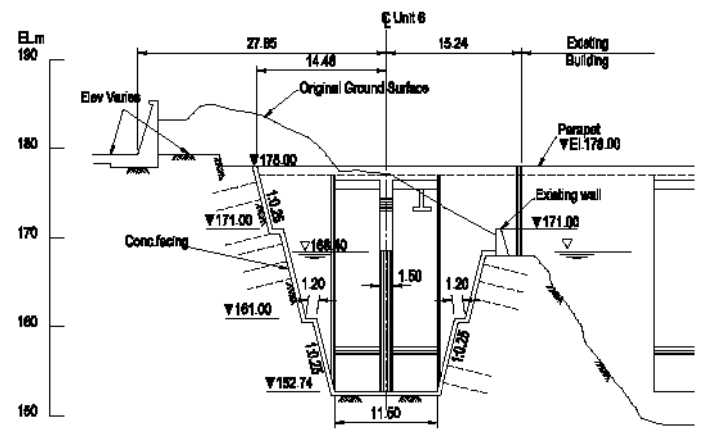




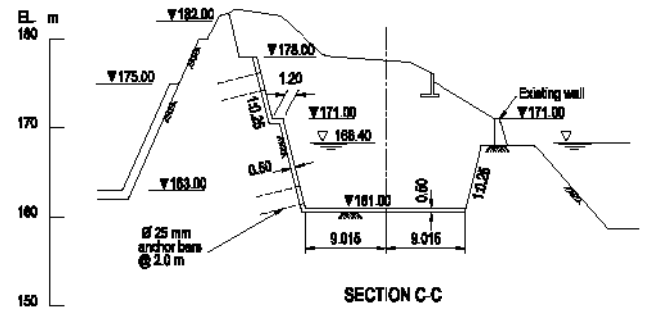
PLAN



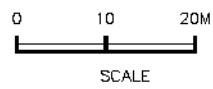
SECTION A-A






SECTION B-B

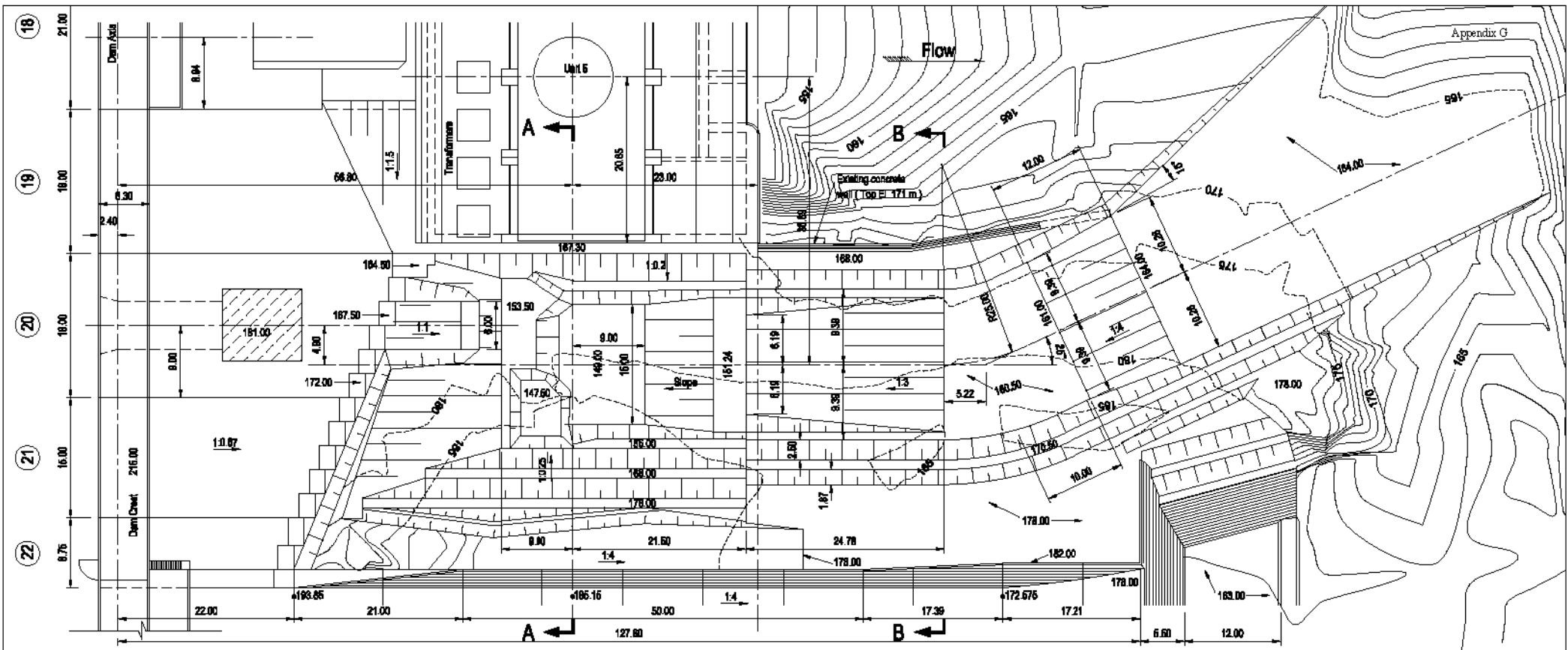


SECTION C-C

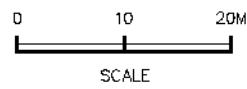
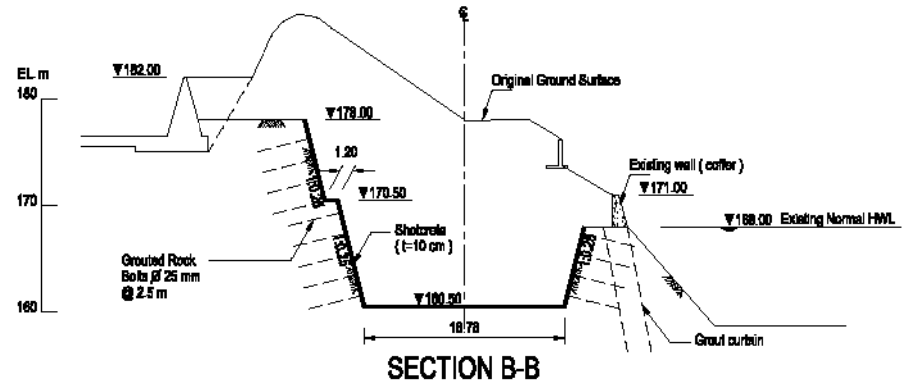
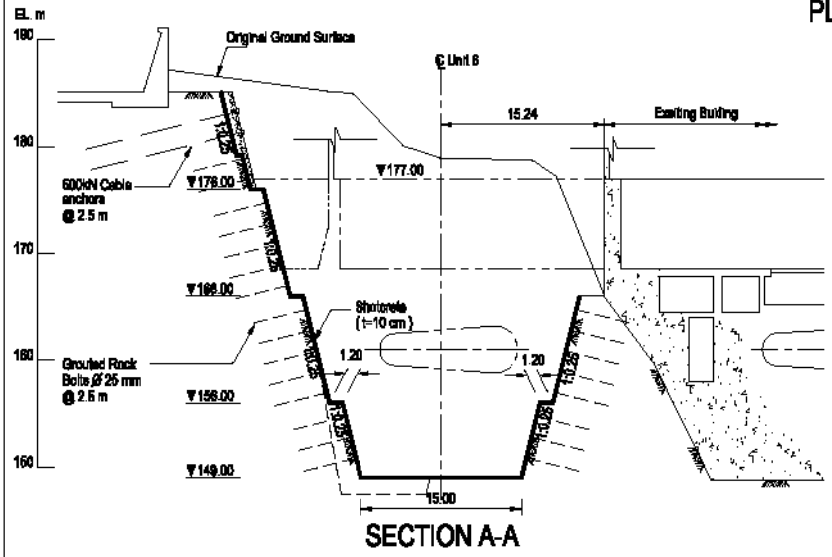


G-20

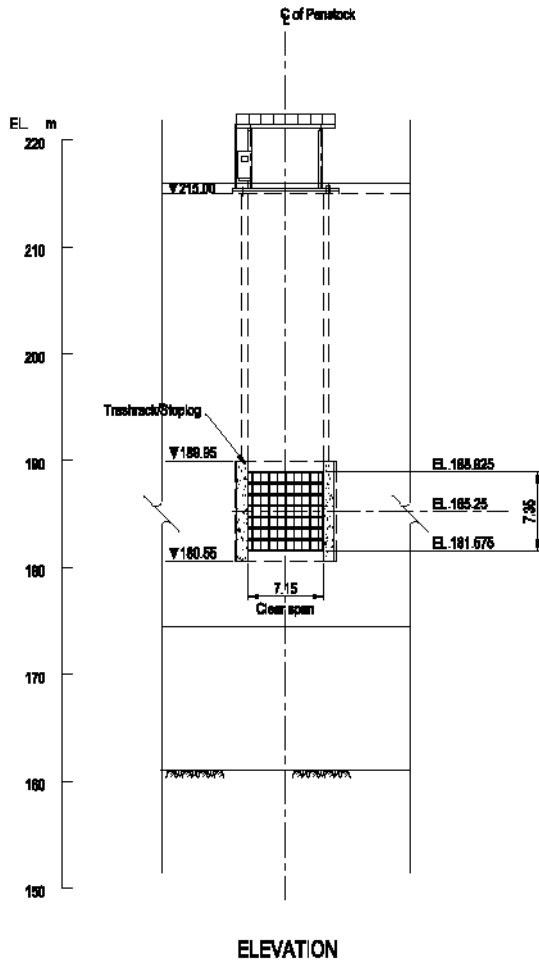
 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Tailrace Channel Plan and Sections	Drawing No.: C-230 Date: Oct. 2009



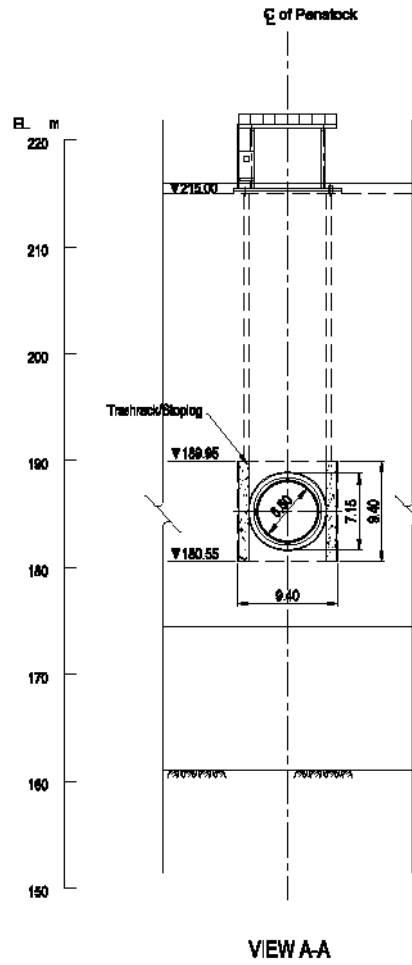
PLAN



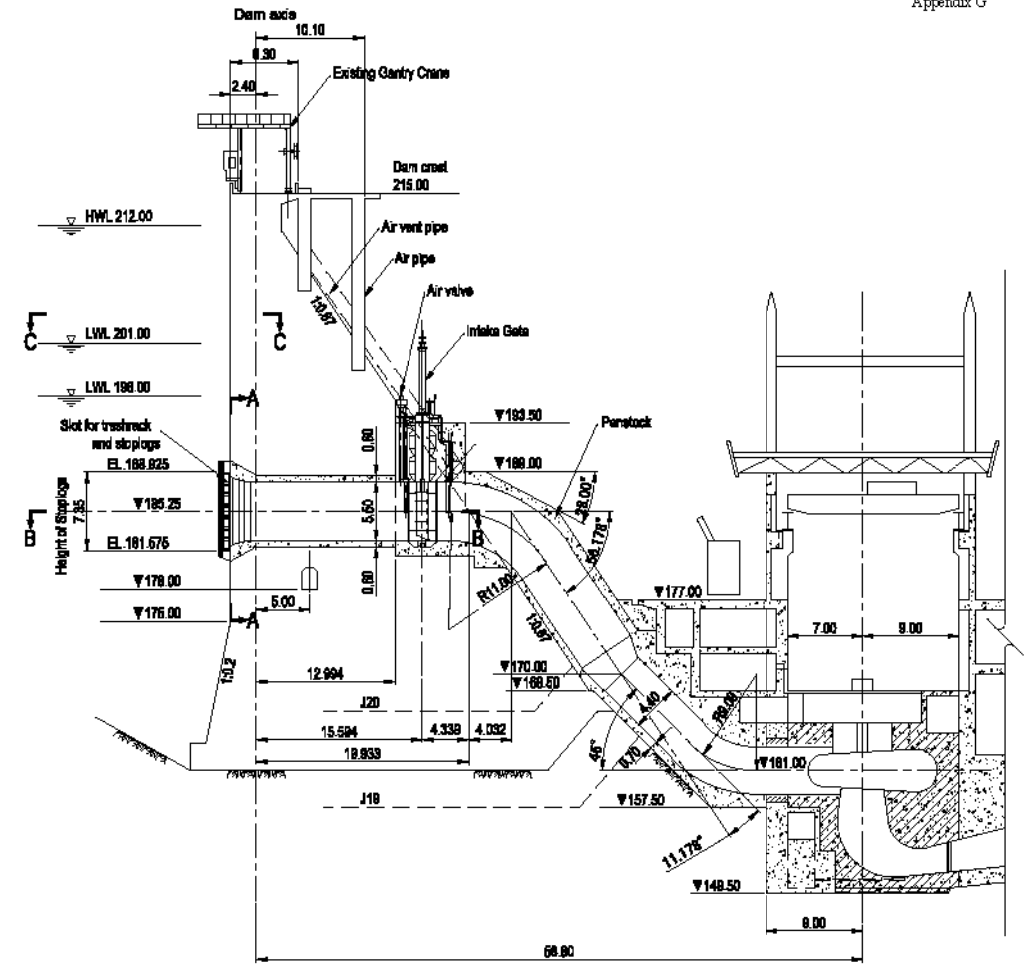
<p>JICA</p> <p>JAPAN INTERNATIONAL COOPERATION AGENCY</p> <p>PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION</p> <p>EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC</p>		
<p>Prepared by:</p> <p>NIPPON KOEI</p> <p>POWER</p>	<p>Drawing Title:</p> <p>Powerhouse and Tailrace</p> <p>Excavation Plan & Sections</p>	<p>Drawing No:</p> <p>C-240</p> <p>Date:</p> <p>Oct. 2008</p>



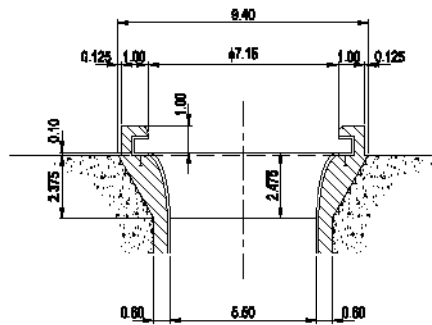
ELEVATION



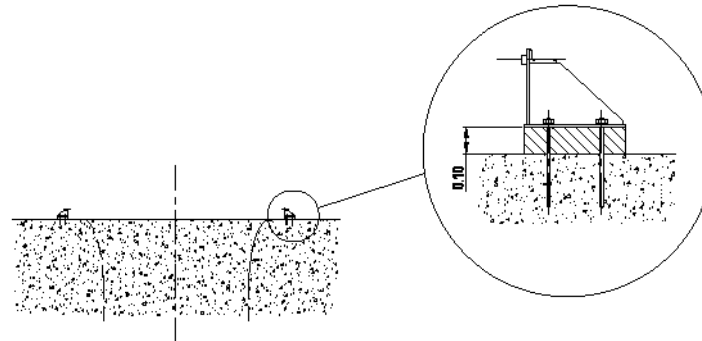
VIEW A-A



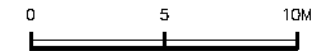
PROFILE



VIEW B-B



VIEW C-C

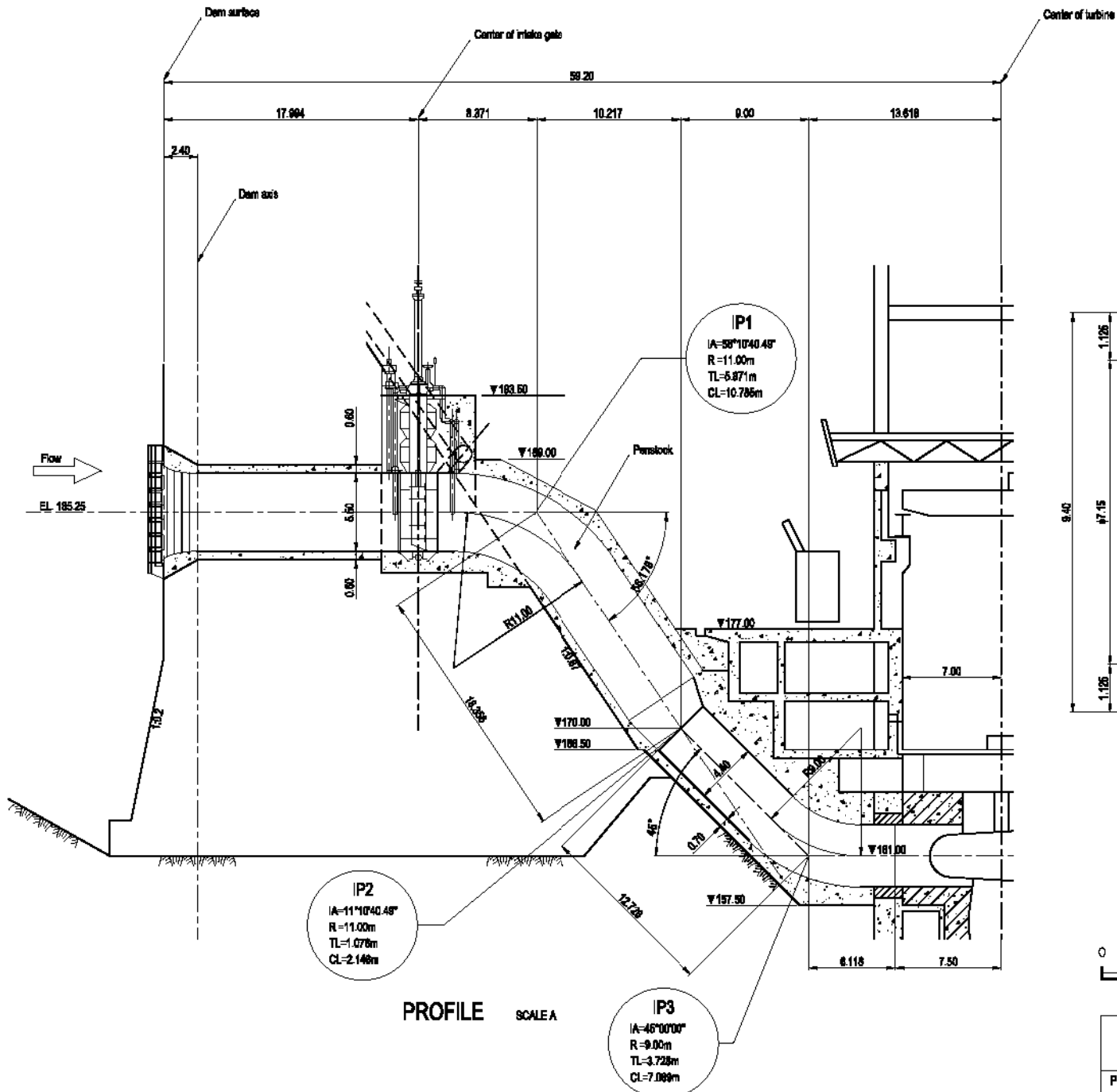


SCALE : 1/200

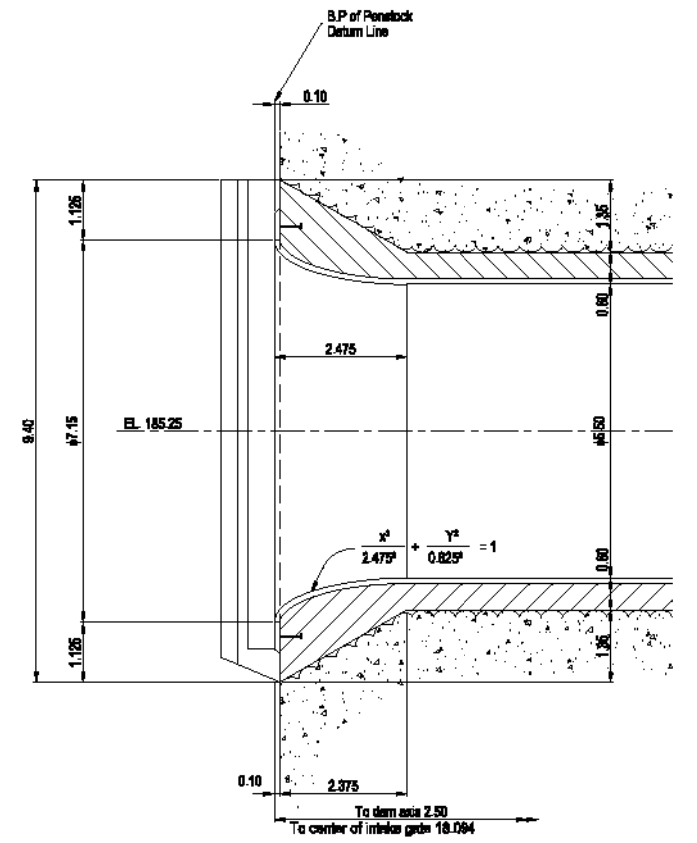


SCALE : 1/500

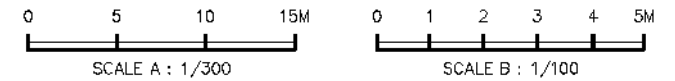
<p>JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC</p>		Drawing Title: Hydraulic Steel Works Intake Trashrack & Stoplog	Drawing No.: H-010
Prepared by: NIPPON KOEI POWER	Date: Oct. 2009		



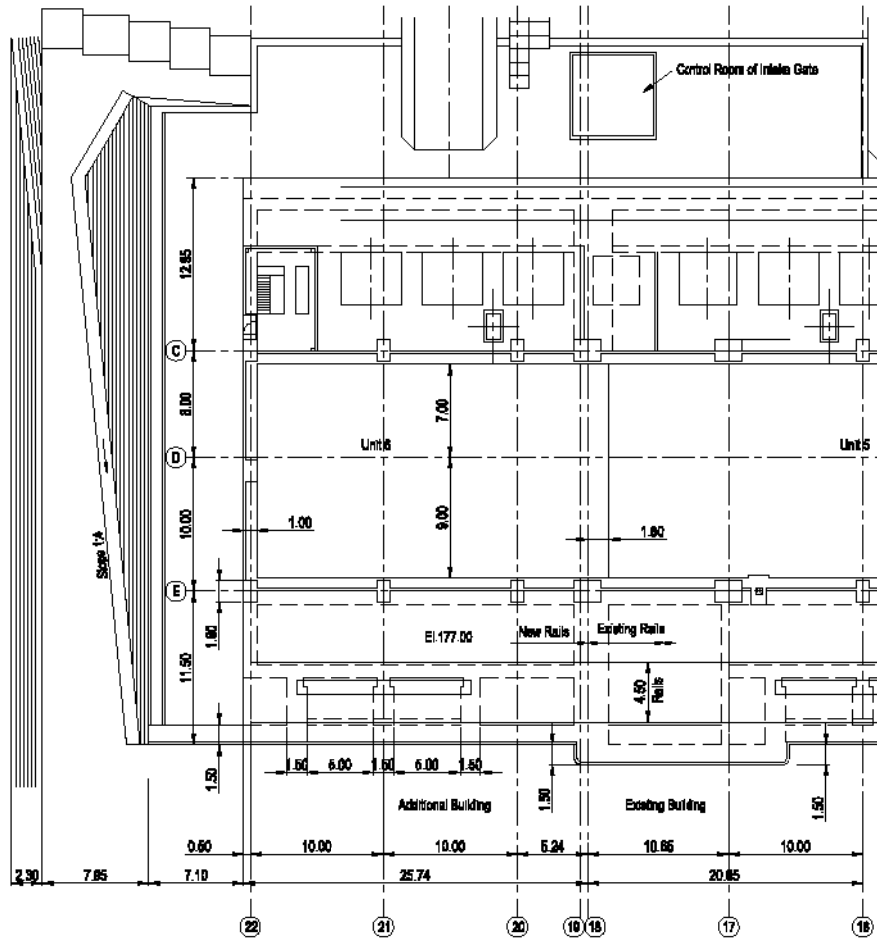
PROFILE SCALE A



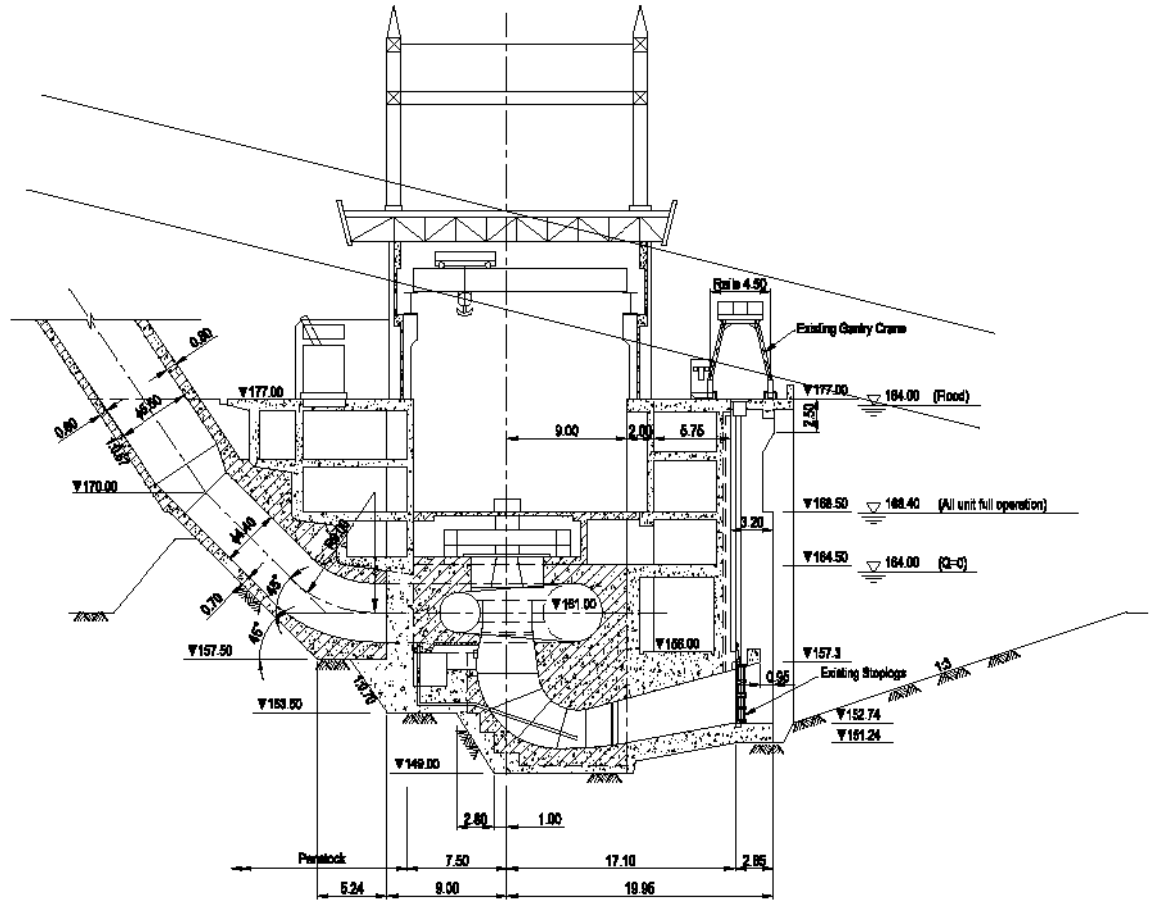
BELLMOUTH SCALE B



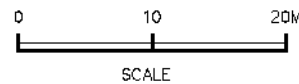
JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by: NIPPON KOEI POWER	Drawing Title: Hydraulic Steel Works Penstock Pipe	Drawing No.: H-020 Date: Oct. 2009






PLAN

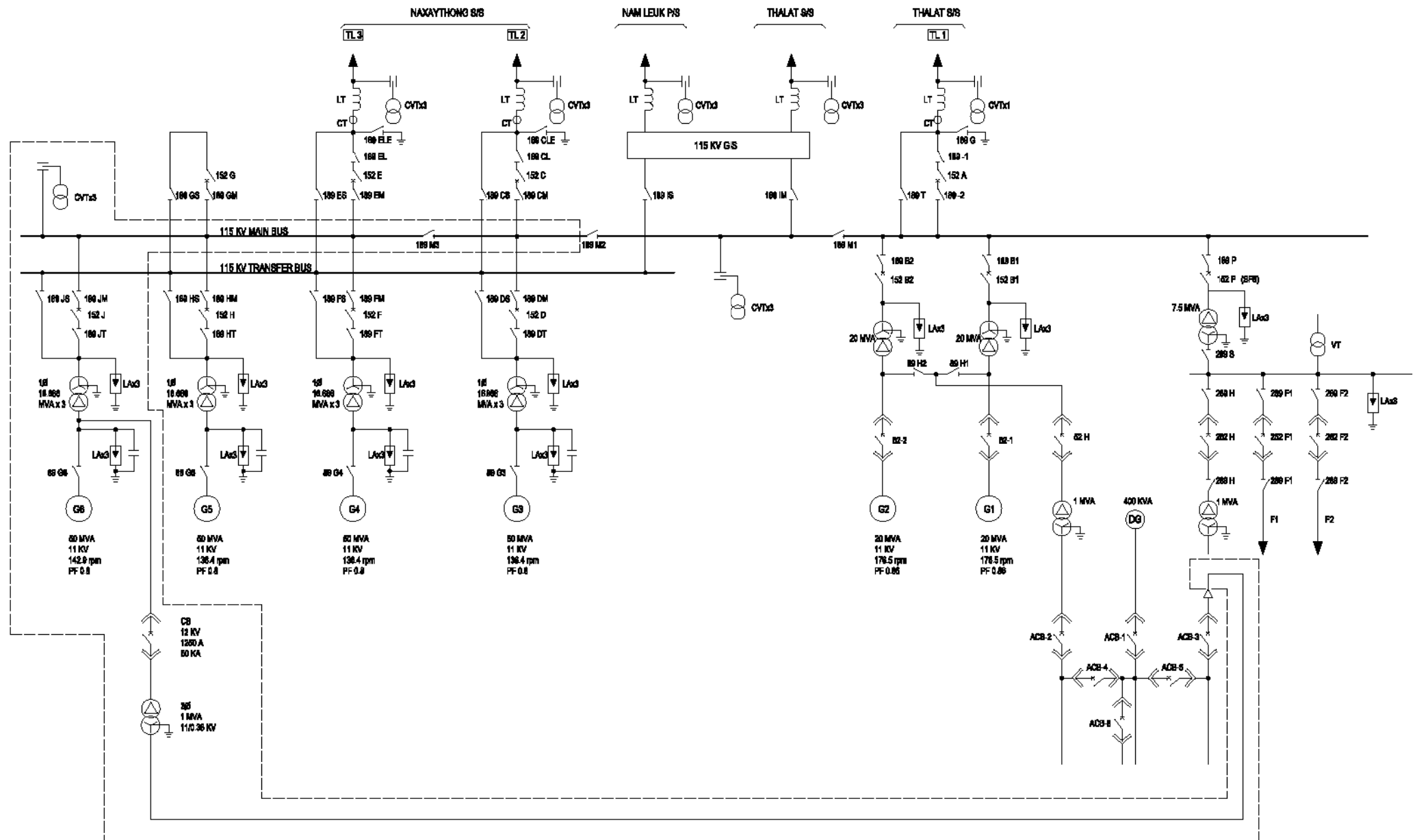


PROFILE



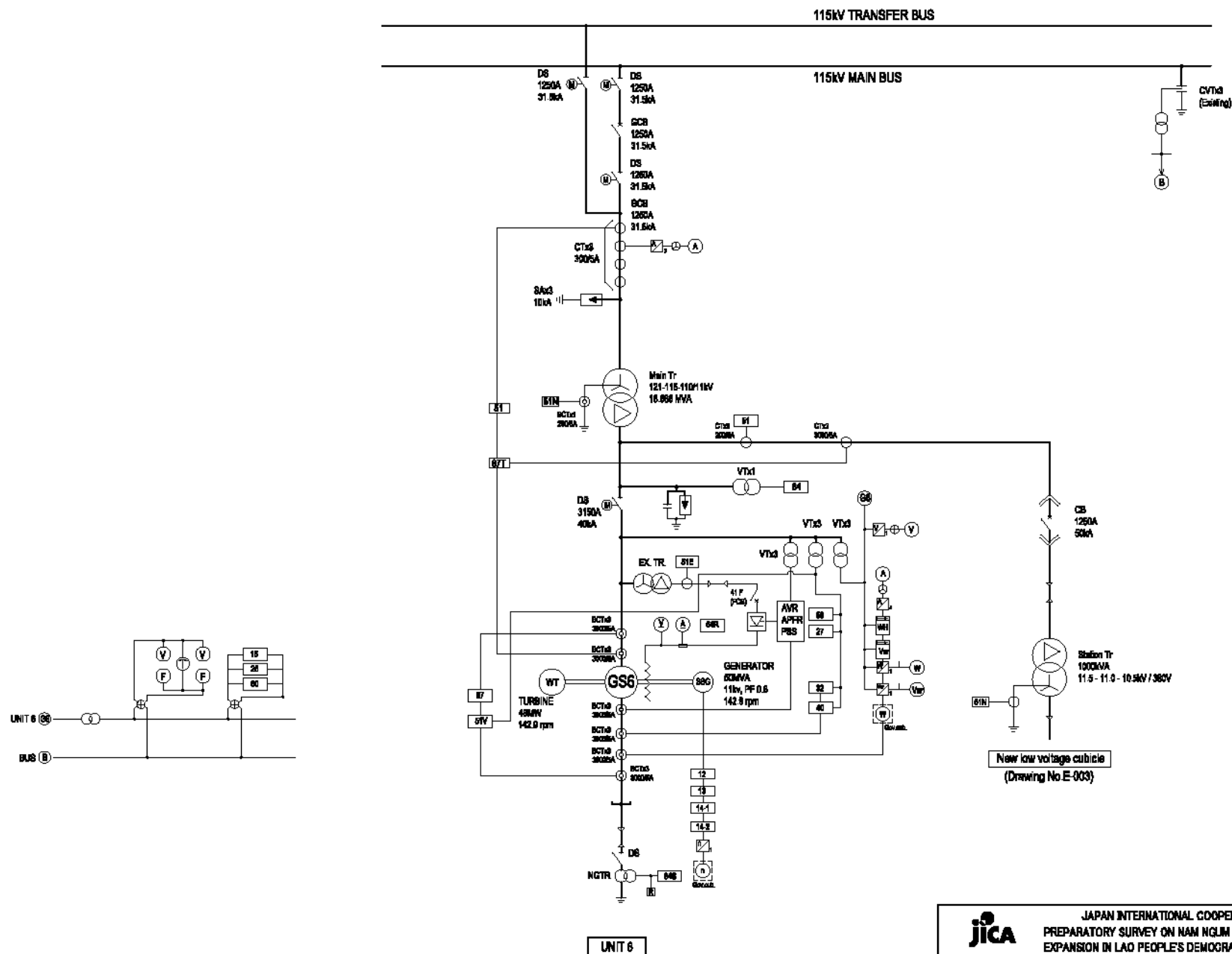
G-24


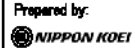

 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: Hydraulic Steel Works Draft Tube Gate Slot & Gantry Crane	Drawing No.: H-030 Date: Oct. 2009

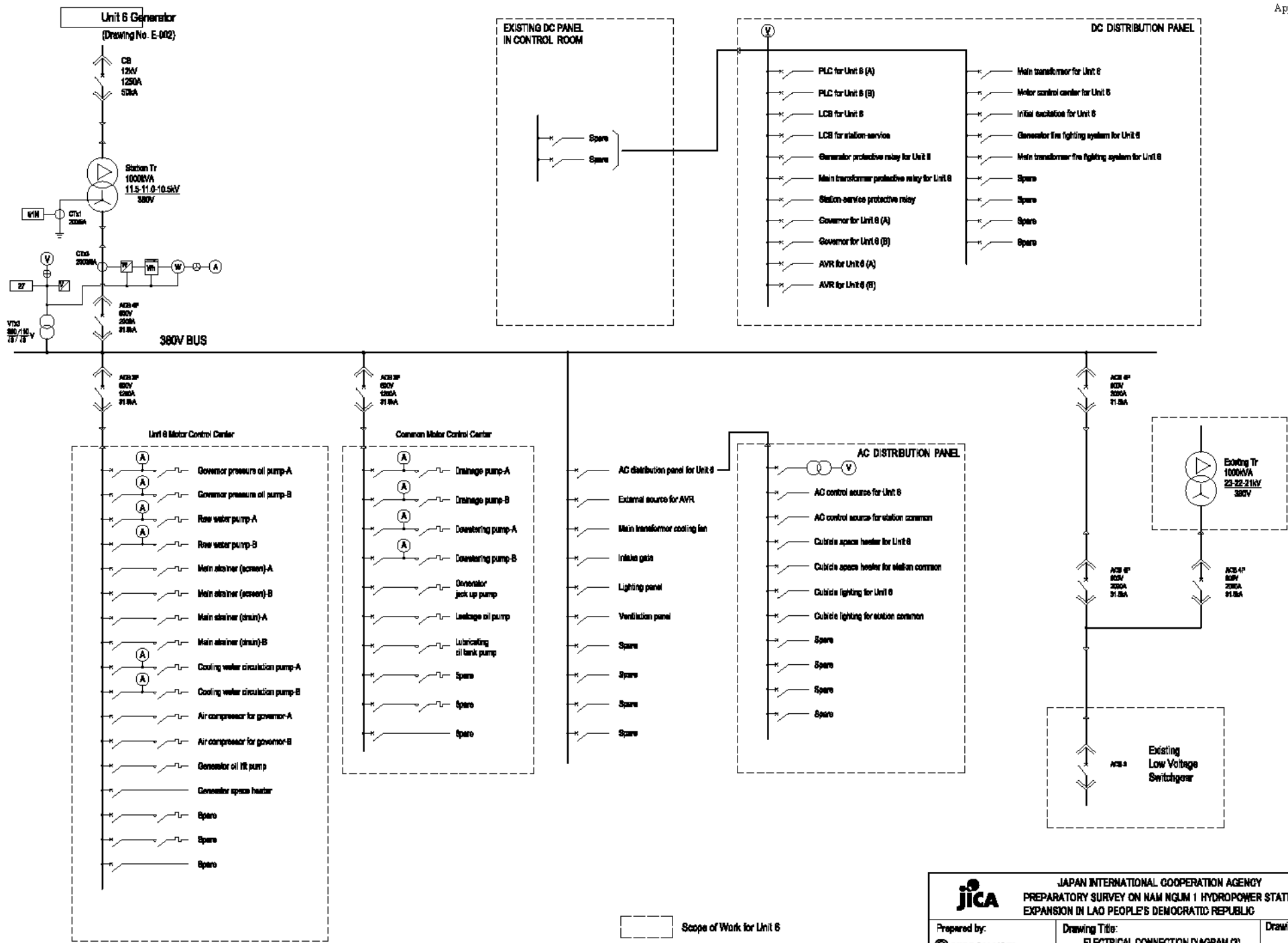


Scope of Work for Unit 6



<p>JICA JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC</p>		
<p>Prepared by: NIPPON KOEI </p>	<p>Drawing Title: ELECTRICAL CONNECTION DIAGRAM (1) OVERALL SCHEME</p>	<p>Drawing No: E-001</p> <p>Date: Jan. 2010</p>

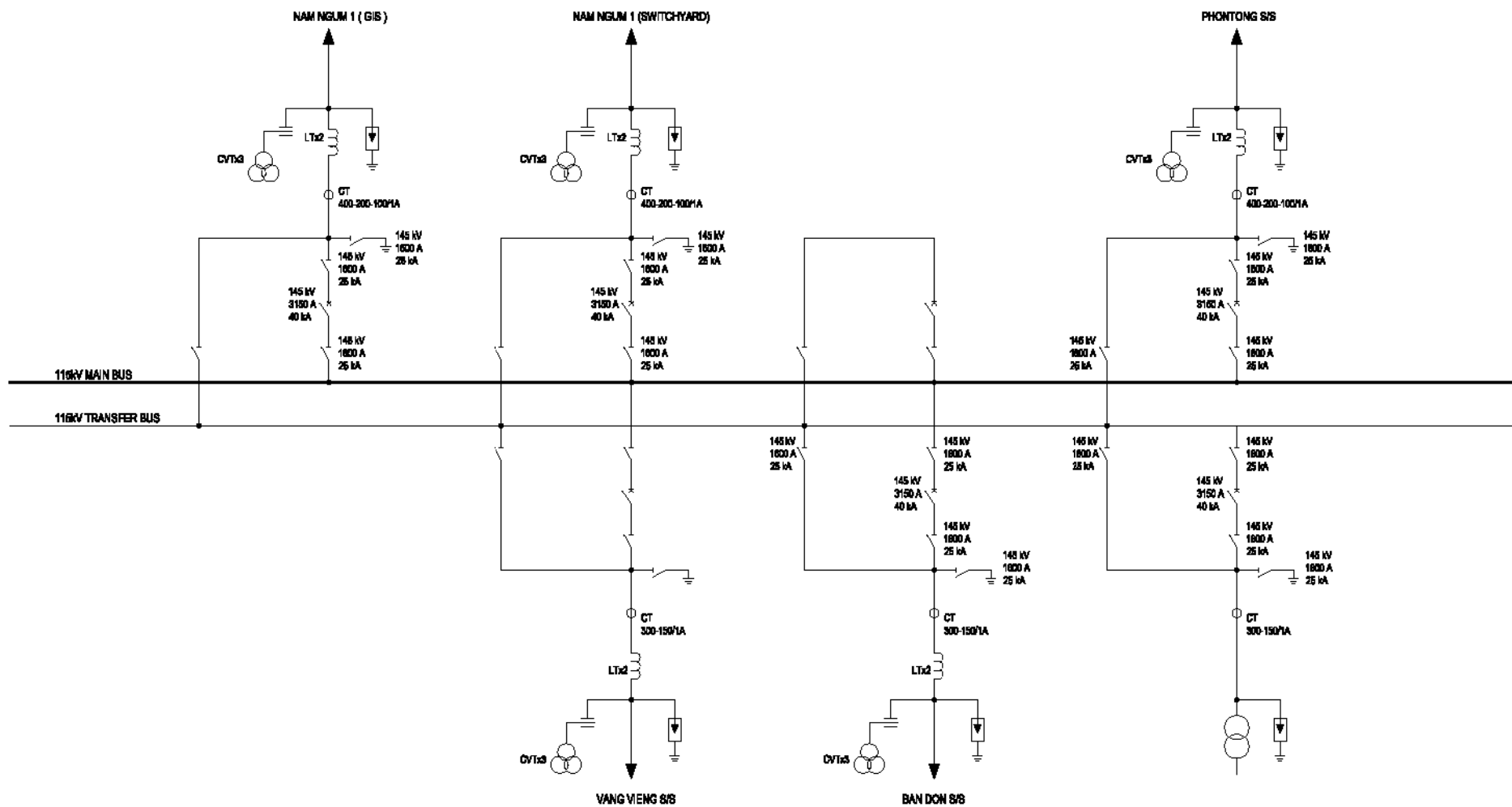


 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: ELECTRICAL CONNECTION DIAGRAM (2) MAIN CIRCUITS FOR UNIT6	Drawing No: E-002 Date: Oct. 2008






Scope of Work for Unit 6

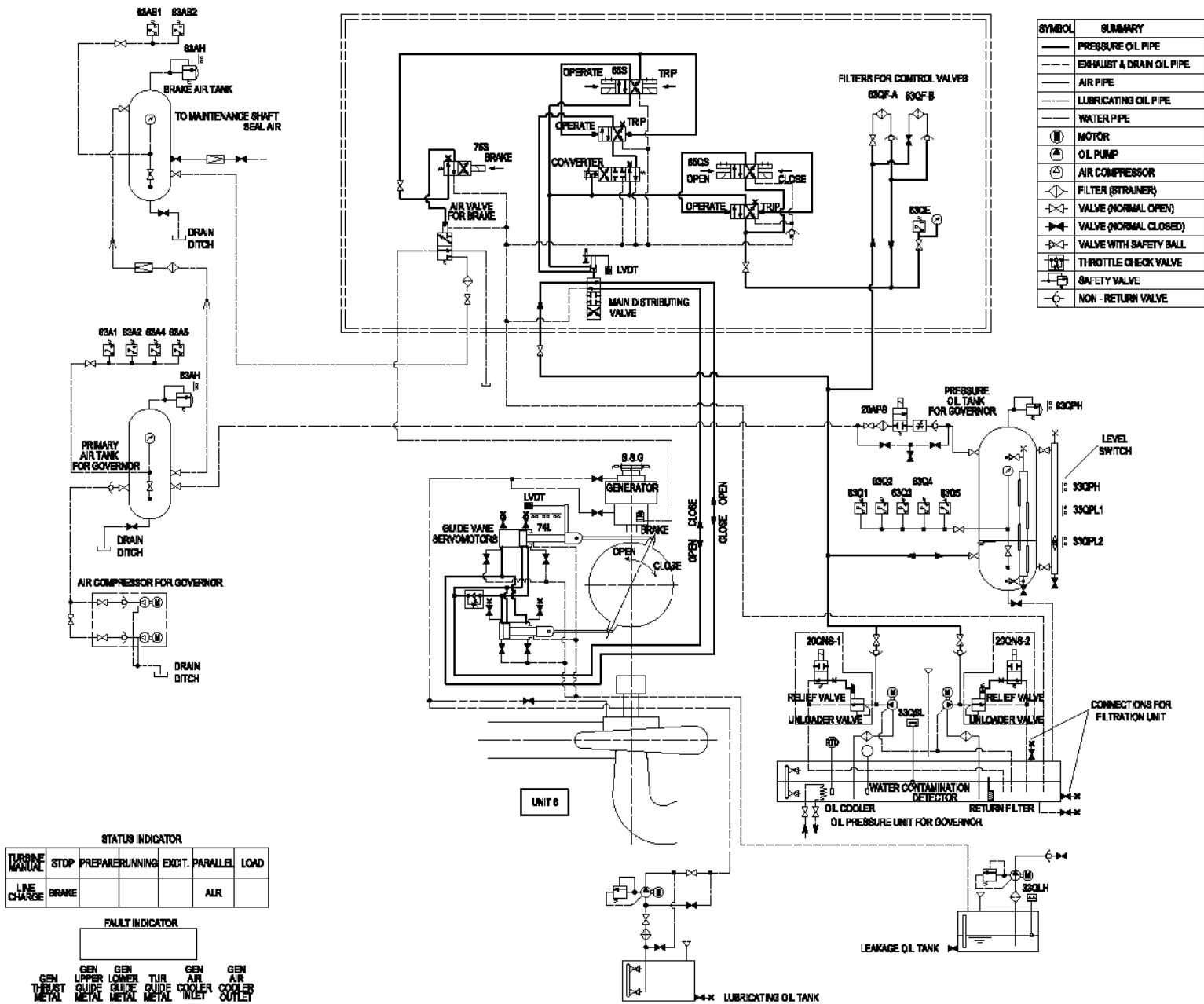
 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI POWER	Drawing Title: ELECTRICAL CONNECTION DIAGRAM (3) STATION-SERVICE CIRCUITS	Drawing No: E-003 Date: Jan. 2010



Note

The existing conductors for the 115 kV main bus shall be replaced by ACSR 410 mm² or equivalent.

 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:	Drawing Title:	Drawing No:
 NIPPON KOEI 	ELECTRICAL CONNECTION DIAGRAM(4) THALAT SUBSTATION	E-004
		Date: Oct. 2008



SYMBOL	SUMMARY
—	PRESSURE OIL PIPE
- - -	EXHAUST & DRAIN OIL PIPE
---	AIR PIPE
- · - · -	LUBRICATING OIL PIPE
---	WATER PIPE
Ⓜ	MOTOR
Ⓜ	OIL PUMP
Ⓜ	AIR COMPRESSOR
Ⓜ	FILTER (STRAINER)
Ⓜ	VALVE (NORMAL OPEN)
Ⓜ	VALVE (NORMAL CLOSED)
Ⓜ	VALVE WITH SAFETY BALL
Ⓜ	THROTTLE CHECK VALVE
Ⓜ	SAFETY VALVE
Ⓜ	NON - RETURN VALVE

SYMBOL	SUMMARY
Ⓜ	PRESSURE GAUGE
Ⓜ	RTD
Ⓜ	AIR BREATHER
Ⓜ	PRESSURE SWITCH
Ⓜ	DIFFERENTIAL TRANSFORMER (LVDT)
Ⓜ	LIMIT SWITCH (POSITION SWITCH)
Ⓜ	SOLENOID OPERATION
Ⓜ	DETENT MECHANISM
Ⓜ	PRESSURE OIL OPERATION
Ⓜ	SPRING OPERATION
Ⓜ	THROTTLE VALVE
Ⓜ	PLUG OR COVER
Ⓜ	REDUCING VALVE

STATUS INDICATOR

TURBINE MANUAL	STOP	PREPARING	RUNNING	EXCIT.	PARALLEL	LOAD
LINE CHARGE	BRAKE				AIR	

FAULT INDICATOR

GEN TURBINE METAL	GEN UPPER GUIDE METAL	GEN LOWER GUIDE METAL	TURBINE GUIDE METAL	GEN AIR COOLER INLET	GEN AIR COOLER OUTLET
I	T	I	T	I	T

SPRINKLER CASE (S)

TACH-METER INDICATOR (M)

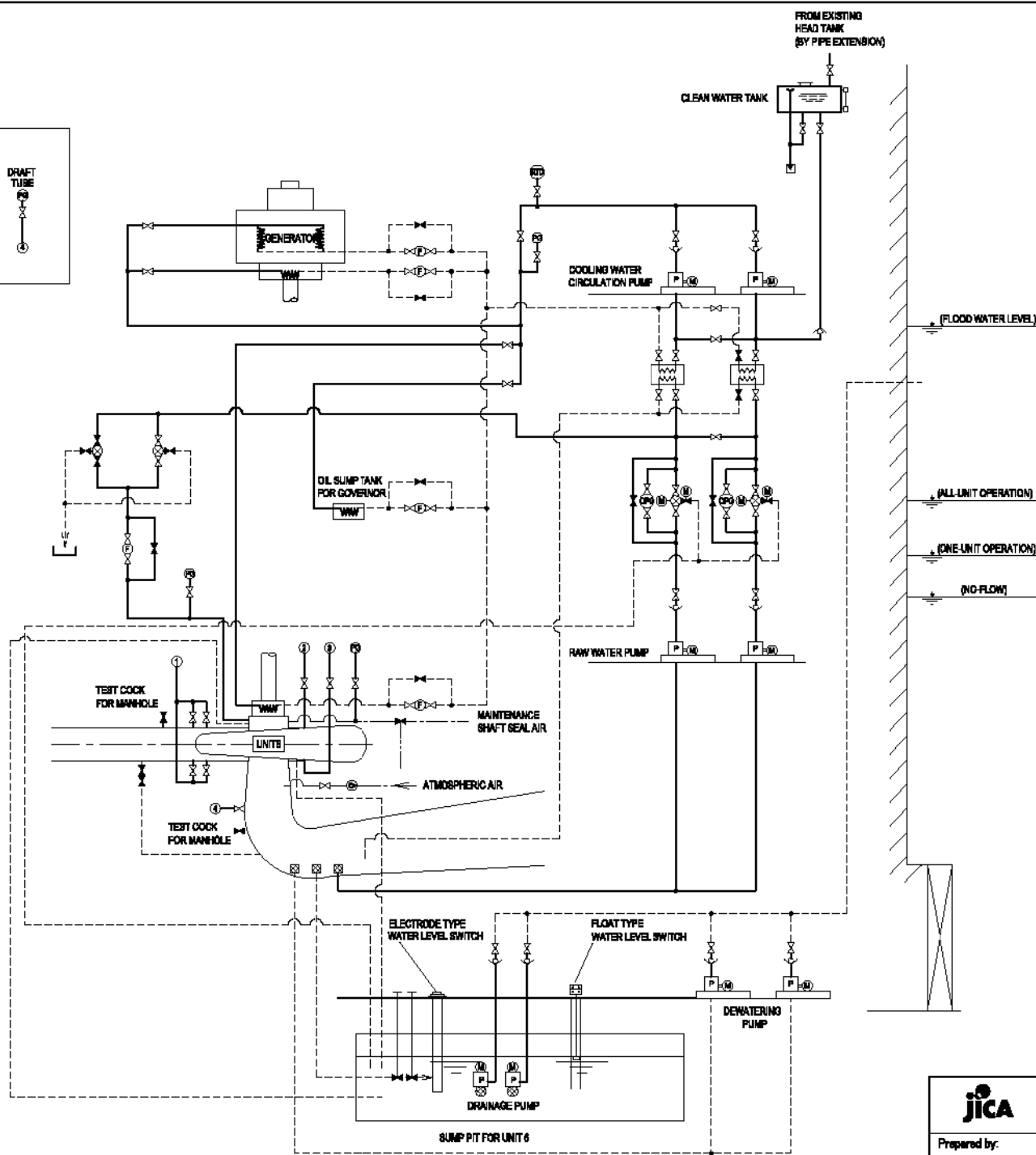
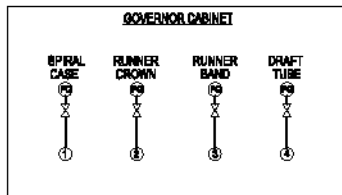
POSITION INDICATOR (W)

JICA JAPAN INTERNATIONAL COOPERATION AGENCY
 PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION
 EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

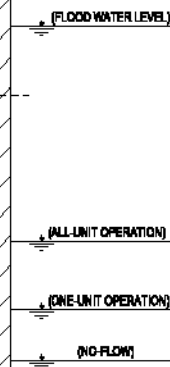
Prepared by: **NIPPON KOEI POWER**

Drawing Title: **SCHEMATIC DIAGRAM(1)
 PRESSURE OIL AND COMPRESSED AIR
 SUPPLY SYSTEM**

Drawing No: **E-011**
 Date: **Oct 2008**



SYMBOL	DESCRIPTION
—	WATER SUPPLY PIPE
- - -	WATER DISCHARGE PIPE
- · - · -	AIR SUPPLY PIPE
- · - - -	AIR VENT PIPE
⊗	STRAINER (MANUAL)
⊗	STRAINER (MOTOR OPERATED)
⊗	STOP VALVE (NORMALLY OPENED)
⊗	STOP VALVE (NORMALLY CLOSED)
⊗	MOTOR OPERATED VALVE
⊗	OIL PRESSURE OPERATED VALVE
⊗	NON - RETURN VALVE
⊗	AIR ADMISSION VALVE
⊗	FLOW METER WITH ALARM CONTACT
⊗	PRESSURE GAUGE
⊗	DIFFERENTIAL PRESSURE GAUGE
⊗	RTD
⊗	SCREEN OR FILTER
⊗	PRESSURE REDUCER
⊗	SAFETY VALVE

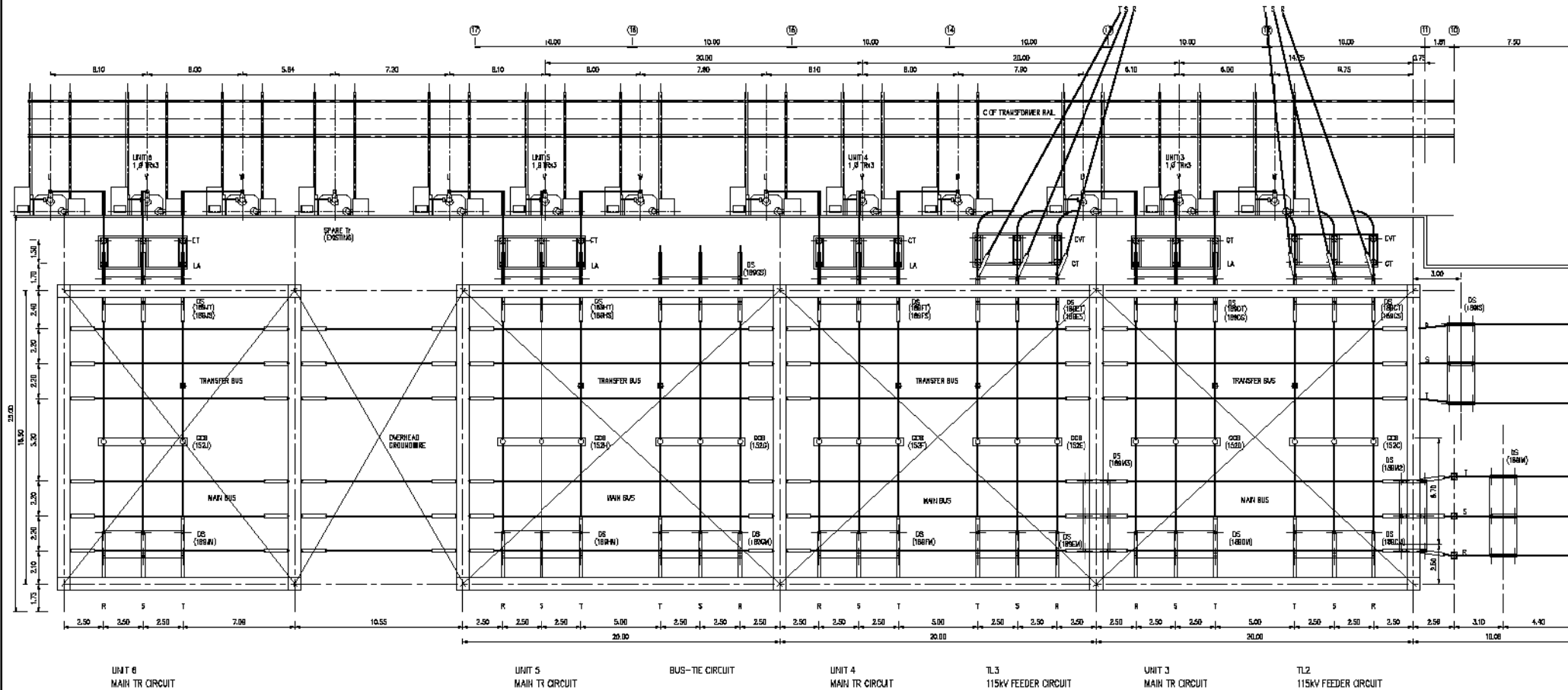



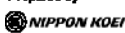

JICA JAPAN INTERNATIONAL COOPERATION AGENCY
 PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION
 EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC

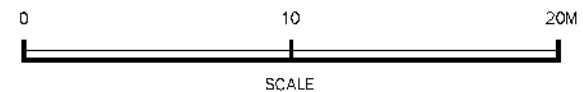
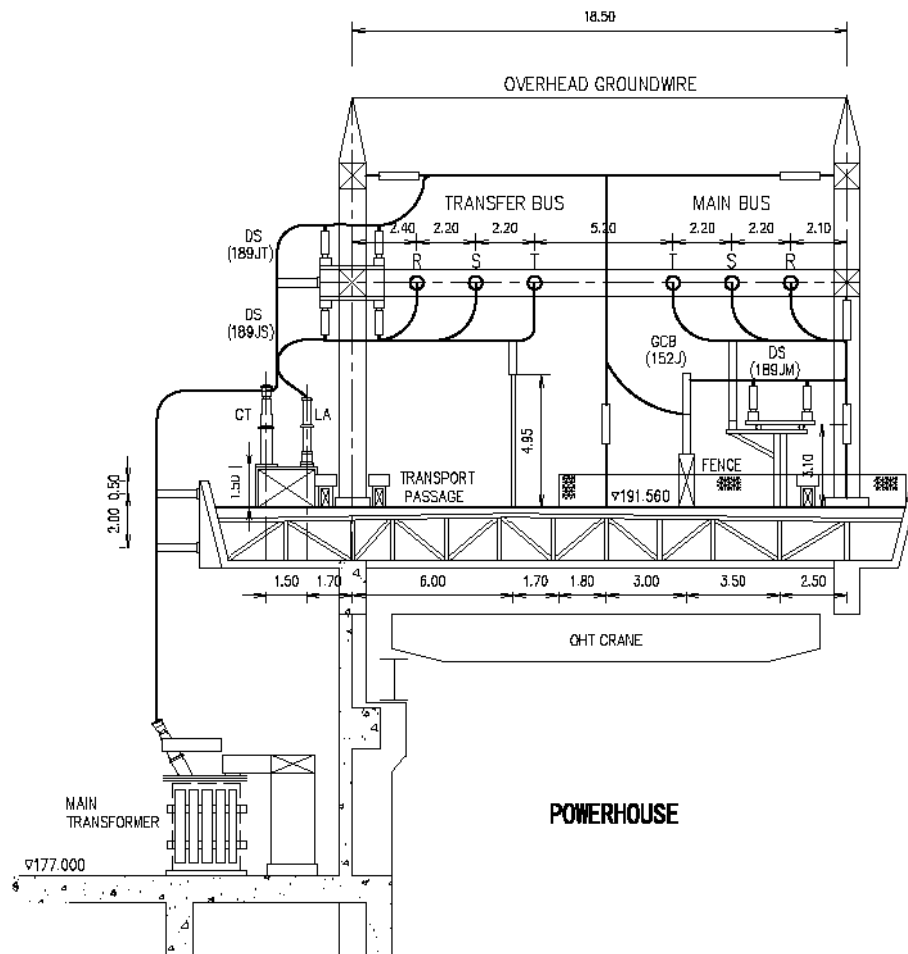
Prepared by: **NIPPON KOEI**
 POWER




Drawing Title: **SCHEMATIC DIAGRAM(2)
 COOLING WATER SUPPLY AND
 DRAINAGE SYSTEM**

Drawing No: **E-012**
 Date: **Oct. 2008**



 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI 	Drawing Title: 110KV OUTDOOR SWITCHYARD EQUIPMENT LAYOUT PLAN	Drawing No: E - 021 Date: Oct. 2009



 JAPAN INTERNATIONAL COOPERATION AGENCY PREPARATORY SURVEY ON NAM NGUM 1 HYDROPOWER STATION EXPANSION IN LAO PEOPLE'S DEMOCRATIC REPUBLIC		
Prepared by:  NIPPON KOEI  POWER	Drawing Title: 116 W/ OUTDOOR SWITCHYARD EQUIPMENT LAYOUT SECTION	Drawing No: E-022 Date: Oct. 2009

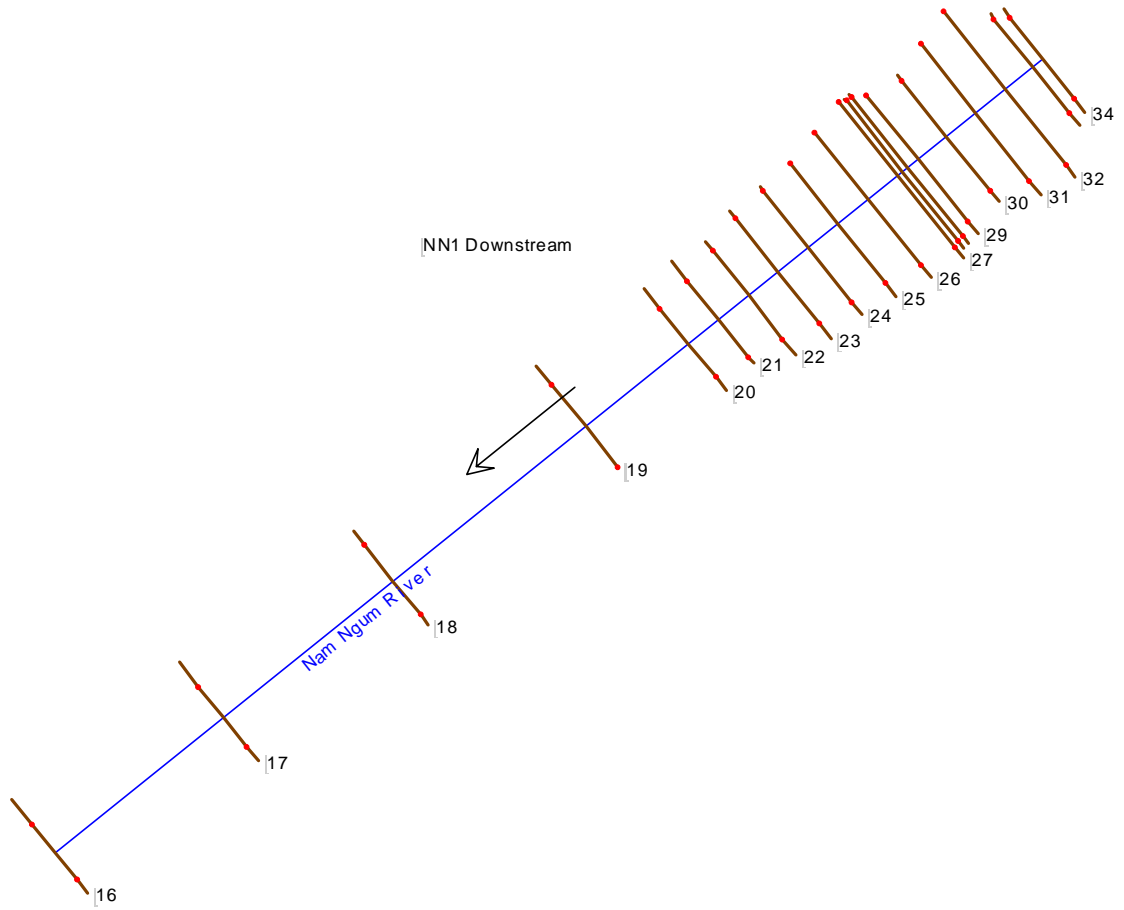
THE PREPARATORY SURVEY
ON
EXPANSION OF NAM NGUM 1 HYDROPOWER STATION
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
FINAL REPORT

Appendices

Appendix H Tailrace Hydraulic Analysis

1 Geometric Input Data

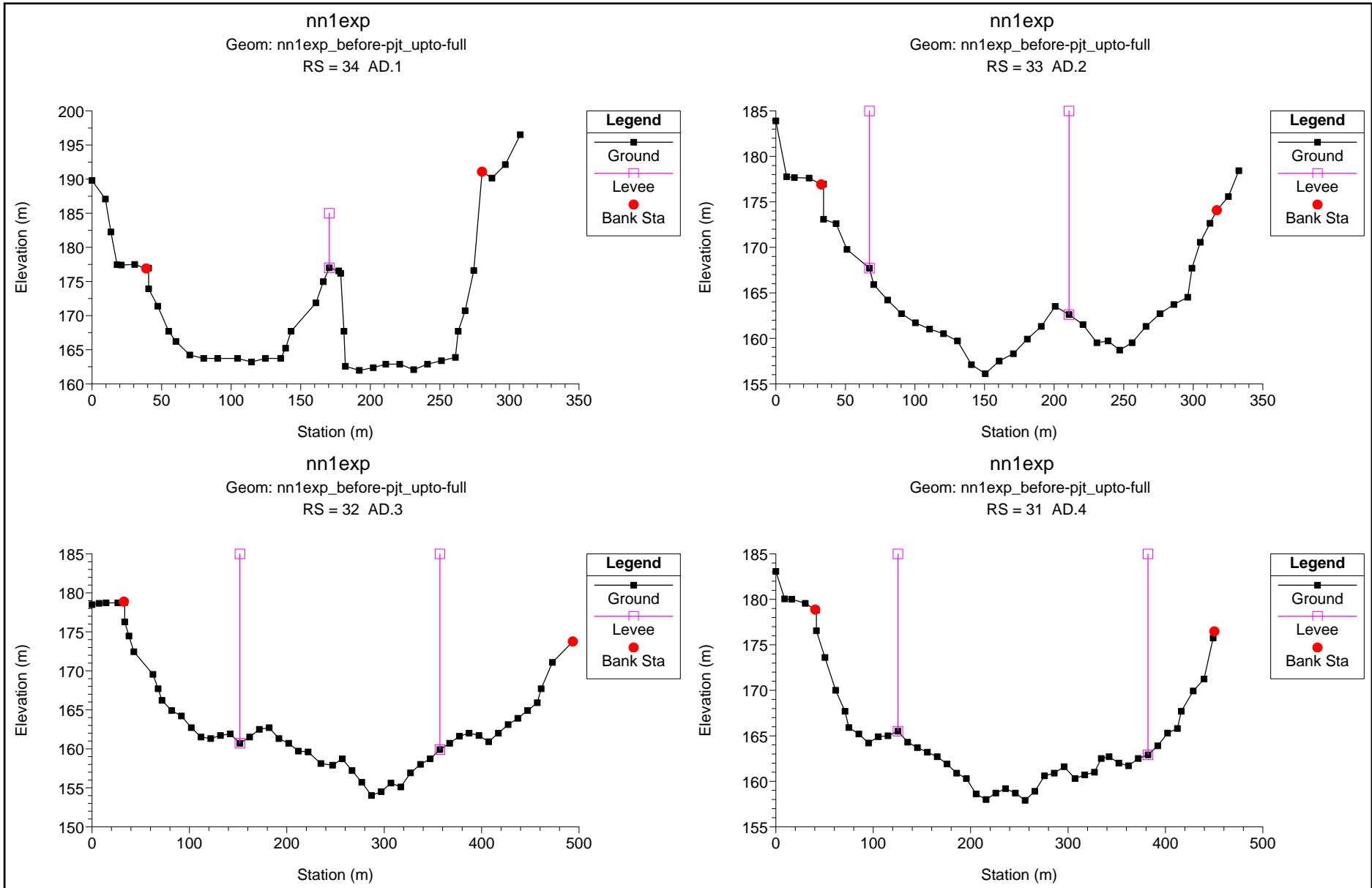
1.1 Geometric Input Data - Plan

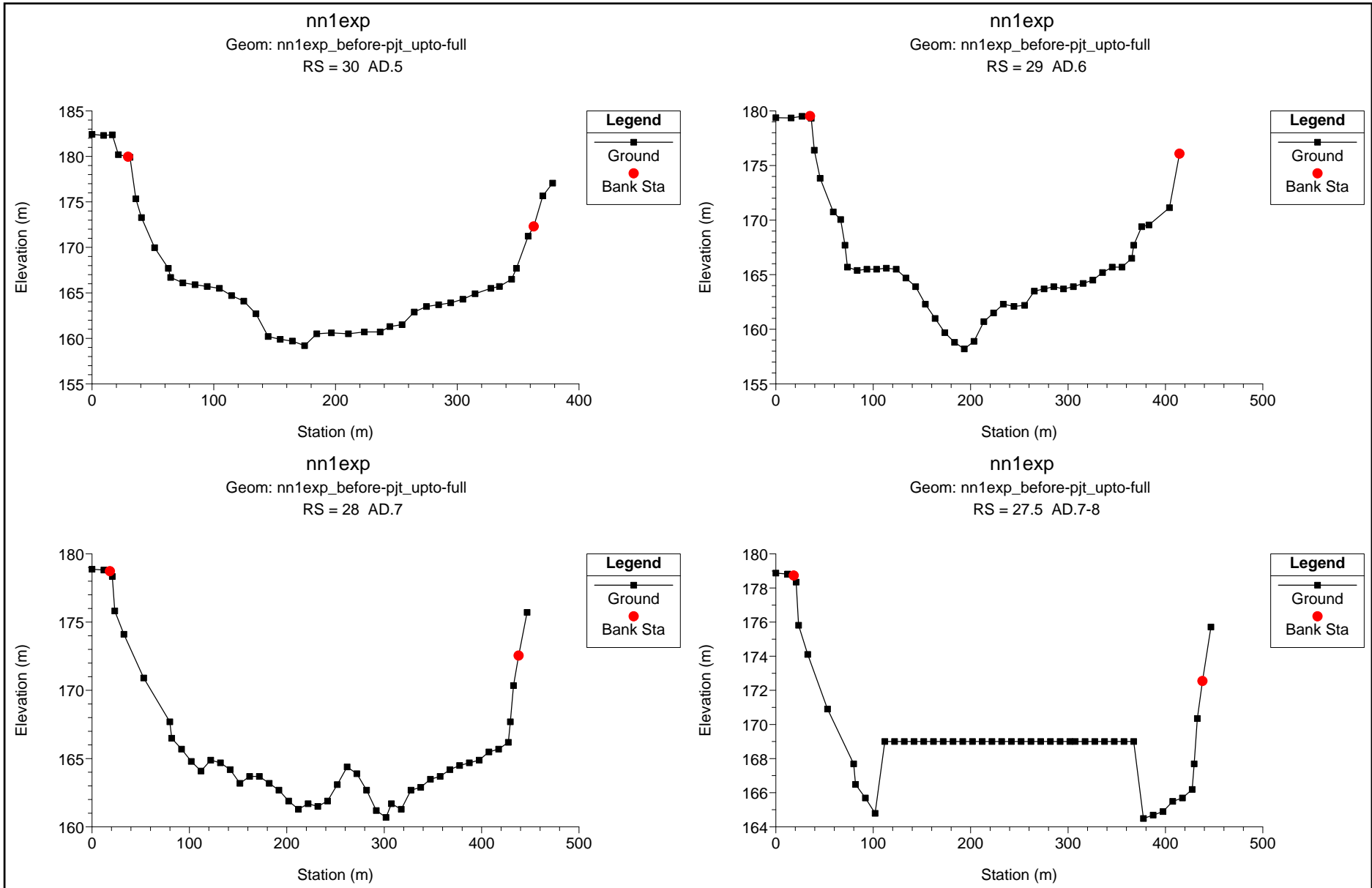


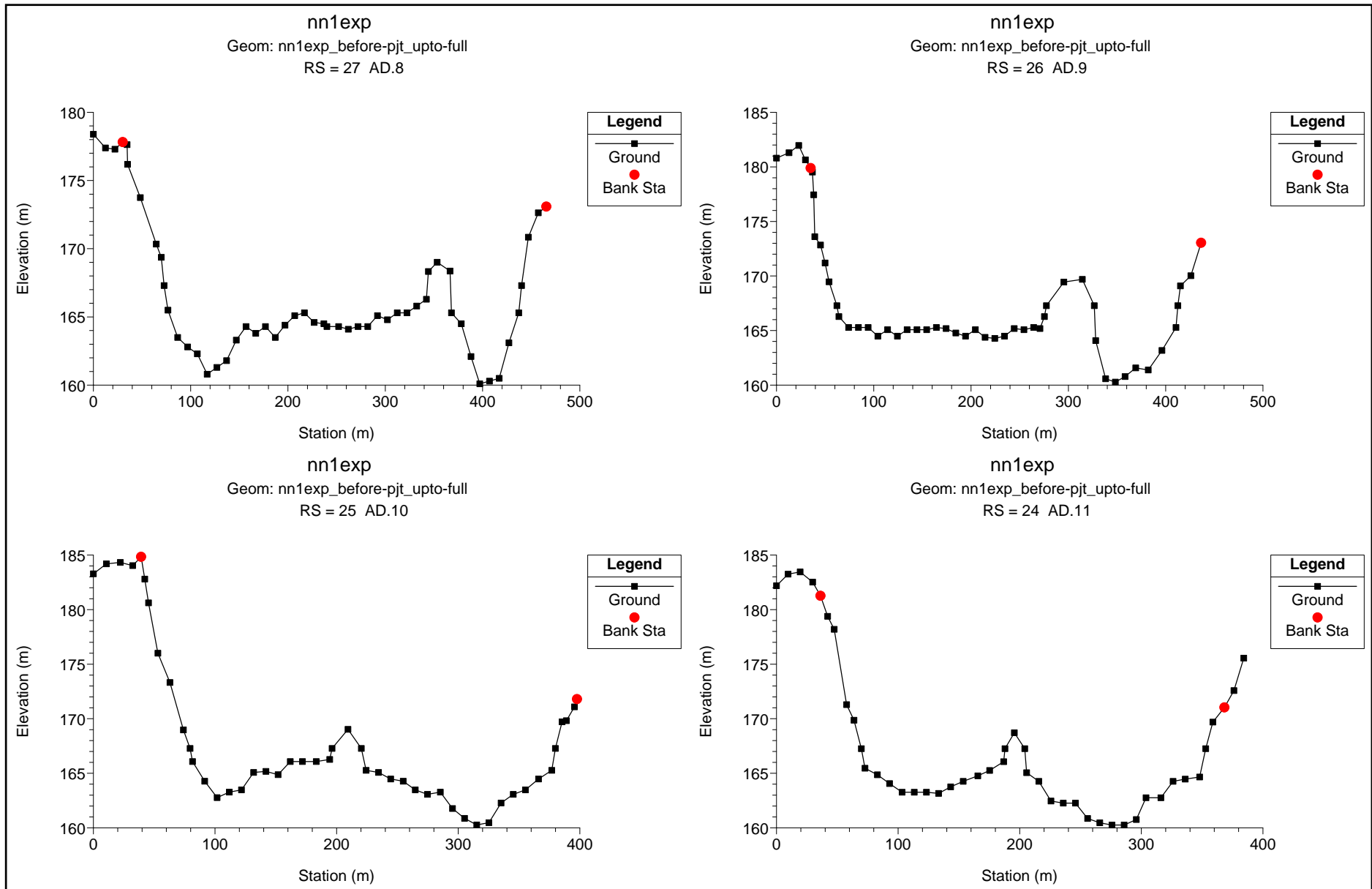
1.2 Geometric Input Data - Sections

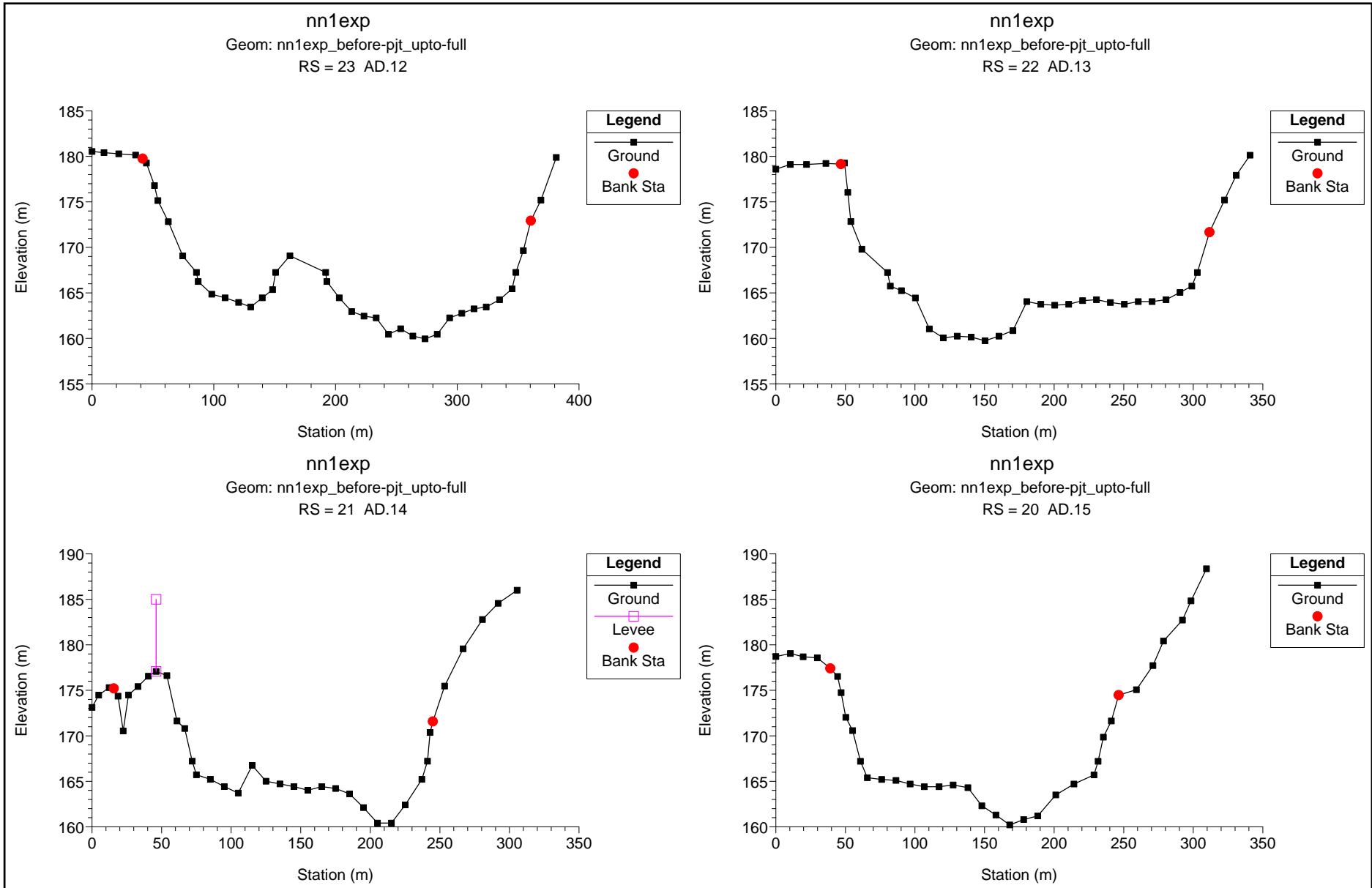
1.2.1 Sections for Current Condition

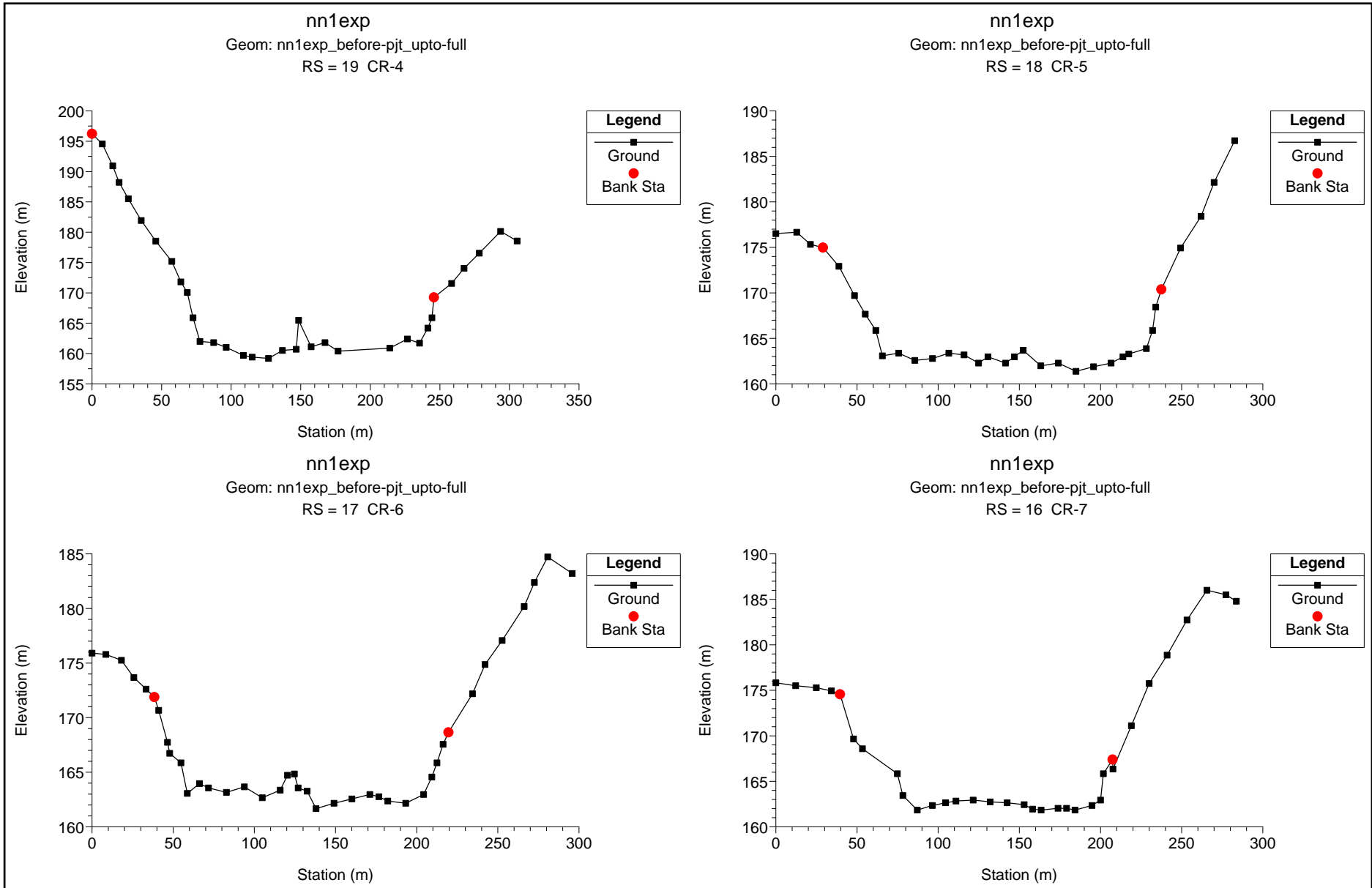
- (1) Sections for $Q=105, 167, 247, 351, 440, 467 \text{ m}^3/\text{s}$ (w/o spill-out)



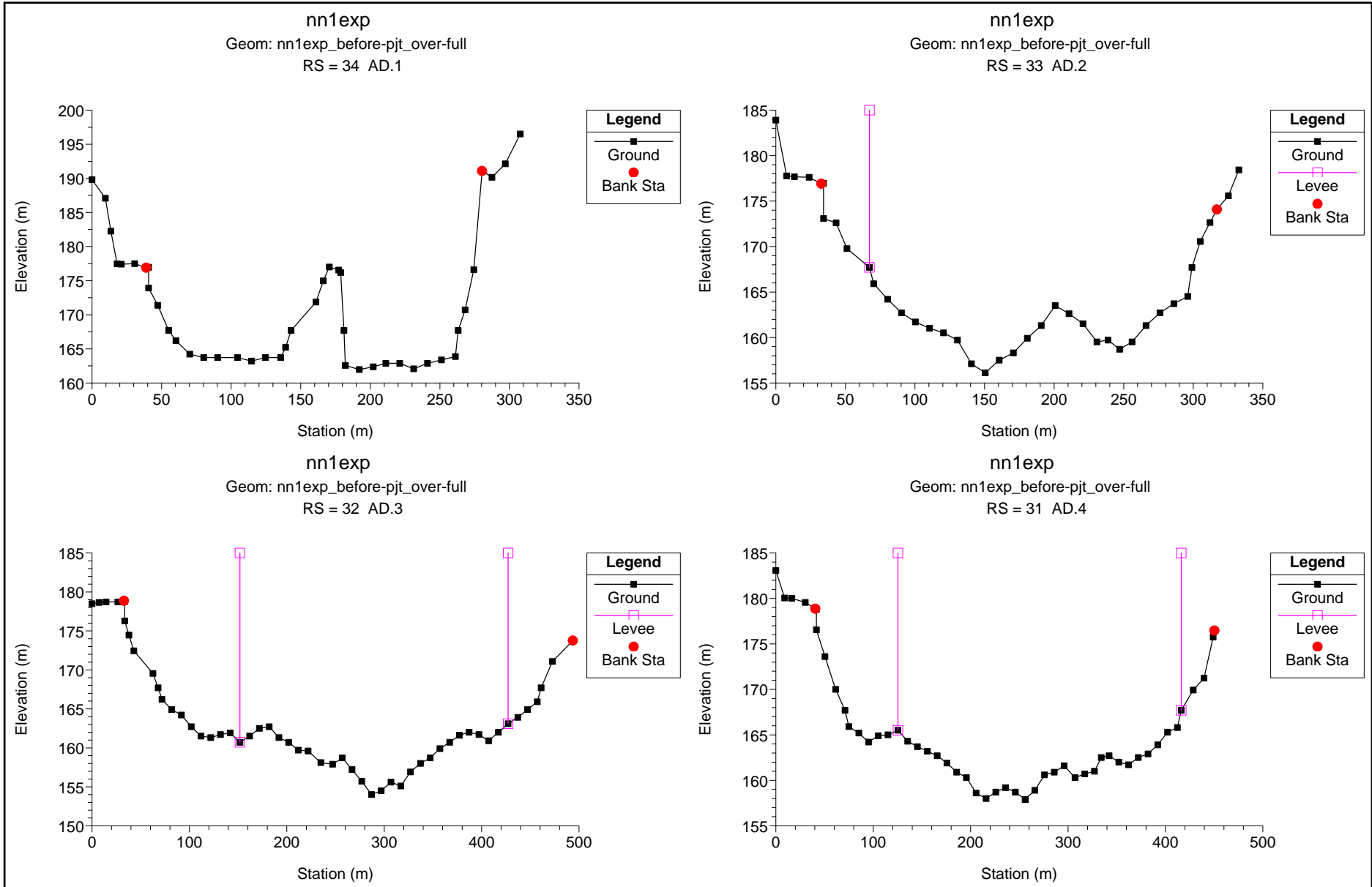


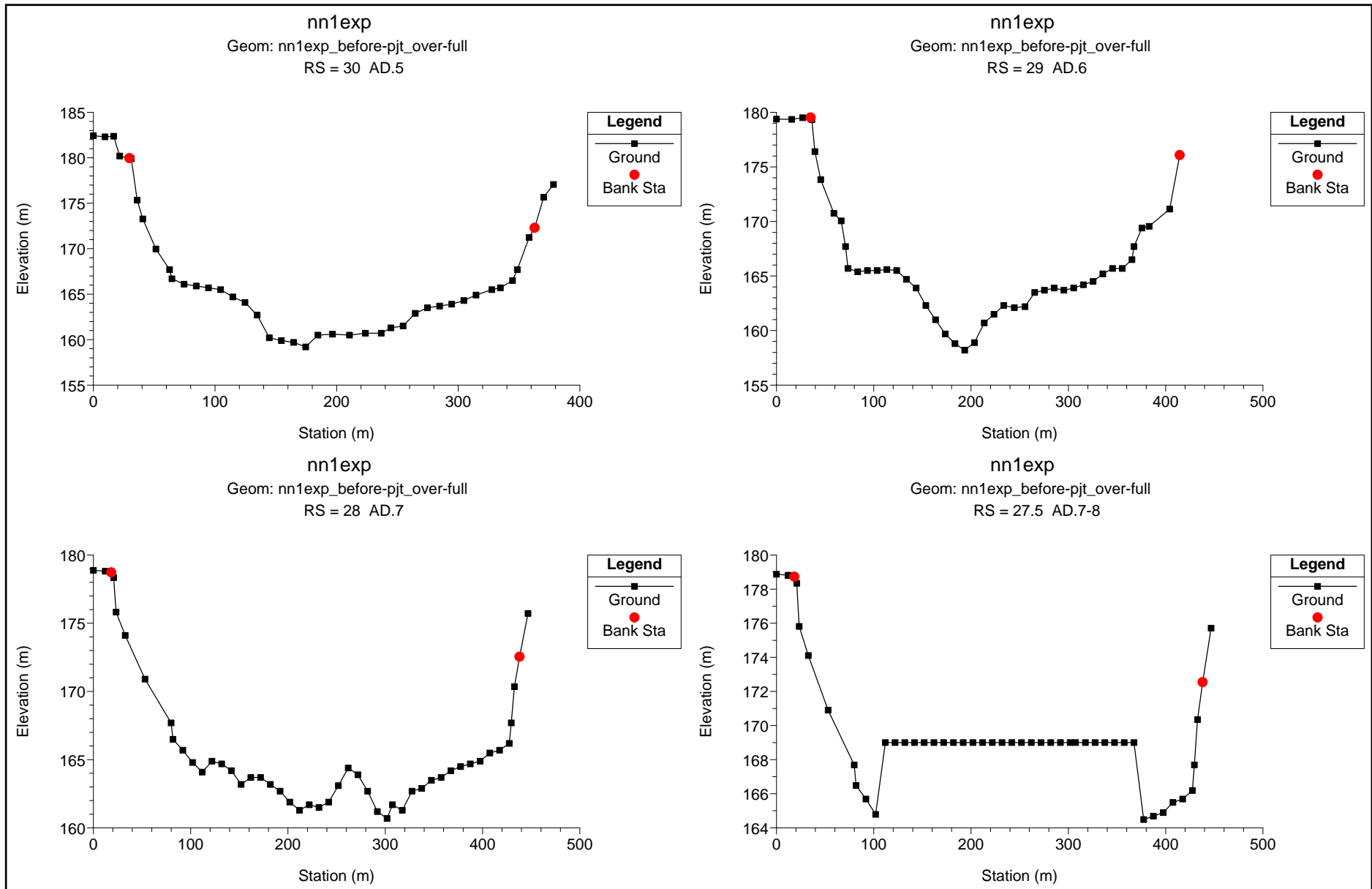


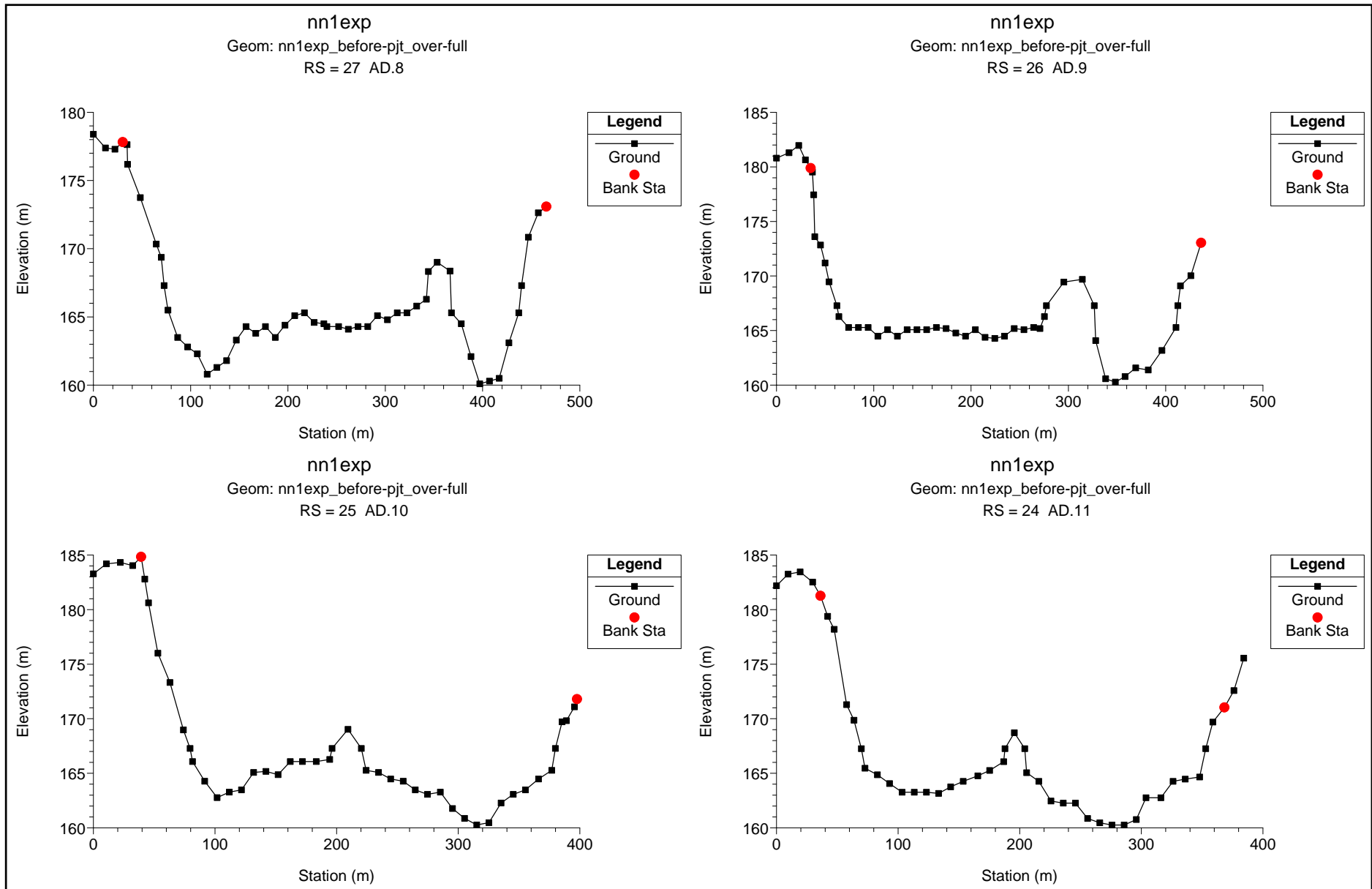


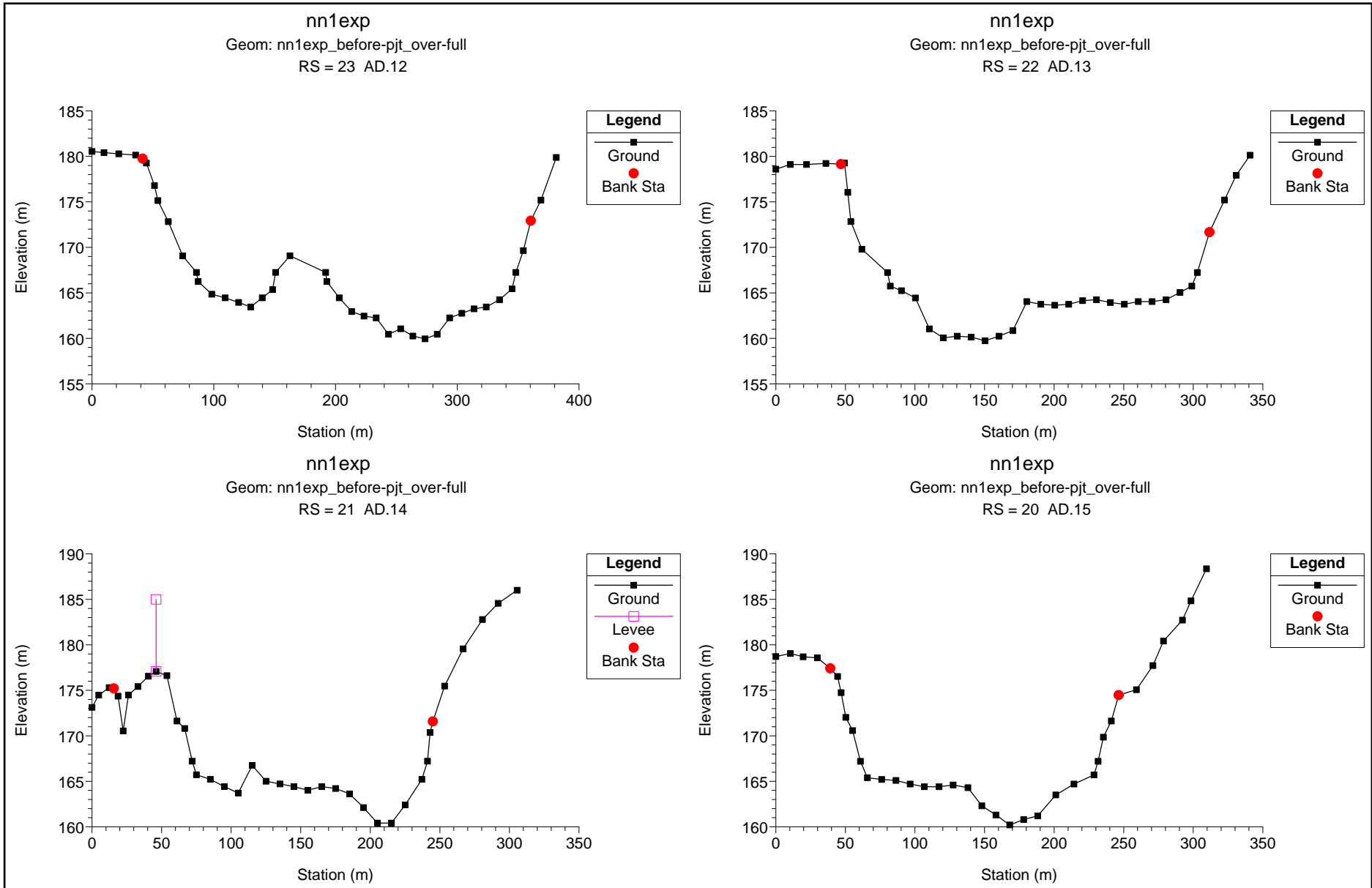


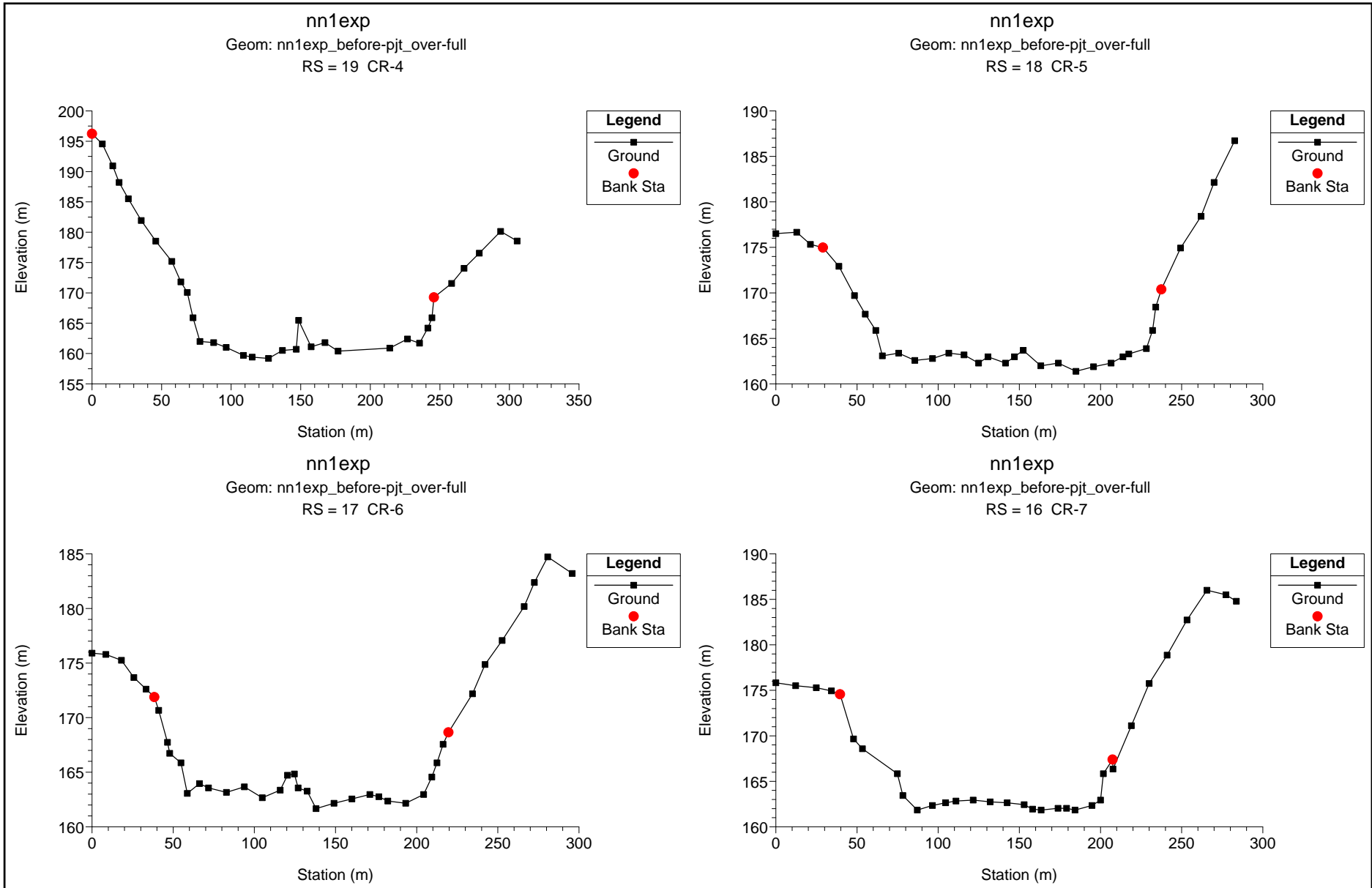
(2) Sections for $Q=735, 1025, 2815 \text{ m}^3/\text{s}$ (w/ spill-out)





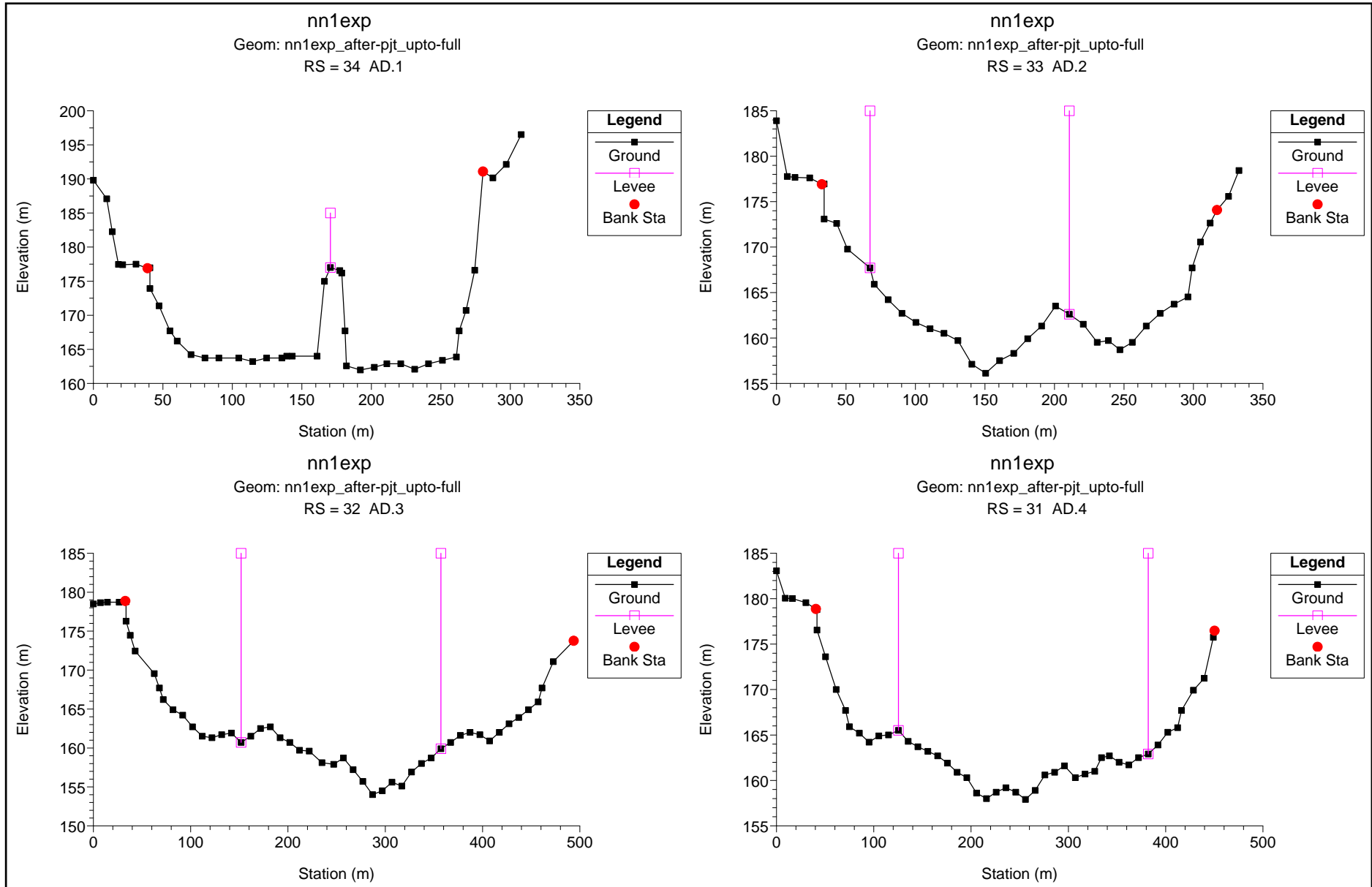


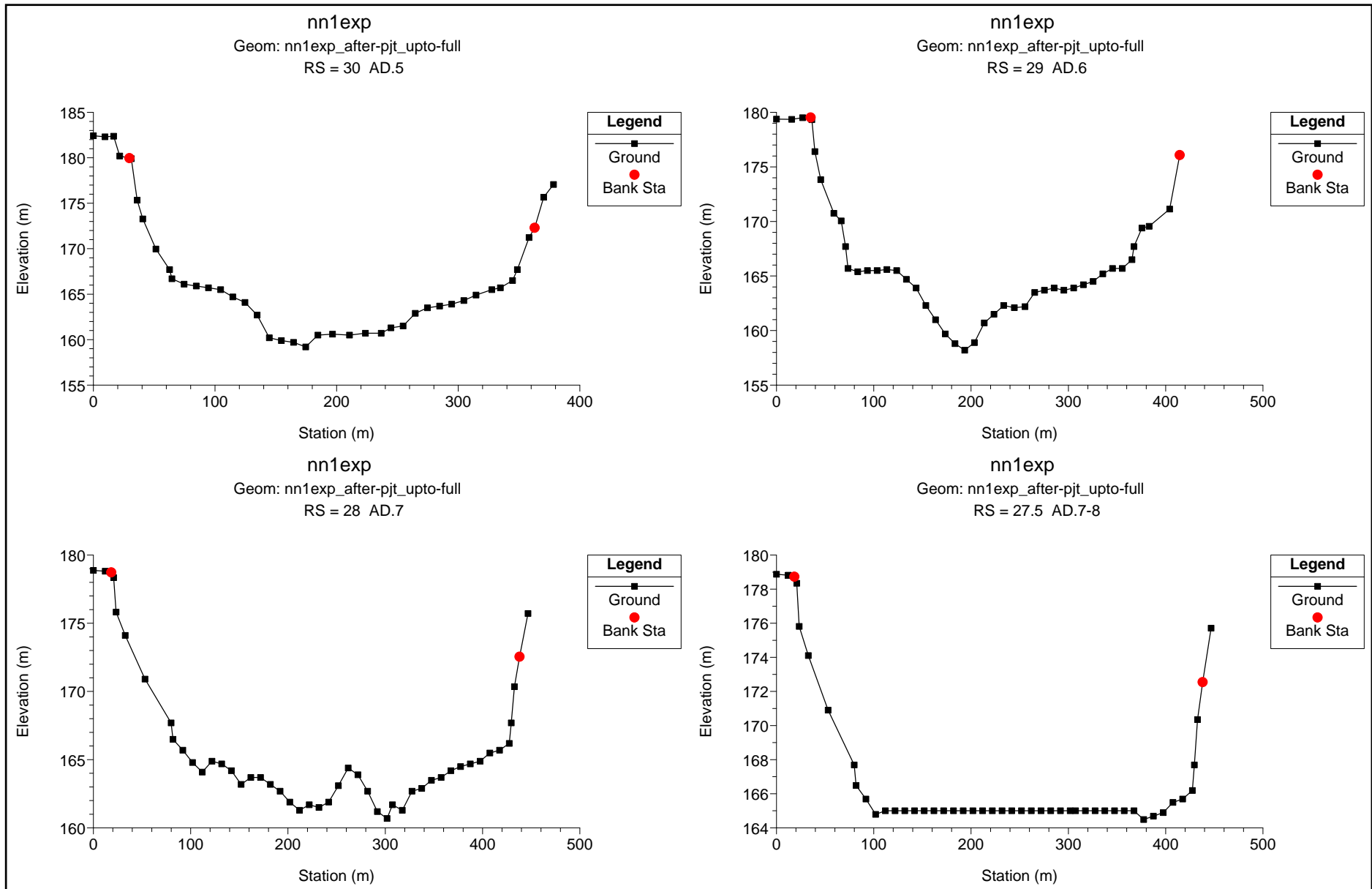


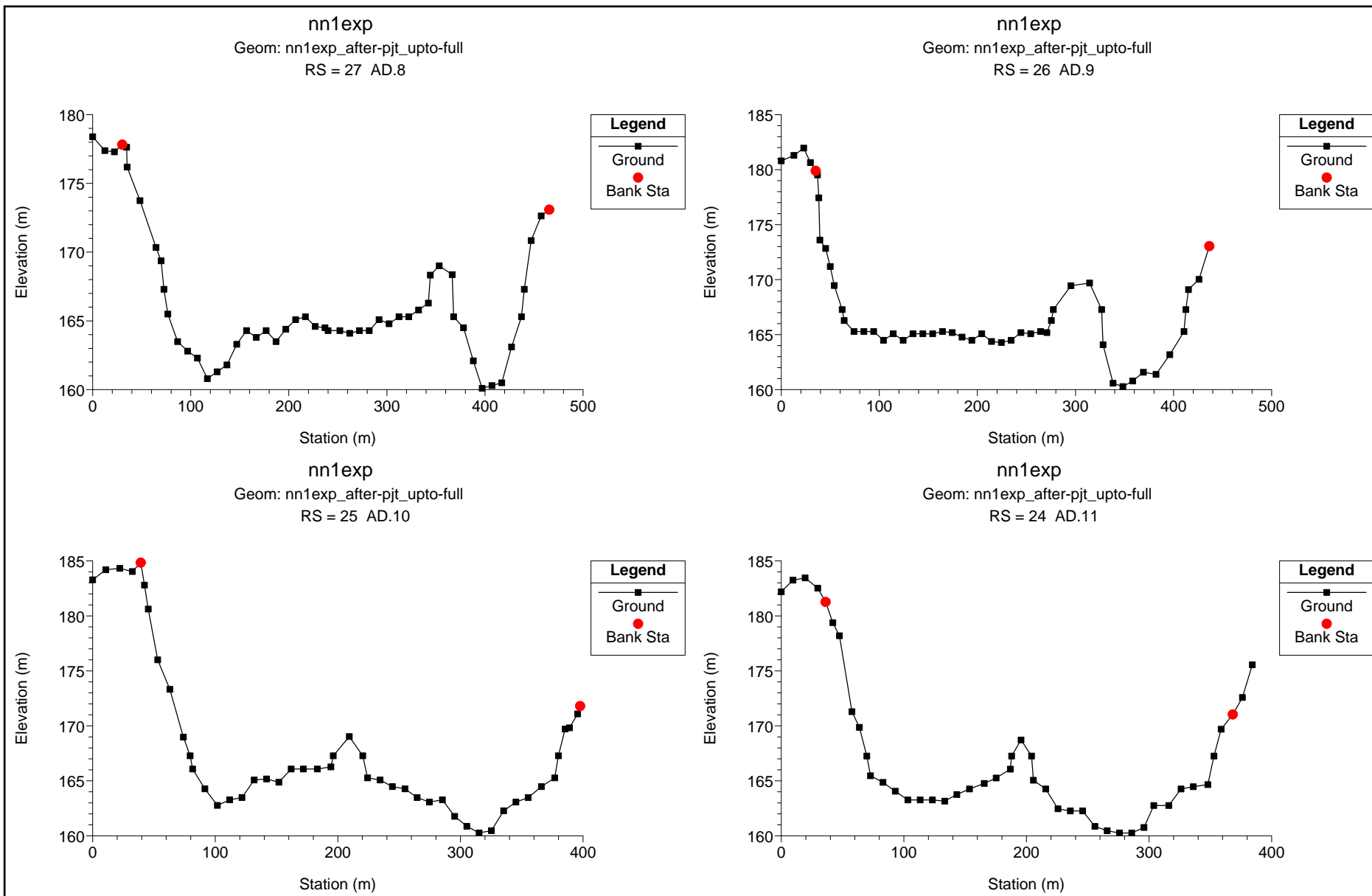


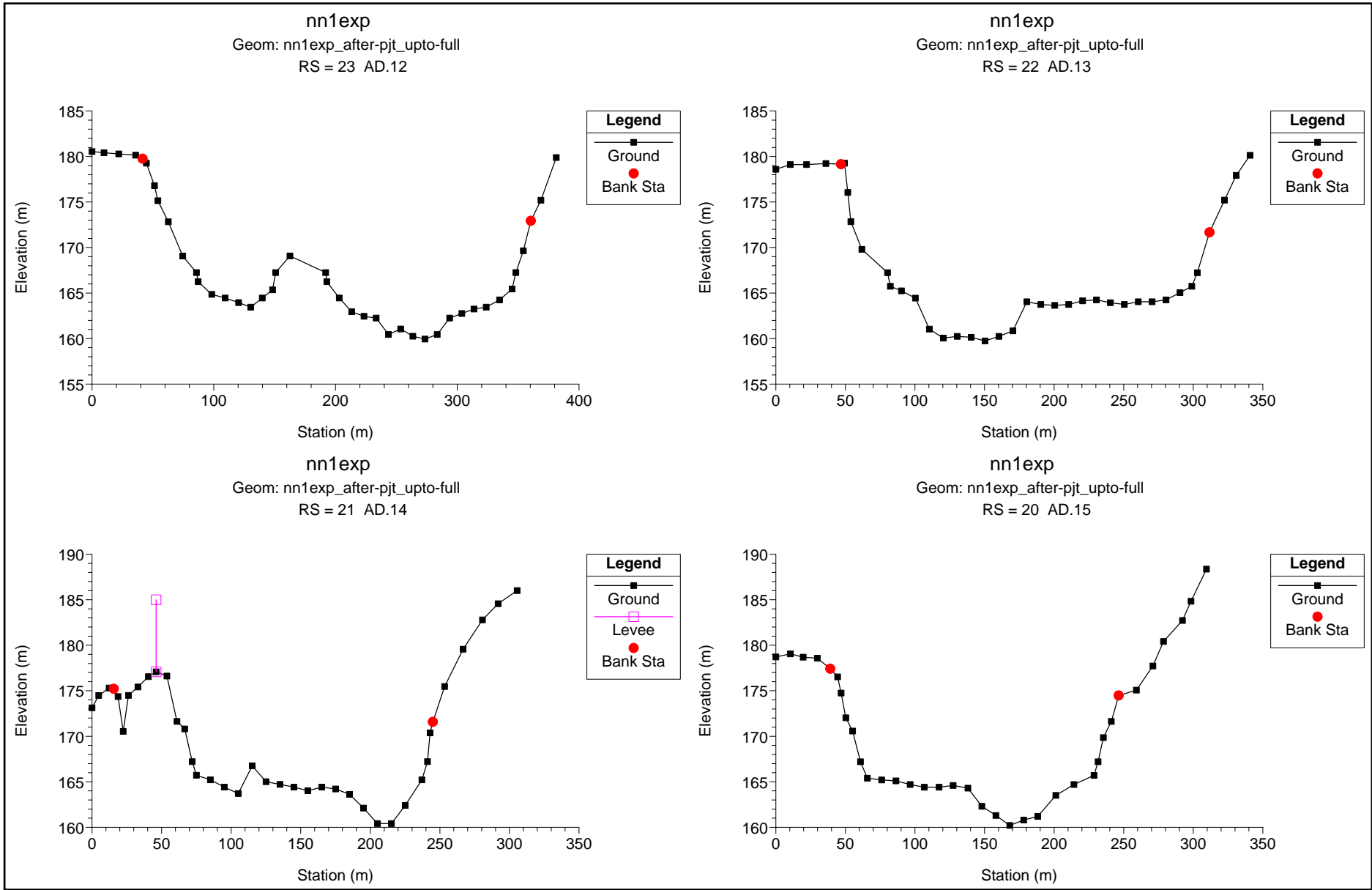
1.2.2 Sections for Condition after Riverbed Excavation

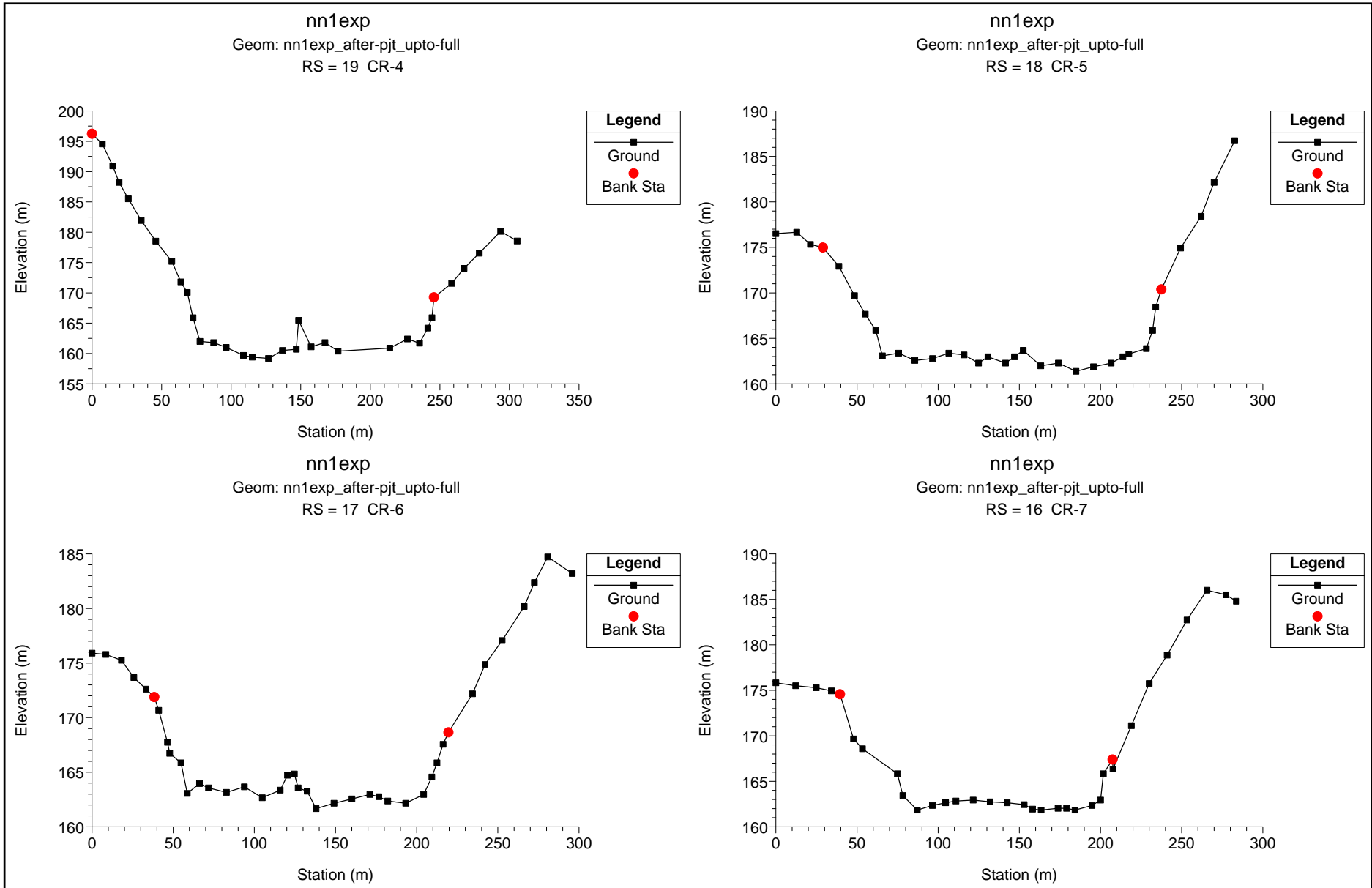
- (1) Sections for $Q=105, 167, 247, 351, 440, 467 \text{ m}^3/\text{s}$ (w/o spill-out)



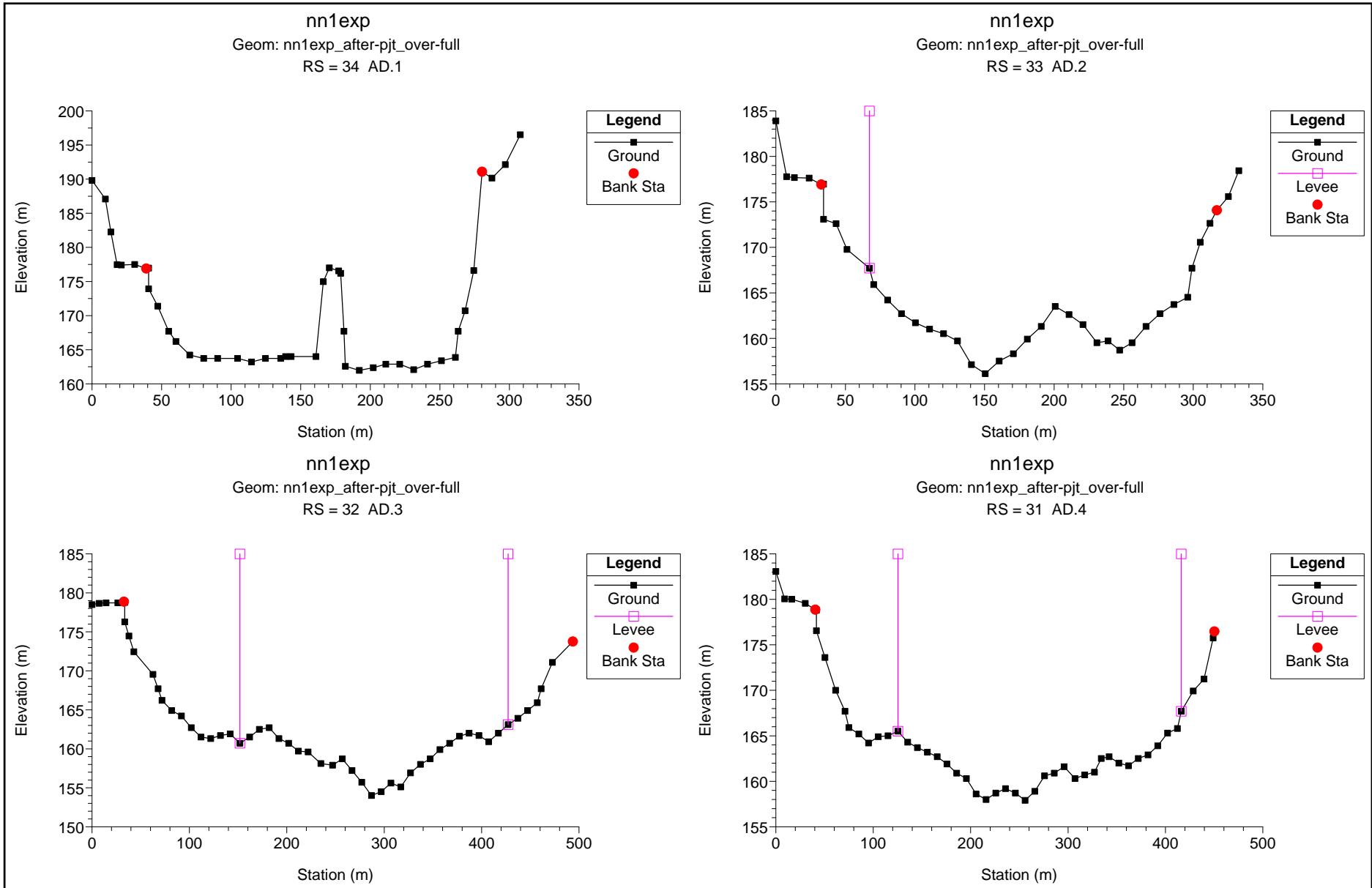


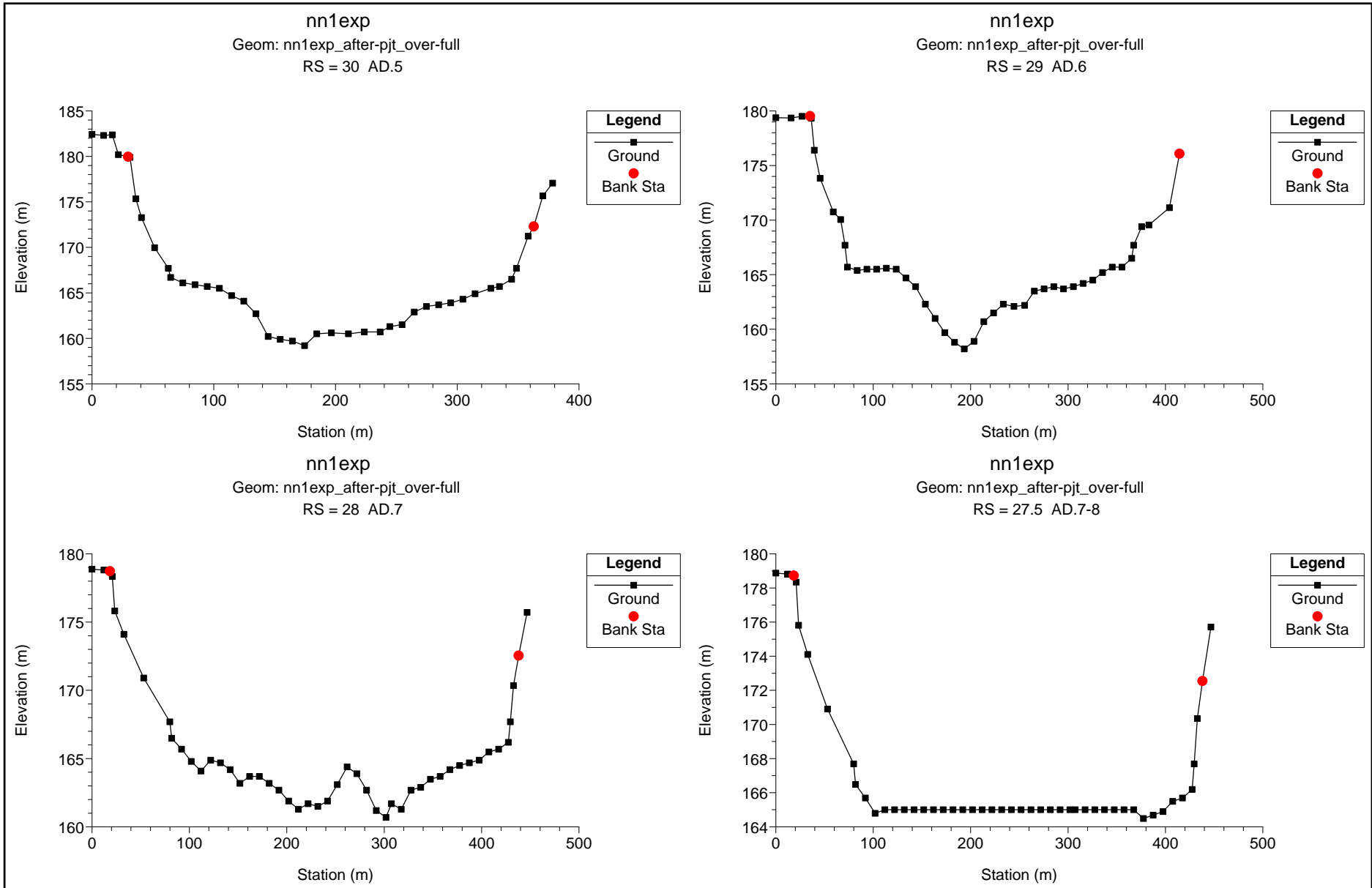


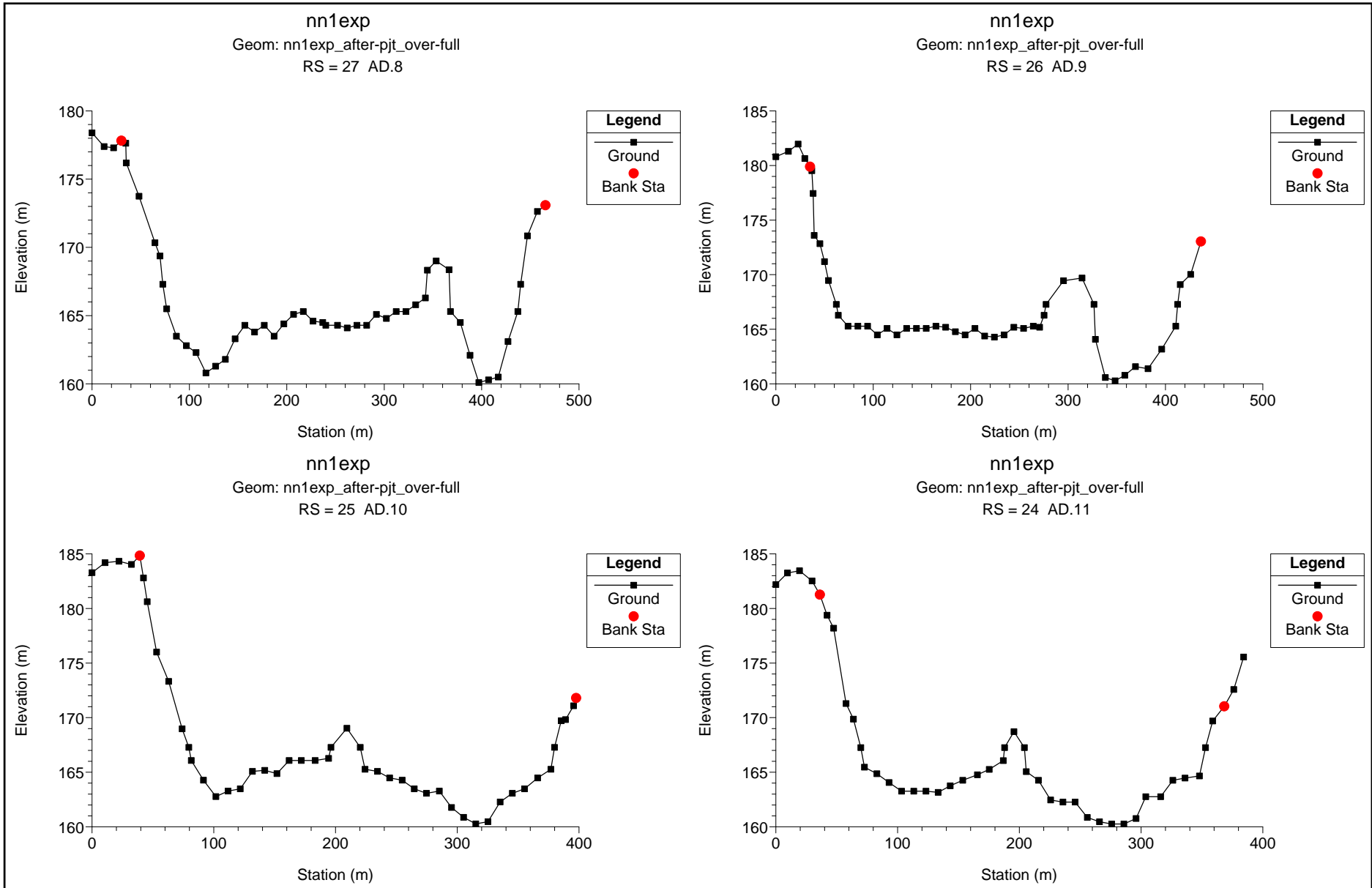


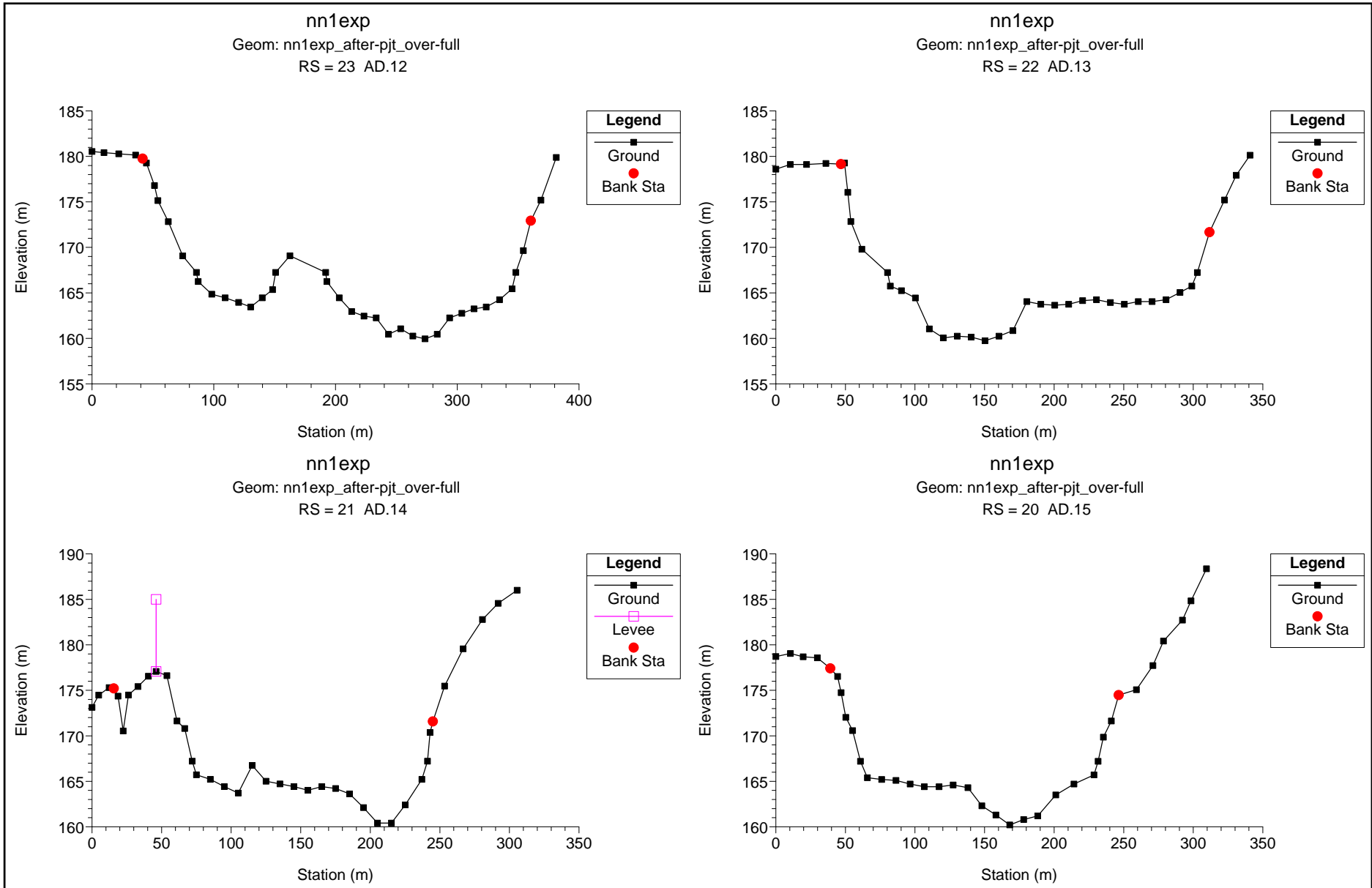


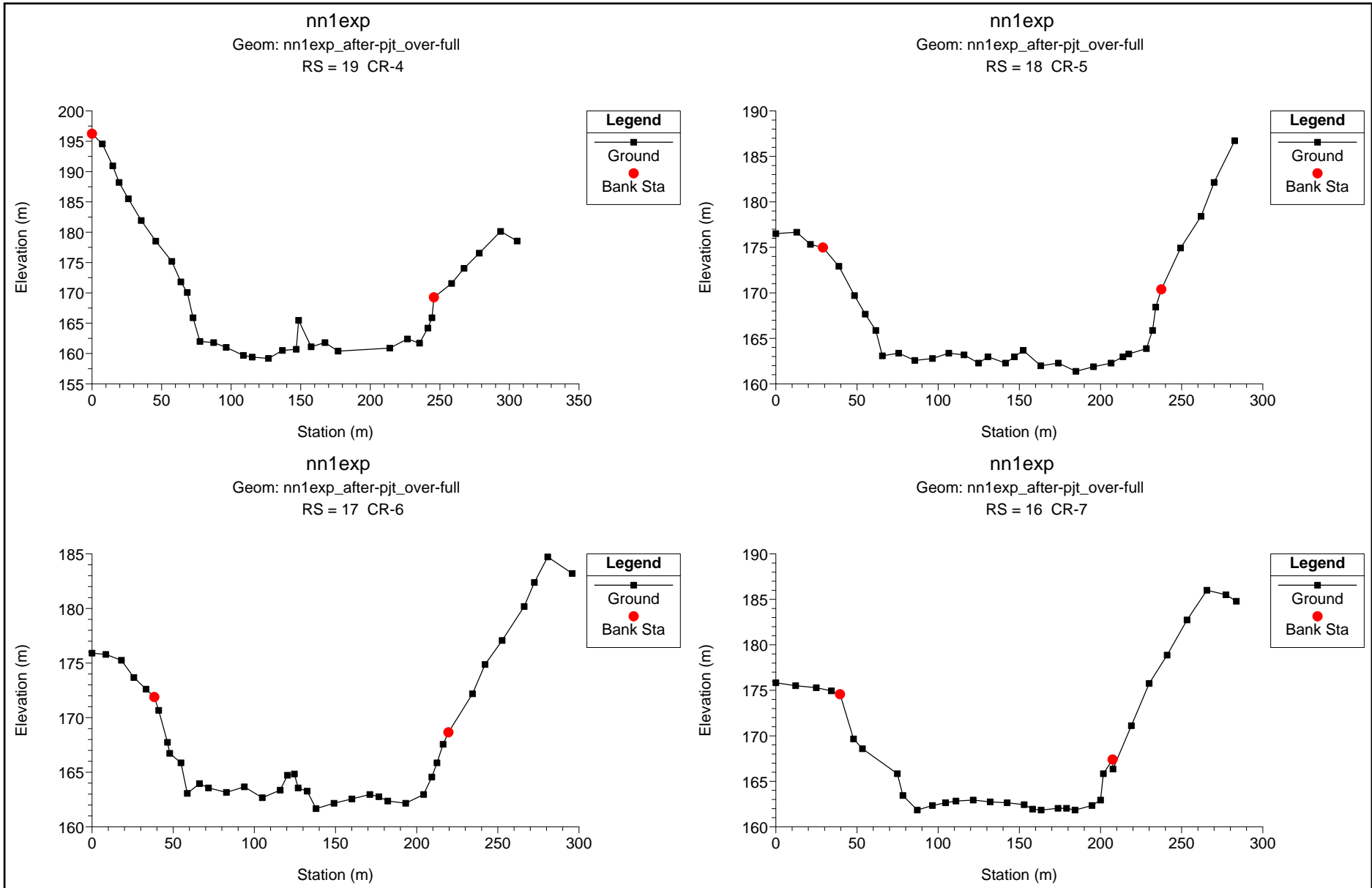
(2) Sections for $Q=735, 1025, 2815 \text{ m}^3/\text{s}$ (w/ spill-out)











2 Outputs

2.1 Outputs for Current Condition

Current Condition												
Q=105												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	105.00	161.98	166.19	164.32	166.20	0.000188	0.58	180.06	80.21	0.12
NN1 Dow	33	PF 1	105.00	156.11	166.20	158.14	166.20	0.000003	0.13	790.96	140.90	0.02
NN1 Dow	32	PF 1	105.00	154.01	166.20	155.77	166.20	0.000000	0.07	1,591.89	205.35	0.01
NN1 Dow	31	PF 1	105.00	157.91	166.20	159.22	166.20	0.000001	0.08	1,321.85	256.74	0.01
NN1 Dow	30	PF 1	105.00	159.20	166.20		166.20	0.000004	0.11	929.13	267.87	0.02
NN1 Dow	29	PF 1	105.00	158.20	166.20		166.20	0.000005	0.12	867.92	288.81	0.02
NN1 Dow	28	PF 1	105.00	160.69	166.20		166.20	0.000005	0.11	942.31	341.93	0.02
NN1 Dow	27.5	PF 1	105.00	164.49	165.82	165.82	166.16	0.018549	2.61	40.26	59.47	1.01
NN1 Dow	27	PF 1	105.00	160.10	165.66		165.66	0.000015	0.16	669.74	322.98	0.03
NN1 Dow	26	PF 1	105.00	160.28	165.65		165.66	0.000047	0.23	453.05	285.99	0.06
NN1 Dow	25	PF 1	105.00	160.27	165.65		165.65	0.000025	0.21	499.75	228.43	0.05
NN1 Dow	24	PF 1	105.00	160.26	165.65		165.65	0.000013	0.17	632.95	253.00	0.03
NN1 Dow	23	PF 1	105.00	159.95	165.65		165.65	0.000015	0.19	563.66	205.79	0.04
NN1 Dow	22	PF 1	105.00	159.74	165.65		165.65	0.000014	0.18	578.84	213.97	0.04
NN1 Dow	21	PF 1	105.00	160.42	165.64	162.07	165.65	0.000081	0.35	298.57	151.29	0.08
NN1 Dow	20	PF 1	105.00	160.20	165.63		165.64	0.000056	0.31	342.21	162.53	0.07
NN1 Dow	19	PF 1	105.00	159.20	165.63		165.64	0.000004	0.14	763.91	170.94	0.02
NN1 Dow	18	PF 1	105.00	161.38	165.63		165.63	0.000019	0.22	486.50	169.69	0.04
NN1 Dow	17	PF 1	105.00	161.66	165.61		165.62	0.000032	0.26	401.25	156.76	0.05
NN1 Dow	16	PF 1	105.00	161.84	165.60	162.77	165.60	0.000026	0.27	393.48	126.39	0.05
Current Condition												
Q=167												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	167.00	161.98	166.53	164.56	166.57	0.000301	0.80	208.31	82.03	0.16
NN1 Dow	33	PF 1	167.00	156.11	166.56	158.55	166.56	0.000006	0.20	841.49	141.50	0.03
NN1 Dow	32	PF 1	167.00	154.01	166.56	156.09	166.56	0.000001	0.10	1,665.47	205.35	0.01
NN1 Dow	31	PF 1	167.00	157.91	166.56	159.46	166.56	0.000002	0.12	1,413.81	256.74	0.02
NN1 Dow	30	PF 1	167.00	159.20	166.56		166.56	0.000007	0.16	1,026.79	277.80	0.03
NN1 Dow	29	PF 1	167.00	158.20	166.55		166.56	0.000010	0.17	971.96	293.08	0.03
NN1 Dow	28	PF 1	167.00	160.69	166.55		166.56	0.000009	0.16	1,065.32	346.18	0.03
NN1 Dow	27.5	PF 1	167.00	164.49	166.09	166.09	166.51	0.016943	2.87	58.27	69.81	1.00
NN1 Dow	27	PF 1	167.00	160.10	166.00		166.00	0.000023	0.21	782.35	331.31	0.04
NN1 Dow	26	PF 1	167.00	160.28	166.00		166.00	0.000063	0.30	551.84	291.34	0.07
NN1 Dow	25	PF 1	167.00	160.27	165.99		166.00	0.000040	0.29	578.59	234.35	0.06
NN1 Dow	24	PF 1	167.00	160.26	165.99		165.99	0.000022	0.23	720.09	259.38	0.04
NN1 Dow	23	PF 1	167.00	159.95	165.99		165.99	0.000026	0.26	634.32	211.41	0.05
NN1 Dow	22	PF 1	167.00	159.74	165.99		165.99	0.000025	0.26	652.02	217.63	0.05
NN1 Dow	21	PF 1	167.00	160.42	165.97	162.53	165.98	0.000127	0.48	349.93	156.98	0.10
NN1 Dow	20	PF 1	167.00	160.20	165.96		165.97	0.000089	0.42	396.24	164.91	0.09
NN1 Dow	19	PF 1	167.00	159.20	165.96		165.96	0.000009	0.20	820.24	171.82	0.03
NN1 Dow	18	PF 1	167.00	161.38	165.95		165.96	0.000033	0.31	541.46	170.85	0.06
NN1 Dow	17	PF 1	167.00	161.66	165.93		165.93	0.000056	0.37	450.41	158.38	0.07
NN1 Dow	16	PF 1	167.00	161.84	165.90	162.98	165.91	0.000049	0.39	431.49	127.56	0.07
Current Condition												
Q=247												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	247.00	161.98	166.89	164.81	166.95	0.000438	1.04	237.78	83.83	0.20
NN1 Dow	33	PF 1	247.00	156.11	166.92	158.97	166.93	0.000011	0.28	893.83	142.11	0.04
NN1 Dow	32	PF 1	247.00	154.01	166.93	156.44	166.93	0.000002	0.14	1,741.43	205.35	0.02
NN1 Dow	31	PF 1	247.00	157.91	166.93	159.72	166.93	0.000004	0.16	1,508.71	256.74	0.02
NN1 Dow	30	PF 1	247.00	159.20	166.92		166.93	0.000012	0.22	1,130.27	281.89	0.03
NN1 Dow	29	PF 1	247.00	158.20	166.92		166.93	0.000015	0.23	1,080.13	294.15	0.04
NN1 Dow	28	PF 1	247.00	160.69	166.92		166.92	0.000013	0.21	1,193.06	347.28	0.04
NN1 Dow	27.5	PF 1	247.00	164.49	166.36	166.36	166.87	0.015859	3.17	78.03	76.53	1.00
NN1 Dow	27	PF 1	247.00	160.10	166.45		166.45	0.000030	0.26	932.67	339.23	0.05
NN1 Dow	26	PF 1	247.00	160.28	166.44		166.45	0.000070	0.36	683.09	296.69	0.08
NN1 Dow	25	PF 1	247.00	160.27	166.44		166.44	0.000058	0.36	694.31	270.38	0.07
NN1 Dow	24	PF 1	247.00	160.26	166.43		166.44	0.000030	0.30	836.03	262.61	0.05
NN1 Dow	23	PF 1	247.00	159.95	166.43		166.44	0.000037	0.34	729.21	216.74	0.06
NN1 Dow	22	PF 1	247.00	159.74	166.43		166.43	0.000034	0.33	748.43	219.40	0.06
NN1 Dow	21	PF 1	247.00	160.42	166.41	162.99	166.42	0.000159	0.59	419.52	162.66	0.12
NN1 Dow	20	PF 1	247.00	160.20	166.40		166.41	0.000114	0.53	468.18	166.98	0.10
NN1 Dow	19	PF 1	247.00	159.20	166.40		166.40	0.000014	0.28	894.67	172.43	0.04
NN1 Dow	18	PF 1	247.00	161.38	166.38		166.38	0.000048	0.40	614.56	172.71	0.07
NN1 Dow	17	PF 1	247.00	161.66	166.34		166.35	0.000080	0.48	516.94	162.60	0.09
NN1 Dow	16	PF 1	247.00	161.84	166.30	163.16	166.31	0.000076	0.51	483.46	132.17	0.09

Current Condition												
Q=351												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	351.00	161.98	167.28	165.10	167.36	0.000593	1.30	270.75	85.80	0.23
NN1 Dow	33	PF 1	351.00	156.11	167.33	159.42	167.34	0.000018	0.37	951.87	142.79	0.05
NN1 Dow	32	PF 1	351.00	154.01	167.34	156.82	167.34	0.000004	0.19	1,825.37	205.35	0.02
NN1 Dow	31	PF 1	351.00	157.91	167.33	160.02	167.34	0.000007	0.22	1,613.56	256.74	0.03
NN1 Dow	30	PF 1	351.00	159.20	167.33		167.34	0.000018	0.28	1,245.57	284.07	0.04
NN1 Dow	29	PF 1	351.00	158.20	167.33		167.33	0.000021	0.29	1,200.05	295.34	0.05
NN1 Dow	28	PF 1	351.00	160.69	167.33		167.33	0.000019	0.26	1,334.62	348.50	0.04
NN1 Dow	27.5	PF 1	351.00	164.49	166.64	166.64	167.27	0.014877	3.51	100.10	80.04	1.00
NN1 Dow	27	PF 1	351.00	160.10	166.91		166.91	0.000036	0.32	1,089.04	341.61	0.06
NN1 Dow	26	PF 1	351.00	160.28	166.90		166.91	0.000078	0.43	819.42	299.19	0.08
NN1 Dow	25	PF 1	351.00	160.27	166.89		166.90	0.000069	0.43	818.49	273.66	0.08
NN1 Dow	24	PF 1	351.00	160.26	166.89		166.90	0.000040	0.37	956.29	264.94	0.06
NN1 Dow	23	PF 1	351.00	159.95	166.88		166.89	0.000050	0.42	828.18	219.23	0.07
NN1 Dow	22	PF 1	351.00	159.74	166.88		166.89	0.000046	0.41	848.22	221.21	0.07
NN1 Dow	21	PF 1	351.00	160.42	166.85	163.48	166.88	0.000195	0.71	493.28	167.58	0.13
NN1 Dow	20	PF 1	351.00	160.20	166.84		166.86	0.000143	0.65	542.71	169.10	0.12
NN1 Dow	19	PF 1	351.00	159.20	166.84		166.84	0.000022	0.36	971.04	173.05	0.05
NN1 Dow	18	PF 1	351.00	161.38	166.81		166.82	0.000068	0.51	689.72	174.60	0.08
NN1 Dow	17	PF 1	351.00	161.66	166.76		166.78	0.000110	0.60	585.94	166.65	0.10
NN1 Dow	16	PF 1	351.00	161.84	166.70	163.36	166.72	0.000113	0.65	537.40	137.68	0.11
Current Condition												
Q=440												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	440.00	161.98	167.57	165.33	167.69	0.000706	1.48	296.33	87.29	0.26
NN1 Dow	33	PF 1	440.00	156.11	167.64	159.75	167.65	0.000025	0.44	996.44	143.31	0.05
NN1 Dow	32	PF 1	440.00	154.01	167.65	157.11	167.65	0.000005	0.23	1,889.61	205.35	0.02
NN1 Dow	31	PF 1	440.00	157.91	167.65	160.24	167.65	0.000009	0.26	1,693.80	256.74	0.03
NN1 Dow	30	PF 1	440.00	159.20	167.64		167.65	0.000022	0.33	1,334.38	285.73	0.05
NN1 Dow	29	PF 1	440.00	158.20	167.64		167.65	0.000026	0.34	1,292.11	296.25	0.05
NN1 Dow	28	PF 1	440.00	160.69	167.64		167.65	0.000023	0.30	1,443.27	349.44	0.05
NN1 Dow	27.5	PF 1	440.00	164.49	166.85	166.85	167.57	0.014271	3.76	117.11	81.63	1.00
NN1 Dow	27	PF 1	440.00	160.10	167.25		167.26	0.000040	0.36	1,207.63	343.41	0.06
NN1 Dow	26	PF 1	440.00	160.28	167.24		167.26	0.000083	0.48	922.95	301.08	0.09
NN1 Dow	25	PF 1	440.00	160.27	167.24		167.25	0.000076	0.48	913.08	276.12	0.08
NN1 Dow	24	PF 1	440.00	160.26	167.23		167.24	0.000046	0.42	1,047.65	266.69	0.07
NN1 Dow	23	PF 1	440.00	159.95	167.23		167.24	0.000059	0.49	903.49	221.11	0.08
NN1 Dow	22	PF 1	440.00	159.74	167.22		167.23	0.000055	0.48	923.96	222.58	0.07
NN1 Dow	21	PF 1	440.00	160.42	167.19	163.91	167.22	0.000216	0.80	549.76	168.93	0.14
NN1 Dow	20	PF 1	440.00	160.20	167.18		167.20	0.000163	0.73	599.51	170.70	0.13
NN1 Dow	19	PF 1	440.00	159.20	167.17		167.18	0.000029	0.43	1,028.76	173.51	0.06
NN1 Dow	18	PF 1	440.00	161.38	167.13		167.15	0.000083	0.59	746.77	176.02	0.09
NN1 Dow	17	PF 1	440.00	161.66	167.08		167.10	0.000131	0.69	638.58	167.79	0.11
NN1 Dow	16	PF 1	440.00	161.84	167.00	163.51	167.03	0.000143	0.76	579.33	141.91	0.12
Current Condition												
Q=467												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	467.00	161.98	167.66	165.39	167.78	0.000737	1.54	303.82	87.73	0.26
NN1 Dow	33	PF 1	467.00	156.11	167.73	159.86	167.75	0.000027	0.46	1,009.41	143.43	0.06
NN1 Dow	32	PF 1	467.00	154.01	167.74	157.19	167.74	0.000005	0.24	1,908.26	205.35	0.03
NN1 Dow	31	PF 1	467.00	157.91	167.74	160.31	167.74	0.000010	0.27	1,717.09	256.74	0.03
NN1 Dow	30	PF 1	467.00	159.20	167.73		167.74	0.000024	0.34	1,360.26	286.29	0.05
NN1 Dow	29	PF 1	467.00	158.20	167.73		167.74	0.000028	0.35	1,318.89	296.65	0.05
NN1 Dow	28	PF 1	467.00	160.69	167.73		167.74	0.000024	0.32	1,474.88	349.98	0.05
NN1 Dow	27.5	PF 1	467.00	164.49	166.91	166.91	167.66	0.014395	3.85	121.31	82.02	1.01
NN1 Dow	27	PF 1	467.00	160.10	167.37		167.37	0.000041	0.37	1,245.73	343.96	0.06
NN1 Dow	26	PF 1	467.00	160.28	167.35		167.37	0.000084	0.49	956.32	302.63	0.09
NN1 Dow	25	PF 1	467.00	160.27	167.35		167.36	0.000078	0.49	943.65	277.80	0.09
NN1 Dow	24	PF 1	467.00	160.26	167.34		167.35	0.000048	0.43	1,077.14	268.15	0.07
NN1 Dow	23	PF 1	467.00	159.95	167.34		167.35	0.000062	0.50	927.91	223.91	0.08
NN1 Dow	22	PF 1	467.00	159.74	167.33		167.34	0.000057	0.49	948.41	223.47	0.08
NN1 Dow	21	PF 1	467.00	160.42	167.30	164.10	167.33	0.000219	0.82	568.07	169.20	0.14
NN1 Dow	20	PF 1	467.00	160.20	167.28		167.31	0.000167	0.76	617.99	171.08	0.13
NN1 Dow	19	PF 1	467.00	159.20	167.28		167.29	0.000031	0.45	1,047.48	173.66	0.06
NN1 Dow	18	PF 1	467.00	161.38	167.24		167.26	0.000086	0.61	765.42	176.48	0.09
NN1 Dow	17	PF 1	467.00	161.66	167.18		167.20	0.000135	0.71	655.96	168.16	0.12
NN1 Dow	16	PF 1	467.00	161.84	167.10	163.55	167.13	0.000151	0.79	593.58	143.32	0.12

Current Condition												
Q=735												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	735.00	161.98	168.92		168.96	0.000124	0.80	922.31	180.17	0.11
NN1 Dow	33	PF 1	735.00	156.11	168.94	160.49	168.95	0.000017	0.40	1,849.26	234.32	0.05
NN1 Dow	32	PF 1	735.00	154.01	168.94	157.90	168.95	0.000006	0.27	2,676.51	275.35	0.03
NN1 Dow	31	PF 1	735.00	157.91	168.94	161.01	168.94	0.000013	0.34	2,167.31	290.86	0.04
NN1 Dow	30	PF 1	735.00	159.20	168.93		168.94	0.000029	0.43	1,709.20	295.48	0.06
NN1 Dow	29	PF 1	735.00	158.20	168.93		168.94	0.000032	0.44	1,679.49	304.73	0.06
NN1 Dow	28	PF 1	735.00	160.69	168.93		168.94	0.000026	0.39	1,901.67	361.49	0.05
NN1 Dow	27.5	PF 1	735.00	164.49	168.51		168.90	0.003489	2.78	264.47	99.54	0.54
NN1 Dow	27	PF 1	735.00	160.10	168.77		168.78	0.000037	0.42	1,737.32	364.49	0.06
NN1 Dow	26	PF 1	735.00	160.28	168.76		168.78	0.000065	0.52	1,400.69	328.65	0.08
NN1 Dow	25	PF 1	735.00	160.27	168.76		168.77	0.000066	0.54	1,353.92	304.77	0.08
NN1 Dow	24	PF 1	735.00	160.26	168.75		168.77	0.000047	0.50	1,470.66	290.23	0.07
NN1 Dow	23	PF 1	735.00	159.95	168.74		168.76	0.000068	0.58	1,273.93	267.82	0.08
NN1 Dow	22	PF 1	735.00	159.74	168.74		168.75	0.000057	0.58	1,271.85	236.40	0.08
NN1 Dow	21	PF 1	735.00	160.42	168.70	164.86	168.74	0.000173	0.91	807.69	172.15	0.13
NN1 Dow	20	PF 1	735.00	160.20	168.69		168.73	0.000142	0.85	861.74	175.45	0.12
NN1 Dow	19	PF 1	735.00	159.20	168.68		168.70	0.000039	0.57	1,293.01	175.63	0.07
NN1 Dow	18	PF 1	735.00	161.38	168.64		168.67	0.000087	0.72	1,016.65	182.48	0.10
NN1 Dow	17	PF 1	735.00	161.66	168.58		168.61	0.000125	0.82	895.63	174.43	0.12
NN1 Dow	16	PF 1	735.00	161.84	168.50	163.96	168.54	0.000153	0.92	805.71	158.77	0.13
Current Condition												
Q=1025												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	1,025.00	161.98	169.87		169.91	0.000144	0.94	1,096.20	188.08	0.12
NN1 Dow	33	PF 1	1,025.00	156.11	169.89	161.02	169.90	0.000022	0.49	2,072.71	236.31	0.05
NN1 Dow	32	PF 1	1,025.00	154.01	169.89	158.62	169.90	0.000009	0.35	2,938.27	275.35	0.03
NN1 Dow	31	PF 1	1,025.00	157.91	169.89	161.43	169.90	0.000017	0.42	2,443.50	290.86	0.05
NN1 Dow	30	PF 1	1,025.00	159.20	169.88		169.89	0.000035	0.51	1,992.77	302.74	0.06
NN1 Dow	29	PF 1	1,025.00	158.20	169.88		169.89	0.000039	0.52	1,974.42	320.50	0.07
NN1 Dow	28	PF 1	1,025.00	160.69	169.88		169.89	0.000030	0.46	2,248.72	370.58	0.06
NN1 Dow	27.5	PF 1	1,025.00	164.49	169.71		169.87	0.002842	1.78	575.55	368.97	0.46
NN1 Dow	27	PF 1	1,025.00	160.10	169.81		169.83	0.000038	0.48	2,126.69	377.65	0.06
NN1 Dow	26	PF 1	1,025.00	160.28	169.80		169.82	0.000069	0.58	1,759.31	370.12	0.09
NN1 Dow	25	PF 1	1,025.00	160.27	169.80		169.81	0.000066	0.61	1,677.17	316.20	0.08
NN1 Dow	24	PF 1	1,025.00	160.26	169.79		169.81	0.000050	0.58	1,775.04	295.59	0.08
NN1 Dow	23	PF 1	1,025.00	159.95	169.78		169.80	0.000072	0.66	1,562.73	282.31	0.09
NN1 Dow	22	PF 1	1,025.00	159.74	169.77		169.80	0.000065	0.67	1,521.95	245.94	0.09
NN1 Dow	21	PF 1	1,025.00	160.42	169.73	165.29	169.78	0.000178	1.04	985.92	174.31	0.14
NN1 Dow	20	PF 1	1,025.00	160.20	169.72		169.77	0.000150	0.98	1,043.91	178.66	0.13
NN1 Dow	19	PF 1	1,025.00	159.20	169.71		169.74	0.000050	0.70	1,474.76	179.40	0.08
NN1 Dow	18	PF 1	1,025.00	161.38	169.66		169.70	0.000100	0.85	1,205.07	187.63	0.11
NN1 Dow	17	PF 1	1,025.00	161.66	169.59		169.64	0.000135	0.96	1,074.78	180.44	0.12
NN1 Dow	16	PF 1	1,025.00	161.84	169.50	164.35	169.56	0.000171	1.07	968.40	166.47	0.14
Current Condition												
Q=2815												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
NN1 Dow	34	PF 1	2,815.00	161.98	174.89		174.98	0.000151	1.32	2,130.35	218.90	0.14
NN1 Dow	33	PF 1	2,815.00	156.11	174.92	162.97	174.96	0.000040	0.85	3,301.59	254.32	0.07
NN1 Dow	32	PF 1	2,815.00	154.01	174.93	160.64	174.95	0.000020	0.65	4,325.52	275.35	0.05
NN1 Dow	31	PF 1	2,815.00	157.91	174.92	163.15	174.95	0.000028	0.72	3,907.96	290.86	0.06
NN1 Dow	30	PF 1	2,815.00	159.20	174.92		174.95	0.000041	0.78	3,595.33	331.65	0.08
NN1 Dow	29	PF 1	2,815.00	158.20	174.91		174.94	0.000042	0.75	3,749.42	369.10	0.08
NN1 Dow	28	PF 1	2,815.00	160.69	174.92		174.94	0.000032	0.67	4,233.83	416.28	0.07
NN1 Dow	27.5	PF 1	2,815.00	164.49	174.87		174.93	0.000162	1.08	2,605.27	415.93	0.14
NN1 Dow	27	PF 1	2,815.00	160.10	174.90		174.92	0.000036	0.68	4,169.17	423.56	0.07
NN1 Dow	26	PF 1	2,815.00	160.28	174.89		174.92	0.000048	0.76	3,727.89	397.56	0.08
NN1 Dow	25	PF 1	2,815.00	160.27	174.88		174.91	0.000055	0.84	3,358.81	340.48	0.09
NN1 Dow	24	PF 1	2,815.00	160.26	174.87		174.91	0.000049	0.84	3,383.71	330.03	0.08
NN1 Dow	23	PF 1	2,815.00	159.95	174.86		174.90	0.000064	0.92	3,065.39	312.33	0.09
NN1 Dow	22	PF 1	2,815.00	159.74	174.84		174.90	0.000068	1.00	2,830.04	268.84	0.10
NN1 Dow	21	PF 1	2,815.00	160.42	174.77	166.98	174.88	0.000166	1.47	1,919.36	195.41	0.15
NN1 Dow	20	PF 1	2,815.00	160.20	174.76		174.86	0.000150	1.40	2,006.85	205.57	0.14
NN1 Dow	19	PF 1	2,815.00	159.20	174.75		174.82	0.000079	1.16	2,467.43	212.29	0.10
NN1 Dow	18	PF 1	2,815.00	161.38	174.68		174.76	0.000116	1.28	2,217.97	218.25	0.13
NN1 Dow	17	PF 1	2,815.00	161.66	174.60		174.70	0.000134	1.40	2,070.87	220.03	0.14
NN1 Dow	16	PF 1	2,815.00	161.84	174.50	166.22	174.62	0.000172	1.55	1,854.25	187.31	0.15

2.2 Outputs for Condition after Riverbed Excavation

Condition after Riverbed Excavation												
Q=105												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m ³ /s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m ²)	(m)	
NN1 Dow	34	PF 1	105.00	161.98	165.65	164.28	165.67	0.000262	0.59	177.00	98.62	0.14
NN1 Dow	33	PF 1	105.00	156.11	165.67	158.14	165.67	0.000004	0.15	716.30	138.96	0.02
NN1 Dow	32	PF 1	105.00	154.01	165.67	155.77	165.67	0.000001	0.07	1,482.56	205.35	0.01
NN1 Dow	31	PF 1	105.00	157.91	165.67	159.22	165.67	0.000002	0.09	1,185.15	256.74	0.01
NN1 Dow	30	PF 1	105.00	159.20	165.66		165.67	0.000006	0.13	793.74	237.03	0.02
NN1 Dow	29	PF 1	105.00	158.20	165.66		165.67	0.000009	0.15	716.26	270.24	0.03
NN1 Dow	28	PF 1	105.00	160.69	165.66		165.66	0.000010	0.14	764.57	323.98	0.03
NN1 Dow	27.5	PF 1	105.00	164.49	165.65		165.66	0.000695	0.50	211.39	323.17	0.20
NN1 Dow	27	PF 1	105.00	160.10	165.66		165.66	0.000015	0.16	669.74	322.98	0.03
NN1 Dow	26	PF 1	105.00	160.28	165.65		165.66	0.000047	0.23	453.05	285.99	0.06
NN1 Dow	25	PF 1	105.00	160.27	165.65		165.65	0.000025	0.21	499.75	228.43	0.05
NN1 Dow	24	PF 1	105.00	160.26	165.65		165.65	0.000013	0.17	632.95	253.00	0.03
NN1 Dow	23	PF 1	105.00	159.95	165.65		165.65	0.000015	0.19	563.66	205.79	0.04
NN1 Dow	22	PF 1	105.00	159.74	165.65		165.65	0.000014	0.18	578.84	213.97	0.04
NN1 Dow	21	PF 1	105.00	160.42	165.64	162.07	165.65	0.000081	0.35	298.57	151.29	0.08
NN1 Dow	20	PF 1	105.00	160.20	165.63		165.64	0.000056	0.31	342.21	162.53	0.07
NN1 Dow	19	PF 1	105.00	159.20	165.63		165.64	0.000004	0.14	763.91	170.94	0.02
NN1 Dow	18	PF 1	105.00	161.38	165.63		165.63	0.000019	0.22	486.50	169.69	0.04
NN1 Dow	17	PF 1	105.00	161.66	165.61		165.62	0.000032	0.26	401.25	156.76	0.05
NN1 Dow	16	PF 1	105.00	161.84	165.60	162.77	165.60	0.000026	0.27	393.48	126.39	0.05
Condition after Riverbed Excavation												
Q=167												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m ³ /s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m ²)	(m)	
NN1 Dow	34	PF 1	167.00	161.98	165.99	164.47	166.02	0.000382	0.79	210.60	100.47	0.17
NN1 Dow	33	PF 1	167.00	156.11	166.01	158.55	166.01	0.000008	0.22	764.72	140.59	0.03
NN1 Dow	32	PF 1	167.00	154.01	166.01	156.09	166.01	0.000001	0.11	1,553.74	205.35	0.01
NN1 Dow	31	PF 1	167.00	157.91	166.01	159.46	166.01	0.000003	0.13	1,274.08	256.74	0.02
NN1 Dow	30	PF 1	167.00	159.20	166.01		166.01	0.000011	0.19	879.66	259.42	0.03
NN1 Dow	29	PF 1	167.00	158.20	166.01		166.01	0.000017	0.21	813.84	286.22	0.04
NN1 Dow	28	PF 1	167.00	160.69	166.01		166.01	0.000016	0.19	878.47	335.94	0.04
NN1 Dow	27.5	PF 1	167.00	164.49	166.00		166.01	0.000441	0.51	325.05	335.50	0.17
NN1 Dow	27	PF 1	167.00	160.10	166.00		166.00	0.000023	0.21	782.35	331.31	0.04
NN1 Dow	26	PF 1	167.00	160.28	166.00		166.00	0.000063	0.30	551.84	291.34	0.07
NN1 Dow	25	PF 1	167.00	160.27	165.99		166.00	0.000040	0.29	578.59	234.35	0.06
NN1 Dow	24	PF 1	167.00	160.26	165.99		165.99	0.000022	0.23	720.09	259.38	0.04
NN1 Dow	23	PF 1	167.00	159.95	165.99		165.99	0.000026	0.26	634.32	211.41	0.05
NN1 Dow	22	PF 1	167.00	159.74	165.99		165.99	0.000025	0.26	652.02	217.63	0.05
NN1 Dow	21	PF 1	167.00	160.42	165.97	162.53	165.98	0.000127	0.48	349.93	156.98	0.10
NN1 Dow	20	PF 1	167.00	160.20	165.96		165.97	0.000089	0.42	396.24	164.91	0.09
NN1 Dow	19	PF 1	167.00	159.20	165.96		165.96	0.000009	0.20	820.24	171.82	0.03
NN1 Dow	18	PF 1	167.00	161.38	165.95		165.96	0.000033	0.31	541.46	170.85	0.06
NN1 Dow	17	PF 1	167.00	161.66	165.93		165.93	0.000056	0.37	450.41	158.38	0.07
NN1 Dow	16	PF 1	167.00	161.84	165.90	162.98	165.91	0.000049	0.39	431.49	127.56	0.07
Condition after Riverbed Excavation												
Q=247												
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m ³ /s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m ²)	(m)	
NN1 Dow	34	PF 1	247.00	161.98	166.43	164.68	166.48	0.000455	0.97	255.19	102.56	0.20
NN1 Dow	33	PF 1	247.00	156.11	166.46	158.97	166.46	0.000014	0.30	827.86	141.34	0.04
NN1 Dow	32	PF 1	247.00	154.01	166.46	156.44	166.46	0.000002	0.15	1,645.91	205.35	0.02
NN1 Dow	31	PF 1	247.00	157.91	166.46	159.72	166.46	0.000005	0.18	1,389.23	256.74	0.02
NN1 Dow	30	PF 1	247.00	159.20	166.46		166.46	0.000018	0.25	999.91	275.47	0.04
NN1 Dow	29	PF 1	247.00	158.20	166.46		166.46	0.000023	0.26	943.15	292.37	0.05
NN1 Dow	28	PF 1	247.00	160.69	166.46		166.46	0.000021	0.24	1,031.22	345.51	0.04
NN1 Dow	27.5	PF 1	247.00	164.49	166.44		166.46	0.000277	0.52	477.99	345.33	0.14
NN1 Dow	27	PF 1	247.00	160.10	166.45		166.45	0.000030	0.26	932.67	339.23	0.05
NN1 Dow	26	PF 1	247.00	160.28	166.44		166.45	0.000070	0.36	683.09	296.69	0.08
NN1 Dow	25	PF 1	247.00	160.27	166.44		166.44	0.000058	0.36	694.31	270.38	0.07
NN1 Dow	24	PF 1	247.00	160.26	166.43		166.44	0.000030	0.30	836.03	262.61	0.05
NN1 Dow	23	PF 1	247.00	159.95	166.43		166.44	0.000037	0.34	729.21	216.74	0.06
NN1 Dow	22	PF 1	247.00	159.74	166.43		166.43	0.000034	0.33	748.43	219.40	0.06
NN1 Dow	21	PF 1	247.00	160.42	166.41	162.99	166.42	0.000159	0.59	419.52	162.66	0.12
NN1 Dow	20	PF 1	247.00	160.20	166.40		166.41	0.000114	0.53	468.18	166.98	0.10
NN1 Dow	19	PF 1	247.00	159.20	166.40		166.40	0.000014	0.28	894.67	172.43	0.04
NN1 Dow	18	PF 1	247.00	161.38	166.38		166.38	0.000048	0.40	614.56	172.71	0.07
NN1 Dow	17	PF 1	247.00	161.66	166.34		166.35	0.000080	0.48	516.94	162.60	0.09
NN1 Dow	16	PF 1	247.00	161.84	166.30	163.16	166.31	0.000076	0.51	483.46	132.17	0.09

Condition after Riverbed Excavation												
Q=351												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	351.00	161.98	166.88	164.92	166.95	0.000541	1.16	301.60	104.33	0.22
NN1 Dow	33	PF 1	351.00	156.11	166.92	159.42	166.93	0.000023	0.39	893.14	142.10	0.05
NN1 Dow	32	PF 1	351.00	154.01	166.92	156.82	166.93	0.000004	0.20	1,740.78	205.35	0.02
NN1 Dow	31	PF 1	351.00	157.91	166.92	160.02	166.92	0.000008	0.23	1,507.74	256.74	0.03
NN1 Dow	30	PF 1	351.00	159.20	166.92		166.92	0.000024	0.31	1,128.69	281.86	0.05
NN1 Dow	29	PF 1	351.00	158.20	166.92		166.92	0.000030	0.33	1,078.06	294.13	0.05
NN1 Dow	28	PF 1	351.00	160.69	166.92		166.92	0.000027	0.29	1,190.58	347.26	0.05
NN1 Dow	27.5	PF 1	351.00	164.49	166.90		166.92	0.000217	0.55	637.16	347.22	0.13
NN1 Dow	27	PF 1	351.00	160.10	166.91		166.91	0.000036	0.32	1,089.04	341.61	0.06
NN1 Dow	26	PF 1	351.00	160.28	166.90		166.91	0.000078	0.43	819.42	299.19	0.08
NN1 Dow	25	PF 1	351.00	160.27	166.89		166.90	0.000069	0.43	818.49	273.66	0.08
NN1 Dow	24	PF 1	351.00	160.26	166.89		166.90	0.000040	0.37	956.29	264.94	0.06
NN1 Dow	23	PF 1	351.00	159.95	166.88		166.89	0.000050	0.42	828.18	219.23	0.07
NN1 Dow	22	PF 1	351.00	159.74	166.88		166.89	0.000046	0.41	848.22	221.21	0.07
NN1 Dow	21	PF 1	351.00	160.42	166.85	163.48	166.88	0.000195	0.71	493.28	167.58	0.13
NN1 Dow	20	PF 1	351.00	160.20	166.84		166.86	0.000143	0.65	542.71	169.10	0.12
NN1 Dow	19	PF 1	351.00	159.20	166.84		166.84	0.000022	0.36	971.04	173.05	0.05
NN1 Dow	18	PF 1	351.00	161.38	166.81		166.82	0.000068	0.51	689.72	174.60	0.08
NN1 Dow	17	PF 1	351.00	161.66	166.76		166.78	0.000110	0.60	585.94	166.65	0.10
NN1 Dow	16	PF 1	351.00	161.84	166.70	163.36	166.72	0.000113	0.65	537.40	137.68	0.11
Condition after Riverbed Excavation												
Q=440												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	440.00	161.98	167.22	165.10	167.30	0.000599	1.31	337.01	105.67	0.23
NN1 Dow	33	PF 1	440.00	156.11	167.27	159.75	167.28	0.000030	0.47	942.53	142.68	0.06
NN1 Dow	32	PF 1	440.00	154.01	167.27	157.11	167.27	0.000006	0.24	1,812.29	205.35	0.03
NN1 Dow	31	PF 1	440.00	157.91	167.27	160.24	167.27	0.000011	0.28	1,597.05	256.74	0.04
NN1 Dow	30	PF 1	440.00	159.20	167.27		167.27	0.000029	0.36	1,226.82	283.71	0.06
NN1 Dow	29	PF 1	440.00	158.20	167.26		167.27	0.000035	0.37	1,180.15	295.14	0.06
NN1 Dow	28	PF 1	440.00	160.69	167.26		167.27	0.000031	0.34	1,311.13	348.30	0.06
NN1 Dow	27.5	PF 1	440.00	164.49	167.25		167.27	0.000192	0.58	757.52	348.26	0.13
NN1 Dow	27	PF 1	440.00	160.10	167.25		167.26	0.000040	0.36	1,207.63	343.41	0.06
NN1 Dow	26	PF 1	440.00	160.28	167.24		167.26	0.000083	0.48	922.95	301.08	0.09
NN1 Dow	25	PF 1	440.00	160.27	167.24		167.25	0.000076	0.48	913.08	276.12	0.08
NN1 Dow	24	PF 1	440.00	160.26	167.23		167.24	0.000046	0.42	1,047.65	266.69	0.07
NN1 Dow	23	PF 1	440.00	159.95	167.23		167.24	0.000059	0.49	903.49	221.11	0.08
NN1 Dow	22	PF 1	440.00	159.74	167.22		167.23	0.000055	0.48	923.96	222.58	0.07
NN1 Dow	21	PF 1	440.00	160.42	167.19	163.91	167.22	0.000216	0.80	549.76	168.93	0.14
NN1 Dow	20	PF 1	440.00	160.20	167.18		167.20	0.000163	0.73	599.51	170.70	0.13
NN1 Dow	19	PF 1	440.00	159.20	167.17		167.18	0.000029	0.43	1,028.76	173.51	0.06
NN1 Dow	18	PF 1	440.00	161.38	167.13		167.15	0.000083	0.59	746.77	176.02	0.09
NN1 Dow	17	PF 1	440.00	161.66	167.08		167.10	0.000131	0.69	638.58	167.79	0.11
NN1 Dow	16	PF 1	440.00	161.84	167.00	163.51	167.03	0.000143	0.76	579.33	141.91	0.12
Condition after Riverbed Excavation												
Q=467												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	467.00	161.98	167.32	165.16	167.42	0.000607	1.34	348.50	106.09	0.24
NN1 Dow	33	PF 1	467.00	156.11	167.38	159.86	167.39	0.000032	0.49	958.35	142.87	0.06
NN1 Dow	32	PF 1	467.00	154.01	167.38	157.19	167.39	0.000006	0.25	1,835.14	205.35	0.03
NN1 Dow	31	PF 1	467.00	157.91	167.38	160.31	167.39	0.000012	0.29	1,625.58	256.74	0.04
NN1 Dow	30	PF 1	467.00	159.20	167.38		167.38	0.000030	0.37	1,258.32	284.31	0.06
NN1 Dow	29	PF 1	467.00	158.20	167.37		167.38	0.000036	0.39	1,212.87	295.47	0.06
NN1 Dow	28	PF 1	467.00	160.69	167.37		167.38	0.000032	0.35	1,349.76	348.63	0.06
NN1 Dow	27.5	PF 1	467.00	164.49	167.36		167.38	0.000184	0.59	796.15	348.59	0.12
NN1 Dow	27	PF 1	467.00	160.10	167.37		167.37	0.000041	0.37	1,245.73	343.96	0.06
NN1 Dow	26	PF 1	467.00	160.28	167.35		167.37	0.000084	0.49	956.32	302.63	0.09
NN1 Dow	25	PF 1	467.00	160.27	167.35		167.36	0.000078	0.49	943.65	277.80	0.09
NN1 Dow	24	PF 1	467.00	160.26	167.34		167.35	0.000048	0.43	1,077.14	268.15	0.07
NN1 Dow	23	PF 1	467.00	159.95	167.34		167.35	0.000062	0.50	927.91	223.91	0.08
NN1 Dow	22	PF 1	467.00	159.74	167.33		167.34	0.000057	0.49	948.41	223.47	0.08
NN1 Dow	21	PF 1	467.00	160.42	167.30	164.10	167.33	0.000219	0.82	568.07	169.20	0.14
NN1 Dow	20	PF 1	467.00	160.20	167.28		167.31	0.000167	0.76	617.99	171.08	0.13
NN1 Dow	19	PF 1	467.00	159.20	167.28		167.29	0.000031	0.45	1,047.48	173.66	0.06
NN1 Dow	18	PF 1	467.00	161.38	167.24		167.26	0.000086	0.61	765.42	176.48	0.09
NN1 Dow	17	PF 1	467.00	161.66	167.18		167.20	0.000135	0.71	655.96	168.16	0.12
NN1 Dow	16	PF 1	467.00	161.84	167.10	163.55	167.13	0.000151	0.79	593.58	143.32	0.12

Condition after Riverbed Excavation												
Q=735												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	735.00	161.98	168.78		168.80	0.000107	0.74	995.85	194.52	0.10
NN1 Dow	33	PF 1	735.00	156.11	168.79	160.49	168.80	0.000018	0.41	1,813.64	234.00	0.05
NN1 Dow	32	PF 1	735.00	154.01	168.79	157.90	168.79	0.000007	0.28	2,634.65	275.35	0.03
NN1 Dow	31	PF 1	735.00	157.91	168.79	161.01	168.79	0.000014	0.35	2,123.04	290.86	0.04
NN1 Dow	30	PF 1	735.00	159.20	168.78		168.79	0.000031	0.44	1,664.19	294.31	0.06
NN1 Dow	29	PF 1	735.00	158.20	168.78		168.79	0.000035	0.45	1,632.97	303.70	0.06
NN1 Dow	28	PF 1	735.00	160.69	168.78		168.79	0.000029	0.40	1,846.50	360.02	0.06
NN1 Dow	27.5	PF 1	735.00	164.49	168.77		168.78	0.000094	0.57	1,294.03	359.92	0.10
NN1 Dow	27	PF 1	735.00	160.10	168.77		168.78	0.000037	0.42	1,737.32	364.49	0.06
NN1 Dow	26	PF 1	735.00	160.28	168.76		168.78	0.000065	0.52	1,400.69	328.65	0.08
NN1 Dow	25	PF 1	735.00	160.27	168.76		168.77	0.000066	0.54	1,353.92	304.77	0.08
NN1 Dow	24	PF 1	735.00	160.26	168.75		168.77	0.000047	0.50	1,470.66	290.23	0.07
NN1 Dow	23	PF 1	735.00	159.95	168.74		168.76	0.000068	0.58	1,273.93	267.82	0.08
NN1 Dow	22	PF 1	735.00	159.74	168.74		168.75	0.000057	0.58	1,271.85	236.40	0.08
NN1 Dow	21	PF 1	735.00	160.42	168.70	164.86	168.74	0.000173	0.91	807.69	172.15	0.13
NN1 Dow	20	PF 1	735.00	160.20	168.69		168.73	0.000142	0.85	861.74	175.45	0.12
NN1 Dow	19	PF 1	735.00	159.20	168.68		168.70	0.000039	0.57	1,293.01	175.63	0.07
NN1 Dow	18	PF 1	735.00	161.38	168.64		168.67	0.000087	0.72	1,016.65	182.48	0.10
NN1 Dow	17	PF 1	735.00	161.66	168.58		168.61	0.000125	0.82	895.63	174.43	0.12
NN1 Dow	16	PF 1	735.00	161.84	168.50	163.96	168.54	0.000153	0.92	805.71	158.77	0.13
Condition after Riverbed Excavation												
Q=1025												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	1,025.00	161.98	169.81		169.85	0.000116	0.85	1,200.55	199.27	0.11
NN1 Dow	33	PF 1	1,025.00	156.11	169.83	161.02	169.84	0.000023	0.50	2,058.83	236.19	0.05
NN1 Dow	32	PF 1	1,025.00	154.01	169.83	158.62	169.84	0.000009	0.35	2,922.11	275.35	0.03
NN1 Dow	31	PF 1	1,025.00	157.91	169.83	161.43	169.84	0.000018	0.42	2,426.40	290.86	0.05
NN1 Dow	30	PF 1	1,025.00	159.20	169.82		169.84	0.000036	0.52	1,974.94	302.28	0.06
NN1 Dow	29	PF 1	1,025.00	158.20	169.82		169.83	0.000040	0.52	1,955.51	319.60	0.07
NN1 Dow	28	PF 1	1,025.00	160.69	169.82		169.83	0.000031	0.46	2,226.85	370.01	0.06
NN1 Dow	27.5	PF 1	1,025.00	164.49	169.81		169.83	0.000081	0.61	1,674.31	369.92	0.09
NN1 Dow	27	PF 1	1,025.00	160.10	169.81		169.83	0.000038	0.48	2,126.69	377.65	0.06
NN1 Dow	26	PF 1	1,025.00	160.28	169.80		169.82	0.000069	0.58	1,759.31	370.12	0.09
NN1 Dow	25	PF 1	1,025.00	160.27	169.80		169.81	0.000066	0.61	1,677.17	316.20	0.08
NN1 Dow	24	PF 1	1,025.00	160.26	169.79		169.81	0.000050	0.58	1,775.04	295.59	0.08
NN1 Dow	23	PF 1	1,025.00	159.95	169.78		169.80	0.000072	0.66	1,562.73	282.31	0.09
NN1 Dow	22	PF 1	1,025.00	159.74	169.77		169.80	0.000065	0.67	1,521.95	245.94	0.09
NN1 Dow	21	PF 1	1,025.00	160.42	169.73	165.29	169.78	0.000178	1.04	985.92	174.31	0.14
NN1 Dow	20	PF 1	1,025.00	160.20	169.72		169.77	0.000150	0.98	1,043.91	178.66	0.13
NN1 Dow	19	PF 1	1,025.00	159.20	169.71		169.74	0.000050	0.70	1,474.76	179.40	0.08
NN1 Dow	18	PF 1	1,025.00	161.38	169.66		169.70	0.000100	0.85	1,205.07	187.63	0.11
NN1 Dow	17	PF 1	1,025.00	161.66	169.59		169.64	0.000135	0.96	1,074.78	180.44	0.12
NN1 Dow	16	PF 1	1,025.00	161.84	169.50	164.35	169.56	0.000171	1.07	968.40	166.47	0.14
Condition after Riverbed Excavation												
Q=2815												
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
NN1 Dow	34	PF 1	2,815.00	161.98	174.88		174.96	0.000126	1.24	2,265.35	219.01	0.12
NN1 Dow	33	PF 1	2,815.00	156.11	174.91	162.97	174.95	0.000040	0.85	3,298.38	254.25	0.08
NN1 Dow	32	PF 1	2,815.00	154.01	174.92	160.64	174.94	0.000020	0.65	4,322.05	275.35	0.05
NN1 Dow	31	PF 1	2,815.00	157.91	174.91	163.15	174.94	0.000028	0.72	3,904.29	290.86	0.06
NN1 Dow	30	PF 1	2,815.00	159.20	174.90		174.93	0.000041	0.79	3,591.14	331.60	0.08
NN1 Dow	29	PF 1	2,815.00	158.20	174.90		174.93	0.000042	0.75	3,744.75	369.05	0.08
NN1 Dow	28	PF 1	2,815.00	160.69	174.90		174.93	0.000032	0.67	4,228.57	416.17	0.07
NN1 Dow	27.5	PF 1	2,815.00	164.49	174.90		174.93	0.000051	0.77	3,676.07	416.10	0.08
NN1 Dow	27	PF 1	2,815.00	160.10	174.90		174.92	0.000036	0.68	4,169.17	423.56	0.07
NN1 Dow	26	PF 1	2,815.00	160.28	174.89		174.92	0.000048	0.76	3,727.89	397.56	0.08
NN1 Dow	25	PF 1	2,815.00	160.27	174.88		174.91	0.000055	0.84	3,358.81	340.48	0.09
NN1 Dow	24	PF 1	2,815.00	160.26	174.87		174.91	0.000049	0.84	3,383.71	330.03	0.08
NN1 Dow	23	PF 1	2,815.00	159.95	174.86		174.90	0.000064	0.92	3,065.39	312.33	0.09
NN1 Dow	22	PF 1	2,815.00	159.74	174.84		174.90	0.000068	1.00	2,830.04	268.84	0.10
NN1 Dow	21	PF 1	2,815.00	160.42	174.77	166.98	174.88	0.000166	1.47	1,919.36	195.41	0.15
NN1 Dow	20	PF 1	2,815.00	160.20	174.76		174.86	0.000150	1.40	2,006.85	205.57	0.14
NN1 Dow	19	PF 1	2,815.00	159.20	174.75		174.82	0.000079	1.16	2,467.43	212.29	0.10
NN1 Dow	18	PF 1	2,815.00	161.38	174.68		174.76	0.000116	1.28	2,217.97	218.25	0.13
NN1 Dow	17	PF 1	2,815.00	161.66	174.60		174.70	0.000134	1.40	2,070.87	220.03	0.14
NN1 Dow	16	PF 1	2,815.00	161.84	174.50	166.22	174.62	0.000172	1.55	1,854.25	187.31	0.15

THE PREPARATORY SURVEY
ON
EXPANSION OF NAM NGUM 1 HYDROPOWER STATION
IN
LAO PEOPLE'S DEMOCRATIC REPUBLIC
FINAL REPORT

Appendices

Appendix I Implementation Plan and Cost Estimate

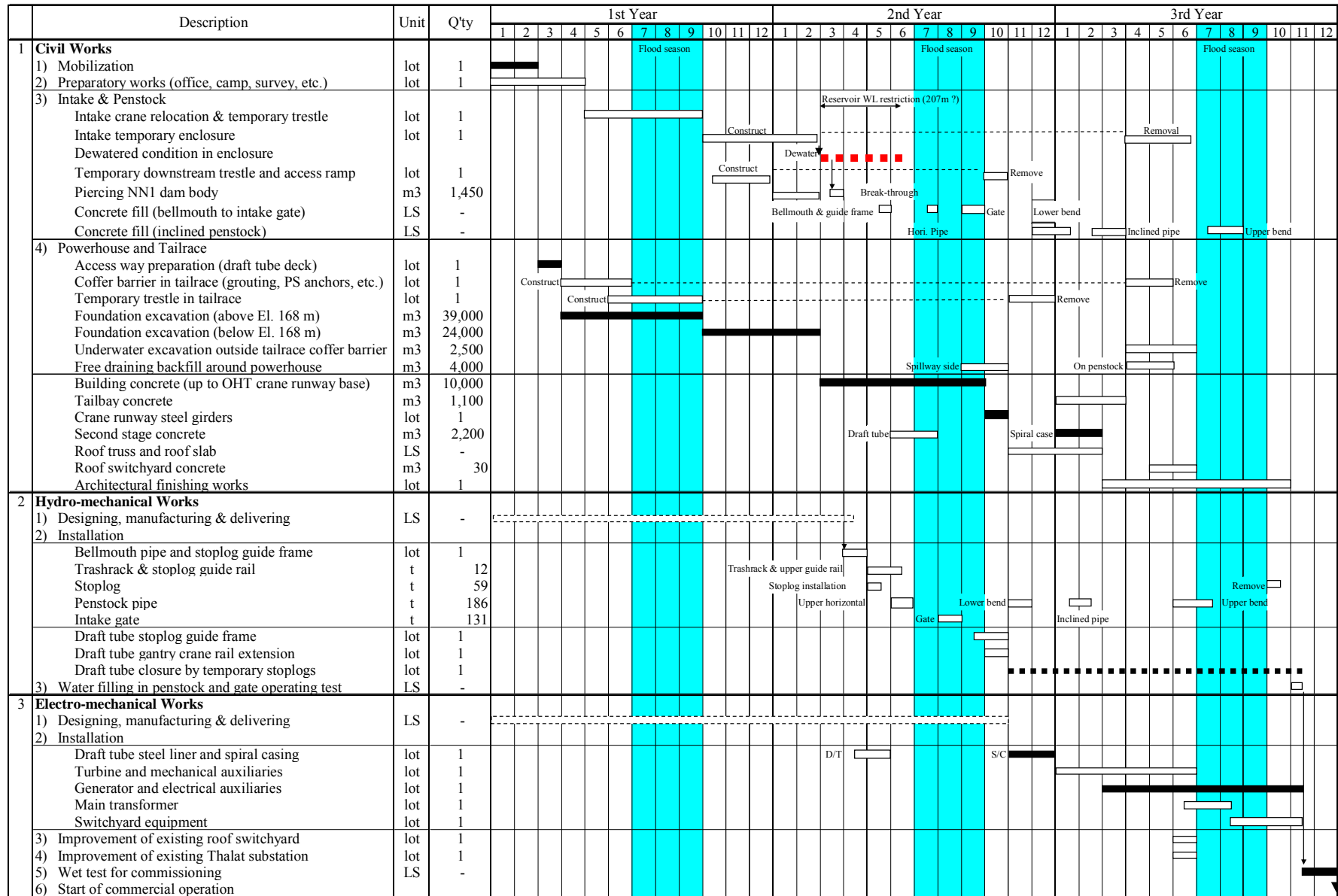
- Appendix I-1 Overall Implementation Schedule
- Appendix I-2 Construction Time Schedule
- Appendix I-3 Layout Plan of Temporary Construction Facilities, Proposed
- Appendix I-4 Financial Cost (With Outcrop Excavation)
- Appendix I-5 Financial Cost (Without Outcrop Excavation)
- Appendix I-6 Direct Cost (With Outcrop Excavation)
- Appendix I-7 Direct Cost (Without Outcrop Excavation)
- Appendix I-8 Manning Schedule for Consulting Services

Appendix I-1 NN1 Expansion - Overall Implementation Schedule

Description	Year 1												Year 2												Year 3												Year 4												Year 5											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
	Pre-construction activities																																																											
1 Loan Pledge	▼																																																											
2 Selection of consultant																																																												
Preparation of TOR by EdL	█																																																											
Tender & evaluation	█																																																											
Contract award	█																																																											
3 D/D & Tender Document																																																												
Detailed design for tender level	█																																																											
Tender documents	█																																																											
4 Selection of Contractors																																																												
PQ, tender & evaluation	█																																																											
Contract award	█																																																											
5 Construction	<div style="border-bottom: 1px dashed black; padding-bottom: 5px;">Construction period</div>																																																											
Mobilization/Preparatory works	█																																																											
Powerhouse & tailrace																																																												
Access to PH excavation site	█																																																											
Tail bay coffer barrier	█																																																											
Temporary trestle (platform)	█																																																											
Foundation excavation (incl. tailrace)	█																																																											
Concrete up to crane rail level	█																																																											
Turbine & mechanical	█																																																											
Generator & electrical	█																																																											
Building utilities and finishing	█																																																											
Intake & Penstock																																																												
Dam crest temporary platform	█																																																											
Temporary d/s platform and ramp	█																																																											
Intake temporary coffer enclosure	█																																																											
Dewatered period in coffer enclosure	█																																																											
Piercing NN1 dam body	█																																																											
Trashrack and stoplog	█																																																											
Penstock pipe and intake gate	█																																																											
Concrete	█																																																											
6 Commissioning																																																												
Wet test & start of commercial operation	█																																																											

Prepared by the JICA Survey Team

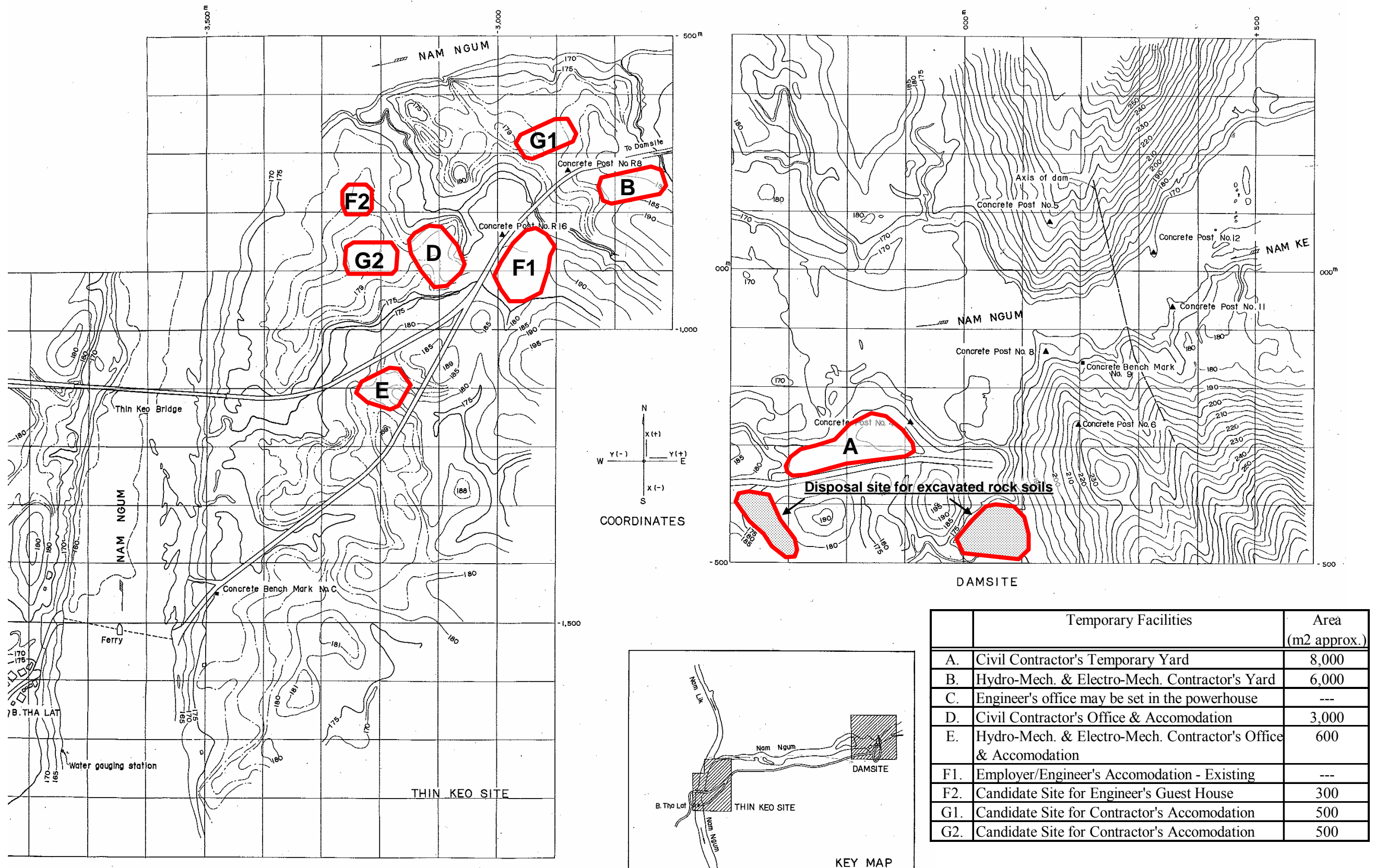
Appendix I-2 Nam Ngum 1 Expansion Work - Construction Time Schedule



Prepared by the JICA Survey Team

Legend [Thick black bar] Critical path work

Appendix I-3 Layout Plan of Temporary Construction Facilities, Proposed



Appendix I-4 Total Fund Requirement

(WITHOUT the removal cost of rock outcrops)

Base Year for Cost Estimation: Aug, 2009
 Exchange Rates: Kip = Yen 0.01116
 Price Escalation: FC: 2.4% LC: 7.3%
 Physical Contingency: 10%
 Physical Contingency for Consultant: 5%

FC :million JPY
 LC :million Kip
 Total :million JPY

Item	Total		
	FC	LC	Total
A. ELIGIBLE PORTION			
) Procurement / Construction	4,738	89,476	5,737
a. civil works	2,079	32,867	2,446
b. hydro-mechanical works	261	4,128	307
c. electro-mechanical works	1,599	25,283	1,882
Base cost	3,940	62,279	4,635
Price escalation	367	19,063	580
Physical contingency	431	8,134	522
) Consulting services	805	3,284	842
Base cost	711	2,470	739
Price escalation	56	658	63
Physical contingency	38	156	40
Total (+)	5,543	92,760	6,578
B. NON ELIGIBLE PORTION			
a Procurement / Construction	0	0	0
Base cost	0	0	0
Price escalation	0	0	0
Physical contingency	0	0	0
b Land Acquisition	0	0	0
Base cost	0	0	0
Price escalation	0	0	0
Physical contingency	0	0	0
c Administration cost	0	29,464	329
d VAT	0	0	0
e Import Tax	0	0	0
Total (a+b+c+d+e)	0	29,464	329
TOTAL (A+B)	5,543	122,224	6,907
C. Interest during Construction	3	0	3
Interest during Construction (Const.)	2	0	2
Interest during Construction (Consul.)	0	0	0
D. Commitment Charge	0	0	0
GRAND TOTAL (A+B+C+D)	5,546	122,224	6,910

Administration Cost = 5%
 VAT = 0% of the expenditure in local currency of the eligible portion
 Import Tax = 0%

Appendix I-5 Total Fund Requirement

With the removal cost of rock outcrops

Base Year for Cost Estimation: Aug, 2009 FC : million JPY
 Exchange Rates Kip = Yen 0.01116 LC : million Kip
 Price Escalation: FC: 2.4% LC: 7.3% Total : million JPY
 Physical Contingency 10%
 Physical Contingency for Consultant 5%

Item	Total		
	FC	LC	Total
A. ELIGIBLE PORTION			
) Procurement / Construction	4,814	90,907	5,828
a. civil works	2,142	33,863	2,520
b. hydro-mechanical works	261	4,128	307
c. electro-mechanical works	1,599	25,283	1,882
Base cost	4,003	63,274	4,709
Price escalation	373	19,368	590
Physical contingency	438	8,264	530
) Consulting services	805	3,284	842
Base cost	711	2,470	739
Price escalation	56	658	63
Physical contingency	38	156	40
Total (+)	5,619	94,191	6,670
B. NON ELIGIBLE PORTION			
a Procurement / Construction	0	0	0
Base cost	0	0	0
Price escalation	0	0	0
Physical contingency	0	0	0
b Land Acquisition	0	0	0
Base cost	0	0	0
Price escalation	0	0	0
Physical contingency	0	0	0
c Administration cost	0	29,875	333
d VAT	0	0	0
e Import Tax	0	0	0
Total (a+b+c+d+e)	0	29,875	333
TOTAL (A+B)	5,619	124,066	7,003
C. Interest during Construction			
Interest during Construction (Const.)	3	0	3
Interest during Construction (Const.)	2	0	2
Interest during Construction (Consul.)	0	0	0
D. Commitment Charge			
	0	0	0
GRAND TOTAL (A+B+C+D)	5,621	124,066	7,006

Administration Cost = 5%
 VAT= 0% of the expenditure in local currency of the eligible portion
 Import Tax= 0%

Appendix I-6 Priced Bill of Quantities on Nam Ngum-1 Power Station Expansion, 40 MW
(without the removal cost of rock outcrops at downstream stretch)

US\$ 1.0 = JPY 95
US\$ 1.0 = Kip 8,510

No.	Work Item	Unit	Quantity	Unit Rate		Amount		Total
				(JPY)	(Kip)	(10 ³ JPY)	(10 ³ Kip)	(10 ³ JPY)
A	CIVIL WORKS							
A1	Preparatory Works							
	a) Preparation of access on the existing draft tube deck	lot	1			808	12,765	950
	b) Relocation of gantry cranes (dam crest & draft tube)	lot	1			1,615	25,530	1,900
	Sub-total					2,423	38,295	2,850
A2	Intake and Penstock							
1	Temporary works							
	a) Intake enclosure structure in reservoir	lot	1			817,998	12,930,945	962,350
	b) Platform for dam penetration work	lot	1			101,745	1,608,390	119,700
2	Concrete excavation for dam penetration	m3	1,450	25,840	408,480	37,468	592,296	44,080
3	Concrete (above El. 177m)	m3	1,130	15,343	242,535	17,337	274,065	20,397
4	Re-bars	t	48	121,125	1,914,750	5,814	91,908	6,840
5	Miscellaneous works (metal works, road, landscaping, etc.)	LS				98,050	1,549,987	115,354
	Sub-total					1,078,412	17,047,590	1,268,720
A3	Powerhouse and Tailrace							
1	Temporary works							
	a) Tailrace coffer structure (incl. grouting and rock anchoring)	lot	1			5,007	79,143	5,890
	b) Trestle at EL. 177 m for muck loading	lot	1			83,173	1,314,795	97,850
2	Excavation							
	a) Open excavation, rock, above El. 168m	m3	39,000	1,211	19,148	47,239	746,753	55,575
	b) Pit excavation, rock, below El. 168m	m3	24,000	3,634	57,443	87,210	1,378,620	102,600
	d) Underwater excavation, rock, outside coffer	m3	2,500	4,845	76,590	12,113	191,475	14,250
	e) Demolition of existing reinforced conc.	m3	400	4,845	76,590	1,938	30,636	2,280
3	Slope protection and rock support							
	a) Rock bolts on cut slope	m	4,300	2,019	31,913	8,681	137,224	10,213
	b) Shotcrete on cut slope	m3	540	32,300	510,600	17,442	275,724	20,520
4	Backfill with free draining materials	m3	4,000	404	6,383	1,615	25,530	1,900
5	Cut slope stabilization (spillway side)	lot	1			8,075	127,650	9,500
6	Concrete (incl. formwork cost)							
	a) Penstock below El. 177 m	m3	770	16,958	268,065	13,057	206,410	15,362
	b) Powerhouse	m3	13,100	17,765	280,830	232,722	3,678,873	273,790
	c) Tailrace	m3	1,100	16,958	268,065	18,653	294,872	21,945
7	Re-bars	t	840	121,125	1,914,750	101,745	1,608,390	119,700
8	Steel structures (roof truss, crane beams)	t	98	363,375	5,744,250	35,611	562,937	41,895
9	Architectural works (finishing, windows, doors, roofing, plumbing, lighting, ventilating, etc.)	lot	1			30,685	485,070	36,100
10	Miscellaneous works (metalwork, earthing, paving, landscaping, etc.)	LS				21,157	334,456	24,891
	Sub-total					726,121	11,478,557	854,260
A4	Roof Switchyard							
1	Concrete	m3	30	24,225	382,950	727	11,489	855
2	Re-bars	t	2.0	121,125	1,914,750	242	3,830	285
3	Miscellaneous works	LS				51	806	60
	Sub-total					1,020	16,124	1,200
A5	General Item Cost							
1	Contractors' offices, camps, workshop, power/water supply, insurance, bonds, etc.)	lot	1			271,150	4,286,353	319,000
	Total of A					2,079,126	32,866,919	2,446,030

Appendix I-6 (continued)

No.	Work Item	Unit	Quantity	Unit Rate		Amount		Total
				(JPY)	(Kip)	(10 ³ JPY)	(10 ³ Kip)	(10 ³ JPY)
B	HYDRAULIC STEEL STRUCTURES							
B1	Intake and Penstock							
1	Trash rack	t	12	323,000	5,106,000	3,876	61,272	4,560
2	Stoplog	t	59	565,250	8,935,500	33,350	527,195	39,235
3	Intake gate and hoist	t	131	888,250	14,041,500	116,361	1,839,437	136,895
5	Penstock steel pipe, D5.5m	t	186	565,250	8,935,500	105,137	1,662,003	123,690
	Sub-total					258,723	4,089,906	304,380
B2	Draft Tube Stoplog Facility							
1	Gantry crane rails & cable extension	LS				2,423	38,295	2,850
	Sub-total					2,423	38,295	2,850
	Total of B					261,146	4,128,201	307,230
C	ELECTRICAL /MECHANICAL EQUIPMENT							
C1	Generating Equipment							
1	Turbine and auxiliaries	lot	1			591,211	9,345,895	695,543
2	Generator and auxiliaries	lot	1			675,918	10,684,943	795,198
3	Transformers	lot	1			118,218	1,868,796	139,080
4	Indoor switchgear	lot	1			68,419	1,081,578	80,494
5	Outdoor switchyard equipment	lot	1			39,761	628,549	46,778
6	Control and protection equipment	lot	1			46,601	736,668	54,825
7	Auxiliary equipment	lot	1			21,778	344,272	25,622
8	Miscellaneous materials	lot	1			22,034	348,317	25,923
	Sub-total					1,583,941	25,039,018	1,863,460
C2	Thalat Substation Improvement							
1	Overhead power conductors	lot	1			654	10,340	770
	Sub-total					654	10,340	770
C3	Inspection, training and model test							
1	Factory inspection by the Emplier	lot	1			4,748	75,058	5,586
2	Factory training to the Employer	lot	1			1,583	25,019	1,862
3	Site instruction	lot	1			5,653	89,355	6,650
4	Turbine model test	lot	1			2,824	44,637	3,322
	Sub-total					14,807	234,070	17,420
	Total of C					1,599,402	25,283,427	1,881,650
D	CONSULTING SERVICES							
1	Design and construction supervision	lot	1			711,020	2,469,696	738,590
	Total of D					711,020	2,469,696	738,590
Grand Total						4,650,693	64,748,243	5,373,500

Appendix I-7 Priced Bill of Quantities on Nam Ngum-1 Power Station Expansion, 40 MW
(with the removal cost of rock outcrops at downstream stretch)

US\$ 1.0 = JPY 95
US\$ 1.0 = Kip 8,510

No.	Work Item	Unit	Quantity	Unit Rate		Amount		Total
				(JPY)	(Kip)	(10 ³ JPY)	(10 ³ Kip)	(10 ³ JPY)
A	CIVIL WORKS							
A1	Preparatory Works							
	a) Preparation of access on the existing draft tube deck	lot	1			808	12,765	950
	b) Relocation of gantry cranes (dam crest & draft tube)	lot	1			1,615	25,530	1,900
	Sub-total					2,423	38,295	2,850
A2	Intake and Penstock							
1	Temporary works							
	a) Intake enclosure structure in reservoir	lot	1			817,998	12,930,945	962,350
	b) Platform for dam penetration work	lot	1			101,745	1,608,390	119,700
2	Concrete excavation for dam penetration	m3	1,450	25,840	408,480	37,468	592,296	44,080
3	Concrete (above EL. 177m)	m3	1,130	15,343	242,535	17,337	274,065	20,397
4	Re-bars	t	48	121,125	1,914,750	5,814	91,908	6,840
5	Miscellaneous works (metal works, road, landscaping, etc.)	LS				98,050	1,549,987	115,354
	Sub-total					1,078,412	17,047,590	1,268,720
A3	Powerhouse and Tailrace							
1	Temporary works							
	a) Tailrace coffer structure (incl. grouting and rock anchoring)	lot	1			5,007	79,143	5,890
	b) Trestle at EL. 177 m for muck loading	lot	1			83,173	1,314,795	97,850
2	Excavation							
	a) Open excavation, rock, above EL. 168m	m3	39,000	1,211	19,148	47,239	746,753	55,575
	b) Pit excavation, rock, below EL. 168m	m3	24,000	3,634	57,443	87,210	1,378,620	102,600
	d) Underwater excavation, rock, outside coffer	m3	2,500	4,845	76,590	12,113	191,475	14,250
	e) Demolition of existing reinforced conc.	m3	400	4,845	76,590	1,938	30,636	2,280
3	Slope protection and rock support							
	a) Rock bolts on cut slope	m	4,300	2,019	31,913	8,681	137,224	10,213
	b) Shotcrete on cut slope	m3	540	32,300	510,600	17,442	275,724	20,520
4	Backfill with free draining materials	m3	4,000	404	6,383	1,615	25,530	1,900
5	Cut slope stabilization (spillway side)	lot	1			8,075	127,650	9,500
6	Concrete (incl. formwork cost)							
	a) Penstock below EL. 177 m	m3	770	16,958	268,065	13,057	206,410	15,362
	b) Powerhouse	m3	13,100	17,765	280,830	232,722	3,678,873	273,790
	c) Tailrace	m3	1,100	16,958	268,065	18,653	294,872	21,945
7	Re-bars	t	840	121,125	1,914,750	101,745	1,608,390	119,700
8	Steel structures (roof truss, crane beams)	t	98	363,375	5,744,250	35,611	562,937	41,895
9	Architectural works (finishing, windows, doors, roofing, plumbing, lighting, ventilating, etc.)	lot	1			30,685	485,070	36,100
10	Miscellaneous works (metalwork, earthing, paving, landscaping, etc.)	LS				21,157	334,456	24,891
	Sub-total					726,121	11,478,557	854,260
A4	Roof Switchyard							
1	Concrete	m3	30	24,225	382,950	727	11,489	855
2	Re-bars	t	2.0	121,125	1,914,750	242	3,830	285
3	Miscellaneous works	LS				51	806	60
	Sub-total					1,020	16,124	1,200
A5	General Item Cost							
1	Contractors' offices, camps, workshop, power/water supply, insurance, bonds, etc.)	lot	1			271,159	4,286,487	319,010
A6	Removal Cost of Rock Outcrops							
	Removal cost of rock outcrops at downstream stretch	m3	13,000	4,845	76,590	62,985	995,670	74,100
	Total of A					2,142,119	33,862,723	2,520,140

Appendix I-7 (continued)

No.	Work Item	Unit	Quantity	Unit Rate		Amount		Total
				(JPY)	(Kip)	(10 ³ JPY)	(10 ³ Kip)	(10 ³ JPY)
B	HYDRAULIC STEEL STRUCTURES							
B1	Intake and Penstock							
1	Trash rack	t	12	323,000	5,106,000	3,876	61,272	4,560
2	Stoplog	t	59	565,250	8,935,500	33,350	527,195	39,235
3	Intake gate and hoist	t	131	888,250	14,041,500	116,361	1,839,437	136,895
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	Sub-total					258,723	4,089,906	304,380
B2	Draft Tube Stoplog Facility							
1	Gantry crane rails & cable extension	LS				2,423	38,295	2,850
	Sub-total					2,423	38,295	2,850
	Total of B					261,146	4,128,201	307,230
C	ELECTRICAL /MECHANICAL EQUIPMENT							
C1	Generating Equipment							
1	Turbine and auxiliaries	lot	1			591,211	9,345,895	695,543
2	Generator and auxiliaries	lot	1			675,918	10,684,943	795,198
3	Transformers	lot	1			118,218	1,868,796	139,080
4	Indoor switchgear	lot	1			68,419	1,081,578	80,494
5	Outdoor switchyard equipment	lot	1			39,761	628,549	46,778
6	Control and protection equipment	lot	1			46,601	736,668	54,825
7	Auxiliary equipment	lot	1			21,778	344,272	25,622
8	Miscellaneous materials	lot	1			22,034	348,317	25,923
	Sub-total					1,583,941	25,039,018	1,863,460
C2	Thalat Substation Improvement							
1	Overhead power conductors	lot	1			654	10,340	770
	Sub-total					654	10,340	770
C3	Inspection, training and model test							
1	Factory inspection by the Emplier	lot	1			4,748	75,058	5,586
2	Factory training to the Employer	lot	1			1,583	25,019	1,862
3	Site instruction	lot	1			5,653	89,355	6,650
4	Turbine model test	lot	1			2,824	44,637	3,322
	Sub-total					14,807	234,070	17,420
	Total of C					1,599,402	25,283,427	1,881,650
D	CONSULTING SERVICES							
1	Design and construction supervision	lot	1			711,020	2,469,696	738,590
	Total of D					711,020	2,469,696	738,590
Grand Total						4,713,687	65,744,048	5,447,610

Appendix I-8 Manning Schedule for the Consulting Services

	Position	BillingRate		Fiscal Year 1			Fiscal Year 2			Fiscal Year 3			Fiscal Year 4			Fiscal Year 5			Total									
		F/C Yen	LC/ Kip	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6		7	8	9	10	11	12	1	2	3
a	1 Project director	2,600,000	0				1					1				1				1				1				8
a	2 Project manager	2,600,000	0				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	47
a	3 Civil designer 1 (intake)	2,600,000	0				1	1	1																			9
a	4 Civil designer 2 (powerhouse)	2,600,000	0				1	1	1	1	1	1	1	1	1	1	1	1									23	
a	5 Architectural engineer	2,600,000	0							1	1																	2
a	6 Civil contract engineer	2,600,000	0							1	1	1	1	1	1	1					1	1						22
a	7 Cost estimate engineer	2,600,000	0																									2
a	8 Geologist	2,600,000	0				1	1	1							1												7
a	9 Hydro-mechanical engineer	2,600,000	0																									11
a	10 Electro-mechanical engineer	2,600,000	0																									20
a	11 Civil construction engineer	2,600,000	0																									29
a	12 Tele-communication engineer	2,600,000	0																									3
a	13 Environmental engineer	2,600,000	0																									4
b	1 Administrator	400,000	1,500,000				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	55
b	2 Civil engineer 1 (intake)	400,000	1,500,000				1	1	1	1	1																	9
b	3 Civil engineer 2 (powerhouse)	400,000	1,500,000				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	49
b	4 Structural engineer	400,000	1,500,000				1	1	1	1																		10
b	5 Architectural engineer	400,000	1,500,000																									18
b	6 Geologist	400,000	1,500,000				1	1	1	1																		10
b	7 Mechanical engineer	400,000	1,500,000																									15
b	8 Electrical engineer	400,000	1,500,000																									22
b	9 CAD operator	400,000	1,500,000				2	2	3	3	3																	79
b	10 Inspector	400,000	1,500,000																									94
b	11 Environmental engineer	400,000	1,500,000																									20
	[Total MM of Pro-A]						35																					187
	[Total MM of Pro-B]						51																					381
	[Total MM of Pro-A+Pro-B]						86																					568
	Total Cost of FC for Each Month(Pro-A), Yen						91,000,000																					486,200,000
	Total Cost of FC for Each Month(Pro-B), Yen						20,400,000																					152,400,000
	Total Cost of LC for Each Month(Pro-A), Kip						0																					0
	Total Cost of LC for Each Month(Pro-B), Kip						76,500,000																					571,500,000
c	1 secretary	0	3,000,000				1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	91
		0	0																									0
		0	0																									0
	[Total MM of Supporting Staff]						7																					91
	Total Cost of LC for Each Month(SS), Kip						21,000,000																					273,000,000
	Grand Total (MM)						93																					659

Prepared by the JICA Survey Team