Peace River Project Water Use Plan

Boat Ramp Mackenzie Landing

Reference: GMSWORKS-47

Mackenzie Boat Ramp Project, Mackenzie's Landing, Mackenzie, BC

Study Period: Completion Report

BC Hydro
Christine Boehringer, MBA, PMP

June 13, 2014

BC Hydro

PROJECT COMPLETION REPORT

Mackenzie Boat Ramp Project

Mackenzie's Landing, Mackenzie BC

In-Service: May 16, 2014

Project Close-out: July 31, 2014

Prepared for: BC Hydro, Water Licence Requirements
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Burnaby, BC
V3N 4X8

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Project Manager
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Executive Summary

This completion report is limited to the work undertaken to develop an implementation project plan and complete construction for Mackenzie's Landing Boat Ramp project following the user requirements and feasibility design resulting from the Peace Water Use Planning (WUP) process which was signed between 2001 and 2003. The implementation plan was time bound to see completion of the hard surfacing of the low water ramp, extension of the high water ramp and elevation of the access road between the two ramps prior to site inundation due to annual reservoir water elevations. The user requirements for the project specified the following:

- Provide access to the Williston Reservoir over a May 15 to October 31 recreational season to an elevation of 659.2 (toe elevation of 658m)
- Remove the operational gap between the upper and lower ramps that result in the inability for boaters to access the reservoir in a range of elevations between 662m and 663.5m.
- Extend the upper ramp with an additional concrete section to reach a toe elevation is 662m.
- Erosion protection will be added to the upper ramp to reduce the incidence of erosion.
- The extension of the upper ramp will be re-contoured to achieve a slope of 15%.
- Construct the access roadway to achieve an elevation of 663.5m on the driving surface and protect from erosion.
- Place navigational aids to warn boaters of the access roadway when it is submerged.
- Re-contour the lower ramp to achieve a slope of 15%.
- Construct the lower ramp surface of concrete and extend the toe of the ramp to an elevation of 658m.
- Provide Record Drawings.
- Provide a boat ramp maintenance manual

The Project in-service date (ISD) was planned for August 29, 2014 to meet user requirements for access during hunting season beginning in September 2014 and to serve the normal recreational season the boat ramp is intended to serve, defined as annual from May to October, beginning in 2015. The actual ISD for the full project was met May 16, 2014.

A key schedule and cost constraint during ramp construction was associated with water levels in Williston Reservoir. Ramp design to support boat launching across all recreation season operating water levels required the ramp toe to be installed at elevation 658.0 m while minimum water levels at the time of construction were 657.993 and, in order to protect the toe from erosion, a rip rap structure was required to extend to an elevation of 656.5. In order to achieve the design requirements a small earth swale was used to hold water out of the construction area and the last three ramp panels, which will see boat and trailer weight only, is supported by fill sandwiched between layers of geo grid material. This geo grid and fill structure was used to eliminate the need to excavate and compact saturated material on the reservoir floor.

Given previous experience with road building, capacity to undertake the work, planning time, remaining material procurement timing, the need to expedite permit acquisition and the fact that Treaty 8 First Nations were not entirely supportive of increasing reservoir access for recreational fishing and hunting, which they view as having the potential to negatively impact their own fishing and hunting opportunities

on the reservoir, the project utilized a Treaty 8 First Nation construction contractor to complete all site work. Duz Cho Construction, a McLeod Lake First Nation owned company, was contracted to develop their environmental protection plan, safety management plan and to prepare to implement the designed works.

Environmental monitoring was undertaken daily throughout the construction period by White Pine Environmental Services supported by Ecofor Consulting.

Construction Management was undertaken by Antares Project Services, a St'at'imc First Nation owned company.

Engineers drawings were developed by Moffatt and Nichol Engineering while Owner's Engineer reviews were completed by Klohn Crippen, on contract to BC Hydro. Site inspections prior to, during and at completion of the works were conducted by Moffatt and Nichol.

The project included the following objectives:

Extension of the existing high water ramp, raising the elevation of the access road to the low water ramp, installing a hard surface on the low water ramp and adding erosion control in order to provide:

- Access to the reservoir at all water levels across the defined recreation season
- A 12-15% grade on both the extension to the high water ramp and the full low water ramp
- A large turnaround area at the low water ramp to allow appropriate and safe access to the low water ramp

The Project achieved an in-service date (ISD) of May 16, 2014 and will close on August 30, 2014.

A key schedule constraint was to complete in-water construction prior to reservoir water elevations impeding construction. Water forecasts suggested site inundation at the low water ramp on or about May 8 and therefore the toe of the low water ramp was targeted for install at the lowest forecast water level based on daily site monitoring.

In order to achieve the early ISD date all team members and the First Nations Construction vendor were involved in early stages prior to the work commencing which allowed these team members to know and understand the scope of work and rapidly address emerging issues during construction.

During construction a portion of the pre-existing high water ramp concrete surface was identified as experiencing spalling and de-lamination. This damage, not included in project scope for 2014, will be addressed at a later date.

Project

1. Status

The Mackenzie Boat Launch site met an ISD of May 16, 2014 with no deficiencies and project completion was achieved on June 30, 2014 when all project closing documentation was received, approved and archived and all outstanding invoices were processed.

2. Background

Pursuant to direction from the BC Comptroller of Water Rights, BC Hydro has carried out a province wide Water Use Planning (WUP) process for most of its existing hydroelectric facilities. The Peace Water Use Plan Consultative Committee recommended a package including scientific studies and physical works for the Peace Hydroelectric System that would result in enhanced recreational access to Williston Reservoir, Dinosaur Reservoir, and the Peace River below Peace Canyon Dam.

This project was a condition of the Water Licence as well as being ordered by the Comptroller of Water Rights. It was implemented in accordance with the Order to Implement the Peace Project Water Use Plan dated August 9, 2007.

3. Project Objectives

1. **Upper Ramp** - Extend the toe of the ramp from an elevation of 664.75m to 662m. The extension will have a slope between 11% and 15%.
2. **Access Road** - Increase the elevation of the access road from 662 to 663.5m.
3. **Lower Ramp** – Reconstruct the lower ramp and increase the slope from 4.2% to 15%. The lower ramp will be constructed with concrete panels and the toe of the lower ramp will be extended to an elevation of 658m.
4. **Erosion Protection** – Provide erosion protection to support longevity of the ramps and access road.

4. Planning

A site visit was conducted in August 2013 with the Project Manager, Construction Manager, Engineer of Record, Environmental Manager, Environmental Monitor, Safety Management and the Construction Contractor.

During the pre-construction site visit all aspects of the project were discussed including permit requirements, site layout, environmental and safety protection planning. A second pre-construction site visit was undertaken in February 2014 with Construction Management, the Environmental Monitor and the contractor.

The combined resource site visits was an excellent way to familiarize everyone with the project at the same time and to exchange thoughts and requirements in a meaningful way. As a result, during construction, there were no lost time safety incidents and only one minor environmental incident that was quickly and professionally handled.

5. Location

The Mackenzie's Landing boat ramp is located along Highway 39, two kilometers North of the town of Mackenzie, B.C. on the east side of Williston Lake Reservoir as shown below.

Site Location (Source: Google Earth)

6. Project Objectives

The Mackenzie Boat Ramp project included the following specific objectives:

Upper Ramp - Extend the toe of the ramp from an elevation of 664.75m to 662m. The extension will have a slope between 11% and 15%.

Access Road - Increase the elevation of the access road from 662 to 663.5m.

Lower Ramp – Reconstruct the lower ramp and increase the slope from 4.2% to 15%. The lower ramp will be constructed with concrete panels and the toe of the lower ramp will be extended to an elevation of 658m.

Erosion Protection – Provide erosion protection to support longevity of the ramps and access road.

7. Project Schedule

Project schedule objectives included ensuring the development of contingency plans for key issues including:

- Public safety through excluding access during construction
- Post construction public safety by utilizing Safety by Design during construction
- Environmental protection through the application of a well-developed environmental protection plan that was executed as planned throughout construction

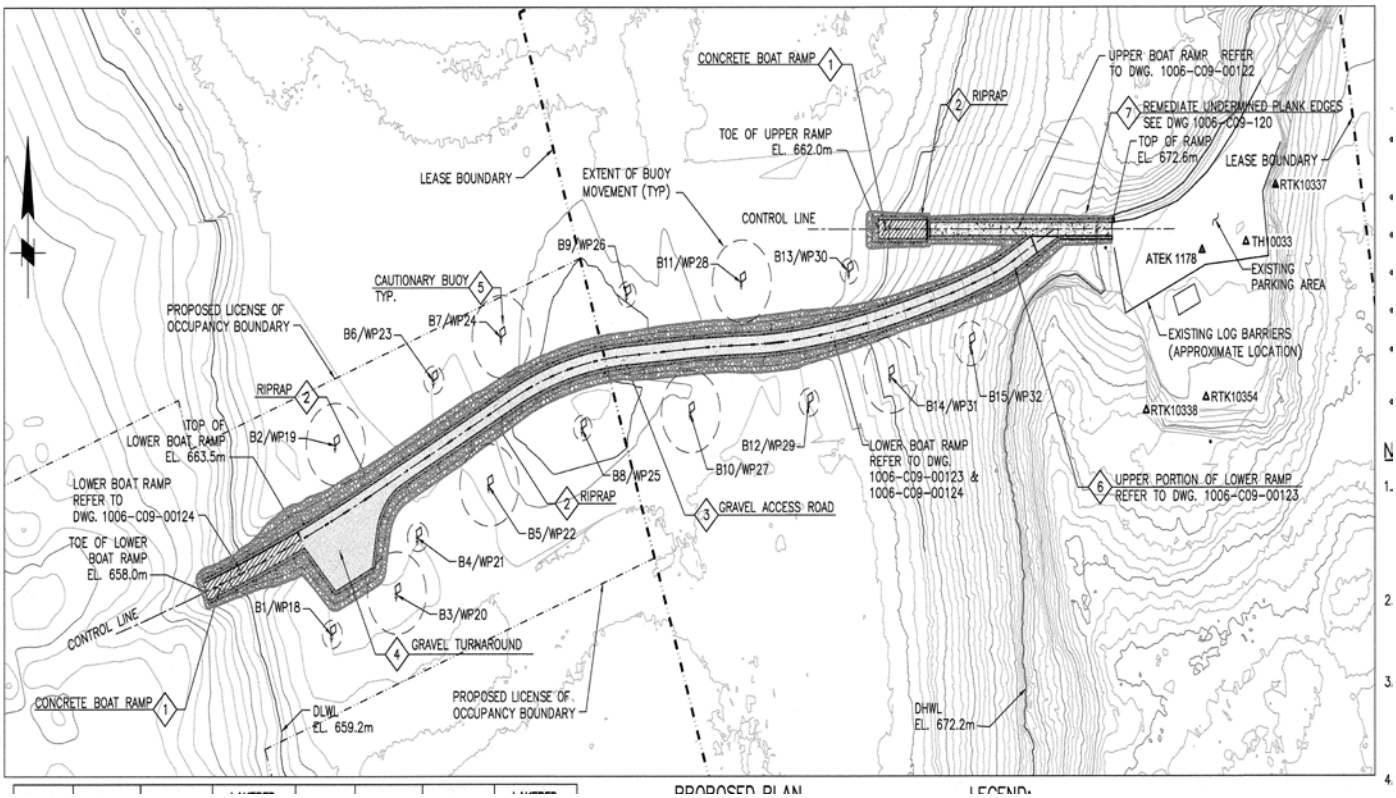
Other schedule objectives are summarized in the table below:

Schedule Milestones

Definition Complete	December 13, 2013
Contract Award <$3M Complete	December 20, 2013
Construction Start	March 3, 2014
In-Service – Mackenzie boat Ramp (Includes upper ramp, access road, lower ramp)	August 29, 2014
Project Complete	February 27, 2015

8. Site Overview

The following figure shows the general arrangement of new and refurbished works completed in 2014.



Source: Extracted from Moffatt and Nichol's drawing 1006-C09-00121 – General Arrangement

9. Project Organization

The project was organized with a mix of BC Hydro staff and contractors. The following list identifies all personnel involved in project identification definition and implementation activities.

Personnel Type	Description of Availability / Constraints
Project Sponsor	Edie Thome – BC Hydro
Program Manager	Conny-Maud Groenevelt – BC Hydro
Project Delivery Team Lead	Mark Leng – BC Hydro
WLR Manager, Water Program – Initiator	Alison Briggs – BC Hydro
WLR Project Manager	Julie Fournier – BC Hydro
Project Manager	Christine Boehringer, C. Boehringer & Associates
Community Relations	Bob Gammer – BC Hydro
Procurement	Todd Patterson – BC Hydro
Safety	Patrick Sutherland – BC Hydro
Contract Management	Dave Williamson - Contractor
Environment	Cindy Powell – BC Hydro
Properties	Sharon Szameit – BC Hydro
Commercial Manager	Brad Samis – BC Hydro
Environmental Monitor	Kevin Wilson – Ecofor/ Rick Johnstone – White Pine Environmental
Construction Contractor	Grant Webber – Duz Cho Construction
Design Engineer	Paul Hoo – Moffatt Nichol
Geotechnical Engineer	Walt Dengler – EXP Environmental
Owner's Engineer	Geoff Cooper – Klohn Crippen
Construction Officer	Cameron Dodd – Antares Project Services
Construction Manager	Rob Emlyn - Antares Project Services
Aboriginal Relations	Rod Hill – BC Hydro

10. Status

The Mackenzie's Landing boat ramp has been successfully completed in accordance with the Project Management Procedures of BC Hydro and went into service on May 16, 2014 while repairs to the pre-existing high water ramp concrete surface, identified during construction but excluded from scope from this project, will be undertaken in a future year.

Appendices

Document Reference	Date on Document
Project Documentation	
• Construction Photographs	Various
• Record Drawings	May 26, 2014

Turnaround area at top of low water ramp.

Access road with final lift of gravel placed, graded and compacted

Upper ramp and access road complete – final riprap keyed-in on shoulders

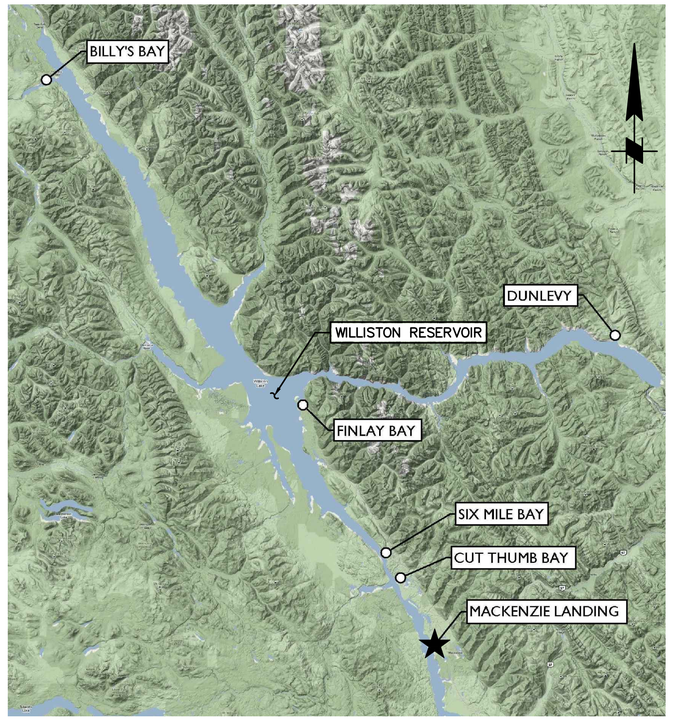
View of low water ramp and portion of turnaround area

Record Drawings begin on next page.

GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER

MACKENZIE LANDING REPLACEMENT BOAT RAMP

DRAWING INDEX				
DRAWING NO.	DWG. TITLE			REV.
1006-C09-00119	MACKENZIE LANDING	COVER SHEET		3
1006-C09-00120	MACKENZIE LANDING	GENERAL NOTES AND DESIGN CRITERIA		1
1006-C09-00121	MACKENZIE LANDING	GENERAL ARRANGEMENT	EXISTING AND PROPOSED SITE PLANS	1
1006-C09-00122	MACKENZIE LANDING	UPPER BOAT RAMP EXTENSION	PLAN AND PROFILE	2
1006-C09-00123	MACKENZIE LANDING	LOWER BOAT RAMP	PLAN AND PROFILE 1	2
1006-C09-00124	MACKENZIE LANDING	LOWER BOAT RAMP	PLAN AND PROFILE 2	2
1006-C09-00125	MACKENZIE LANDING	RAMP	SECTIONS	1
1006-C09-00126	MACKENZIE LANDING	RAMP	DETAILS	3
1006-C09-00127	MACKENZIE LANDING	RAMP	PANEL DETAILS	2
1006-C09-00128	NOT USED	–	–	–
1006-C09-00129	MACKENZIE LANDING	SIGNAGE AND BUOY DETAILS	DETAILS	1
1006-C09-00130	NOT USED	–	–	–
1006-C09-00131	NOT USED	–	–	–



SOURCE: USGS

KEY PLAN
N.T.S.

THIS RECORD DRAWING CONTAINS AS-CONSTRUCTED INFORMATION PROVIDED BY OTHERS AND REFLECTS THE ORIGINAL DESIGN AND THE MATERIAL DESIGN CHANGES MADE DURING CONSTRUCTION. MOFFATT & NICHOL DOES NOT WARRANT OR GUARANTEE THE ACCURACY OF COMPLETENESS OF THE INFORMATION SUPPLIED BY OTHERS.

NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
3	RECORD DRAWING	MAY26/14		PH	AM				
2	DWG 122-124, 126 & 127 REV'D	MAR.20/14	PH	PH	AM				
1	DWG 126 REVISED	FEB.26/14	PH	PH	AM				
0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

REVISIONS

DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
REFERENCE DRAWINGS				REVISIONS								

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	

DATE: September 03, 2013

moffatt & nichol
777 WEST BROADWAY, SUITE 301
VANCOUVER, BC, CANADA, V5Z 4J7
604-707-9004

BCHydro ENGINEERING

GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER

MACKENZIE LANDING REPLACEMENT BOAT RAMP
COVER SHEET

μ | DWG NO CAD 1006-C09-00119 | R 3

P:\8146 Mackenzie Boat Launch Ramp Redesign\CADD_active\8146_1006-C09-00119.dwg Monuzon, Allen 5/26/2014 3:48 PM

GENERAL NOTES

1.0 GENERAL

1.1 DETAILED REQUIREMENTS FOR THE MATERIALS AND FABRICATION ARE DESCRIBED IN THE SPECIFICATIONS. FOR CONVENIENCE, CERTAIN EXTRACTS ARE REPRODUCED BELOW. IN THE EVENT OF CONFLICT, THE SPECIFICATIONS SHALL GOVERN.

1.2 SOUNDINGS AND CONTOURS ARE IN METRES WITH RESPECT TO GEODETIC DATUM AND HAVE BEEN REPRODUCED FROM A BASE DRAWING PROVIDED BY ATEK HYDROGRAPHIC SURVEY LTD IN MAY 2009 AND UPLAND SURVEY BY McELHANNEY CONSULTING SERVICES IN DECEMBER 2012.

1.3 LOCATIONS AND ELEVATIONS OF EXISTING ELEMENTS AS SHOWN ON THE DRAWINGS ARE SUBJECT TO CONSTRUCTION VARIATIONS. THE CONTRACTOR SHALL VISIT THE SITE AND TAKE HIS OWN MEASUREMENTS OF ALL EXISTING STRUCTURES, GROUND AND OTHER WORK. ALL DIMENSIONS AND DETAILS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO FABRICATION AND CONSTRUCTION. DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER PROMPTLY.

2.0 CONCRETE REINFORCING

REINFORCING STEEL SHALL BE BILLET STEEL DEFORMED BARS TO CAN/CSA –30.18, GRADE 400 UNLESS NOTED OTHERWISE.

3.0 PRECAST CONCRETE

3.1 PRECAST CONCRETE MATERIALS AND CONSTRUCTION SHALL CONFORM TO CSA A23.4.

3.2 CONCRETE MIX DESIGNS SHALL CONFORM TO THE REQUIREMENTS OF THE SPECIFICATIONS AND SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW.

3.3 MINIMUM CONCRETE COVER OVER THE REINFORCING SHALL BE AS NOTED ON THE DRAWINGS.

3.4 INDICATE LOCATION OF LIFTING DEVICES AND TEMPORARY SUPPORT POINTS ON THE SHOP DRAWINGS. CONTRACTOR IS RESPONSIBLE FOR DESIGN OF LIFTING DEVICES AND TEMPORARY SUPPORTS.

3.5 MINIMUM 28 DAY COMPRESSIVE STRENGTH FOR CONCRETE SHALL BE 35MPa, UNLESS NOTED OTHERWISE.

4.0 STRUCTURAL STEEL

4.1 ALL STRUCTURAL STEELWORK SHALL CONFORM TO CSA S16.1.

4.2 SUBMIT FABRICATION DRAWINGS FOR ALL STEEL WORK PRIOR TO COMMENCING FABRICATION. ENGINEER'S REVIEW OF FABRICATION DRAWINGS WILL BE TO ASCERTAIN COMPLIANCE WITH THE DESIGN CONCEPT ONLY AND SHALL NOT RELIEVE THE FABRICATOR OF HIS RESPONSIBILITIES UNDER THE CONTRACT.

4.3 STRUCTURAL STEEL FABRICATOR AND ERECTOR SHALL BE CERTIFIED UNDER CSA W47.1 AND REGULATIONS TO DIV 2.1.

4.4 MATERIALS:

ROLLED SECTIONS:	TO CSA G40.21 GRADE 300W
HOLLOW STEEL SECTIONS:	TO CSA G40.21 GRADE 350W CLASS C
PLATES :	TO CSA G40.21 GRADE 300W
STRUCTURAL BOLTS:	TO ASTM A307 HOT DIP GALVANIZED

4.5 WELDED CONNECTIONS SHALL CONFORM TO CSA W59 AND BE MADE BY CWB QUALIFIED WELDERS. FIELD WELDED CONNECTIONS SHALL NOT BE USED UNLESS APPROVED BY THE ENGINEER.

4.6 ALL STEEL EMBEDMENT FIXTURES AND FASTENERS SHALL BE HOT–DIP GALVANIZED, IN ACCORDANCE WITH ASTM F2329 & ASTM A153. MINIMUM THICKNESS OF ZINC TO BE 0.11mm, UNO.

4.7 ALL EXPOSED STEEL TO BE HOT DIP GALVANIZED IN ACCORDANCE WITH SPECIFICATIONS.

4.8 ALL HSS MEMBERS TO BE PROVIDED WITH MINIMUM 6mm END PLATES AND SEAL WELDED. ALL HSS MEMBERS SHALL BE SEALED.

4.9 STIFFENERS ARE TO BE MINIMUM 10mm PLATE UNLESS NOTED OTHERWISE.

4.10 ALL HSS SPLICES ARE TO BE COMPLETE PENETRATION FULL STRENGTH WELDS.

4.11 AT ALL FULL SPLICE WELDS, ALL BACKING BARS SHALL BE REMOVED.

5.0 FILTER STONE

CLEAN, WELL GRADED IMPORTED QUARRIED ROCK PROVIDING PERMANENT FILTERING, BEDDING WITH THE FOLLOWING GRADATION:

FILTER STONE FOR 55kg RIPRAP

	% SMALLER (BY WEIGHT) THAN			
MASS (Kg)	TARGET	LOWER LIMIT	UPPER LIMIT	D* (m)
25	100	95	100	0.21
17	85	70	95	0.19
5	50	40	65	0.13
2.0	15	10	25	0.09
1.0	5	0	5	0.07

* APPROXIMATE AVERAGE DIAMETER OF ANGULAR ROCK

6.0 RIPRAP

CLEAN, GRADED, ROUGH ANGULAR, NON–FRIABLE QUARRY STONE RIPRAP MEETING THE FOLLOWING GRADATION:

CLASS 55kg RIPRAP

	% SMALLER (BY WEIGHT) THAN			
MASS (Kg)	TARGET	LOWER LIMIT	UPPER LIMIT	D* (m)
250	100	95	100	0.45
175	85	70	95	0.40
55	50	40	65	0.28
20	15	10	25	0.20
10	5	0	5	0.15

* APPROXIMATE AVERAGE DIAMETER OF ANGULAR ROCK

7.0 GRANULAR BASE

CLEAN, ANGULAR COARSE GRAVEL, FREE OF SILT, CLAY, LOAM, FRIABLE OR SOLUBLE MATERIALS AND VEGETABLE MATTER WITH THE FOLLOWING GRADATION:

SIEVE SIZE (mm)	GRADATION LIMITS (% PASSING BY DRY WEIGHT)
25	100
19	75–100
9.5	30–65
4.75	5–30
2.36	0–10
0.30	0–8
0.075	0–5

8.0 75mm CBC – CRUSHED BASE COURSE AGGREGATES

CLEAN, HARD, DURABLE CRUSHED GRAVEL FREE OF ORGANIC, SILT, CLAY, LOAM, FRIABLE OR SOLUBLE MATERIALS AND VEGETABLE MATTER WITH THE FOLLOWING GRADATION:

SIEVE SIZE (mm)	GRADATION LIMITS (% PASSING BY DRY WEIGHT)
75	100
37.5	60–100
19	35–80
9.5	25–60
4.75	20–40
2.36	15–30
1.18	10–20
0.30	3–10
0.075	0–5

9.0 GENERAL FILL

GENERAL FILL SHALL CONSIST OF DURABLE, NATURAL, GRANULAR MATERIAL, FREE OF ORGANICS, WITH NO MORE THAN 8% BY WEIGHT PASSING THE NO. 200 SIEVE. THE MAXIMUM PARTICLE SIZE SHALL NOT EXCEED 150mm.

10.0 NAVIGABLE WATERS PROTECTION ACT (NWPA) PERMIT

CONTRACTOR SHALL SATISFY THE REQUIREMENTS STATED IN THE NWPA PERMIT. REFER TO DRAWING 1006–C09–00129 FOR DETAILS ON SIGNAGE AND BUOY REQUIREMENTS. ADDITIONAL BUOYS HAVE BEEN INCLUDED OVER THE MINIMUM REQUIREMENT AS AN OPERATIONAL ALLOWANCE FOR SEASONAL DETERIORATION.

11.0 ICE REMOVAL PLAN

CONTRACTOR SHALL SUBMIT AN ICE REMOVAL PLAN TO ENGINEER FOR APPROVAL PRIOR TO SITE MOBILIZATION. THE PLAN SHALL DESCRIBE THE PROPOSED EQUIPMENT AND METHODOLOGY TO BE UTILIZED FOR THE REMOVAL OF ICE AT THE PROJECT WORK LIMITS TO FACILITATE CONSTRUCTION DURING THE WINTER SEASON.

12.0 REMEDIAL PLAN TO REPAIR UNDERMINED EDGES OF EXISTING PLANKS

CONTRACTOR SHALL SUBMIT TO THE ENGINEER FOR APPROVAL, A REMEDIAL PLAN THAT ADDRESSES THE LOSS OF FOUNDATION MATERIAL NOTED AT SOME PORTIONS AT THE EDGES OF THE EXISTING PLANKS AT THE UPPER RAMP. CONTRACTOR TO FILL VOIDS UNDER EDGES OF EXISTING PLANKS WITH HAND COMPACTED CEMENTITIOUS MATERIALS OR GROUTED BAGS. CRACKS IN CONCRETE PLANKS SHALL BE REPAIRED USING INJECTED EPOXY GROUT OR SIMILAR APPROVED.

DESIGN CRITERIA

1.0 CODES AND STANDARD

THE STRUCTURES ARE DESIGNED TO CONFORM TO THE MOST CURRENT VERSION OF THE FOLLOWING CODES AND STANDARDS:

- CALIFORNIA DEPARTMENT OF BOATING AND WATERWAYS. "LAYOUT, DESIGN AND CONSTRUCTION HANDBOOK FOR SMALL CRAFT BOAT LAUNCHING FACILITIES";
- PROVINCE OF BRITISH COLUMBIA, MINISTRY OF ENVIRONMENT LANDS AND PARKS, "PARK DESIGN GUIDELINES AND DATA"
- NATIONAL BUILDING CODE OF CANADA (NBCC)
- CSA A23.3 – "DESIGN OF CONCRETE STRUCTURES"
- CAN/CSA S16.1 – "LIMIT STATES DESIGN OF STEEL STRUCTURES"
- CAN/CSA O86–01 – "ENGINEERING DESIGN IN WOOD"
- OREGON STATE MARINE BOARD. "LAYOUT AND DESIGN GUIDELINES FOR RECREATIONAL BOATING FACILITIES"

2.0 MATERIALS AND TESTING

MATERIALS AND TESTING IS SPECIFIED TO CONFORM TO THE MOST CURRENT EDITION OF THE RELEVANT STANDARDS, WHERE APPLICABLE, AS PUBLISHED BY THE FOLLOWING ORGANIZATIONS:

- CANADIAN STANDARDS ASSOCIATION (CSA)
- AMERICAN SOCIETY OF TESTING AND MATERIALS (ASTM)

CSA TAKES PRECEDENCE OVER ASTM IN CASE OF CONFLICT OR DISPUTE.

3.0 UNITS OF MEASUREMENT

CONSTRUCTION DRAWINGS AND SPECIFICATIONS ARE IN ACCORDANCE WITH THE INTERNATIONAL SYSTEM OF UNITS (SI) METRIC UNITS. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.

4.0 PROJECT DATUM AND ELEVATIONS

COORDINATES ARE IN METERS TO UTM NAD83 COORDINATE SYSTEM. ALL ELEVATIONS ARE REFERENCED TO GEODETIC DATUM, AND ARE IN METRES UNLESS NOTED OTHERWISE.

5.0 DESIGN LIFE

THE NEW COMPONENTS OF THE PROPOSED FACILITY ARE DESIGNED FOR THE FOLLOWING SERVICE LIFE:

- LAUNCHING RAMPS – 30 YEARS

6.0 MARINE CRITERIA

6.1 WATER LEVELS

THE MINIMUM AND MAXIMUM WATER LEVEL ELEVATIONS ARE REFERENCED TO GEODETIC DATUM AS SHOWN BELOW:

WATER LEVEL DESIGNATION	ELEVATION (M)	LOCATION
MINIMUM RECORDED WATER ELEVATION	654.3	MACKENZIE LANDING
RAMP DESIGN HIGH WATER ELEVATION (DHWL)	672.2	MACKENZIE LANDING
RAMP DESIGN LOW WATER ELEVATION (URDLWL) FOR UPPER RAMP	663.2	MACKENZIE LANDING
RAMP DESIGN LOW WATER ELEVATION (LRDLWL) FOR LOWER RAMP	659.2	MACKENZIE LANDING
OPERATIONAL WATER LEVEL RANGE FOR UPPER RAMP	672.2 to 663.2	MACKENZIE LANDING
OPERATIONAL WATER LEVEL RANGE FOR LOWER RAMP	663.2 to 659.2	MACKENZIE LANDING

THE RAMP DESIGN LOW WATER ELEVATION IS CALCULATED AS THE SUMMATION OF THE TOE OF RAMP ELEVATION PLUS 1.2m WATER DEPTH.

6.2 DESIGN VESSELS

THE RANGE OF DESIGN VESSELS IS SHOWN AS FOLLOWS:

VESSEL TYPE	LENGTH (m)	WIDTH (m)	MAX. DRAFT (m)	WEIGHT (t)
MAXIMUM POWER BOAT	6.1	2.4	1.0	4.0

7.0 STRUCTURAL LOADS

THE RAMPS ARE DESIGNED TO CARRY THE WEIGHT OF A VEHICLE WITH A LOADED BOAT TRAILER. THE DESIGN WEIGHT OF THE VEHICLE IS 6050kg AND THE DESIGN WEIGHT OF A LOADED BOAT TRAILER IS 4400kg.

8.0 GEOTECHNICAL INFORMATION

GEOTECHNICAL INFORMATION IS BASED ON THE THREE FOLLOWING REPORTS:

– "GEOTECHNICAL REPORT – BC HYDRO BOAT LAUNCH RAMPS, EIGHT LOCATIONS AT WILLISTON RESERVOIR, BC" NOVEMBER 1, 2010, PROVIDED BY TROW ASSOCIATES.

– "GEOTECHNICAL REPORT – PROPOSED BOAT LAUNCH RAMP, MACKENZIE LANDING UPPER BOAT RAMP, WILLISTION LAKE, BC, BCH REF. NO. EC12–479620" DATED DECEMBER 24, 2012 BY EXP SERVICES INC. (FORMERLY KNOWN AS TROW ASSOCIATES)

– "MACKENZIE LANDING GEOTECHNICAL ASSESSMENT" MSCL FILE 2331–20107–0, DATED AUGUST 13, 2013 BY McELHANNEY CONSULTING SERVICES LTD.

9.0 WAVE HEIGHT AND PERIOD

THE DESIGN WAVE HEIGHT AND PERIOD IS BASED ON THE ACES WIND–WAVE GROWTH ANALYSIS FOR THE I IN 50 YEAR EXTREME WIND SPEED AT MACKENZIE, WHERE THE SIGNIFICANT WAVE HEIGHT AND PERIOD FOR LOCALLY WIND – GENERATED WAVES IS 0.36m AND 2.2 SECONDS.

10.0 ICE LOADS:

ICE LOADING WAS NOT CONSIDERED IN THE DESIGN AS DIRECTED BY BC HYDRO. RIPRAP WAS DESIGNED FOR WAVE FORCES ONLY.

11.0 ACCESSIBILITY

DUE TO THE REMOTENESS OF THE SITE, NO PROVISION HAVE BEEN MADE TO ENSURE THAT THE SITE IS FULLY ACCESSIBLE FOR ALL USERS.

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DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
REFERENCE DRAWINGS												
		μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
REVISIONS			1	RECORD DRAWING	MAY26/14	PH	PH	AM				
			0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	
DATE	September 03, 2013

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604–707–9004

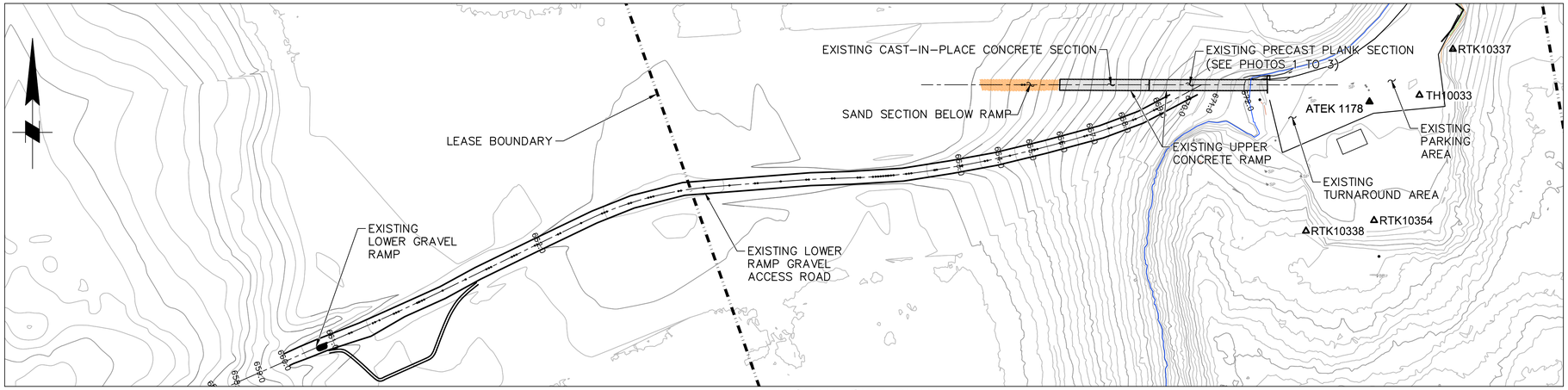
BCHydro ENGINEERING

GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER

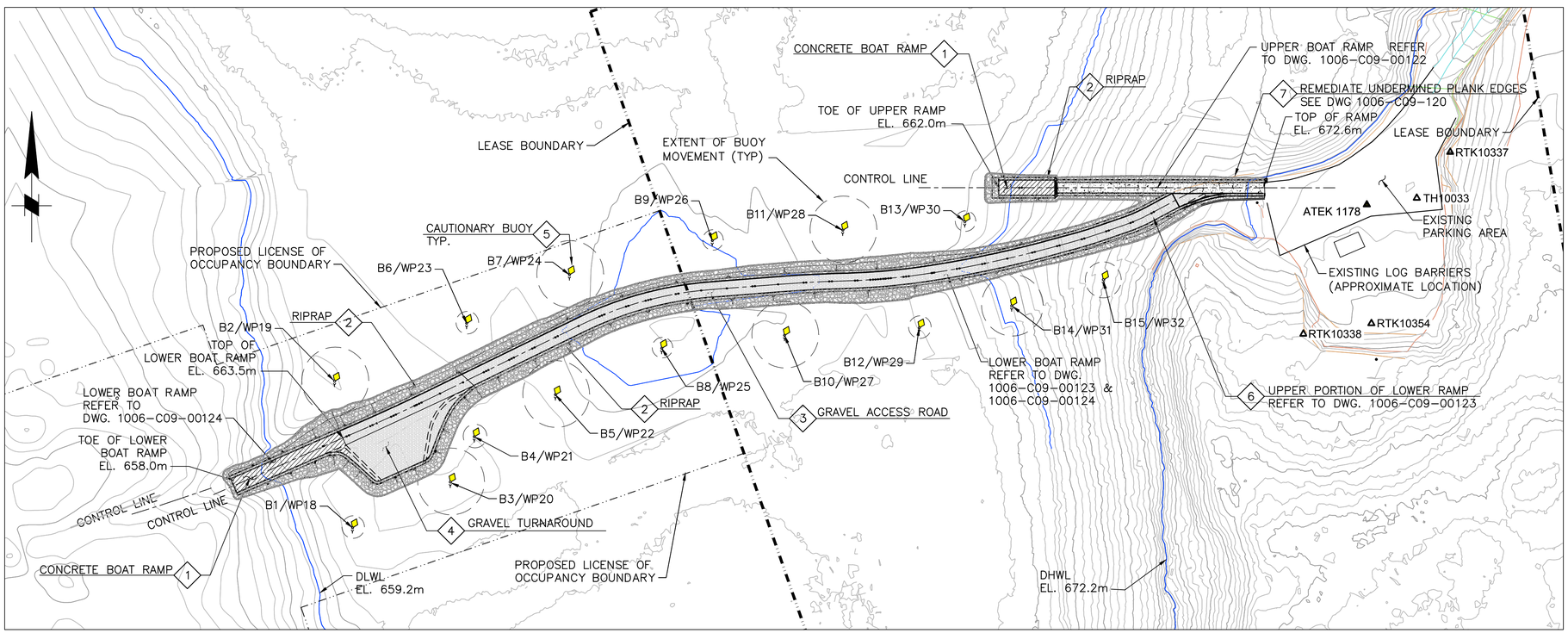
MACKENZIE LANDING REPLACEMENT BOAT RAMP
GENERAL NOTES AND DESIGN CRITERIA

μ | DWG NO CAD 1006-C09-00120 | R 1

P:\8146 Mackenzie Boat Launch Ramp Redesign\CADD_Active\8146_1006-C09-00120.dwg Menuzon, Allen 5/26/2014 3:48 PM



EXISTING SITE PLAN
1:1000



PROPOSED PLAN
1:1000

BUOY No.	EASTING	NORTHING	LAKEBED ELEVATION (m)	BUOY No.	EASTING	NORTHING	LAKEBED ELEVATION (m)
B1/WP18	489159.678	6134907.590	661.5	B9/WP26	489299.758	6135019.294	662.2
B2/WP19	489152.694	6134964.594	661.4	B10/WP27	489327.890	6134982.467	662.0
B3/WP20	489197.765	6134925.335	661.5	B11/WP28	489350.547	6135023.370	661.8
B4/WP21	489207.081	6134942.996	661.5	B12/WP29	489380.309	6134985.374	661.5
B5/WP22	489238.699	6134959.350	661.7	B13/WP30	489398.065	6135026.635	662.1
B6/WP23	489204.111	6134987.127	661.5	B14/WP31	489416.306	6134993.923	663.5
B7/WP24	489244.152	6135006.045	661.9	B15/WP32	489451.984	6135004.056	667.8
B8/WP25	489280.073	6134977.402	662.5				

SURVEY CONTROL			
POINT	EASTING	NORTHING	ELEVATION (m)
RTK10337	489587.076	6135053.755	674.694
RTK10338	489529.896	6134983.015	676.917
RTK10354	489556.385	6134987.107	674.153
TH10033	489574.060	6135035.890	673.279
ATEK 1178	489554.604	6135033.300	–

LEGEND:

- EXISTING CONCRETE PAVEMENT WITH BROOM FINISH
- CONCRETE PAVEMENT WITH V-GROOVE FINISH
- GRAVEL PAVEMENT
- CLASS 55kg RIPRAP
- YELLOW CAUTIONARY BUOY
- LEASE BOUNDARY
- PROPOSED LICENSE OF OCCUPANCE BOUNDARY

PHOTO No.1
TYP CRACKS TO PRECAST CONCRETE PLANKS AT EXISTING UPPER RAMP

PHOTO No.2
TYP CRACKS TO PRECAST CONCRETE PLANKS AT EXISTING UPPER RAMP

PHOTO No.3
SCOUR AND DAMAGE AT THE PRECAST CONCRETE PLANKS AT EXISTING UPPER RAMP. LENGTH & WIDTH OF UNDERMINED PLANKS TO BE FIELD MEASURED PRIOR TO SUBMITTING REMEDIATION PLAN.

ITEMS TO BE CONSTRUCTED:

1. CONCRETE BOAT RAMP, REFER TO DWG. 1006-C09-00122 & 00124
2. RIPRAP, REFER TO DWG. 1006-C09-00122
3. GRAVEL ACCESS ROAD, REFER TO DWG. 1006-C09-00123
4. GRAVEL TURNAROUND
5. CAUTIONARY BUOY, REFER TO DWG. 1006-C09-00129
6. UPPER PORTION OF LOWER RAMP, REFER TO DWG. 1006-C09-00123
7. REMEDIATE UNDERMINED EDGES OF EXISTING PLANKS, REFER TO NOTE 12 ON DWG. 1006-C09-00120.

NOTES:

1. DEFINITIONS OF WATER LEVELS
   DHWL – RAMP DESIGN HIGH WATER ELEVATION, EL. 672.2m
   CWL – CONSTRUCTION WATER ELEVATION FOR UPPER RAMP, EL. 662.2m
   DLWL – RAMP DESIGN LOW WATER ELEVATION FOR UPPER RAMP, EL. 663.2m
   RAMP DESIGN LOW WATER ELEVATION FOR LOWER RAMP, EL. 659.2m
   LWL – MINIMUM RECORDED WATER ELEVATION, EL. 654.3m
2. CONTOURS ARE IN METRES TO GEODETIC DATUM AND ARE BASED ON A HYDROGRAPHIC SURVEY CONDUCTED BY ATEK HYDROGRAPHIC SURVEYS LTD. IN MAY 2008, LIDAR DATA PROVIDED BY BC HYDRO IN JULY 07, 2010 AND UPLAND SURVEY BY McELHANNEY CONSULTING SERVICES IN DECEMBER, 2012.
3. THE CONTRACTOR SHALL SATISFY THE REQUIREMENTS OF THE NAVIGABLE WATER PERMIT. REFER TO DRAWING 1006-C09-00129 FOR DETAILS ON SIGNAGE AND BUOY REQUIREMENTS. ADDITIONAL BUOYS HAVE BEEN INCLUDED OVER THE MINIMUM REQUIREMENTS AS AN OPERATIONAL ALLOWANCE FOR SEASONAL DETERIORATION.
4. BC HYDRO TO PROVIDE LOCATIONS AND SIGNS FOR UPLAND RANGE MARKERS, A MARKER POST TO DELINEATE THE DIVERGENCE OF THE UPPER AND LOWER RAMPS, AND HAZARD SIGNS, AT A FUTURE DATE.

20m 0m 20m 40m
SCALE: 1 : 1000

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604-707-9004

DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
REFERENCE DRAWINGS		REVISIONS										
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			0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			
		μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
		REVISIONS										

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	

DATE September 05, 2013

BC hydro ENGINEERING

GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
GENERAL ARRANGEMENT
EXISTING AND PROPOSED SITE PLANS

μ DWG NO CAD 1006-C09-00121 R 1

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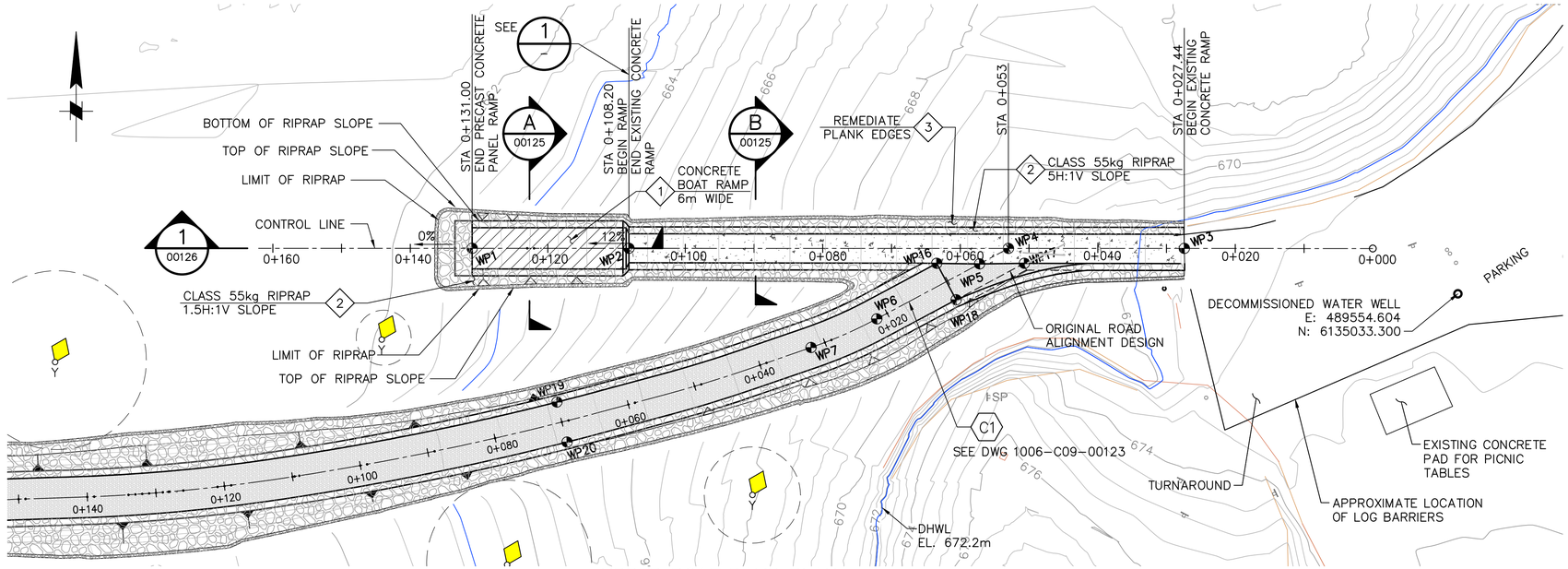


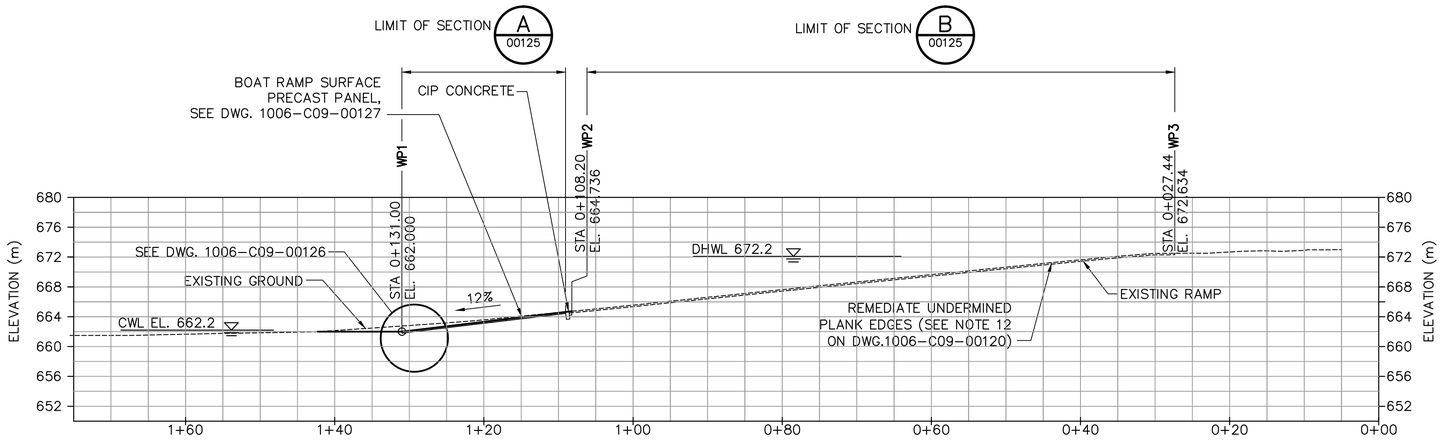
UPPER BOAT RAMP PLAN
1:400

CONSTRUCTION NOTES:

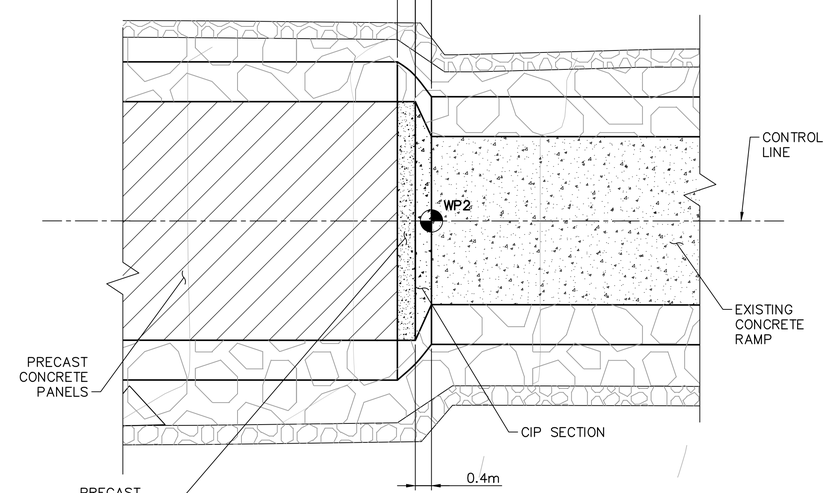
1. CONSTRUCT CONCRETE BOAT RAMP.
2. CONSTRUCT CLASS 55kg RIPRAP.
3. REMEDIATE UNDERMINED EDGES OF EXISTING PLANKS.

COORDINATE CONTROL

POINT NO.	EASTING	NORTHING	ELEVATION	
WP1	489411.224	6135039.912	662.000	
WP2	489434.024	6135039.907	664.736	
WP3	489514.813	6135039.891	672.634	
WP4	489489.224	6135039.896	670.323	
WP5	489485.027	6135037.652	669.912	
WP6	489470.073	6135029.657	668.661	
WP7	489460.515	6135025.488	667.891	
WP16	489478.798	6135037.726	669.165	
~~WP17~~	~~489491.536~~	~~6135037.730~~	~~670.693~~	NOT USED
WP18	489481.628	6135032.433	669.643	
WP19	489423.547	6135017.561	665.097	
WP20	489425.019	6135011.744	665.097	



UPPER BOAT RAMP PROFILE ALONG CENTRELINE
HORIZ = 1:400
VERT = 1:400



1 – N.T.S.

EXISTING RAMP TO RAMP EXTENSION TRANSITION DETAIL

LEGEND:

- EXISTING CONCRETE PAVEMENT WITH BROOM FINISH
- CONCRETE PAVEMENT WITH V-GROOVE FINISH
- GRAVEL PAVEMENT
- CLASS 55kg RIPRAP
- YELLOW CAUTIONARY BUOY

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8m 0m 8m 16m
SCALE: 1 : 400

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604-707-9004

BCHydro ENGINEERING

GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
UPPER BOAT RAMP EXTENSION
PLAN AND PROFILE

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	

DATE: September 09, 2013

μ | DWG NO CAD: 1006-C09-00122 | R 2

NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
2	RECORD DRAWING	MAY26/14		PH	AM				
1	RAMP UPDATED AT TOP & BOTTOM	MAR.20/14	PH	PH	AM				
0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

REVISIONS

DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT

REFERENCE DRAWINGS | REVISIONS

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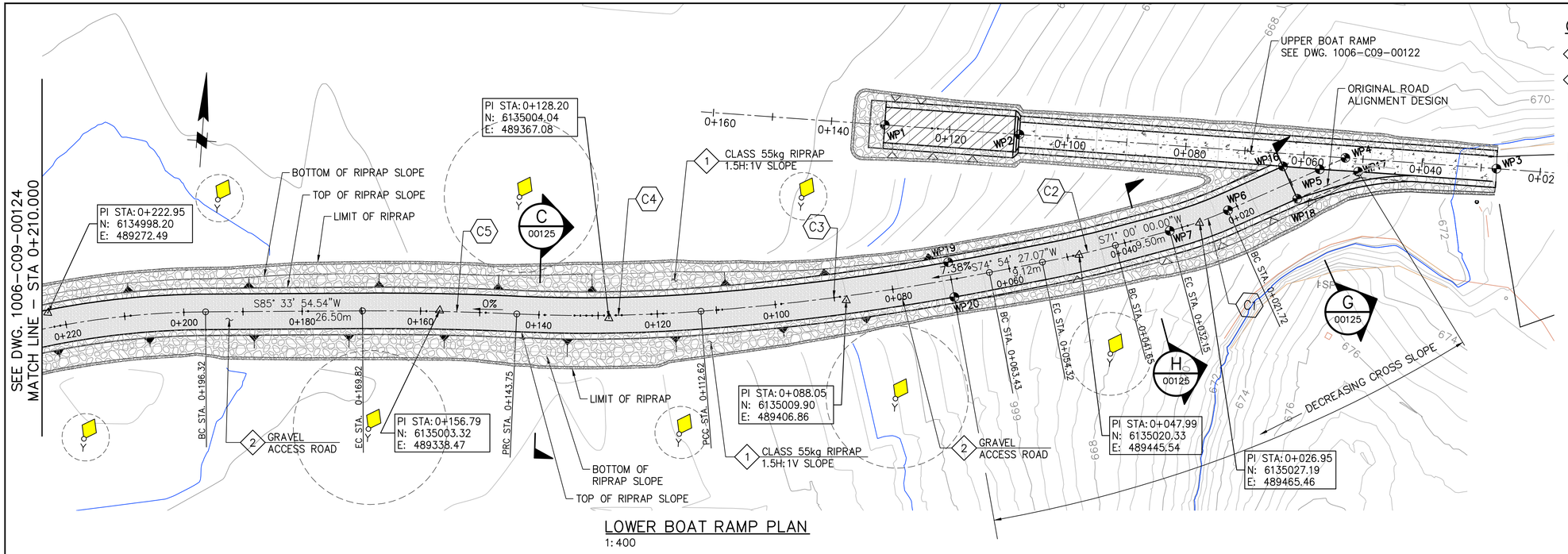


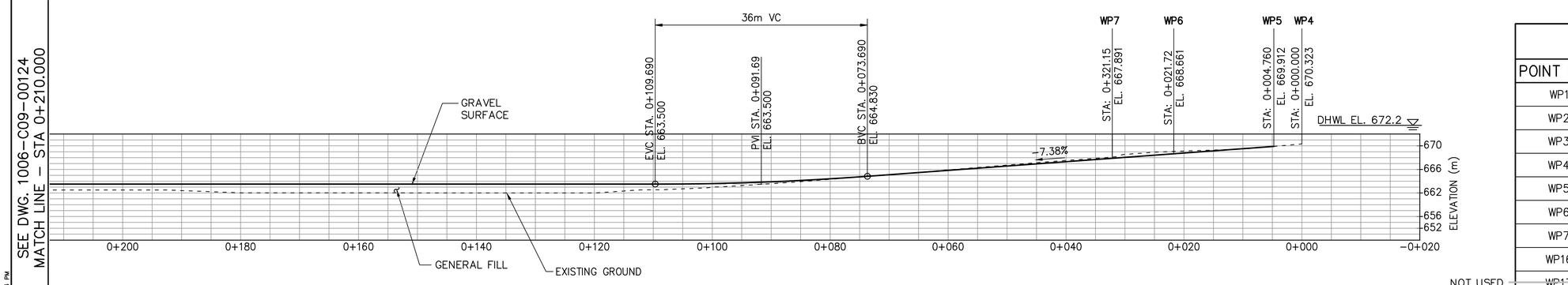
LOWER BOAT RAMP PLAN
1:400

CONSTRUCTION NOTES:

1. CONSTRUCT CLASS 55kg RIPRAP
2. CONSTRUCT 300 THICK GRAVEL ACCESS ROAD.

LEGEND:

- EXISTING CONCRETE PAVEMENT WITH BROOM FINISH
- CONCRETE PAVEMENT WITH V-GROOVE FINISH
- GRAVEL PAVEMENT
- CLASS 55kg RIPRAP
- YELLOW CAUTIONARY BUOY



LOWER BOAT RAMP PROFILE ALONG CENTRELINE
HORIZ = 1:400
VERT = 1:400

COORDINATE CONTROL

POINT NO.	EASTING	NORTHING	ELEVATION
WP1	489411.224	6135039.912	662.000
WP2	489434.024	6135039.907	664.736
WP3	489514.813	6135039.891	672.634
WP4	489489.224	6135039.896	670.323
WP5	489485.027	6135037.652	669.912
WP6	489470.073	6135029.657	668.661
WP7	489460.515	6135025.488	667.891
WP16	489478.798	6135037.726	669.165
NOT USED WP17	489491.536	6135037.730	670.093
WP18	489481.628	6135032.433	669.643
WP19	489423.547	6135017.561	665.097
WP20	489425.019	6135011.744	665.097

CURVE DATA

CURVE#	R	Δ	T	L	START POINT		END POINT	
					EASTING	NORTHING	EASTING	NORTHING
C1	65.50	9°7'53"	5.214	10.44	489470.07,	6135029.66	489460.52,	6135025.49
C2	185.65	3°54'27"	6.330	12.66	489451.53,	6135022.40	489439.43,	6135018.68
C3	419.85	6°42'43"	24.620	49.18	489430.63,	6135016.31	489382.50,	6135006.31
C4	257.31	6°55'58"	15.558	31.14	489382.50,	6135006.31	489351.50,	6135003.65
C5	500.00	2°59'13"	13.032	26.07	489351.50,	6135003.65	489325.47,	6135002.31

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8m 0m 8m 16m
SCALE: 1 : 400

	2	RECORD DRAWING	MAY26/14		PH	AM						
	1	WP1 UPDATED	MAR.20/14	PH	PH	AM						
	0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL					
μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT		

REVISIONS

DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT

REFERENCE DRAWINGS | REVISIONS

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	

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BCHydro ENGINEERING

GMSWORKS #32 TO #39
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
LOWER BOAT RAMP
PLAN AND PROFILE 1

DATE: September 05, 2013
μ | DWG NO: 1006-C09-00123 | CAD | R: 2

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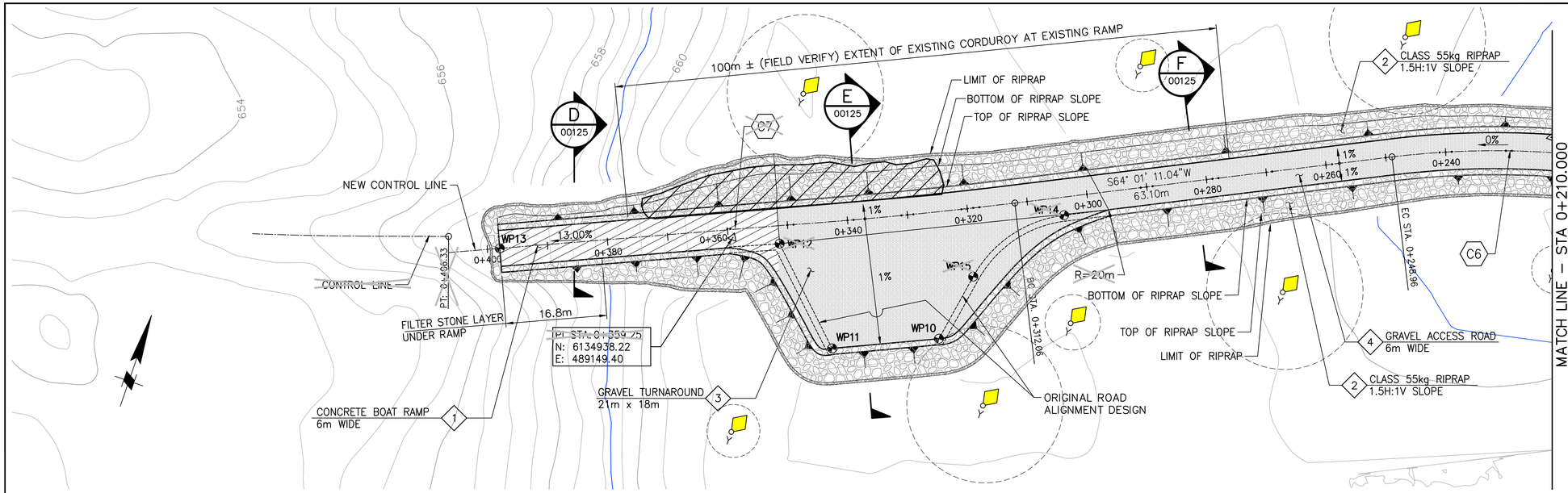
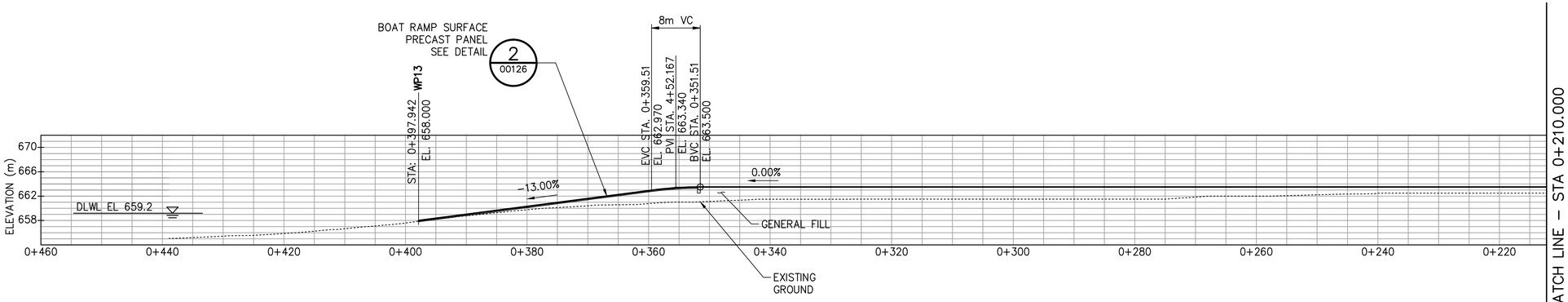


LOWER BOAT RAMP PLAN
1:400



LOWER BOAT RAMP PROFILE ALONG CENTRELINE
HORIZ = 1:400
VERT = 1:400

CONSTRUCTION NOTES:
1. CONSTRUCT 200 THICK CONCRETE BOAT RAMP.
2. CONSTRUCT CLASS 55kg RIPRAP.
3. CONSTRUCT 300 THICK GRAVEL TURNAROUND.
4. CONSTRUCT 300 THICK GRAVEL ACCESS ROAD

LEGEND:
- CONCRETE PAVEMENT WITH V-GROOVE FINISH
- GRAVEL PAVEMENT
- CLASS 55kg RIPRAP
- YELLOW CAUTIONARY BUOY
- FRENCH DRAIN

COORDINATE CONTROL

POINT NO.	EASTING	NORTHING	ELEVATION
WP10	489187.245	6134933.466	663.290
WP11	489171.000	6134926.170	663.290
~~WP12~~ NOT USED	~~489157.091~~	~~6134939.787~~	~~663.470~~
WP13	489113.394	6134923.916	658.000
~~WP14~~ NOT USED	~~489200.206~~	~~6134950.637~~	~~663.470~~
~~WP15~~ NOT USED	~~489189.262~~	~~6134945.080~~	~~663.387~~

CURVE DATA

CURVE#	R	Δ	T	L	START POINT EASTING	START POINT NORTHING	END POINT EASTING	END POINT NORTHING	
C6	140.00	21°32'43"	26.637	52.65	489299.05,	6135000.26	489248.55,	6134986.53	
~~C7~~	~~750.00~~	~~7°12'06"~~	~~47.197~~	~~94.27~~	~~489191.83,~~	~~6134958.89~~	~~489104.71,~~	~~6134923.02~~	NOT USED

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8m 0m 8m 16m
SCALE: 1 : 400

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604-707-9004

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GMSWORKS #32 TO #39
RESERVOIR ACCESS ALONG WILLISTON LAKE
AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
LOWER BOAT RAMP
PLAN AND PROFILE 2

DSGN	PH
INDEP CHK	MN
DFTG	AM
DFTG CHK	
INSP	
REV	
ACPT	

DATE: September 06, 2013
DWG NO CAD: 1006-C09-00124
R: 2

μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
	2	RECORD DRAWING	MAY26/14		PH	AM				
	1	BOTTOM OF RAMP & WP13 UPDATED	MAR.20/14	PH	PH	AM				
	0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

REVISIONS

DRAWING NUMBER	TITLE

REFERENCE DRAWINGS

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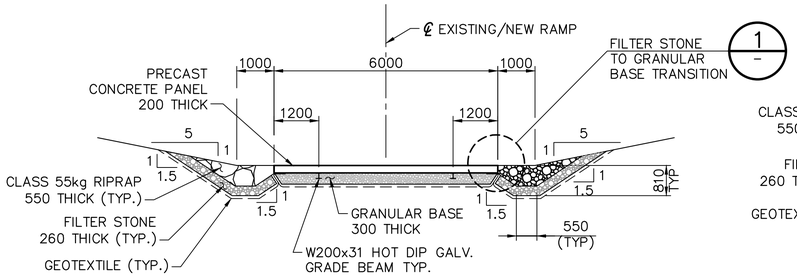

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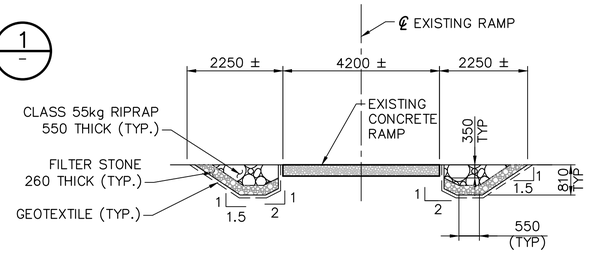

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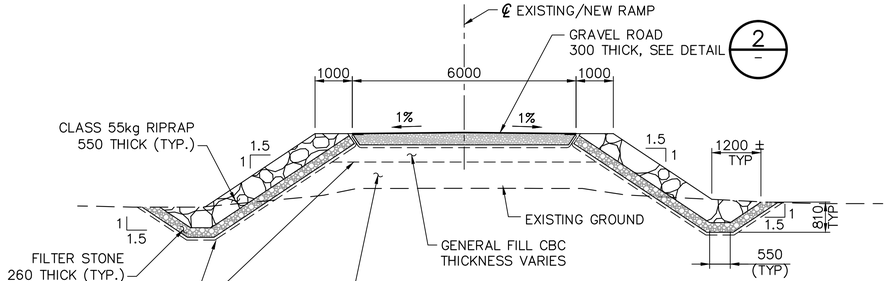

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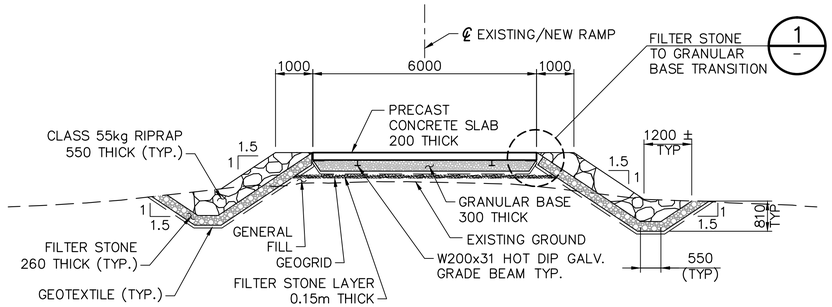

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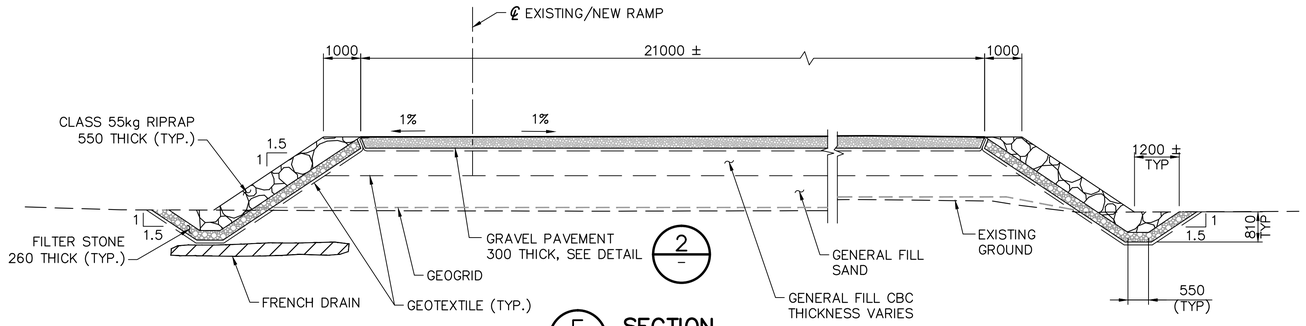

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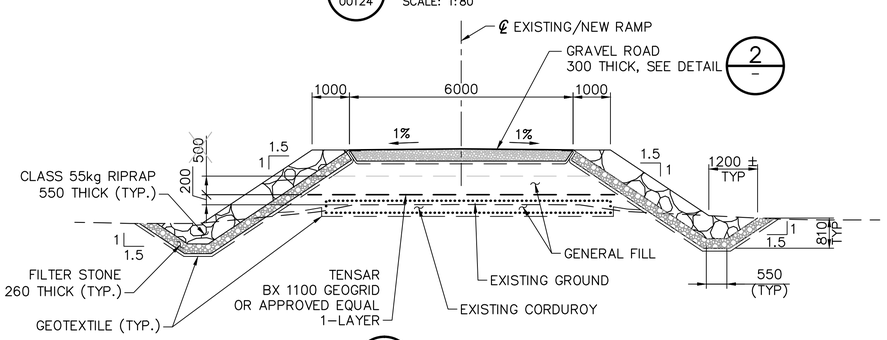

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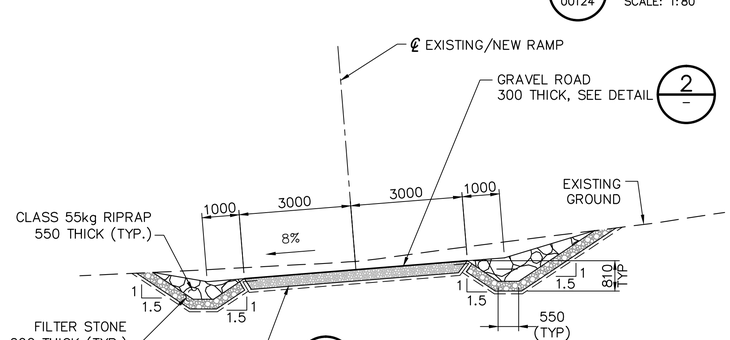

G 00123 **SECTION**
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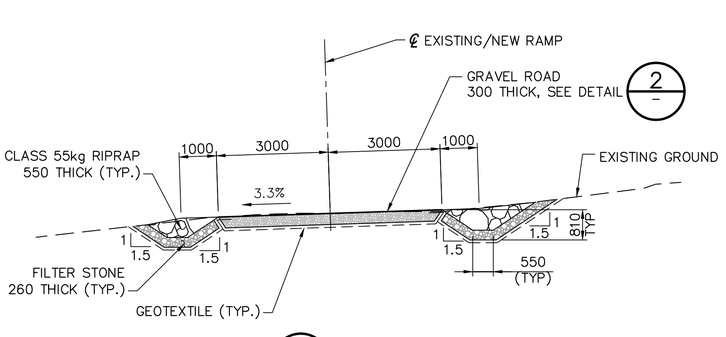
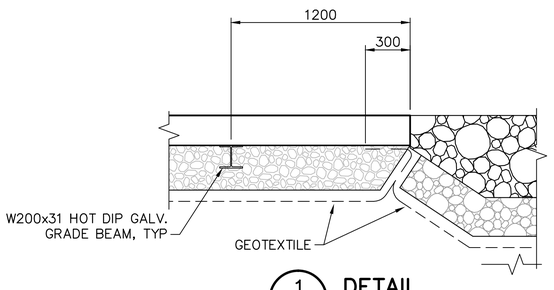
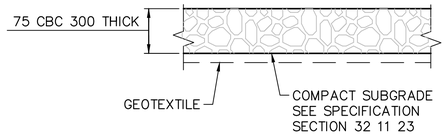


H 00123 **SECTION**
SCALE: 1:80



1 – **DETAIL**
1:20



2 – **TYPICAL GRAVEL ROAD SECTION DETAIL**
00126 N.T.S.

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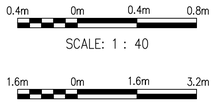

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BC hydro ENGINEERING

GMSWORKS #32 TO #39
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
RAMP
SECTIONS

DATE: September 10, 2013
DWG NO CAD: 1006-C09-00125
R: 1

DRAWING NUMBER	TITLE
REFERENCE DRAWINGS	

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0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL				

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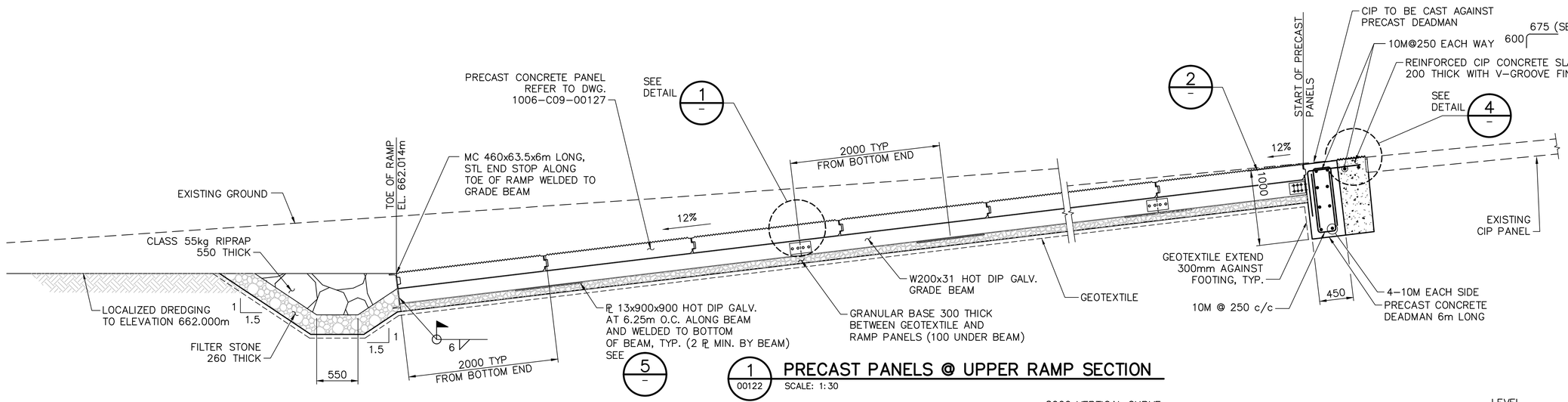
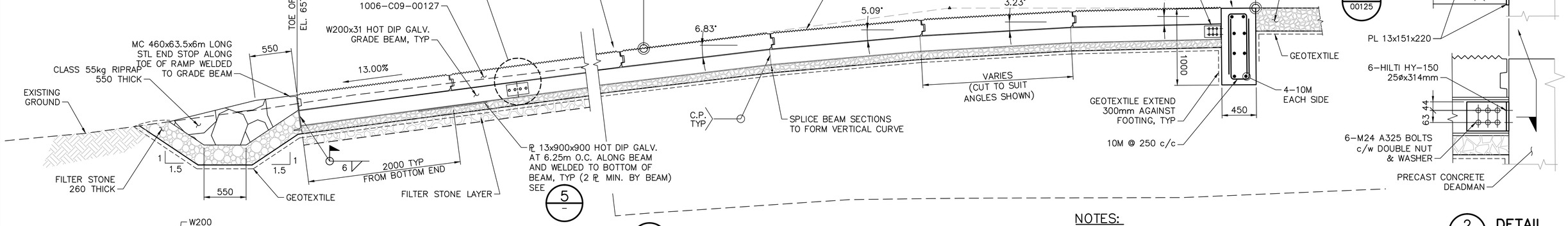


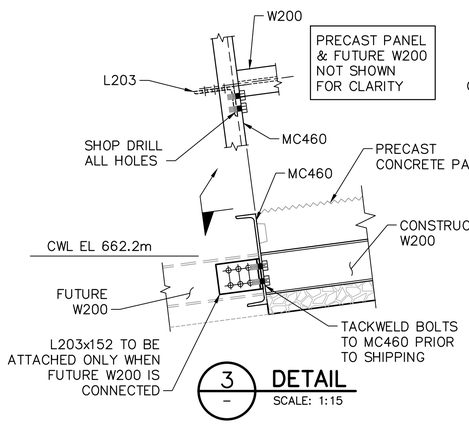
1 00122 **PRECAST PANELS @ UPPER RAMP SECTION**
SCALE: 1:30

1 – **DETAIL**
SCALE: 1:10

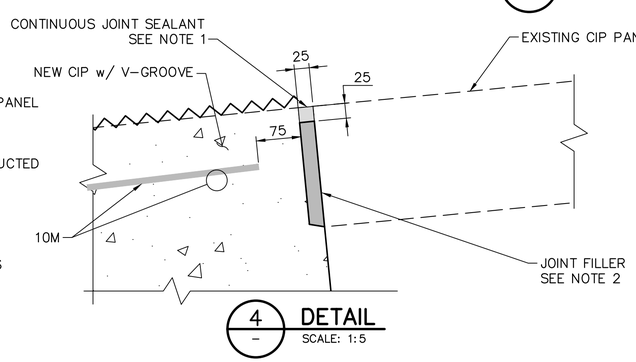


2 00124 **PRECAST PANELS @ LOWER RAMP SECTION**
SCALE: 1:25

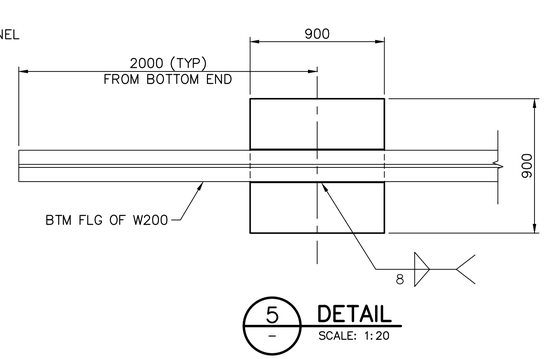
2 – **DETAIL**
SCALE: 1:10



3 – **DETAIL**
SCALE: 1:15



4 – **DETAIL**
SCALE: 1:5



5 – **DETAIL**
SCALE: 1:20

NOTES:

1. JOINT SEALANT SHALL BE SIKAFLEX-2c NS EZ MIX TG, 25mm DEEP, OR APPROVED EQUAL.
2. JOINT FILLER SHALL BE BASF CONSTRUCTION CHEMICALS, SONNEBORN EXPANSION-JOINT FILLER OR APPROVED EQUAL.
3. 1200 MAX LENGTH, CUT TO SUIT AT TAPERED ENDS, MAINTAIN MINIMUM COVER.

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0.2m 0.0m 0.2m 0.4m
SCALE: 1 : 10

0.5m 0.0m 0.5m 1.0m
SCALE: 1 : 25

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GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
RAMP
DETAILS

DSGN	PH
INDEP CHK	MN
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DATE: September 10, 2013
DWG NO CAD: 1006-C09-00126
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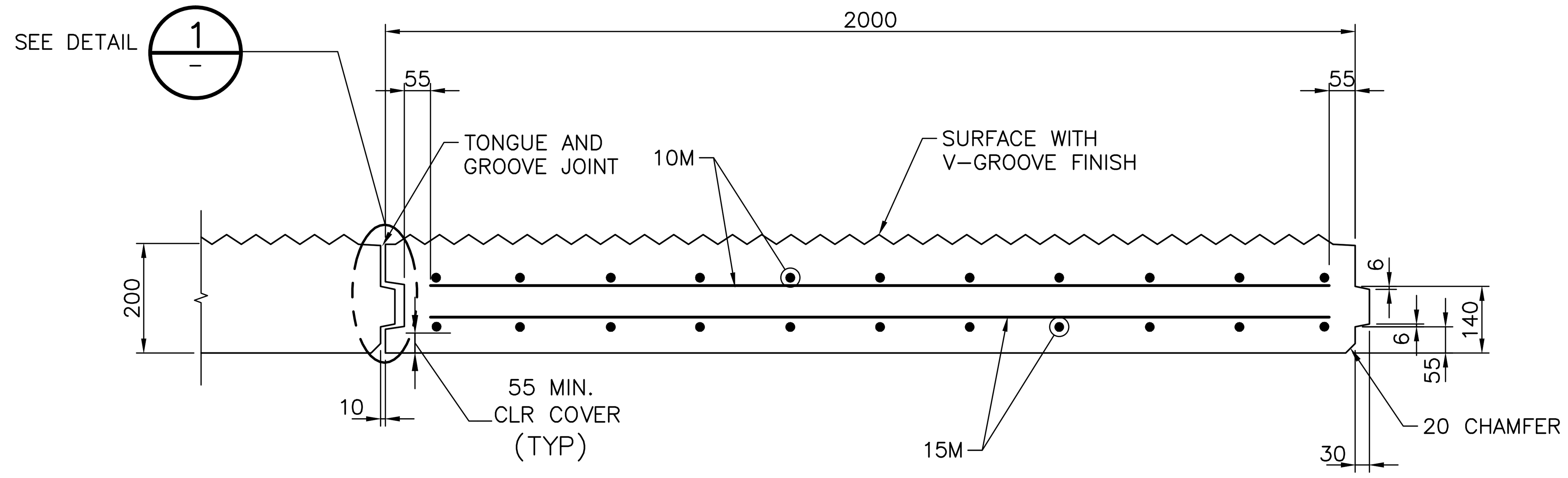
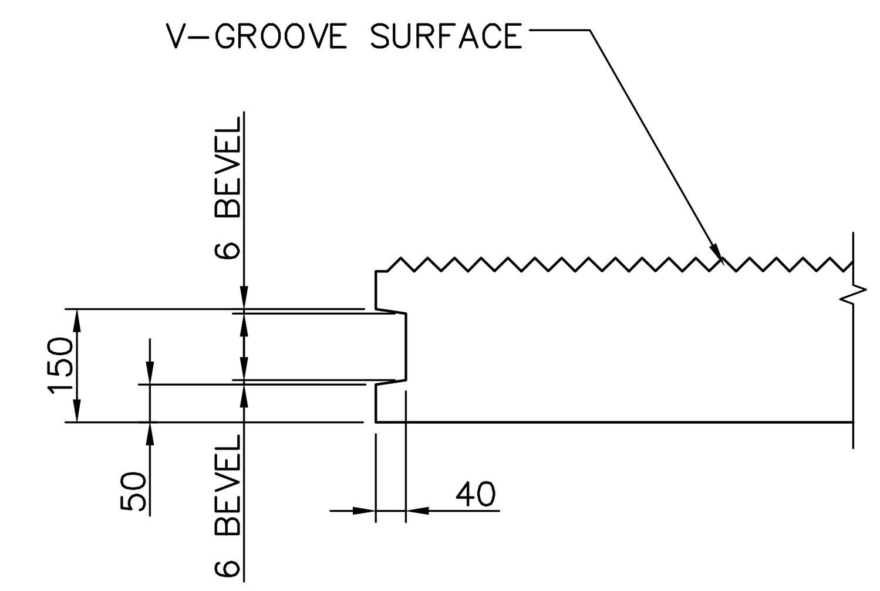
	3	RECORD DRAWING	MAY26/14		PH	AM						1	REBAR CALLOUTS & LENGTHS ADDED	FEB.26/14	PH	PH	AM				
	2	SECT.2: BOTTOM OF RAMP REVISED	MAR.20/14	PH	PH	AM						0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

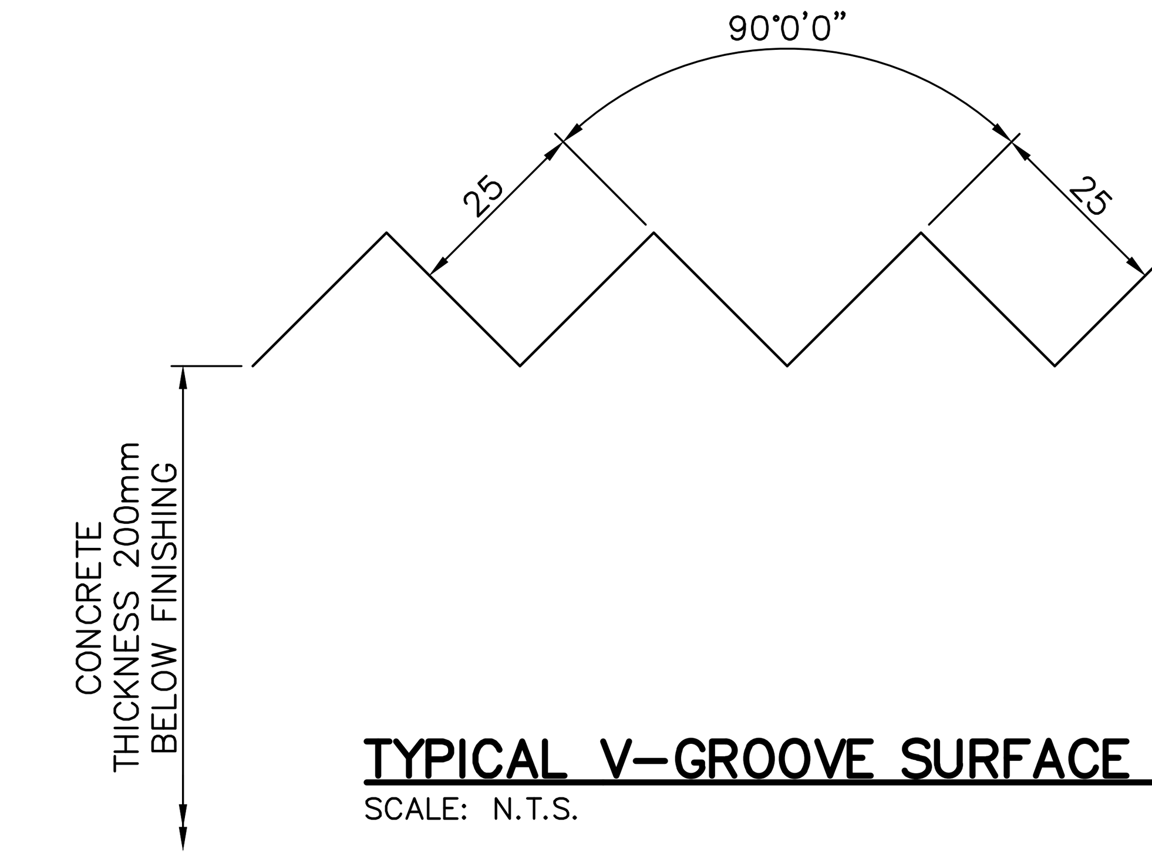
DRAWING NUMBER | TITLE
REFERENCE DRAWINGS



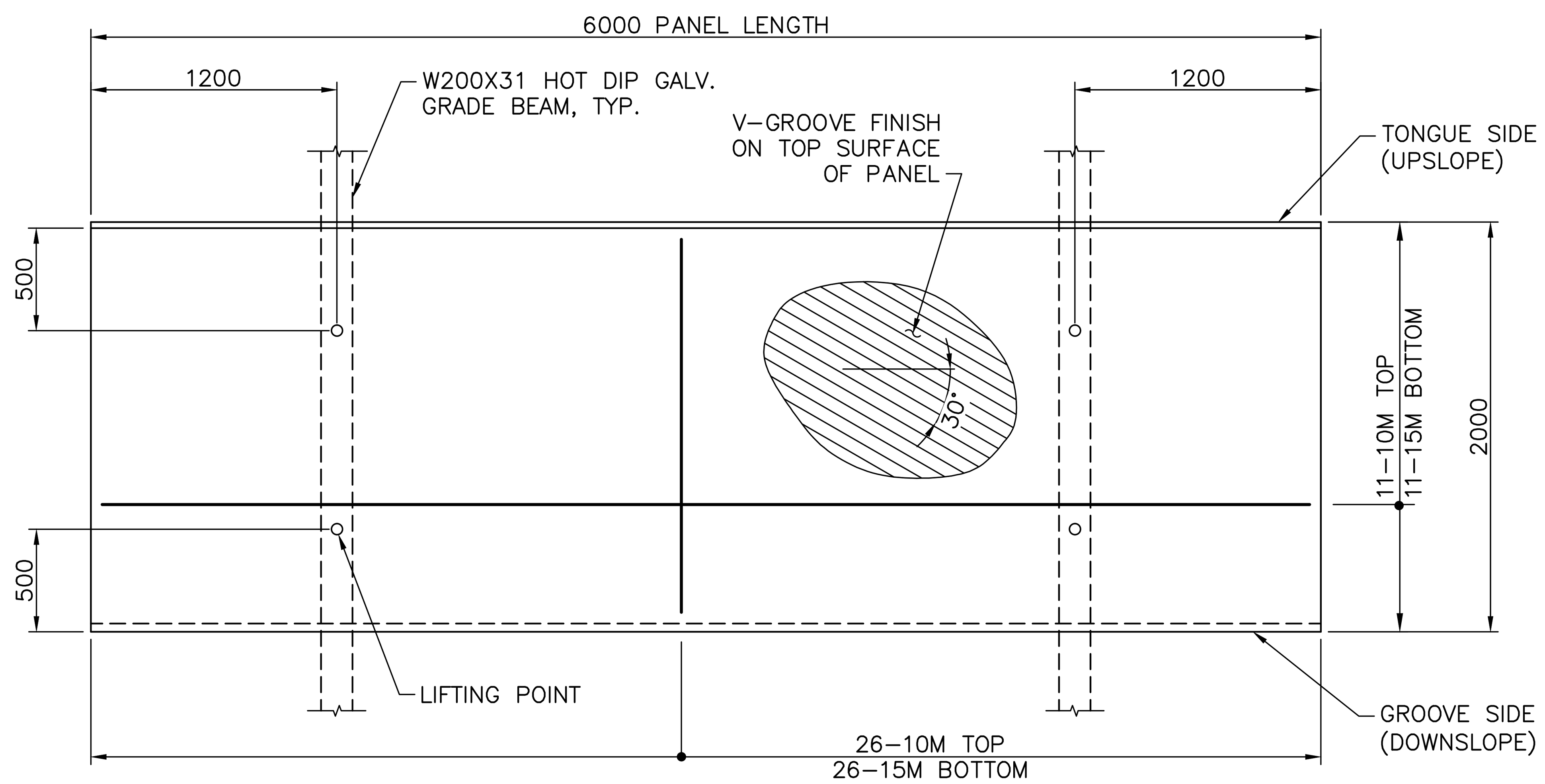
TYPICAL PRECAST PANEL SECTION
SCALE: 1:10



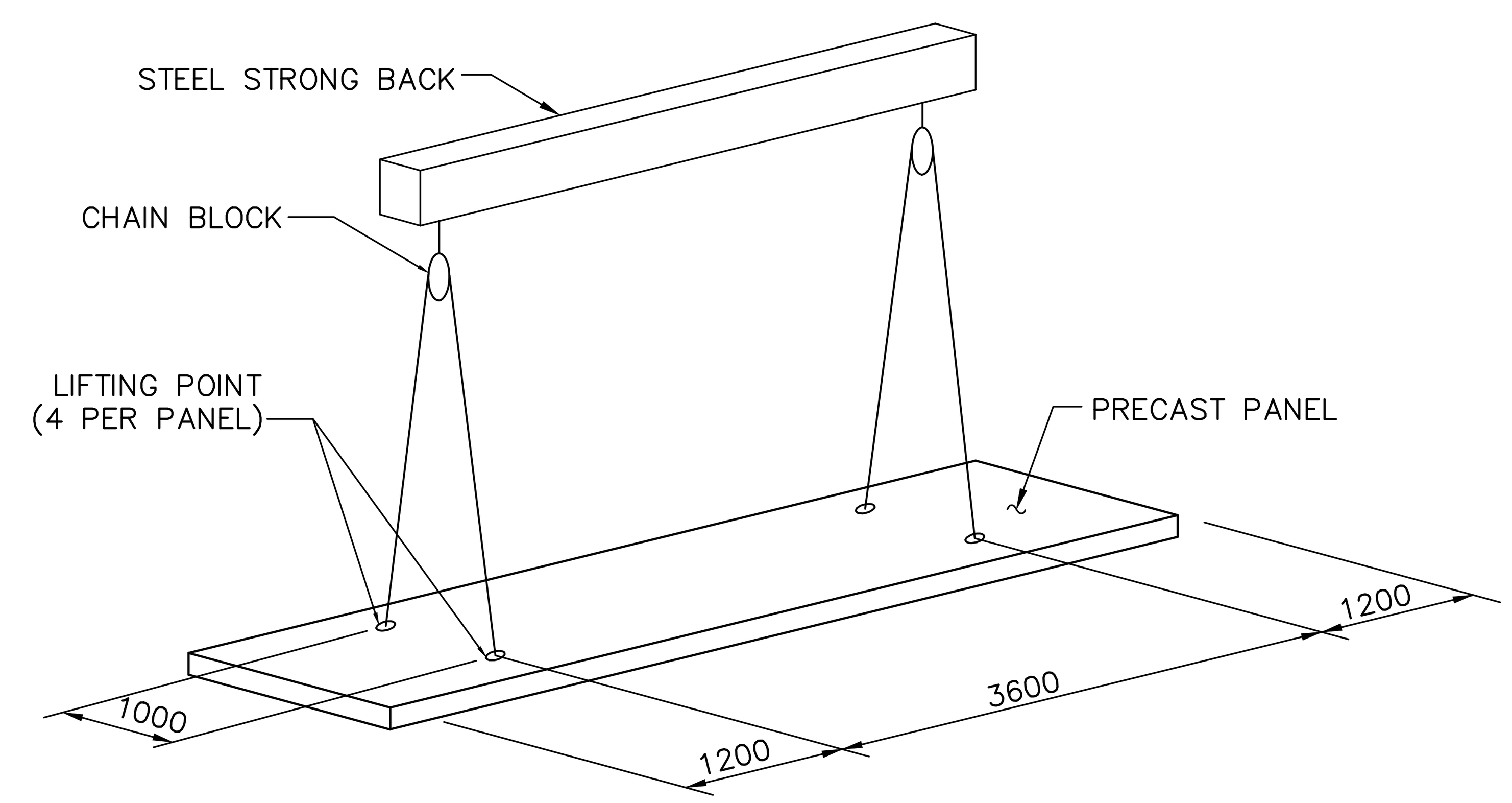
1 – DETAIL
SCALE: 1:10



TYPICAL V–GROOVE SURFACE DETAIL
SCALE: N.T.S.



TYPICAL PRECAST RAMP PANEL REINFORCEMENT DETAIL
SCALE: 1:25



LIFTING DIAGRAM
SCALE: N.T.S.

NOTES:

1. PRECAST PANELS SHALL BE PLANT MANUFACTURED SO THAT PANEL IS SQUARE AND DIMENSIONS DO NOT EXCEED A TOLERANCE OF 10mm OF WIDTH OVER THE LENGTH OF THE PANEL.
2. SHOP DRAWINGS AND CALCULATIONS FOR THE PANEL LIFTING SLING COMPONENTS AND DIMENSIONS SHALL BE PROVIDED BY THE CONTRACTOR FOR REVIEW BY THE ENGINEER PRIOR TO USE.
3. PRECAST PANELS LIFTING POINTS SHALL BE MODEL CT–4 COIL THREAD INSERT 30øx200 STAINLESS STEEL, AS MANUFACTURED BY MEADOW BURKE AT (800) 804–6565, OR APPROVED EQUAL.
4. LENGTH OF RAMP BUILT WITH PRECAST PANELS MAY VARY, DEPENDING ON WATER LEVEL DURING CONSTRUCTION.
5. ENSURE LIFTING DEVICE UTILIZED ALLOWS FOR A MAXIMUM 60° ANGLE BETWEEN THE LEGS.
6. THE STEEL STRONG BACK AND CHAIN BLOCKS ARE SCHEMATIC AND ARE FOR INFORMATION PURPOSES ONLY.
7. CONTRACTOR SHALL ENSURE ADEQUATE COMPRESSIVE STRENGTH OF CONCRETE HAS BEEN ACHIEVED PRIOR TO LIFTING THE BEAMS TO PREVENT ANY CRACKING AND/OR DAMAGE TO THE PANELS.

SCALE: 1 : 10

SCALE: 1 : 25

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2	RECORD DRAWING	MAY26/14		PH	AM				
1	PANEL LENGTH REVISED	MAR.20/14	PH	PH	AM				
0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			

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GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
RAMP
PANEL DETAILS

DATE September 10, 2013
DWG NO CAD 1006-C09-00127
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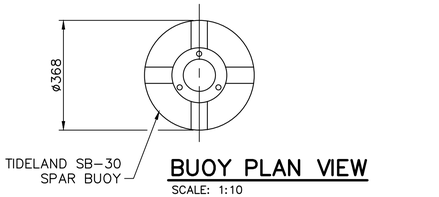
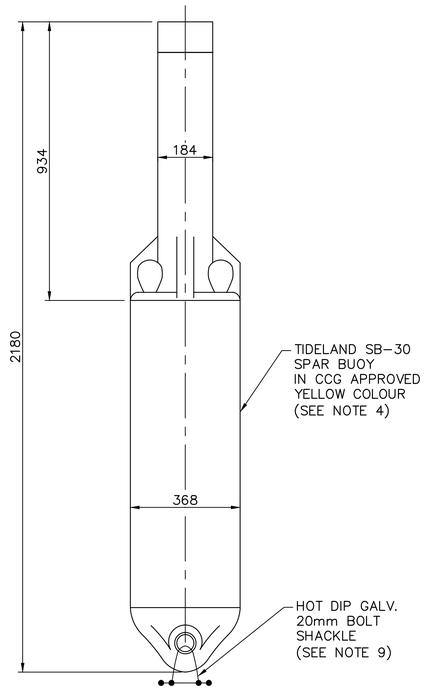
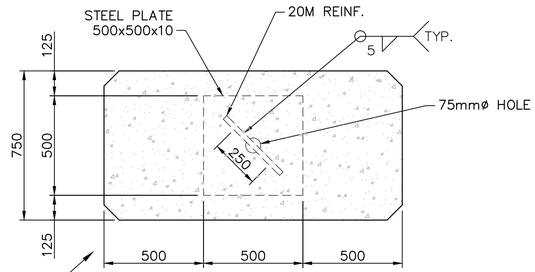


BUOY PLAN VIEW
SCALE: 1:10

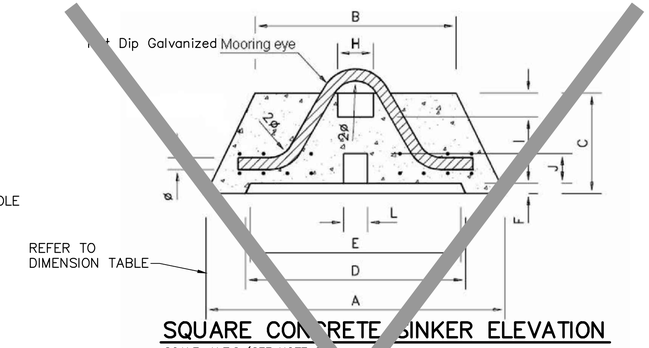


BUOY SYSTEM – ELEVATION VIEW
SCALE: 1:10

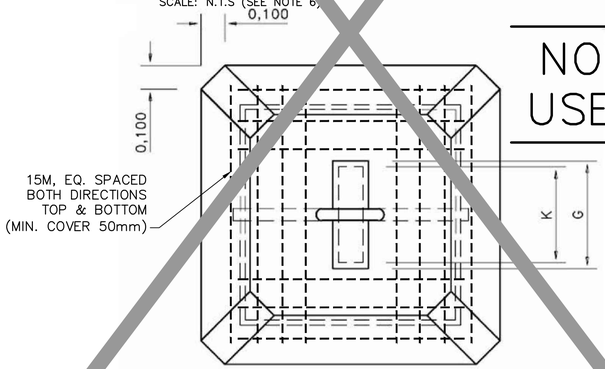


TYPICAL LOCKBLOCK ANCHORAGE
SCALE: 1:15

NOT USED



SQUARE CONCRETE SINKER ELEVATION
SCALE: N.T.S (SEE NOTE 6)



SQUARE CONCRETE SINKER PLAN
SCALE: N.T.S (SEE NOTE 6)

NOT USED

M	Mass of sinker	1000 kg
A	Side of the large base	1250 mm
B	Side of the narrow base (=2A/3)	733 mm
H	Height of sinker (=A/3)	417 mm
D	Base of the suction hole (=22A/30)	917 mm
E	Summit of the suction hole (=21A/30)	875 mm
F	Height of the suction hole (=A/30)	42 mm
G	Length of re-entrant for shackle (=9ϕ)	450 mm
H	Width of re-entrant for shackle (=3 ϕ)	150 mm
I	Depth of re-entrant for shackle (=2 ϕ)	100 mm
J	Height of re-entrant for storage (=2.5 ϕ)	125 mm
K	Length of re-entrant for storage (=8 ϕ)	400 mm
L	Width of re-entrant for storage (=2 ϕ)	100 mm
ϕ	Diameter of mooring eye	50 mm
	Mass of incorporated steel (incl. Scrap Chain and mooring eye)	100 kg
P	Weight of sinker in water	408 kg

CONCRETE SINKER DIMENSION TABLE
SCALE: N.T.S (SEE NOTE 6)

NOTES:

1. THE CONTRACTOR SHALL SATISFY THE REQUIREMENTS OF THE NAVIGABLE WATERS PROTECTION ACT (NWPA) PERMIT IN RELEVANCE TO THE WORK.
2. AS PART OF THE NWPA PERMIT REQUIREMENTS, INSTALL AND MAINTAIN A MINIMUM OF TWO (2) WARNING SIGNS AT A LOCATION FACING THE LAKE (EXACT LOCATION TO BE APPROVED BY THE OWNER'S RESPRESENTATIVE) THAT ADVISES OF CONSTRUCTION WORK IN PROGRESS. SIGNS SHALL BE A WHITE BACKGROUND WITH BLACK LETTER MEASURING AT LEAST 1.2m BY 2.4m WITH TEXT AS OUTLINED "WARNING CONSTRUCTION, PROCEED WITH CAUTION".
3. THE CONTRACTOR SHALL SUPPLY A TELESPAR POST TO MOUNT AN INFORMATION SIGN (TO BE SUPPLIED BY BC HYDRO) AT THE RAMP DEPICTING THE PROPOSED PLAN OF THE UPPER AND LOWER RAMPS AND ADVISE CAUTION TO BOATERS USING WATERWAY AT ELEVATION OF 663 TO 666m. THE CONTRACTOR SHALL INSTALL THE SIGN AT A LOCATION APPROVED BY THE OWNER'S REPRESENTATIVE (TO BE FIELD CONFIRMED).
4. YELLOW CAUTIONARY BUOYS SHALL BE INSTALLED ALONG BOTH SIDES OF THE LOWER RAMP AND LOWER ACCESS ROAD TO MARK THE AREA WHERE BOATERS ARE TO BE WARNED OF UNDERWATER STRUCTURES. THE PROPOSED BUOY LOCATIONS ARE SHOWN IN THE GENERAL ARRANGEMENT DRAWING NO. 1006–C09–00121. BUOYS SHALL BE TIDELAND MODEL SB–30 SPAR BUOY IN CCG APPROVED IALA YELLOW COLOUR (OR APPROVED EQUIVALENT). ALL BUOYS MUST CONFORM TO THE STANDARDS AND GUIDELINES AS DESCRIBED IN THE CANADIAN AIDS TO NAVIGATION SYSTEM 2011 (TP 968).
5. THE TAIL MOORING CHAIN REFERS TO THE LENGTH OF CHAIN CONNECTED TO THE BUOY AND SINKER. ALL MOORING CHAINS SHALL BE HOT DIP GALVANIZED OPEN LINK MOORING CHAIN WITH DIAMETER AND LENGTHS AS SHOWN IN THE TABLE. THE 12.5mm DIAMETER CHAIN SHALL HAVE A MINIMUM BREAKING STRENGTH OF 24,000 LBS.
6. REINFORCED CONCRETE SINKERS WITH A MINIMUM WEIGHT OF 1000KG SHALL BE USED TO KEEP BUOY IN THEIR ASSIGNED POSITIONS. GENERAL DIMENSIONS OF THE CONCRETE SINKER ARE SHOWN IN THIS DRAWING AND REFERENCE FIGURE 40 AND TABLE 7 (SQUARE CONCRETE SINKER DIMENSIONS) OF THE IALA GUIDELINE NO. 1066 ON THE DESIGN OF FLOATING AID TO NAVIGATION MOORINGS, EDITION 1.1, OR APPROVED EQUIVALENT.
7. THE MOORING CHAIN SHALL BE CONNECTED BY A SERIES OF HOT DIP GALVANIZED SHACKLES AND SWIVELS AS SHOWN IN THIS DRAWING, WITH SIZE SUITABLE FOR THE SPECIFIED CHAIN DIAMETER AND STRENGTH AT LEAST EQUAL THAT OF THE CHAIN WHICH IT IS JOINING. ALL SHACKLES SHALL BE 20mm CROSBY BOLT SHACKLES G2130 (STOCK No. 1019515). IF BOLT SHACKLES ARE NOT AVAILABLE, ENLARGED END LINKS FOR THE CHAIN MIGHT BE USED TO ACCOMMODATE THE JOINING SHACKLES. A 16mm SWIVEL SHALL BE USED TO JOIN THE TAIL CHAIN TO SINKER TO PREVENT ANY TWISTING MOTION OF THE CHAIN. SWIVEL SHALL BE CROSBY 5S5 EYE AND EYE SWIVEL (STOCK No. 297253). FOR DETAILS ON TYPES OF SHACKLES AND SWIVELS TO USE, REFER TO IALA GUIDELINE NO. 1066 ON THE DESIGN OF FLOATING AID TO NAVIGATION MOORINGS, EDITION 1.1.
8. CONTRACTOR SHALL PLACE THE BUOY SYSTEM INCLUDING THE SINKER ON THE LAKEBED AT THE PROPOSED LOCATION SHOWN IN DWG. 1006–C09–00121.
9. ALL NUTS TO BE TACK WELDED TO BOLT SHANKS ON SHACKLES.

BUOY No.	LAKEBED EL.(m)	MAX. HIGH WATER LEVEL (m)	MAX. WATER DEPTH (m)	TAIL CHAIN LENGTH (m)	TAIL CHAIN DIAMETER (mm)
1	661.5	665	3.5	6.0	12.5 (SEE NOTE 5)
2	661.4	672.2	10.9	13.5	
3	661.5	672.2	10.8	13.5	
4	661.2	665	3.8	6.0	
5	661.7	672.2	10.6	13.0	
6	661.5	665	3.5	6.0	
7	661.9	672.2	10.4	13.0	
8	662.5	665	2.5	4.5	
9	662.2	665	2.8	5.0	
10	662	672.2	10.3	13.0	
11	661.8	672.2	10.5	13.0	
12	661.5	665	3.5	6.0	
13	662.1	665	2.9	5.0	
14	663.5	672.2	8.8	12.0	
15	667.8	672.2	4.5	7*	

* DOUBLE UP TAIL CHAIN LENGTH TO PROVIDE ADEQUATE HANGING WEIGHT TO DISPLACE ENOUGH WATER FOR BUOY.

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GMSWORKS #37
RESERVOIR ACCESS ALONG WILLISTON LAKE AND PEACE RIVER
MACKENZIE LANDING REPLACEMENT BOAT RAMP
SIGNAGE AND BUOY DETAILS
DETAILS

DATE: September 10, 2013
DWG NO: 1006-C09-00129
CAD
R: 1

DRAWING NUMBER	TITLE	μ	NO	REMARKS	DATE	DESIGNED	INDEP CHK	DFTG	DFTG CHK	INSP	REV	ACPT
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	1	RECORD DRAWING	MAY26/14		PH	AM				
	0	ISSUED FOR CONSTRUCTION	JAN.17/14	PH	MN	EZ	LL			
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