

Nechako Reservoir

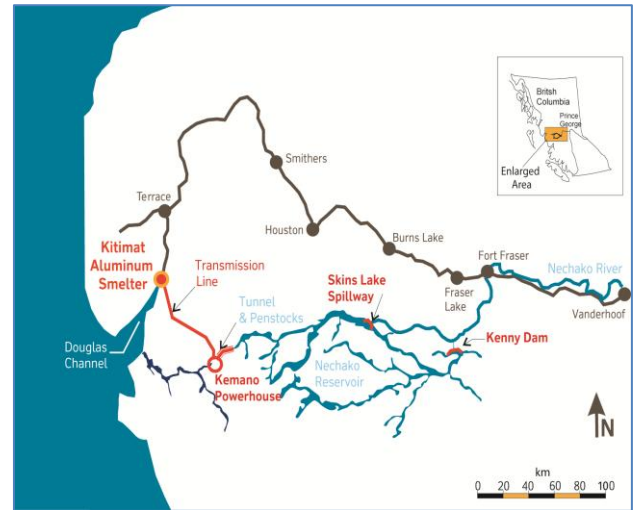
Dam Emergency Plan (DEP)

Dam Alert

Kenny Dam
(Breach)

Saddle
Dams
(Breach)

Extreme
Flood



DAM Owner: RioTinto (Operations Director - Power & Services)

Prepared By: Rio Tinto BC Works Power and Nechako Reservoir Management Teams

**** About this Document ****

This document is specific to Nechako Reservoir emergency management and details information and procedures **to be used and followed by Rio Tinto** staff during the following events;

1. **Dam Alert** (Risk of Dam Breach) - refer to [section 2.1](#)
2. **Dam Breach** – refer to [section 2.2](#) (Kenney Dam) or [section 2.3](#) (Saddle Dams)
3. **Extreme Flood** – refer to [section 2.4](#)
4. **DEP Communication Test** - refer to [section 8](#)
5. **Other Emergencies** – refer to [Appendix E](#).

This plan is intended to have sufficient detail regarding the potential flooding impacts downstream of the Nechako Reservoir to assist downstream communities prepare emergency response plans as per BC Dam Safety Guidelines.

In an emergency event, Rio Tinto will notify the affected stakeholders identified under [Appendix A2 - Notification Chart](#) using One Call Now notification system. This will be a notification of the event only!

IMPORTANT – it is your responsibility to enact your emergency response plan upon receiving this notification. Subsequent notifications about the event will be made by Rio Tinto as information becomes available, using the same notification procedure, and until alternate emergency communication coordination is developed, as deemed appropriate.

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ECopy of this document available on the '[Get Involved Nechako](#)' website.

Doc# 930-001

Link here → <https://www.getinvolvednechako.ca/dam-safety/>

PREFACE

Rio Tinto BC Works has prepared this Dam Emergency Plan (DEP), once referenced as the Emergency Preparedness Plan (EPP) in keeping with regulatory requirements, and for the benefit of downstream communities. This plan is intended to have sufficient detail regarding the potential flooding impacts downstream of the Nechako Reservoir to assist downstream communities prepare emergency response plans as per B C Dam Safety Guidelines ([Dam Safety Regulation \[O.I.C. 114, B.C. Reg. 40/2016\]](#) under the Water Sustainability Act effective February 29, 2016).

This edition of the DEP has been prepared with reference to [Guide & Template for Preparing a Dam Emergency Plan \(DEP\) in British Columbia](#).

How to use this document and when to use this document:

- 1) **DAM ALERT:** This document is to be used in the event of a Dam Alert, of a risk of a dam breach. Go to [section 2.1](#)
- 2) **DAM BREACH:** This document is to be used in the event of a Dam Breach Emergency. Go to [section 2.2 for Kenney Dam](#), Go to [section 2.3 for Saddle Dams](#)
- 3) **EXTREME FLOOD:** This document is to be used in the event of an extreme flood such as the Probable Maximum Flood. Go to [section 2.4 for Extreme Flood](#)
- 4) **DEP COMMUNICATION TEST:** This document is to be used for all Nechako Reservoir DEP communication tests. Go to [Section 8 -NECHAKO RESERVOIR DEP COMMUNICATION TEST](#)

FOR OTHER EMERGENCIES: If other emergencies arise refer to [Appendix E – Other Emergency and Response Guidance Chart](#) for information that may be useful.

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1. INTRODUCTION

1.1 General

This Nechako Reservoir DEP facilitates communication and understanding of potential consequences of flood emergencies related to Nechako Reservoir.

The DEP contains information that can be used to prepare emergency response plans, warnings, and evacuation procedures for the protection and security of downstream communities.

In the event of a Nechako Reservoir DEP Communication test, refer to [Section 8 - NECHAKO RESERVOIR DEP COMMUNICATION TEST](#).

1.2 Roles & Responsibilities

The following are the basic emergency planning and response roles and responsibilities for the five key agencies involved when a level 2 or 3 emergency occurs. For more detailed information regarding emergency planning, preparedness, response and recovery refer to the document, [British Columbia Emergency Management System \(BCEMS\) 2016](#).

1.2.1 Dam Owner (Director – Energy and Watershed Partnerships)

- As soon as an emergency event is observed or reported, immediately determine the emergency level (see [APPENDIX F - Guidance for Determining the Emergency Level](#), Appendix F).
 - Level 1: unusual event, slowly developing
 - Level 2: potential dam failure situation, rapidly developing
 - Level 3: dam failure appears imminent or is in progress
- Immediately notify the personnel in the order shown on the [Appendix A-2 – Notification Chart](#) for the appropriate emergency level.
- Undertake appropriate remedial actions during Level 2. Remedial actions may be recommended by the Dam Owners Technical Representative or required by the Dam Safety Officer.
- Provide updates of the situation to the local emergency authority to assist them in making timely and accurate decisions regarding warnings and evacuations.
- Provide leadership to assure the DEP is reviewed and updated annually and copies of the revised DEP are distributed to all who received copies of the original DEP including the records for the local emergency authorities. Undertake DEP exercises as appropriate.

1.2.1.1 Rio Tinto Internal Roles & Responsibilities

BC Works General Manager

Responsibility for overall safety of the Dams.

Director – Energy and Watershed Partnerships

Act as the Dam Owner as described in 1.2.1 responsibilities, and delegate activities in the response to Reservoir Operations personnel and Manager, Communities and Social Performance.

Reservoir Operations Personnel

Responsible for day to day operation of the reservoir and to carry out the necessary actions under the Nechako Reservoir DEP and as directed by the Director – Energy and Watershed Partnerships.

In the event of an emergency which could affect downstream communities, the designated Reservoir Operations personnel are responsible for initiating a warning system to notify the specified emergency agencies. Roles performing this responsibility include;

- Superintendent Nechako Watershed (*supports role as **Dam Owner's Technical Representative***)
- System Operations
- Spillway Attendant
- Power Control Room
- Plant Protection

Manager – Communities and Social Performance

Responsible for development and implementation of the Rio Tinto BC Operations Emergency Communications Plan. This includes announcements, updates and releases, as well as responses to media enquiries, the co-ordination of media interviews with designated spokespeople, and media site visits.

1.2.2 Local Emergency Authorities

Local emergency authorities support and coordinate the overall emergency response activities within its geographical or functional jurisdiction.

- Serve as the primary contact responsible for coordination of all emergency actions for potentially affected communities.
- When a Level 2 situation occurs:
 - Prepare emergency response personnel for possible evacuations that may be needed if a Level 3 situation occurs.
 - Consider drafting a State of Local Emergency in preparation for Level 3.
 - Provide resources as necessary to the dam owners.
- When a Level 3 situation occurs:
 - Initiate warnings and order evacuation of people at risk downstream of the dam.
 - Declare a State of Local Emergency if required.
 - Direct local emergency response services (may include local law enforcement) to carry out the evacuation of people and close roads within the evacuation area (see [.APPENDIX G - Inundation Maps](#))
 - Provide resources as necessary to the dam owners.
- Decide when to terminate the emergency.
- Participate in review, updates and exercises of the DEP.

1.2.3 Emergency Management & Climate Readiness BC (EMCR)

Emergency Management & Climate Readiness BC (EMCR) is the lead agency in the provincial government for all emergency management activities. EMCR works with local governments, First Nations, federal departments, industry, non-government organizations and volunteers to support the emergency management phases of mitigation/ prevention, preparedness, response and recovery. EMCR has its headquarters, the Provincial Emergency Co-ordination Centre (PECC) and the 24/7 Emergency Call Centre (ECC) in Victoria. Six Provincial Regional Emergency Operations Centres (PREOCs) are located in Terrace, Prince George, Kamloops, Nelson, Surrey and Victoria (co-located with the PECC).

- When a Level 2 or Level 3 situation occurs, provide support as requested or required. For example:
 - Assist local emergency authority when notified of the activation of local emergency plans with issuance of an emergency task number.
 - Propagate the emergency information to other relevant stakeholders.
 - Support the communication needs of local emergency authority.
 - Declare a Provincial State of Emergency if required.
- Participate in exercises of the DEP.

1.2.4 Dam Owner's Technical Representatives

- Undertake an engineering assessment of the safety hazard at the dam.
- Assist the dam owner to determine the emergency level, if time permits.
- Advise the dam owner of remedial actions to take if Level 2 event occurs, as required.

1.2.5 Ministry of Water, Land, and Resource Stewardship

- Ministry of Water, Land and Resource Stewardship (WLRS) is the ministry responsible for the provincial government "Dam Emergency Response Plan (DERP)" under the Emergency Program Act. The BC Dam Safety Program administers the DERP and has an active role in all levels.
- The Dam Safety Officer (DSO) is the first point of contact in WLRS for Level 1, and, is required to inform EMCR if a dam is considered to be at Level 1. EMCR may contact the local emergency authority at their discretion.
- The DSO may have an active role in Levels 2 and 3. The DSO may advise the dam owner of the emergency level determination.
- The DSO may advise the dam owner of remedial actions to take if Level 2 event occurs.
- Support EMCR, local emergency authorities, and other agencies. The DSO may be called on to be the Subject Matter Expert at an emergency response center.
- The DSO is responsible for reviewing and accepting the DEP.

1.3 Reporting

The **Plant Protection** phone number is posted on all Nechako Reservoir Dams to facilitate public reporting of dam related concerns and emergencies. However an emergency could be reported from or to any number of sources.

All emergencies should be reported first to **Plant Protection**. **Plant Protection** will immediately activate the communication protocol in this document on the Notification Chart provided in [Appendix A-2 – Notification Chart](#).

In order to facilitate the management of an emergency, each person involved will keep a written record of all communications related to the emergency. Within 24 hours of an emergency occurring or being reported, the Skins Lake Attendant, Plant Protection, the on-duty Power Control Room Operator, and the Operations Director (or in their absence, the Coordinator) will each complete and submit a "**Notification of Emergency Response**" form found in [Appendix B1 - Notification of Emergency Response](#) to Rio Tinto BC Works Power Control Room.

The **Director – Energy and Watershed Partnerships** will also submit a copy of the report to the **General Manager of B.C. Works**.

Each person making or receiving reports will maintain a diary of events form found in [Appendix B-2 - Diary of Events](#). The diary will include brief details of:

- Date and time;
- Location of incident;
- Summary of incident, including times;
- Names of persons involved;
- Agencies notified and time called;
- Action taken and present condition; and
- Further action planned.

1.4 Review

The Superintendent Nechako Watershed will ensure that all Reservoir Operations personnel become thoroughly familiar with the Nechako Reservoir DEP and the procedures for emergency reporting, notification, and action described in [Section 2 - EMERGENCY SCENARIOS](#).

Annual Nechako Reservoir DEP reviews will be conducted under direction of Operations Director using the following DEP Document Review **process steps**;

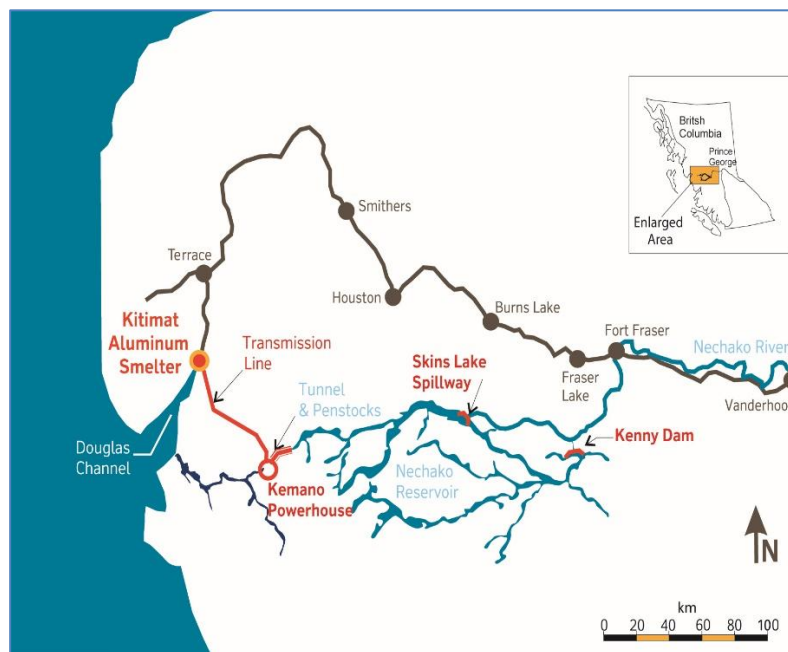
1.4.1 DEP Document REVIEW process Steps:

1. Director – Energy and Watershed Partnerships requests Document Controller to perform Document Review (occurs annually)
2. Document Controller updates DEP, as required
 - a. Input: Filled forms of [C-2 Request for Revision](#) received
 - b. Input: Review of Contact information all [APPENDIX A - Notifications & Contacts](#) and any other updates to DEP document
 - c. Output: DEP updated document (*not reviewed*)
3. Document Controller will put DEP document into Review
 - a. Input: [Appendix C-3 Review Routing](#) and any Requests for outside agencies to review (made by internal Rio Tinto management with [Appendix C-4 Record of Review by Outside Agencies](#))
 - b. Output: DEP updated document (*reviewed with comments*)
4. Final Updates & Approval (update DEP & [Section 9 Record of Document Revision](#))
 - a. Output: DEP Document (Final with Version assigned)
5. DEP Document (new version) Copies Distributed and Letter of Understanding filled for each recipient
 - a. Input: [Appendix A-3 DEP Distribution List and Contacts](#)
 - b. Output: [Appendix C-1 Letter of Understanding](#) (filled for each DEP recipient)

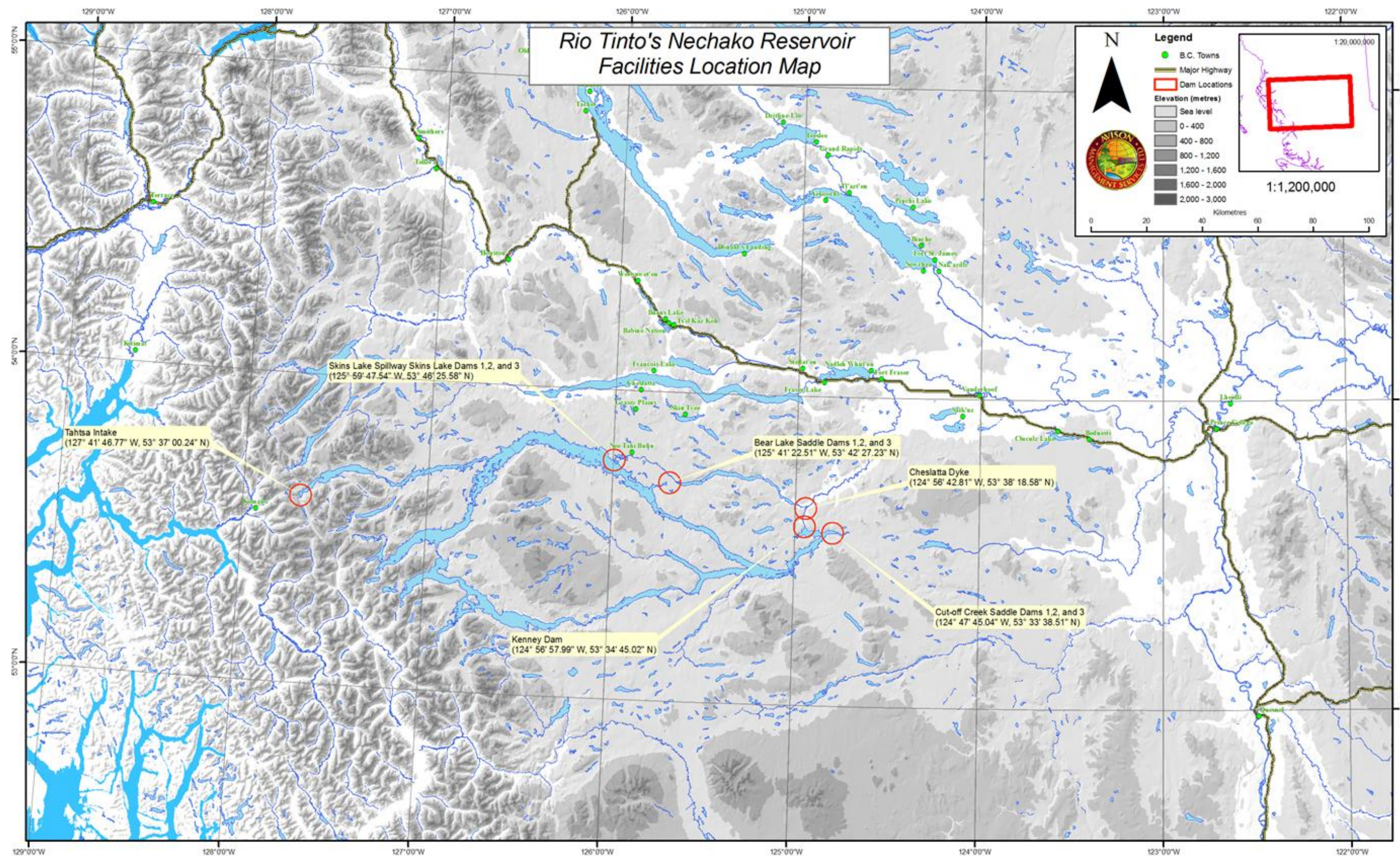
1.5 Location and Map

The Nechako Reservoir has one principal dam, the 95-m-high rockfilled dam with a clay core, Kenney Dam; nine smaller earthfill saddle dams; and Skins Lake Spillway, a reinforced concrete structure with two steel radial gates. Kenney Dam is situated at the eastern end of the reservoir, approximately 87 km south-west of Vanderhoof. Three of the saddle dams are situated at Cut-off Creek to the south-east of Kenney Dam. The spillway and another three of the saddle dams are situated at Skins Lake on the northern shore of the reservoir, approximately 70 km north-west of Kenney Dam. The remaining three saddle dams are situated at Bear Lake to the south-east of the spillway. Throughout the Nechako Reservoir DEP, the 10 dams and the spillway are referred to collectively as the dams. The dams were designed, constructed and have been maintained by Rio Tinto since the beginning of impoundment in 1953. Refer to the following image below and Map on the following page ([Section 1.5.1 Nechako Reservoir Facilities Location Map](#)):

Rio Tinto BC Works Aluminium Smelter, Power and Nechako Reservoir Facilities (shown in Red)



1.5.1 Nechako Reservoir Facilities Location Map



1.6 List of Facilities and Geographic Information

For geological reference, refer to Map → ([Section 1.5.1 Nechako Reservoir Facilities Location Map](#)):

| Name of Facility | Latitude N | Longitude W | UTM Northing Zone 10 *(Zone 9) | UTM Easting Zone 10 *(Zone 9) |
|---|---------------|----------------|---|--|
| Kenney Dam | 53°34'45.28" | 124°56'58.29" | 5938477 | 370931 |
| Skins Lake Spillway | 53°46'25.56" | 125°59'47.55" | 5962519 | 302542 |
| Skins Lake Saddle Dam No. 1 | 53°46'35.57" | 125°59'59.23" | 5962837 | 302341 |
| Skins Lake Saddle Dam No. 2 | 53°46'26.01" | 125°59'48.13" | 5962532 | 302532 |
| Skins Lake Saddle Dam No. 3 | 53°46'13.17" | 125°58'16.83" | 5962066 | 304186 |
| Bear Creek Saddle Dam No. 1 | 53°41'58.18" | 125°42'13.07" | 5953482 | 321524 |
| Bear Creek Saddle Dam No. 2 | 53°42'27.23" | 125°42'22.52" | 5954386 | 321385 |
| Bear Creek Saddle Dam No. 3 | 53°42'43.62" | 125°42'34.50" | 5954902 | 321185 |
| Cut-off Creek Saddle Dam No. 1 | 53°34'26.21" | 124°49'07.54" | 5937659 | 379573 |
| Cut-off Creek Saddle Dam No. 2 | 53°34'26.62" | 124°49'00.70" | 5937668 | 379699 |
| Cut-off Creek Saddle Dam No. 3 | 53°34'24.96" | 124°48'55.30" | 5937614 | 379797 |
| Cheslatta Dyke | 53°38'32.48" | 124°57'10.02" | 5945504 | 370909 |
| West Tahtsa Intake | 53°37'00.24" | 127°41'46.77" | *5941670 (Zone 9) | *586236 (Zone 9) |

2. EMERGENCY SCENARIOS

The types of emergency situations covered within this Nechako Reservoir DEP are:

- **Dam Alert** ([Section 2.1](#))
- **Kenney Dam Breach** ([Section 2.2](#))
- **Saddle Dam Breach** ([Section 2.3](#))
- **Extreme Flood Release** ([Section 2.4](#))

Other emergencies (listed below) are referred to in [Appendix E-1 – Other Emergency and Response Guidance Chart](#). A table is provided and guidance given in terms of what to do if these circumstances occur.

- Landslides,
- Severe Storms,
- Fire,
- Oil, hazardous substances or pesticide spills,
- Major fish or wildlife losses in reservoir,
- Drownings and accidents in reservoir, or
- Criminal activity

2.1 Dam Alert

A dam alert is any condition that poses an immediate threat to the safety of any of the dams, the spillway, their foundations or abutments which could result in a large or rapidly increasing uncontrolled flow of water from the reservoir. This situation requires swift action to prevent development of a dam breach. The situation may require very large releases from the spillway, which may result in substantial downstream flooding.

The following 5 step process will be taken in the event of a Dam Alert Emergency:

- Step 1: Response
- Step 2: Verification
- Step 3: Notification and Remedial Action
- Step 4: Reporting
- Step 5: Media Contacts

2.1.1 Response

If you observe a dam alert condition at any of the dams, or anyone who learns or suspects for good reason that dam alert conditions exist, immediately contact and report to **Plant Protection** in Kitimat (telephone number 250-639-8273). If another person receives a dam alert report, they will transfer the call to **Plant Protection**.

Plant Protection will obtain the following information:

- the observer's name, current location and telephone number;
- details of the threat, including:
 - type, i.e. slide, slough, settlement, cracking, seepage, etc.;
 - location and extent;
 - likelihood of deterioration;
 - effect on adjacent structures;
 - reservoir level;
 - weather conditions; and
- any other relevant details.

2.1.2 Verification

Plant Protection will attempt to confirm that the report is genuine. Verification may include:

- recognition of the caller;
- corroborating evidence from current conditions, e.g. weather, earthquake;
- independent verification by the R.C.M.P. or other sources using the caller's name, telephone number and location;
- Rio Tinto personnel must be included in the verification process

2.1.3 Notification and Remedial Action

After attempting to verify that the dam alert report is genuine, **Plant Protection** will immediately relay the report to **Director – Energy and Watershed Partnerships** or, delegate.

After whatever additional verification is deemed appropriate, the **Director – Energy and Watershed Partnerships** will give authority for Plant Protection to:

- Follow notifications as shown in [Appendix A-2 Notification Chart](#), making certain that everyone understands the nature of a dam alert situation, and the possibility of an eventual dam breach.
- evaluate the threat;
- determine and implement immediate actions to reduce or eliminate the risk of a breach, including:
 - dumping of filler material on a boil, pipe or cloudy seepage;
 - dumping of fill material into a crack or void in the dam, or at the toe of a slide; and
 - repairs to structures or operating equipment.
 - if very large spillway releases are required, initiate the notifications shown on Appendix A-2 Notification Chart;
 - if the situation deteriorates and a dam breach becomes imminent or occurs, initiate the the appropriate Dam Breach notifications and procedures ([Section 2.2 - Kenney Dam Breach](#) or [Section 2.3 - Saddle Dam Breach](#)).

2.1.4 Reporting

Use form located in [Appendix B-1- Notification of Emergency Response](#).

- As soon as practicable, each person responding to an emergency or reported emergency will complete and submit a **Notification of Emergency Response** form to the **Director – Energy and Watershed Partnerships**.
- The **Director – Energy and Watershed Partnerships** will keep a complete record of any emergency or reported emergency and, as soon as practicable, will also complete and distribute a **Notification of Emergency Response**.

Filled Notification of Emergency response forms are to be sent to Power Operations Control Room.

2.1.5 Media Contacts

The **Manager – Communities and Social Performance**, Rio Tinto BC Works will be responsible for overseeing communications, including announcements, updates and releases, as well as responses to media enquiries, the co-ordination of media interviews with designated spokespeople, and media site visits.

2.2 Kenney Dam Breach

A breach of Kenney Dam consists of a failure of the dam or its foundations or abutments accompanied by a large or rapidly increasing uncontrolled flow of water from the reservoir. This is the most serious emergency involving the Nechako Reservoir, and will result in extensive downstream flooding.

The following 7 step process will be taken in the event of a Kenney Dam Breach Emergency:

- Step 1: Response
- Step 2: Verification
- Step 3: Notification
- Step 4: Remedial Action
- Step 5: Reporting
- Step 6: Inundation Maps
- Step 7: Media Contacts

2.2.1 Response

If you observe a breach in Kenney Dam, or flow conditions which indicate that a breach has occurred, you will immediately contact and report to **Plant Protection** on duty in Kitimat 250-639-8273. (If another person receives a dam breach report, they will transfer the call to **Plant Protection**.)

Plant Protection will obtain and record:

- the observer's name, current location and telephone number:
- the position and estimated size of breach:
- the estimated rate or depth of flow:
- the estimated rate of enlargement:
- the estimated time breach occurred:

2.2.2 Verification

Plant Protection will attempt to confirm that the report is genuine. Verification may include:

- recognition of the caller;
- corroborating evidence from current conditions, e.g. weather, earthquake;
- independent verification by the R.C.M.P. or other sources using the caller's name, telephone number and location;
- Rio Tinto personnel must be included in the verification process;
- Piezo Instrumentation;
- CCTV

2.2.3 Notification

After attempting to verify that the breach report is genuine, **Plant Protection** will immediately relay the report to the **Control Room Operators** and the **Director – Energy and Watershed Partnerships** or, delegate. After whatever additional verification is deemed appropriate, the **Director – Energy and Watershed Partnerships** will immediately initiate the notifications shown in Section 9. The notifications are listed in order of priority to maximize the time available for the safe evacuation of downstream communities at risk, and the time available for remedial action.

2.2.4 Remedial Action

After initiating the notifications, the **Director – Energy and Watershed Partnerships** will take all practicable steps to stem the breach.

2.2.5 Reporting

Use form located in [Appendix B-1- Notification of Emergency Response](#).

- As soon as practicable, each person responding to an emergency or reported emergency will complete and submit a **Notification of Emergency Response** form to the **Director – Energy and Watershed Partnerships**.
- The **Director – Energy and Watershed Partnerships** will keep a complete record of any emergency or reported emergency and, as soon as practicable, will also complete and distribute a **Notification of Emergency Response**.

Filled Notification of Emergency response forms are to be sent to Power Operations Control Room.

2.2.6 Inundation Maps

Inundation maps provide sufficient information about potential flood arrival times and water levels to enable local and provincial emergency authorities to develop warning and evacuation procedures for threatened downstream communities.

The maps are based on computer model simulations of a hypothetical breach of Kenney Dam. These techniques involve making assumptions regarding the mode of dam failure and the existing downstream flows - actual conditions may differ from those assumed. The illustrated extent of the inundated areas is only approximate. Refer to [Appendix G for Inundation Maps](#) concerning a Kenney Dam Breach.

2.2.7 Media Contacts

The **Manager – Communities and Social Performance**, Rio Tinto BC Works will be responsible for overseeing communications, including announcements, updates and releases, as well as responses to media enquiries, the co-ordination of media interviews with designated spokespeople, and media site visits.

2.3 Saddle Dam Breach

A Saddle Dam Breach consists of a failure of one of the nine saddle dams, the spillway, or their foundations or abutments accompanied by a large or rapidly increasing uncontrolled flow of water from the reservoir. This is the second most serious emergency involving the Nechako Reservoir. A saddle dam breach may result in extensive downstream flooding.

The following 7 step process will be taken in the event of a Kenney Dam Breach Emergency:

- Step 1: Response
- Step 2: Verification
- Step 3: Notification
- Step 4: Remedial Action
- Step 5: Reporting
- Step 6: Inundation Maps
- Step 7: Media Contacts

2.3.1 Response

If you observe a breach in one of the saddle dams or the spillway, or of flow conditions which indicate that a breach has occurred, you will immediately contact and report to **Plant Protection** on duty in Kitimat (250-639-8273). If another person receives a dam breach report, they will transfer the call to **Plant Protection**.

Plant Protection will obtain and record:

- the observer's name, current location and telephone number:
- the position and estimated size of breach:
- the estimated rate or depth of flow:
- the estimated rate of enlargement:
- the estimated time breach occurred:

2.3.2 Verification

Plant Protection will attempt to confirm that the report is genuine. Verification may include:

- recognition of the caller;
- corroborating evidence from current conditions, e.g. weather, earthquake;
- independent verification by the R.C.M.P. or other sources using the caller's name, telephone number and location;
- Rio Tinto personnel must be included in the verification process

2.3.3 Notification

After attempting to verify that the breach report is genuine, **Plant Protection** will immediately relay the report to **Control Room Operators** and the **Director – Energy and Watershed Partnerships** or, delegate. After whatever additional verification is deemed appropriate, the **Director – Energy and Watershed Partnerships** will immediately initiate the notifications shown in Section 9. The notifications are listed in order of priority to maximize the time available for the safe evacuation of downstream communities at risk, and the time available for remedial action.

2.3.4 Remedial Action

After initiating the notifications, the **Director – Energy and Watershed Partnerships** will take all practicable steps to stem the breach.

2.3.5 Reporting

Use form located in [Appendix B-1- Notification of Emergency Response](#).

- As soon as practicable, each person responding to an emergency or reported emergency will complete and submit a **Notification of Emergency Response** form to the **Director – Energy and Watershed Partnerships**.
- The **Director – Energy and Watershed Partnerships** will keep a complete record of any emergency or reported emergency and, as soon as practicable, will also complete and distribute a **Notification of Emergency Response**.

Filled Notification of Emergency response forms are to be sent to Power Operations Control Room.

2.3.6 Inundation Maps

Inundation maps provide sufficient information about potential flood arrival times and water levels to enable local and provincial emergency authorities to develop warning and evacuation procedures for threatened downstream communities.

The maps are based on computer model simulations of a hypothetical breach of Kenney Dam. These techniques involve making assumptions regarding the mode of dam failure and the existing downstream flows - actual conditions may differ from those assumed. The illustrated extent of the inundated areas is only approximate. Refer to [Appendix G for Inundation Maps](#).

2.3.7 Media Contacts

The **Manager – Communities and Social Performance** will be responsible for overseeing communications with the media, including announcements, updates and releases, as well as responses to media enquiries, the co-ordination of media interviews with designated spokespeople, and media site visits.

2.4 Extreme Flood Release

An extreme flood release is defined as a Skins Lake Spillway discharge at or near the Probable Maximum Flood (PMF) of **1653** m³/s. The PMF results from the combination of a severe hydrometeorological event followed – or preceded - by a second extreme event (Canadian Dam Association Guidelines, 2007).

The PMF flood is estimated to produce a peak daily inflow to the Nechako Reservoir of approximately **3566** m³/s. The Nechako Reservoir is capable of temporarily storing the major portion of these inflows. However, the PMF would require very large releases from Skins Lake Spillway of up to a maximum of approximately **1653** m³/s. These releases would be necessary to prevent excessively high water levels which could cause breaching of the dams.

The PMF would also be accompanied by a substantial rise in reservoir level which would cause flooding around the shoreline. It is anticipated that snowpack and/or weather conditions, together with monitoring of reservoir levels would provide a minimum of several days warning of the need to make very large releases.

The following 4 step process will be taken in the event of an Extreme Flood Release Emergency:

- Step 1: Notification
- Step 2: Reporting
- Step 3: Inundation Maps
- Step 4: Media Contacts

2.4.1 Notification

If conditions indicate the need for very large releases from Skins Lake Spillway, the **Director – Energy and Watershed Partnerships** will initiate the notifications as shown in [Appendix A-2 - Notification Chart](#).

2.4.2 Reporting

The **Director – Energy and Watershed Partnerships** will keep a complete record of any information related to the assessment of the flooding forecast, and as soon as practicable, will also complete and distribute a Notification of Emergency Response, which will include the assessed flood forecast relevant to the PMF.

Use form located in [Appendix B-1- Notification of Emergency Response](#).

- As soon as practicable, each person responding to an emergency or reported emergency will complete and submit a **Notification of Emergency Response** form to the **Director – Energy and Watershed Partnerships**.
- The **Director – Energy and Watershed Partnerships** will keep a complete record of any emergency or reported emergency and, as soon as practicable, will also complete and distribute a **Notification of Emergency Response**.

Filled Notification of Emergency response forms are to be sent to Power Operations Control Room.

2.4.3 Inundation Maps

Inundation maps are based on computer model simulations of a Probable Maximum Flood (PMF) release from Skins Lake Spillway. These techniques involve making assumptions regarding various parameters and the existing downstream flows. If the PMF occurred, actual conditions may differ from those assumed. The illustrated extent of the inundated areas is only approximate. Refer to [Appendix G. for Inundation Maps](#) concerning an Extreme Flood Release.

2.4.4 Media Contacts

The **Manager – Communities and Social Performance**, Rio Tinto BC Works will be responsible for overseeing communications with the media, including announcements, updates and releases, as well as responses to media enquiries, the co-ordination of media interviews with the designated spokespeople, and media site visits.

3. ACCESS

3.1 Road

The dams are accessible from the north from Highway 16 by two gravel forest service roads, one near Houston, and the other at Burns Lake, which involves a ferry crossing of Francois Lake. The dams are also accessible from the north-east by roads from Highway 16 at Fraser Lake and Vanderhoof. Access roads are shown on [Appendix D-1 Access Map](#), located in the Appendix of this DEP.

3.2 Air

Airstrips suitable for fixed-wing aircraft are located at Burns Lake, Fraser Lake, and Vanderhoof. The reservoir may be suitable for the landing of float planes, depending upon weather conditions. There are suitable helicopter landing sites near each of the dams. Jet fuel is available at Skins Lake Spillway and Nechako Lodge near Kenney Dam.

3.3 Interruption of Access - Effect of Dam Breach

3.3.1 Road

In the event of a breach in Kenney Dam, access would still be possible from the north via the Houston forest service road, but large portions of Highway 16, including sections around the Burns Lake access road junction, and the access roads from Highway 16 at Fraser Lake and Vanderhoof would be impassable. In the event of a breach of one of the Skins Lake or Bear Creek saddle dams, road access would still be possible via Houston and Burns Lake as far as the breach, but road access to Kenney Dam would be lost.

4. ELECTRICAL POWER SOURCES

4.1 Skins Lake Spillway

The two gates are powered by separate electric motors. The motors are powered from underground electrical cable initiating at the Skins Lake Spillway generator building. Energy is provided by a connection to BC Hydro and in addition is backed by a 40 kW diesel generator.

The stoplogs are raised and lowered by hydraulically operated winches and, in case of emergency operation, by hydraulically operated cylinders. The hydraulic power is provided by a self-contained diesel powered portable hydraulic pump set.

4.2 Communication Systems

The electrical supply for the telephone land line network is integral with the telephone lines and is provided from the provincial grid.

The Starlink internet, Tower-Tel two-way radio equipment and satellite phone at the Skins Lake Spillway Attendant's residence can be independently powered by a generator.

4.3 Power Supply - Effect of Dam Breach

The power supply for the spillway gates and stoplogs would not be affected by a dam breach except if it is the spillway or adjacent dams that have been breached.

The interruption of land line telephone power supplies would match the interruption of land line telephone communications. The independent power supply for the Starlink internet, Tower-Tel two-way radio equipment and satellite phone at the Skins Lake Spillway Attendant's residence would not be affected.

5. WARNING SYSTEMS

A warning siren is mounted on the Skins Lake Spillway, and is sounded before changing the position of the gates, in order to warn persons in the valley immediately downstream of an impending increase in flow.

In the event of a PMF local and provincial emergency authorities will be notified of anticipated changes in spillway discharge as prescribed in this DEP, see [Section 2 - EMERGENCY SCENARIOS](#), specifically [Section 2.4 - EXTREME FLOOD RELEASE](#).

The **Manager, Communities and Social Performance, BC Works** will be responsible for developing a communications plan.

6. CONSTRUCTION EQUIPMENT, MATERIAL, LABOUR & ENGINEERING EXPERTISE

6.1 Construction Equipment

Items of construction equipment which could be used to assist emergency repairs are located at the Skins Lake Spillway (telephone: 250-694-3532), including:

- Backhoe (4WD);
- Skid Steer
- Truck-mounted Hiab
- Pick up
- Trailers

6.2 Construction Materials

Types of construction materials which could be used to assist emergency repairs are located at the Skins Lake Spillway (telephone: 250-694-3532), including:

- Concrete mix (*Procured as required*)
- Crush rock (*Procured as required*)
- Sand (*Procured as required*)

6.3 Fill Materials

Sources of fill materials at each dam location are shown on Figures A2 and A3 and on the following drawings, shown on Figures A4-A8.

Note: The following identified drawing numbers are BC Works referenced file numbers.

| Location | Material | Drawing Ref. | Appendix. Doc Ref. |
|---|---|---------------------------------------|--|
| Skins Lake Dams No. 1, 2 and 3 | | | |
| Dam No.1 & 2 | Rock Rip Rap | Drawing 120-SF-90 | (Appendix D-3 – Drawing 120-SF-90 (Skins Lake Dam No. 1 & 2)) |
| | Till-like material (“clay pit”) | | |
| Dam No. 3 | Rock Rip Rap | Drawing 120-191 | Appendix D-4 - Drawing 120-191 (Skins Lake Dam No. 3) |
| | Till-like material (“clay pit”) | Drawing 120-191 and Drawing 120-SF-91 | Appendix D-5 - Drawing 120-SF-91 (Skins Lake Dam No. 3) |
| Bear Lake Dams | | | |
| No. 1, 2 & 3 | Till-like material (“clay pit”) | Drawing 117-BF-12 | Appendix D-6 - Drawing 117-BF-12 (Bear Lake Dams No. 2 & 3) |
| | Sand and Gravel | | Appendix D-2 – Drawing Fill Materials (Bear Lake Dam No.1) |
| | ** Riprap is available at a quarry 1.5 miles along the road to the east (St.Mary Pit) | | |
| Kenney Dam | | | |
| Kenney Dam & Cutoff Creek Dams No. 1,2 &3 | Impervious Fill | Drawing 113-5 | Appendix D-7 - Drawing 113-5 (Kenney Dam location of Borrow Areas) |
| | Gravel Filler | | |
| | Rock Quarry | | |

7. COMMUNICATION RESOURCES

7.1 Telephone Facilities

Telephones land lines are located at the Skins Lake Spillway Attendant's residence. Radio communication equipment is also located at the Skins Lake Spillway Attendant's residence. Starlink services are functional at the Skins Lake Spillway residence, Kenney Dam and in the Skins Lake Spillway Attendant's trucks.

Available communications at the Skins Lake Spillway residence include:

- Cell Phone 250-719-8623 (via Starlink)
- Telephone 250-694-3532
- Satellite phone #2: 011-8816-325-72811

7.2 Mobile Radio Phone

If the attendant is not able to be contacted on the phone or by the Sat phone, contact can be made on the mobile radio Tower-Tel system by following these instructions.

Skins Lake Communications Procedures are:

Between Bear Lake Dams and the Spillway:

Dial 1-250-845-2465- when you hear a beep press * and dial in the ANI # 29280 which rings the Rio Tinto truck.

Between Kenney Dams and Cut-off Creek Dams:

Dial 1-250-444-0009- when you hear a beep press * and dial in the ANI # 29280 which rings the Rio Tinto truck.

7.3 **Interruption of Communication – Effect of Dam Breach**

In the event of a breach in Kenney Dam, telephone communication with Skins Lake Spillway would likely still be possible via mobile, land line, radio equipment, or satellite phone, depending upon the extent of telephone system damage in the Burns Lake area.

In the event of a breach in one of the saddle dams, other than Skins Lake No. 1 or No. 2, mobile, land line, radio telephone and satellite phone communication with the Spillway Attendant's residence would still be possible, .

8. NECHAKO RESERVOIR DEP COMMUNICATION TEST

8.1 General

The **Director – Energy and Watershed Partnerships** will ensure that the emergency response procedures are practiced periodically. The practices will consist of limited and full communications tests, and operational tests. During tests, notifications will be through phone, text and email and must commence with the words "***This is a TEST of the Nechako Dam Emergency notification system, issued by Rio Tinto, British Columbia***" to ensure that there is no doubt that it is a test and not an emergency.

8.2 Limited Communications Tests within Rio Tinto BC Operations

The **Director – Energy and Watershed Partnerships** will initiate and co-ordinate limited communications tests involving only Rio Tinto BC Operations employees at intervals which he deems appropriate based on staff changes.

8.3 Full Communications Tests Outside Rio Tinto BC Operations

The **Director – Energy and Watershed Partnerships** will initiate and co-ordinate a full communications test, including external agencies, at least **once a year** as part of the annual DEP document review process.

***Note** - The communication test plan is performed by the DEP review routing participants. Names of the participants are identified in [Appendix C-3](#) Document Review Routing.

8.4 Operational Tests

The planning, co-ordination, and implementation of civil emergency response plans, including warning and evacuation procedures are the responsibility of local and provincial governments. Rio Tinto BC Operations will participate in the planning and initiation of operational tests at the request of the emergency response authorities. The timing of the operational tests will be at the discretion of the emergency response authorities.

8.5 Reporting

The **Director – Energy and Watershed Partnerships** will ensure that each test is recorded on the log in [Appendix C-5 \(Record of Briefings, Limited and Full Communication Tests\)](#). DEP review routing participants (named in [Appendix C-3](#)) will be requested to provide feedback from the test. The team will meet post-test and feedback from the test will be collected either verbally, personal notes or by use of Test Report form [Appendix B3 \(Test Report\)](#).

The **Director – Energy and Watershed Partnerships** will prepare and distribute a brief summary of each test ([Appendix C-6](#) - Debrief Meeting Annual DEP Review and Communication Test REPORT), noting any problems encountered and the steps taken to eliminate or overcome them in the future.

9. RECORD OF DOCUMENT REVISIONS

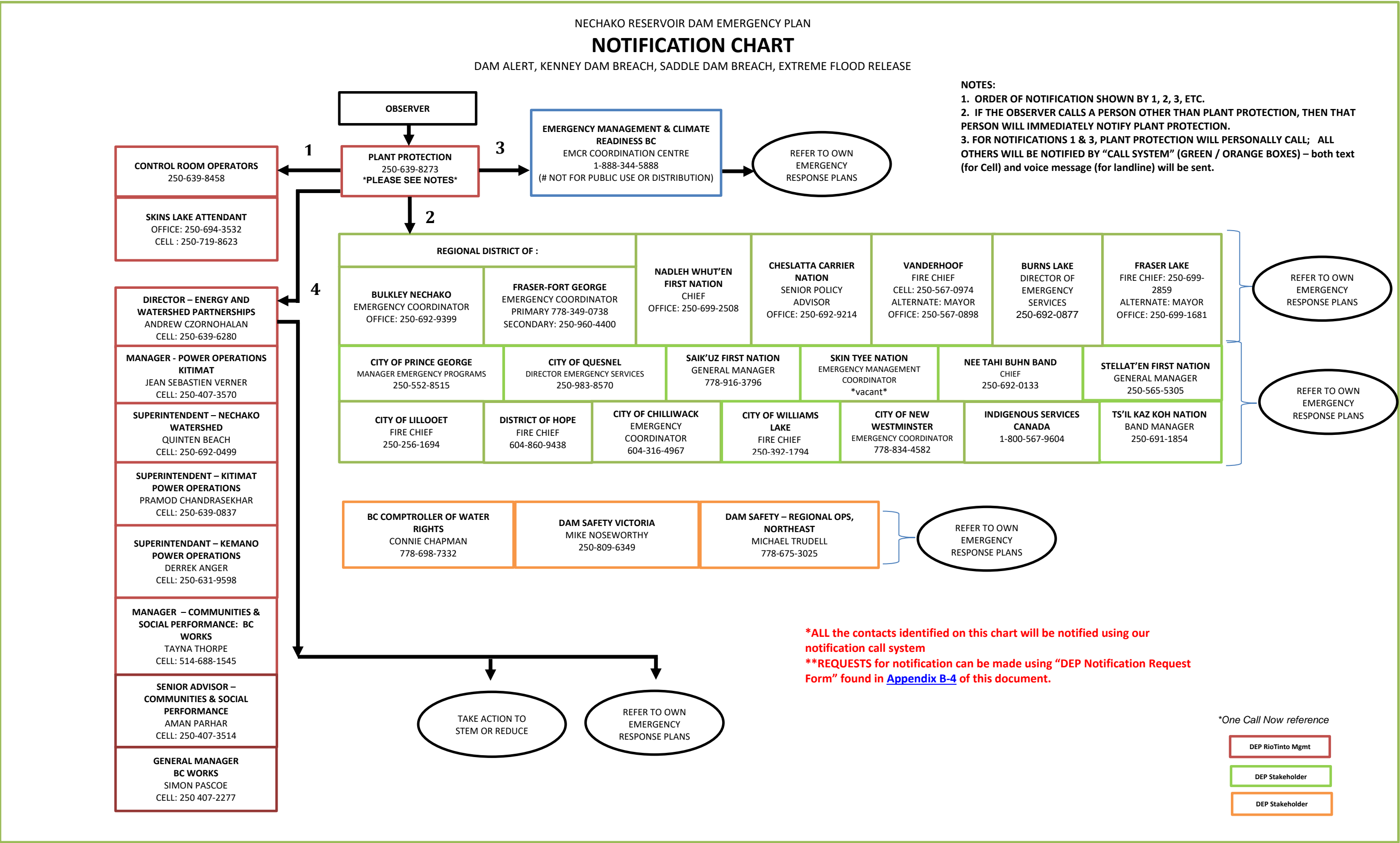
| Version No | Change Description | Revised by | Reviewed by | Approved by | Date |
|------------|--|--|---|--|---------|
| 6 | Regularly scheduled review. Revised mobile radio data. Updated emergency contacts, distribution lists, titles, names. | Power Operations Mgmt | Power Operations Mgmt | Power Operations Management | 2012/04 |
| 7 | Annual review. Updated all references to PEP which is now known as Emergency Management BC. Updated emergency contacts, distribution lists, titles, names. | Power Operations Mgmt | Power Operations Mgmt | Power Operations Management | 2013/04 |
| 8 | Regularly scheduled review. Updated emergency contacts, distribution lists, titles, names. | Power Operations Management | Power Operations Mgmt | Power Operations Management | 2015/04 |
| 9 | Regularly scheduled review. Updated emergency contacts, distribution lists, titles, names. | Power Operations Mgmt | Power Operations Mgmt | Power Operations Management | 2017/04 |
| 10 | Extensive reformatting of document, including updates of Contacts and Distribution Lists. | Debbie Fossil Risk Management Coordinator | Marc Bedard Power Operations Mgmt | Andrew Czornohalan Plant Services and Power Operations Director | 2019/04 |
| 11 | Contacts and Distribution Lists. Document review/updates for 2019 records | Debbie Fossil Risk Management Coordinator | Marc Bedard Power Operations Mgmt | Andrew Czornohalan Plant Services and Power Operations Director | 2020/11 |
| 12 | Contacts and Distribution Lists. Document review/updates for 2022 records | David Silva Kemano Logistics Coordinator | DEP Steering Committee | Andrew Czornohalan Director – Energy and Watershed Partnerships | 2022/12 |
| 13 | Contacts and Distribution Lists. Document review/updates for 2024 records | Trinda Elwert Project Manager | Quinten Beach, David Silva, Aman Parhar | Andrew Czornohalan Director – Energy and Watershed Partnerships | 2025/06 |

APPENDIX A – NOTIFICATIONS & CONTACTS

1. [Appendix A-1](#) – Emergency Contacts for Dam (Rio Tinto BC Works)
2. [Appendix A-2](#) – Notification Chart
3. [Appendix A-3](#) – DEP Distribution List & Contacts
 - a. [Provincial Government Agencies](#)
 - b. [First Nations](#)
 - c. [Municipal Government Agencies](#)
 - d. [Rio Tinto BC Works](#)

Appendix A-1 – Emergency Contacts for Dam (Rio Tinto BC Works)

| Location | Position | Name | Email Address | Office Phone Number | Contact Phone Numbers |
|---------------------|---|-----------------------|-----------------------------------|---------------------|-----------------------|
| Kitimat | Director – Energy and Watershed Partnerships | Andrew Czornohalan | Andrew.Czornohalan@Riotinto.com | | 250-639-6280 |
| Burns Lake | Superintendent - Nechako Watershed | Quinten Beach | Quinten.Beach@riotinto.com | | 250 692 0499 |
| Vanderhoof | Senior Advisor – Communities & Social Performance | Aman Parhar | aman.parhar@riotinto.com | | 250 407 3514 |
| Kitimat | Manager – Power Operations Kitimat | Jean Sebastien Verner | j.verner@riotinto.com | | 250-407-3570 |
| Kitimat | Superintendent – Kitimat Power Operations | Pramod Chandrasekhar | Pramod.chandrasekhar@riotinto.com | | 250-639-0837 |
| Kitimat | Land Management & Operation Permit Advisor | David Silva | david.silva@riotinto.com | | 250-632-1194 |
| Kitimat | Supervisor – Power Operations | Vacant | | | |
| Skins Lake Spillway | Spillway Attendant | Cheslatta Contracting | spillway@cheslattacontracting.ca | 250-694-3532 | 250-719-8623 |
| Kemano | Superintendent –Kemano | Derrek Anger | Derrek.Anger@riotinto.com | | 250-631-9598 |
| Kitimat | Manager – Communities & Social Performance | Tayna Thorpe | Tayna.thorpe@riotinto.com | | 514-688-1545 |
| Kitimat | Regional Security Officer Western Region | Ken Isaak | Ken.Isaak@Riotinto.com | | 250-639-6253 |
| Kitimat | Business Partner – HSE BC Works | Brent Pondaag | Brent.pondaag@riotinto.com | | |
| Kitimat | General Manager BC Works | Simon Pascoe | simon.pascoe@riotinto.com | | 250 407 2277 |
| | | | | | |



Appendix A-3 – DEP Distribution List & Contacts

Provincial Government Agencies

| Contact | | Mailing Address | Physical Address | Telephone | Copy # Issued |
|---|--|---|--|----------------------------------|------------------|
| BC Ministry of Forests Water Authorizations | Sean Staplin | PO Box 5000, Smithers BC V0J 2N0 | Skeena Region, MOE, 3726 Alfred Ave, Smithers BC | 250-877-0091 | 10 |
| Dam Safety - Victoria | Mike Noseworthy | PO Box 9340, Victoria BC V8W 9M1 | 3rd Floor, 395 Waterfront Cres, Victoria BC | O:778-622-6893 C:250-809-6346 | 11 |
| Dam Safety – Prince George | Michael Trudell | 5th Floor – 499 George Street Prince George BC V2L 1R5 | 5th Floor – 499 George Street Prince George BC V2L 1R5 | O:778-675-3025 C:250-645-9422 | 12 |
| BC Comptroller of Water Rights | Connie Chapman | PO Box 9340, Victoria BC V8W 9M1 | 2975 Jutland Road, Victoria BC | 778-698-7332 | 13 |
| Emergency Management & Climate Readiness (EMCR) | Emergency Coordination Centre | | | 1-888-344-5888 | |
| EMCR – North PREOC | Regional Duty Manager – North | 3235 Westwood Drive Prince George, B.C. V2N 1S4 | 3235 Westwood Drive Prince George, B.C. V2N 1S4 | 1-888-344-5888 | |
| EMCR – Souther Interior PREOC | Regional Duty Manager – Southern Interior | 45-450 Lansdowne St., Kamloops, BC, V2C 1Y3 | 45-450 Lansdowne St., Kamloops, BC, V2C 1Y3 | 1-888-344-5888 | |
| EMCR – South Coast PREOC | Regional Duty Manager – South Coast | 14292 Green Timbers Way, Surrey, BC, V3T 0J4 | 14292 Green Timbers Way, Surrey, BC, V3T 0J4 | 1-888-344-5888 | |
| EMCR – Director of Regional Response, Northwest Region | Crissy Bennett | 103-4741 Park Avenue, Terrace BC, V8G 1W2 | 103-4741 Park Avenue, Terrace BC | 778-702-0071 | |
| EMCR – Direcotr of Regional Response, Northeast Region | *currently vacant* | 3235 Westwood Drive Prince George, B.C. V2N 1S4 | 3235 Westwood Drive Prince George, B.C. V2N 1S4 | | |
| ECOMM 911 | Darcy Wilson | 3301 E. Pender Street Vancouver. B.C. V5K 5J3 | 3301 E. Pender Street Vancouver. B.C. V5K 5J3 | 604-375-0320 | 34 |
| BC Ambulance Service | Provincial Operations Manager Team | 5901 Delesalle Street, Burnaby, BC V5J 0G8 | 5901 Delesalle Street, Burnaby, BC V5J 0G8 | 1-250-953-3298 | 35 |
| Vancouver Airport | 24/7 OPS | PO Box 44638, YVR Domestic Terminal RPO Richmond, BC V7B 1W2 | 3211 Grant McConachie Way Link Building, L5 Richmond BC V7B 0A4 | 604-207-7022 | 38 |
| Indigenous Services Canada | | | | 1-800-567-9604 | |
| First Nation Emergency Services Society | Jamie Svedsen | 102 - 70 Orwell Street North Vancouver BC V7J 3R5 | 102 - 70 Orwell Street North Vancouver BC V7J 3R5 | 1-888-822-3388 778-694-9211 | |

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First Nations

| Contact | | Mailing Address | Physical Address | Telephone | Copy # Issued |
|-----------------------------|---|---|---|--------------|---------------|
| Cheslatta Carrier Nation | Mike Robertson (Senior Policy Advisor) | PO Box 909 Burns Lake BC, V0J 1E0 | 1215 Southbank School Rd, Burns Lake BC V0J 1E0 | 250-692-9214 | 17 |
| Cheslatta Carrier Nation | Barb Tom (Director of Operations) | PO Box 909 Burns Lake BC, V0J 1E0 | 1215 Southbank School Rd, Burns Lake BC V0J 1E0 | 250-694-3334 | |
| Nee Tahi Buhn Band | *Vacant* (Emergency Management Coordinator) | RR#2, Site 7, Comp 28, Burns Lake BC, V0J 1E0 | RR#2, Site 7, Comp 28, Burns Lake BC, V0J 1E0 | | 19 |
| Nee Tahi Buhn Band | Marcella Morris (Chief)) | RR#2, Site 7, Comp 28, Burns Lake BC, V0J 1E0 | RR#2, Site 7, Comp 28, Burns Lake BC, V0J 1E0 | 250-692-0133 | |
| Skin Tyee Nation | *Vacant* (Emergency Management Coordinator) | 6914 Campbell Rd, Burns Lake BC, V0J 1E0 | 6914 Campbell Rd, Burns Lake BC, V0J 1E0 | | 18 |
| Nadleh Whut'en First Nation | Beverly Ketlo (Chief) | PO Box 36 Fort Fraser, BC V0J 1N0 | 1416 Nautley Rd, Fort Fraser BC V0J 1N0 | 250-699-2508 | 20 |
| Stellat'en First Nation | Doug Casimel (Lands Department) | PO Box 760, Fraser Lake BC V0J 1S0 | 791 Shun K'et Ti Road, Fraser Lake, BC V0J 1A0 | 306-527-3649 | |
| Stellat'en First Nation | Beverly Best (General Manager) | PO Box 760, Fraser Lake BC V0J 1S0 | 791 Shun K'et Ti Road, Fraser Lake, BC V0J 1A0 | 250-565-5305 | |
| Saik'uz First Nation | Cora McIntosh (General Manager) | 135 Joseph St, Vanderhoof BC V0J 3A1 | 135 Joseph St, Vanderhoof BC V0J 3A1 | 778-916-3796 | |
| Saik'uz First Nation | Priscilla Mueller (Chief) | 135 Joseph St, Vanderhoof BC V0J 3A1 | 135 Joseph St, Vanderhoof BC V0J 3A1 | 778-916-7328 | |

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Municipal Government Offices

| Contact | | Mailing Address | Physical Address | Telephone | Copy # Issued |
|---|---|--|--|------------------------------|------------------|
| Regional District of Bulkley Nechako | Christopher Walker (Emergency Services Manager) | PO Box 820 Burns Lake, BC V0J 1E0 | 37 3rd Ave, Burns Lake BC V0J 1E0 | 250-692-9399 | 22 |
| Regional District of Bulkley Nechako | Jason Blackwell (Regional Fire Chief) | PO Box 820 Burns Lake, BC V0J 1E0 | 37 3rd Ave, Burns Lake BC V0J 1E0 | 250-692-0928 | |
| Regional District of Fraser- Fort George | Colby Molcak (Emergency Services Coordinator) | 155 George St, Prince George BC V2L 1P8 | 155 George St, Prince George BC V2L 1P8 | 250-960-4400 778-349-0738 | 23 |
| Cariboo Regional District | Irene Israel (Manager of Emergency Programs) | Suite D 180 North 3rd Ave Williams Lake, BC V2G 2A4 | Suite D 180 North 3rd Ave Williams Lake, BC V2G 2A4 | 250-855-8924 | 32 |
| Village of Burns Lake | Rob Krause (Director of Protective Services) | PO Box 570 Burns Lake, BC V0J 1E0 | 15 3 rd Ave, Burns Lake BC, V0J 1E0 | 250-692-0877 | |
| Village of Fraser Lake | Sarrah Storey (Mayor) | PO Box 430 Fraser Lake BC, V0J 1S0 | 210 Carrier Cres, Fraser Lake BC, V0J 1S0 | 250-699-1681 | 24 |
| Village of Fraser Lake | Joe Pacheco (Fire Chief) | PO Box 430 Fraser Lake BC, V0J 1S0 | 210 Carrier Cres, Fraser Lake BC, V0J 1S0 | 250-699-2859 | 24 |
| District of Vanderhoof | Kevin Moutray (Mayor) | PO Box 900, Vanderhoof BC, V0J 3A0 | 160 Connaught St, Vanderhoof BC, V0J 3A0 | 250-567-0898 | 21 |
| District of Vanderhoof | Nelson Johnson (Fire Chief) | PO Box 900, Vanderhoof BC, V0J 3A0 | 160 Connaught St, Vanderhoof BC, V0J 3A0 | 250-567-0974 | |
| City of Prince George | Tanya Spooner (Emergency Programs Coordinator) | 1100 Patricia Blvd. Prince George BC, V2L 3V9 | 1100 Patricia Blvd. Prince George BC, V2L 3V9 | 250-552-8515 | 25 |
| City of Prince George | Walter Babicz (City Manager) | 1100 Patricia Blvd. Prince George BC, V2L 3V9 | 1100 Patricia Blvd. Prince George BC, V2L 3V9 | 250-561-7605 | |
| City of Quesnel | Ron Richert (Fire Chief) | 410 Kinchant St, Quesnel BC, V2J 7J5 | 410 Kinchant St, Quesnel BC, V2J 7J5 | 250-983-8570 | 26 |
| City of Williams Lake | Evan Dean (Fire Chief) | 450 Mart St, Williams Lake BC, V2G 1N3 | 450 Mart St, Williams Lake BC, V2G 1N3 | 250-392-1794 | |
| City of Lillooet | Corey Watkinson (Fire Chief) | PO Box 610, Lillooet BC, V0K 1V0 | 615 Main St, Lillooet BC, V0K 1V0 | 250-256-1694 | 28 |
| District of Hope | Thomas Cameron (Fire Chief) | PO Box 609, Hope BC, V0X 1L0 | 325 Wallace St, Hope BC, V0X 1L0 | 604-860-9438 | 29 |
| City of Chilliwack | Chris Willson (Emergency Management Coordinator) | 8550 Young Rd, Chilliwack BC, V2P 8A4 | 8550 Young Rd, Chilliwack BC, V2P 8A4 | 604-316-4967 | 30 |
| City of New Westminster | Cory Hansen (Emergency Coordinator) | #1 East Sixth Avenue East\New Westminster, BC V3L 4G6 | #1 East Sixth Avenue East\New Westminster, BC V3L 4G6 | 778-834-4582 | 31 |

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Rio Tinto BC Works

***PLEASE NOTE** - Refer to [Appendix A-1 – Emergency Contacts for Dam \(Rio Tinto BC Works\)](#) for complete list of contacts, as this list only contains those persons with copies of the DEP!

| Contact | | Mailing Address | Physical Address | Telephone | Copy # Issued |
|--|----------------------|--|--|------------------------------|---------------|
| Superintendent - Nechako Watershed | Quinten Beach | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-692-0499 | 1 |
| BC Works General Manager | Simon Pascoe | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250 407-2277 | 2 |
| Director – Energy and Watershed Partnerships | Andrew Czornohalan | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-639-6280 | 3 |
| Manager – CSP BC Works | Tanya Thorpe | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 514-688-1545 | 4 |
| Supervisor Power Operations | Vacant | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | | 5 |
| Plant Protection - Main Gate | Dispatch | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-639-8273 | 6 |
| Kitimat Control Room | Operators | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-639-8200 | 7 |
| Kemano Incident Commander | George LeBleu | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-639-3152 | 8 |
| Skins Lake Spillway | Spillway Attendant | | | 250-694-3532 250-719-8623 | 9 |
| Superintendent Power Operations Kitimat | Pramod Chandresekhar | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-639-0837 | 33 |
| Vanderhoof Office – Extra Copies | Aman Parhar | 158 Stewart Street, PO Box 25, Vanderhoof, BC V0J 3A0 | 158 Stewart Street, PO Box 25, Vanderhoof, BC V0J 3A0 | 250 407 3514 | 40-41-42 |
| Rio Tinto Kitimat – Extra Copies | David Silva | PO Box 1800, Kitimat BC, V8C 2H2 | 1 Smeltersite Rd, Kitimat BC, V8C 2H2 | 250-632-1194 | |

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APPENDIX B – FORMS

1. [Appendix B-1](#) – Notification of Emergency Response
2. [Appendix B-2](#) – Diary of Events
3. [Appendix B-3](#) – Test Report
4. [Appendix B-4](#) – Request for Notification of Emergency

RioTinto

Important : To be issued within 24 hours of any emergency or reported emergency by Skins Lake Attendant, Plant Protection, on-duty Power Control Room Operator, and Operations Director.

To: _____

Date: _____

From: _____

File: _____

| | |
|--------------------|--|
| Date of Occurance: | |
|--------------------|--|

| | |
|-------------------------|--|
| Description of Problem: | |
| | |
| | |

| | |
|------------------|--|
| Person Notified: | |
|------------------|--|

| | |
|----------------------|--|
| Action Taken: | |
| | |
| | |

| | |
|-------------------------|--|
| Action Proposed: | |
| | |
| | |
| | |
| | |
| | |

Printed copies are uncontrolled

Appendix B-2 - Diary of Events



Diary of Events

Important : To be issued within 24 hours of any emergency or reported emergency by Skins Lake Attendant, Plant Protection, on-duty Power Control Room Operator, and Operations Director.

Report is to be submitted to Power Control Room

To: Director – Energy and Watershed Partnerships,
Rio Tinto,
P.O. Box Box 1800
Kitimat, BC V8C 2H2
Email: andrew.czornohalan@riotinto.com

Date: _____

From: _____

| | |
|------------------------------|--|
| Location of Incident: | |
|------------------------------|--|

| | |
|------------------------------|--|
| Summary of Incident:: | |
| | |
| | |
| | |


| | | |
|-----------------------------------|--|--|
| Names of Persons involved: | | |
| | | |

| | |
|---|--|
| Agencies notified and time called: | |
| | |
| | |

| | |
|--|--|
| Action Taken and Present Condition: | |
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| | |
| Further Action PlanneededTaken and Present Condition: | |
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| | |

cc: (as applicable)

Appendix B-3 - Test Report



TEST REPORT

To: Mr. Andrew Czornohalan
Director – Energy and Watershed Partnerships
Rio Tinto
P.O. Box 1800
Kitimat, BC V8C 2H2
Email: andrew.czornohalan@riotinto.com

Date: __

File: _____

Type of Test:

From: _____

Limited Communications Test☐

Full Communications Test☐

Operational Test☐

Time and Date First Notified: _____

Notified by: _____

Notifications Made:

| Name: | Agency(ies) | Time of Call |
|-------|-------------|--------------|
| | | |

| Message Received / Passed on: | |
|--|--|
| | |
| Comment on Test (If space is insufficient use additional sheet(s)) : | |
| | |
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Appendix B-4 - Request for Notification of Emergency

REQUEST for Notification (BC Works DEP)

***Please Note** – This form is to be added to the RioTinto one call now notification list for Dam Emergencies. In the event of an emergency, Rio Tinto will notify you as per information provided below using the “One Call Now” notification system. For voice/text messages, this will be a recorded message only, not a person to person communication. ***PLEASE NOTE** – it is your responsibility to enact your emergency response plan upon receiving actual emergency notification and follow instructions accordingly.

Date:

Please Check box ✓ for appropriate notification destination type:

☐

Community Organization

☐

Government Agency

Please specify Organization Name (if this is a Community Organization or Government Agency request) :

Contact Person Name :

Contact Location/Address :

City / Town :

Postal Code :

Contact Phone Number :

Message Preference (please check ✓):

☐

Voice Message and/or

☐

Text Message

**Please note – The contact Phone Number provided will be notified by programmed message for any Nechako DEP events.*

Upon receipt of this form indicating Text Message request; RIO TINTO will send you a text message requesting that you Opt-in with instructions to complete the set-up. Please follow the instructions when you receive this text message.

Completed forms can be Emailed to ken.isaak@riotinto.com OR Mailed to following address:

TO: Rio Tinto

P.O. Box 1800

Kitimat, BC V8C 2H2

RE: DEP Notification Request

_OFFICE Use Only: * Attention BC Works Plant Protection (One Call list : DEP Notification REQs)

Date Request Received: _____

Process Date: _____ Processed By: _____

APPENDIX C – DOCUMENT CONTROL (for DEP)

1. [Appendix C-1](#) – Letter of Understanding
2. [Appendix C-2](#) – Request for Revision
3. [Appendix C-3](#) – Document Review Routing
4. [Appendix C-4](#) – Record of Review by Outside Agencies
5. [Appendix C-5](#) – Record of Briefings, Limited and Full Communication and Operational Tests
6. [Appendix C-6](#) - Debrief Meeting Annual DEP Review and Communication Test REPORT (Template)

Appendix C-1 - Letter of Understanding

Date: _____

Mr. Andrew Czornohalan

Director – Energy and Watershed Partnerships

Rio Tinto

P.O. Box 1800

Kitimat, BC V8C 2H2

Email: andrew.czornohalan@riotinto.com

Dear Mr. Czornohalan:

Re: Nechako Reservoir Dam Emergency Plan

We acknowledge receipt of Copy #_____ of the Nechako Reservoir Dam Emergency Plan (DEP) prepared by Rio Tinto Aluminum. In the unlikely event of a breach or dam alert at any of the Nechako Reservoir Dams, or in the event of a severe flood release, we will co-operate in every way possible and as outlined in the DEP, in expediting action to mitigate the effects of the emergency, including assistance with alerting and, if necessary, evacuating the public which would be endangered.

We understand that we are to advise you of changes in our data recorded in the DEP, and that we may contribute information at any time to update or otherwise revise the Nechako Reservoir DEP for currency.

We request that we be provided with an updated copy of the DEP or errata sheets as they are produced. We appreciate the opportunity to participate in the DEP development.

Yours truly.

Signature

Name and Title

Revision Form

To: **Director – Energy and Watershed Partnerships**

Rio Tinto

P.O. Box 1800

Kitimat, BC V8C 2H2

Email: andrew.czornohalan@riotinto.com

Date: _____

From: _____

File: _____

| Proposed Revision: | |
|--------------------|--|
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| | |

cc: (as applicable)

For Office Use Only:

Approved/Not Approved: _____

Date: _____

Actioned: _____

Date: _____

Appendix C-3 - Document Review Routing

| Name | Title | Review Date | Comments |
|----------------------|---|--------------------|-----------------|
| Andrew Czornohalan | Director – Energy and Watershed Partnerships Partnerships | | |
| Quinten Beach | Superintendent, Nechako Watershed | | |
| Vacant | Supervisor, Power Operations | | |
| Pramod Chandrasekhar | Superintendent, Kitimat Power Operations | | |
| Aman Parhar | Advisor, Communities & Social Performance | | |
| Jordan Pacheco | Team Lead, Emergency & Prevention Services | | |
| Ken Isaak | Coordinator, Emergency & Prevention Services | | |
| | | | |
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Appendix C-4 - Record of Review by Outside Agencies

| AGENCY | DATE | REMARKS |
|--|------------|---|
| SECTION HEAD – MFLNRO - DAM SAFETY SECTION SCOTT MORGAN | May 6/2019 | Page 36 – Notifications print outside margin, Page 37 – Change Dam Safety resource names in PG to M.Trudell and Ted White APPENDIX D – did not print clearly – recommend reissue of higher resolution *COPY of communication in record of 2019 Debrief DEP Review and Comm Test |
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Appendix C-5 - Record of Briefings, Limited and Full Communications and Operational Tests

| DATE | INITIATOR | DESCRIPTION | REMARKS |
|--------------|-------------------------------|--|--|
| May 17/02 | D. McDonagh (SL Attendant) | Drill - Breach of Saddle Dam #3 | Outside Agencies require training on use of DEP Manual |
| | | | Notification Chart requires updating |
| | | | Map to be created showing location of all Dams (D. McAndrew) |
| | | | Discussion on necessity of placing emergency contact info at each dam |
| Aug. 30/04 | G. Geeraert (SL Attendant) | Drill - Breach of Dam | Notification Chart requires updating |
| Nov. 25/05 | Skins Lake Attendant | Drill - Breach of Kenney Dam | OK |
| Oct. 20/06 | Al Grier (SL Attendant) | Drill - Breach of Kenney Dam | Notification Chart requires updating |
| Nov. 7/08 | SLS Attendant | Drill – Breach of Kenney Dam | Notification Chart requires updating |
| Nov. 6/09 | SLS Attendant | Drill – Breach of Saddle Dam #3 | OK |
| Nov. 18/10 | SLS Attendant | Drill – Breach of Kenney Dam | Notification Chart requires updating |
| June 20/2019 | RT Plant Protection | Initiate Drill for DEP Communication Test | Debrief was held on July 5/2019. Records of Debrief in Doc Control system |
| Sept 16/2020 | DEP Review Team | Initiate Drill for DEP Communication Test | Debrief on Sept 25 th 2020. Review of 2019 actions and 2020 actions developed |
| Jan 4/2023 | DEP Review Team | Communication Test | Debrief on Jan5, 2023. Initiated review of DEP and Notification Chart. |
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Debrief Meeting Annual DEP Review and Communication Test REPORT (Template)

DEP Review Team Participants

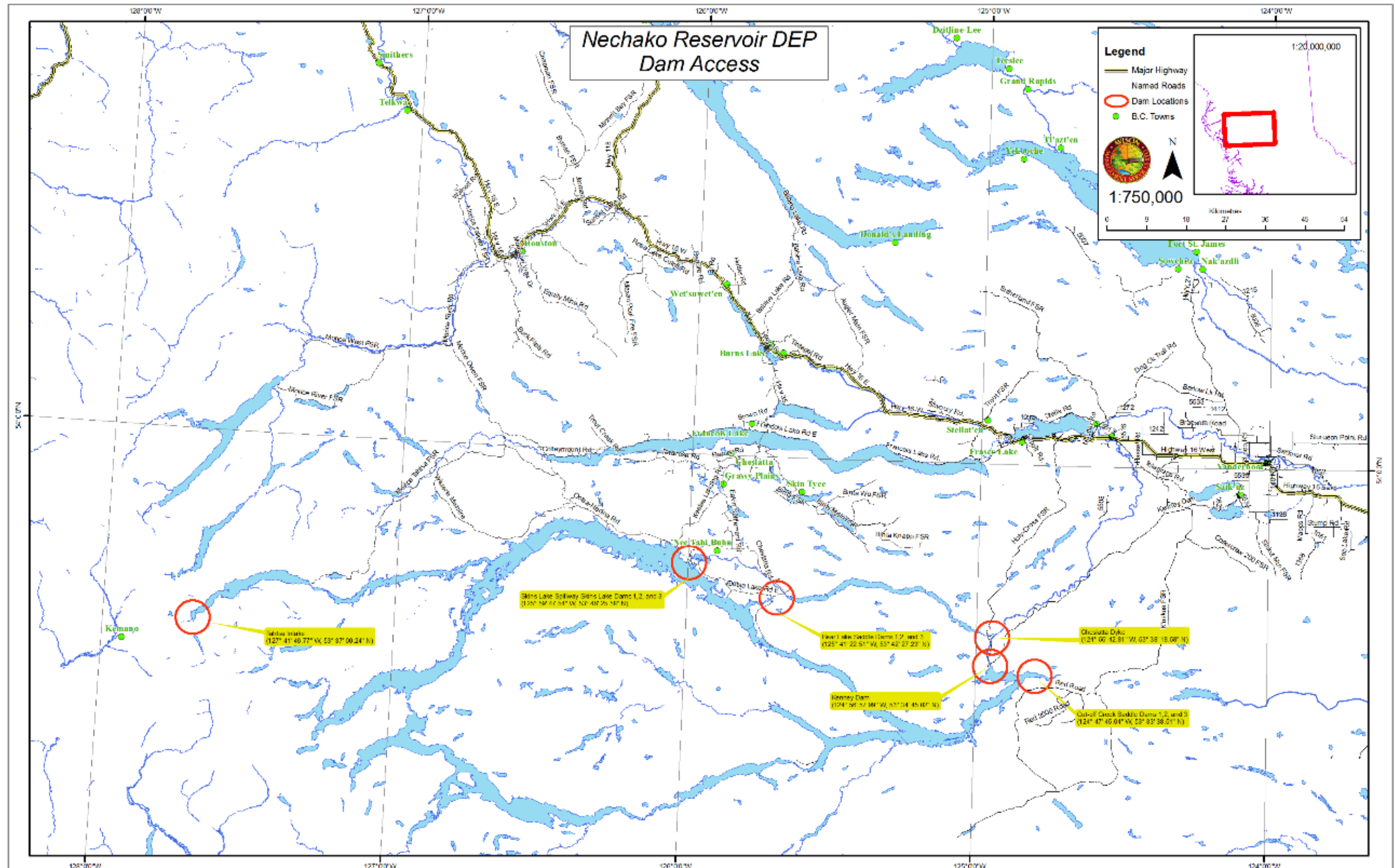
| Name | Role |
|------|------|
| | |
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| | |

Contents

1. Objectives
 - Identify the objective of review for current year for the DEP Document and Communication Test
 - Status of previous recommendations and improvements
2. Introduction (provide the plans for current year and what happened)
 - DEP Document Review process
 - Stakeholder DEP Distribution / Communication planning
 - Communication Test
3. Observation (information gathered from Post-Test meeting, Meetings, etc)
 - Observation / Learning
 - Recommendation / Action Log
4. Conclusion and Next steps
5. Appendix (*items to be included as evidence*)
 - Meeting Minutes of the DEP REVIEW
 - Communication Message (Used During Test)
 - Communication Test - One Call Now Report (Email)
 - Communication Test - One Call Now Report (Phone)
 - Communication Test - One Call Now Report (SMS)
 - *Other pertinent emails, communication records, etc*

APPENDIX D – ACCESS MAPS & DRAWINGS

1. [Appendix D-1](#) – Access Maps
2. [Appendix D-2](#) – Fill Materials (Bear Lake Dam No.1)
3. [Appendix D-3](#) – Drawing 120-SF-90 (Skins Lake Dam No. 1 & 2))
4. [Appendix D-4](#) – Drawing 120-191 (Skins Lake Dam No. 3)
5. [Appendix D-5](#) – Drawing 120-SF-91 (Skins Lake Dam No. 3)
6. [Appendix D-6](#) – Drawing 117-BF-12 (Bear Lake Dams No. 2 & 3)
7. [Appendix D-7](#) – Drawing 113-5 (Kenney Dam location of Borrow Areas)



Appendix D-2 – Drawing Fill Materials (Bear Lake Dam No.1)

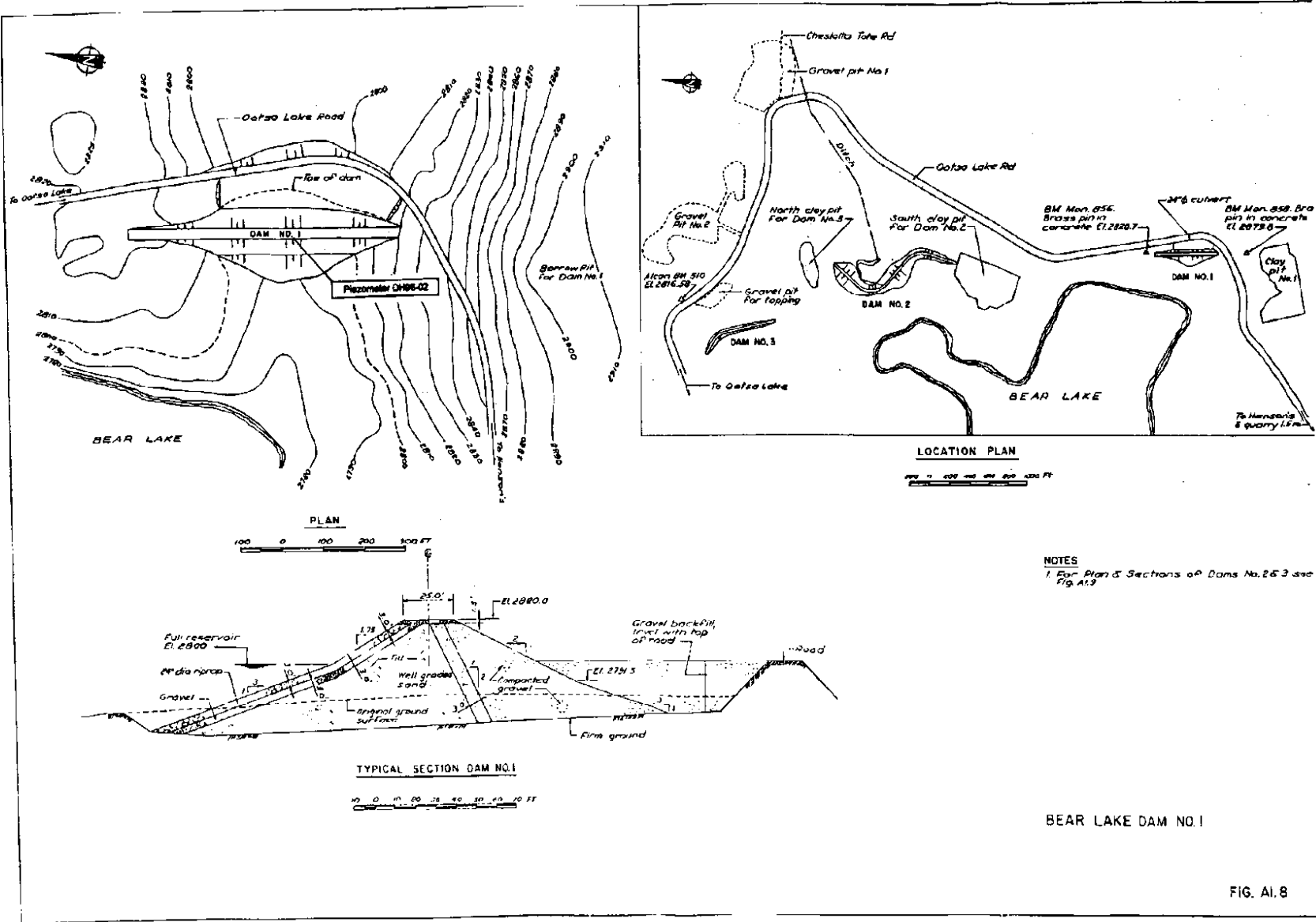
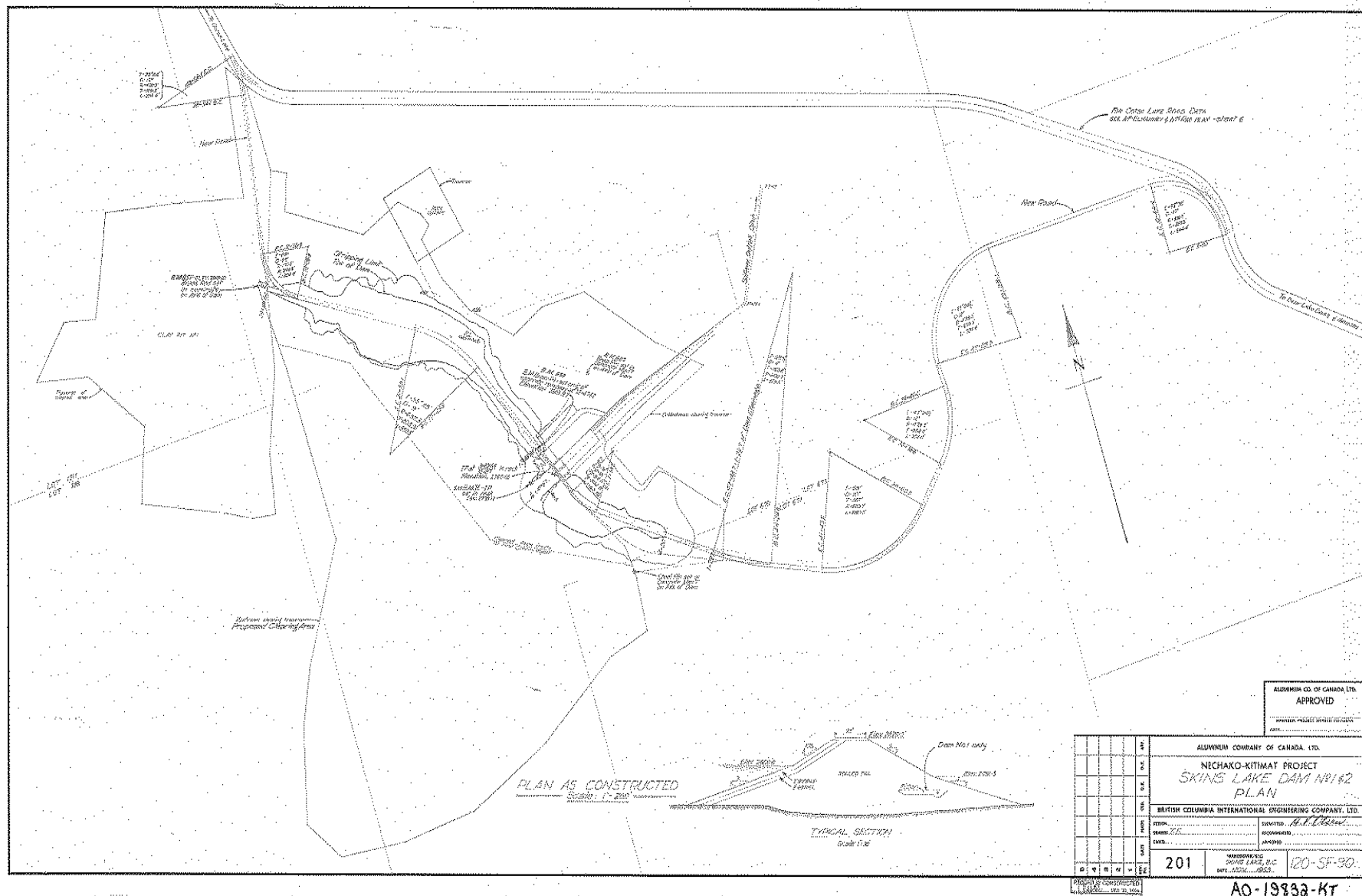
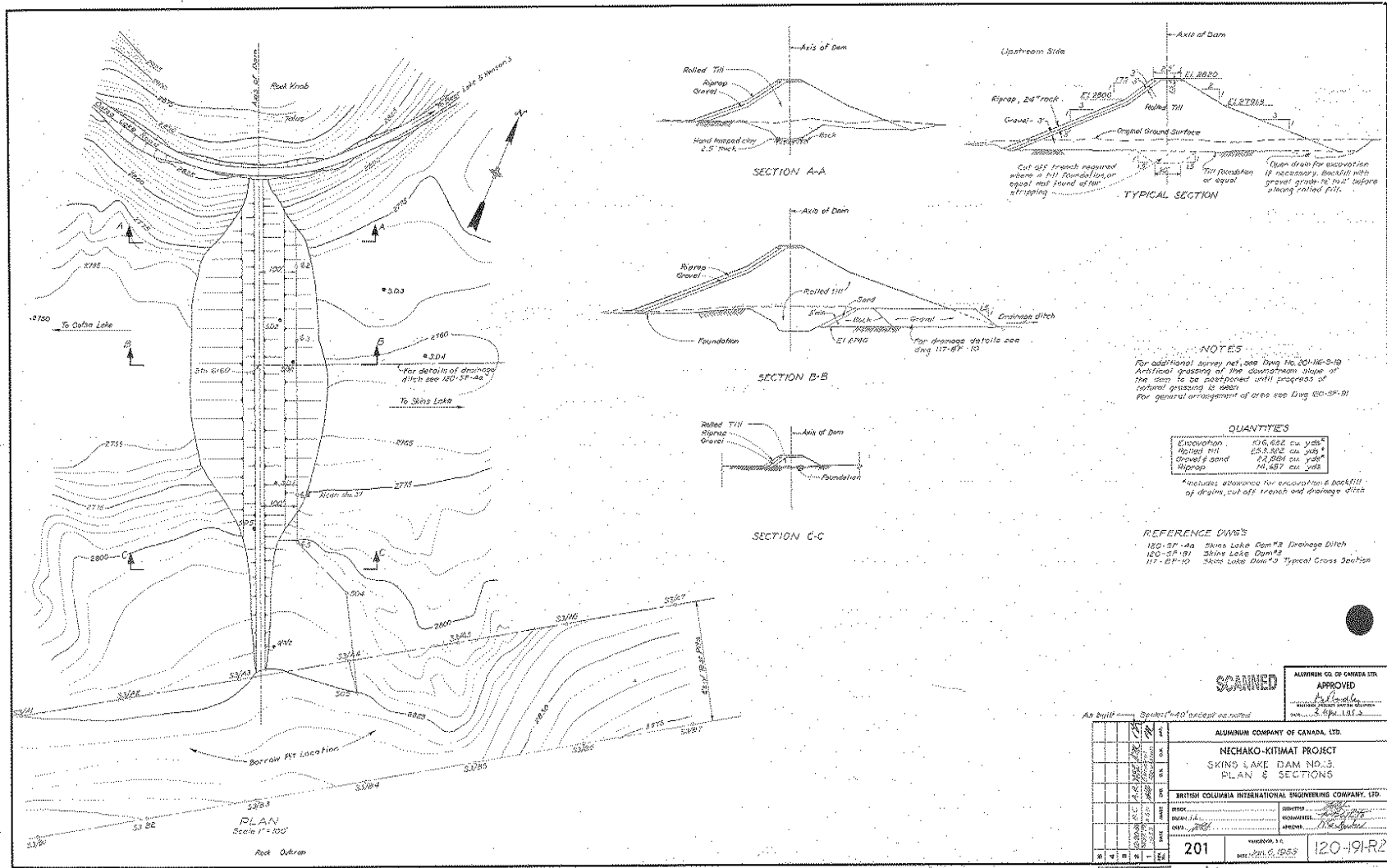
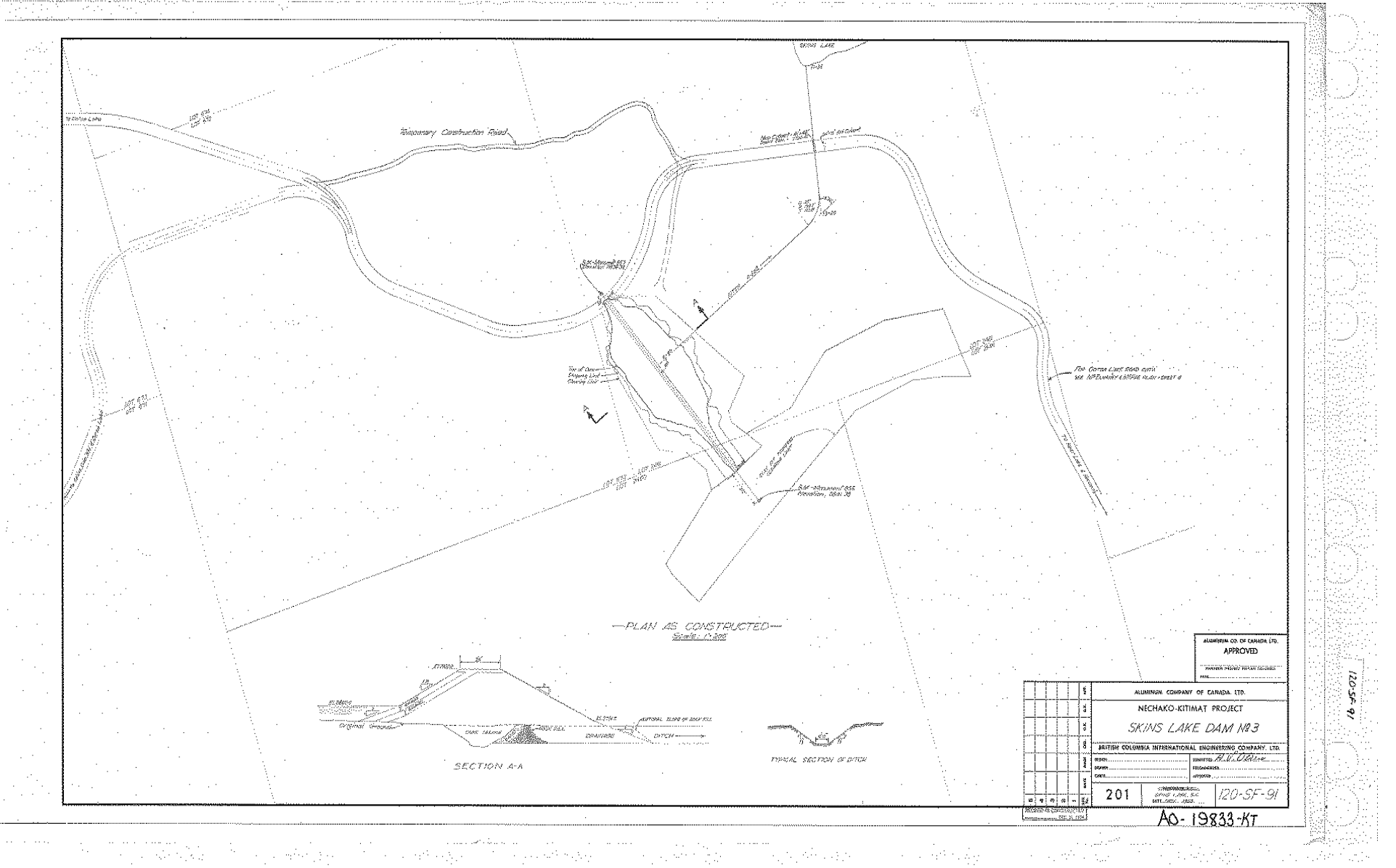


FIG. A1.8

Appendix D-3 – Drawing 120-SF-90 (*Skins Lake Dam No. 1 & 2*)







PLAN
Scale 1"=100'

SECTION A-A

SECTION C-C

TYPICAL SECTION DAM No 3

TYPICAL SECTION DAM No 2

QUANTITIES

| | DAM No. 2 | DAM No. 3 | TOTALS |
|---------------|-------------|-------------|--------------|
| Excavation | 37,181 c.y. | 3,617 c.y. | 40,798 c.y. |
| Rollled Tilt | 20,930 c.y. | 12,213 c.y. | 33,143 c.y. |
| Gravel & Sand | 35,837 c.y. | 85,297 c.y. | 121,134 c.y. |
| Riprap | 3,276 c.y. | | 3,276 c.y. |

NOTES

For general arrangement of work see drawing 201-117-BF12
For additional surveying see drawing 201-117-BF12
Artificial grading of the downstream slope of the dam to be postponed until progress of natural grading is seen.

REFERENCE DWG.
201-117-BF-12 - Bear Lake Dams & Pits
201-117-BF-13 - Bear Lake Dam Right Bank Embankment and Filter Details

APPROVED
[Signature]
[Name]
[Title]

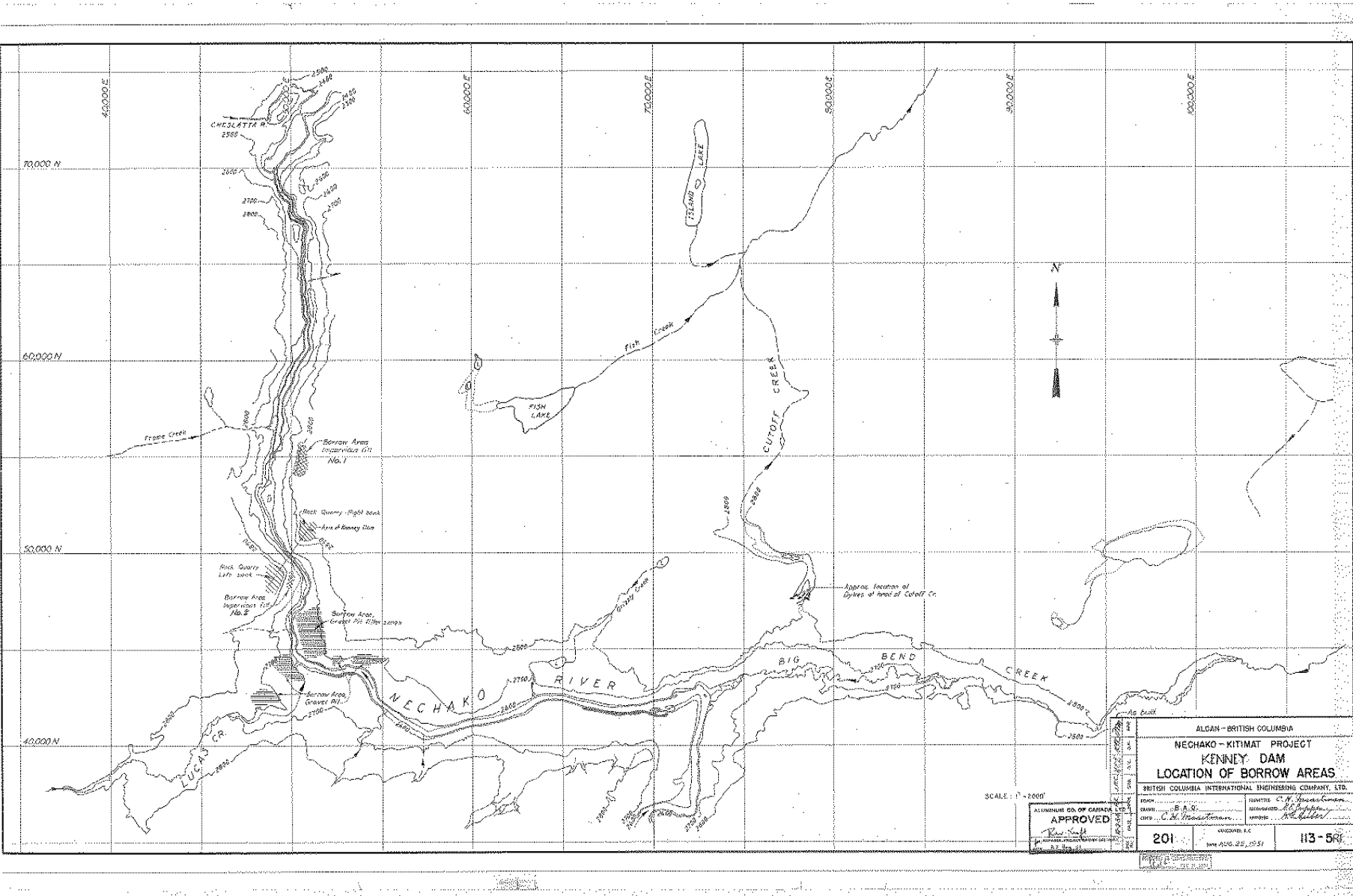
ALUMINUM COMPANY OF CANADA LTD.
NECHAKO-KITIMAT PROJECT
BEAR LAKE DAMS NO 2 & 3
PLAN AND SECTIONS

BRITISH COLUMBIA INTERNATIONAL ENGINEERING COMPANY, LTD.

201

117-21-R2

Appendix D-7 - Drawing 113-5 (Kenney Dam location of Borrow Areas)



APPENDIX E – OTHER EMERGENCY RESPONSE GUIDANCE

1. [Appendix E-1](#) – Other Emergency and Response Guidance Chart

- [Figure 1](#). Assumed Breach for Kenney DAM
- [Figure 2](#). Assumed Breach for Skins Lake DAM 3
- [Figure 3](#). Flood discharge Hygrographs resulting from assumed Kenney DAM Breach
- [Figure 4](#). Flood Elevation resulting from assumed Kenney DAM Breach
- [Figure 5](#). Flood Elevation resulting from assumed Kenney DAM Breach
- [Figure 6](#). Flood Elevation resulting from assumed Kenney DAM Breach
- [Figure 7](#). Flood Discharge Hygrographs resulting from assumed Skins Lake DAM 3 Breach
- [Figure 8](#). Flood Elevation resulting from assumed Skins Lake DAM 3 Breach
- [Figure 9](#). Flood Elevation resulting from assumed Skins Lake DAM 3 Breach
- [Figure 10](#). Flood Elevation resulting from assumed Skins Lake DAM 3 Breach
- [Figure 11](#). Flood Discharge Hygrographs resulting from assumed Extra Flood Release
- [Figure 12](#). Flood Elevation resulting from Extreme Flood Release
- [Figure 13](#). Flood Elevation resulting from Extreme Flood Release

Appendix E-1 – Other Emergency and Response Guidance Chart

*NOTE: The following graphs and figures contained in this section are provided to reference the following situations:

| Other Emergencies | Situation and Important Information | *Response Type |
|--|---|----------------|
| Landslides | Landslides upstream or downstream could affect the stability of the dams and must be reported to the Power Control Room, who will inform the Operations Director who will take appropriate action including who caused the slide, monitor to determine ongoing movement, and post warning signs. | 1 |
| Severe storms | Heavy rainfall could lead to erosion of dam slopes, and high winds, heavy snowfall, or icing conditions could lead to equipment damage. Inspections should be carried out and repair all damage caused by storms. | 3 |
| Fire | Forest fires are unlikely to be damaging to any of the reservoir structures but the Skins Lake Spillway residence and facilities may be at risk. Report forest fires to BC Wildfire Service (1-800-663-5555) and Plant Protection (250-639-8273). | 3 |
| Oil, Hazardous substances or pesticide spills | Refer to Rio Tinto BC Operations Management Manuel. Report to Plant Protection (250-639-8273). | 1 |
| Major fish or wildlife losses in reservoir | A significant loss of fish or wildlife will be recorded and reported to the Operations Director. The observer will record details of the loss, including species, number, location, causes and any other relevant information. The Operations Director will notify the Fish and Wildlife Branch and the federal Department of Fisheries and Oceans, and notify and update the Manager, Communication and Communities, BC Works. | 1 |
| Drownings or accidents in reservoir | All accidents in the reservoir will be reported to the Plant Protection, who will report to the R.C.M.P. as soon as possible. If personnel learn indirectly of an accident already reported to the R.C.M.P., the event will be reported to the Operations Director who will notify and update the Manager, Communication and Communities, BC Works. | 2 |
| Criminal Activity | All criminal activity in the vicinity of the Nechako Reservoir will be reported to the Plant Protection, who will report to the R.C.M.P. as soon as possible and notify and update the Manager, Communication and Communities, BC Works. | 2 |

*** Response Type 1: Non Dam Emergency or other emergency, monitor event that is slowly developing**

*** Response Type 2: Emergency requiring R.C.M.P. direct involvement**

*** Response Type 3: Inspection of all Dams and Spillway and repair if needed**

Figure 1. Assumed Breach for Kenney Dam

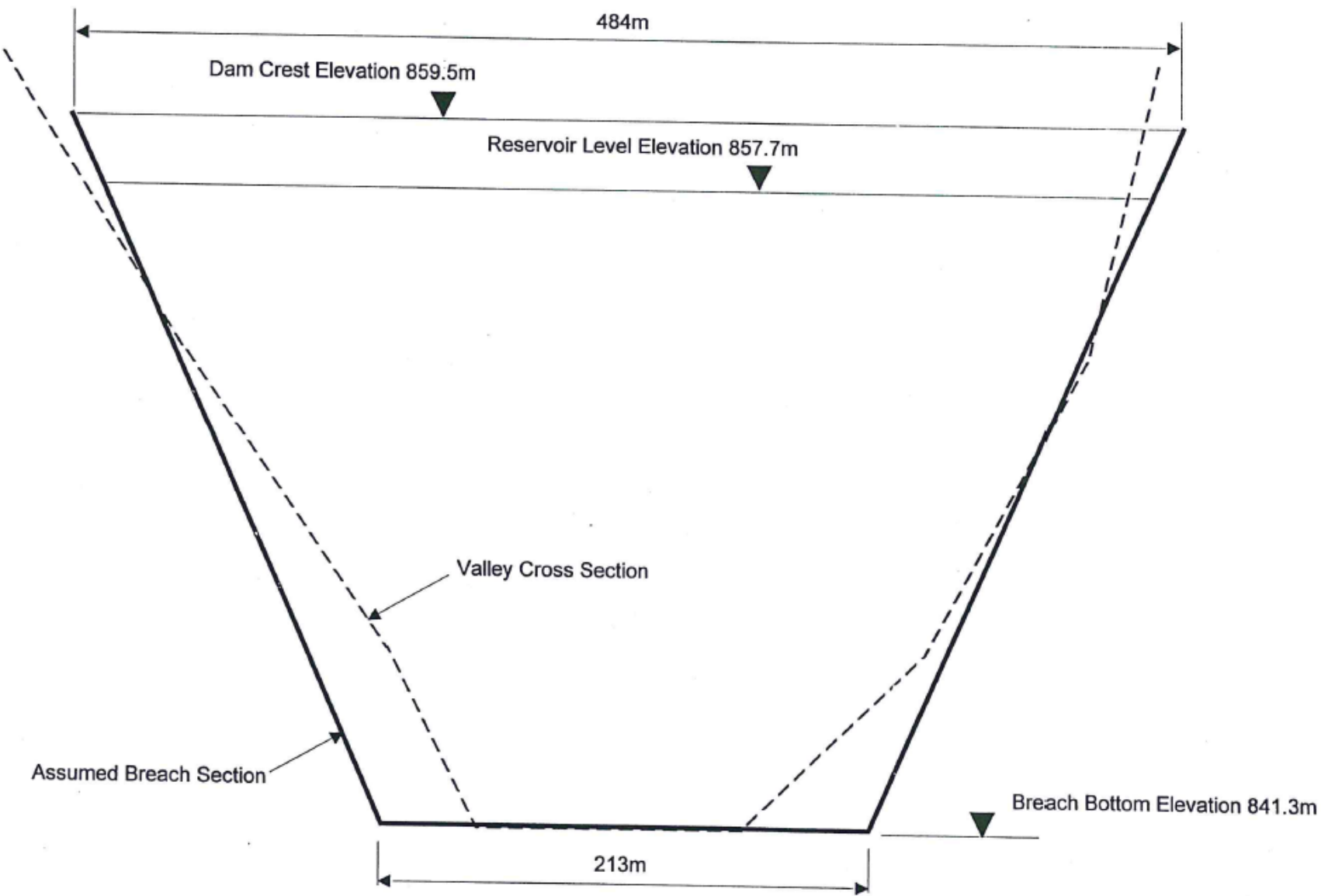


Figure 2. Assumed Breach for Skins Lake DAM 3

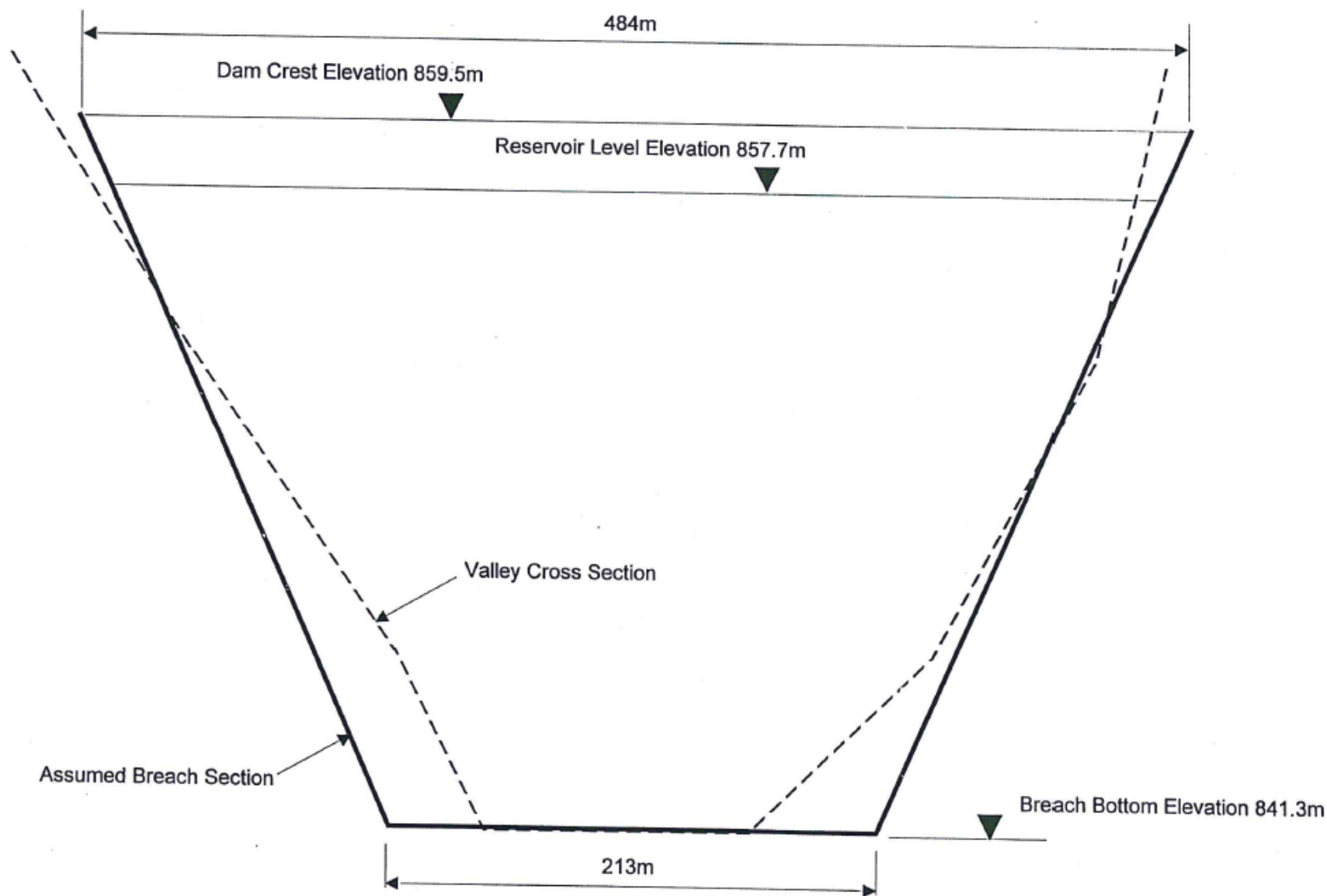


Figure 3. Flood discharge Hydrographs resulting from assumed Kenney DAM Breach

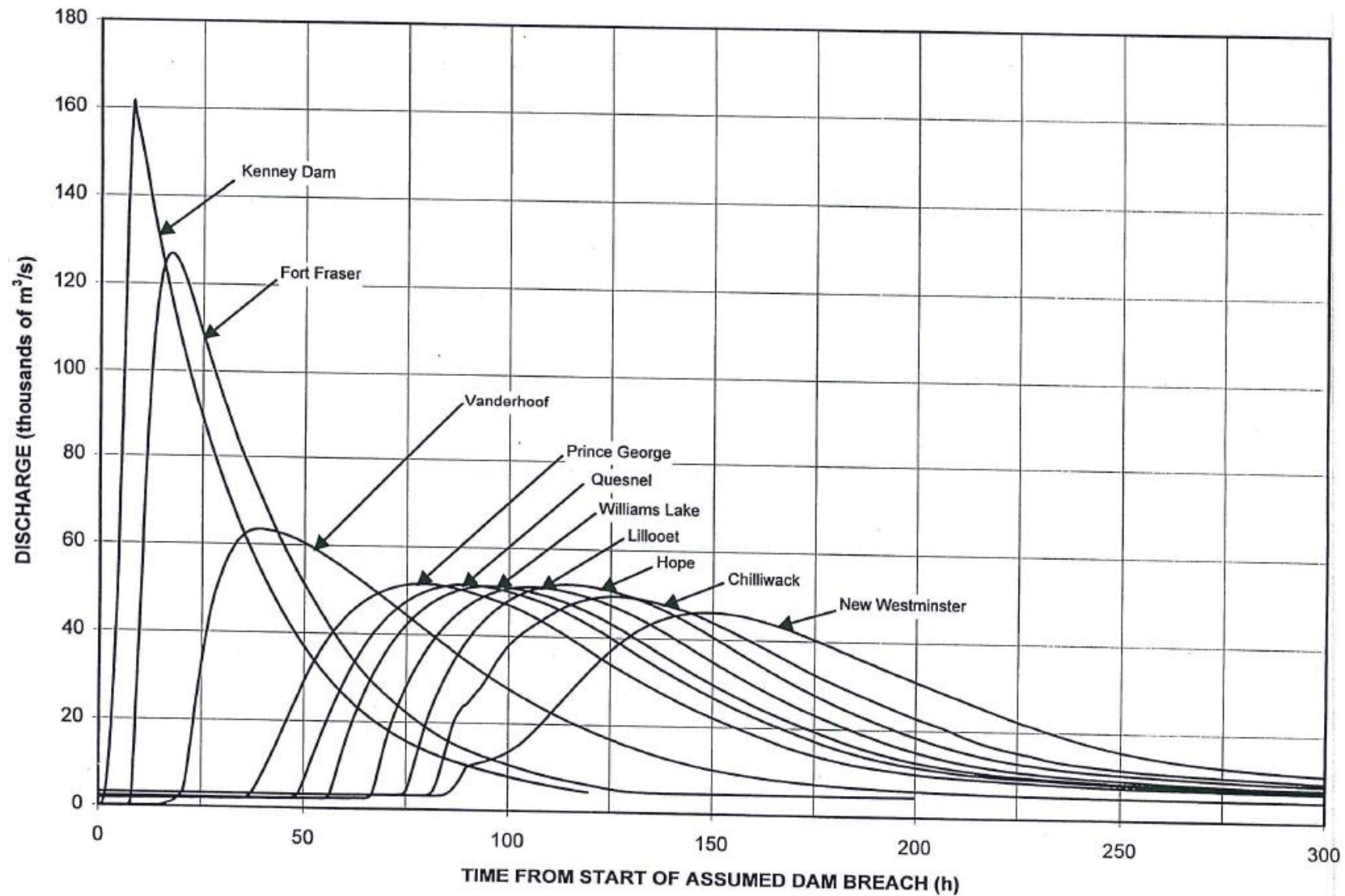


Figure 4. Flood Elevation resulting from assumed Kenney DAM Breach

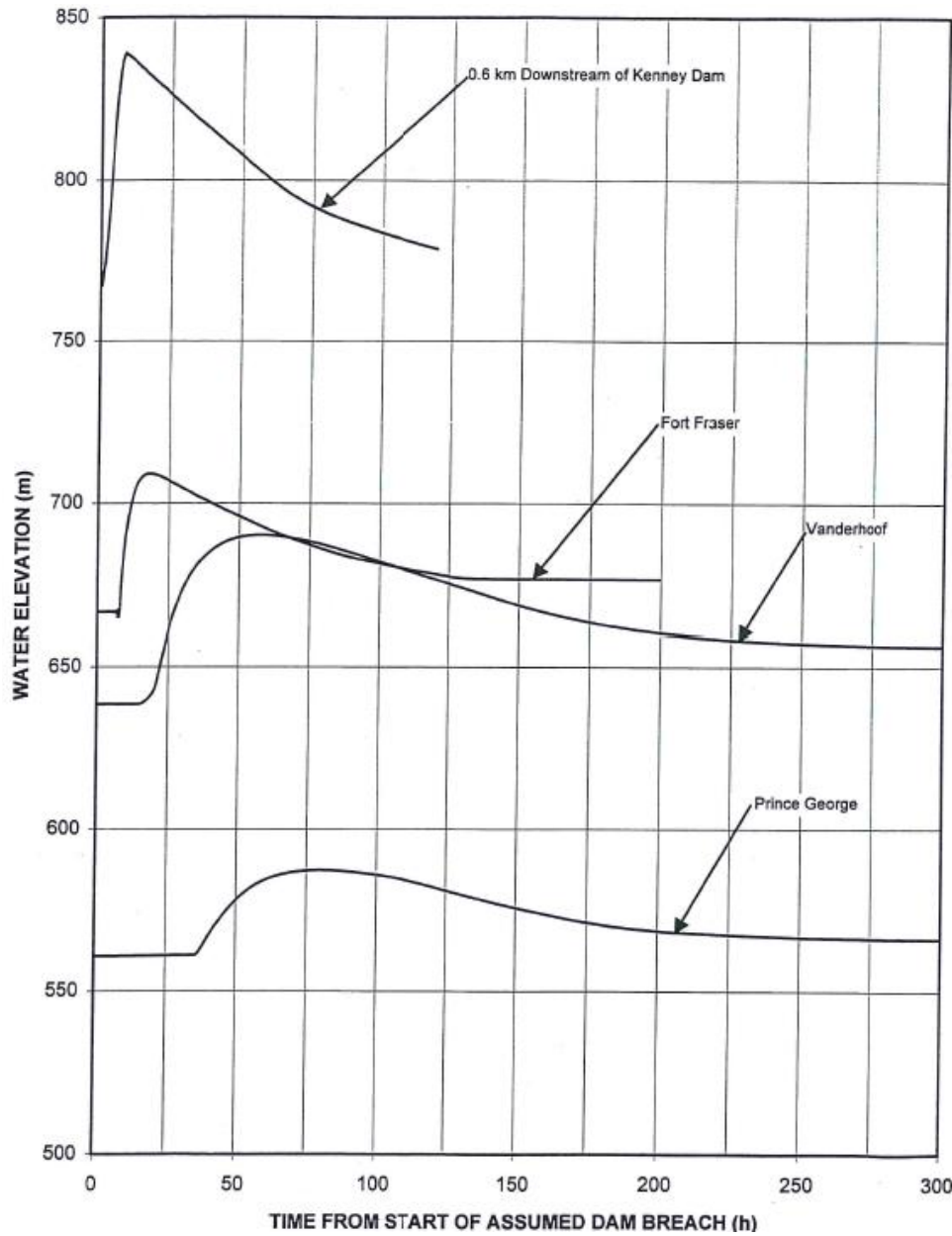


Figure 5. Flood Elevation resulting from assumed Kenney DAM Breach

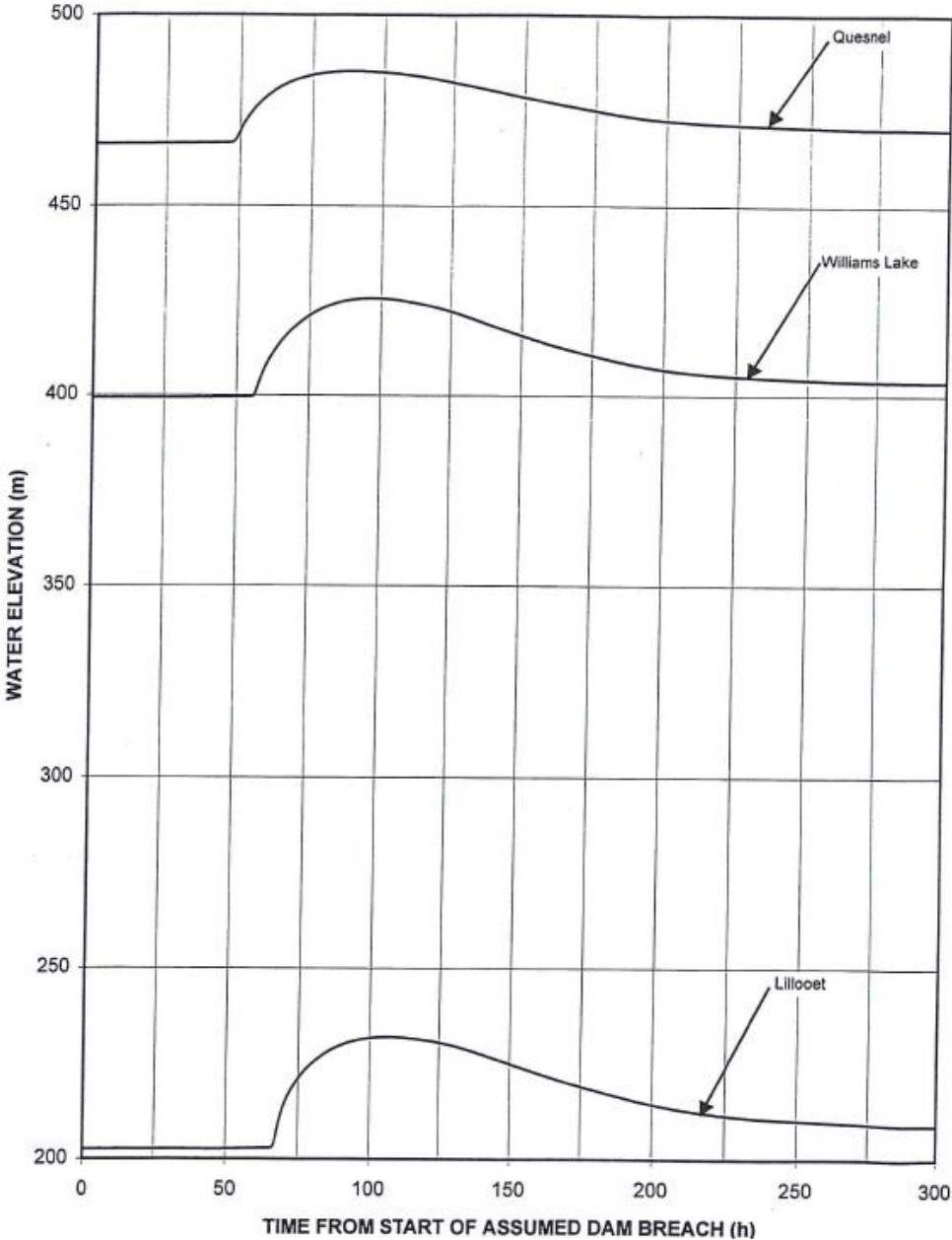


Figure 6. Flood Elevation resulting from assumed Kenney DAM Breach

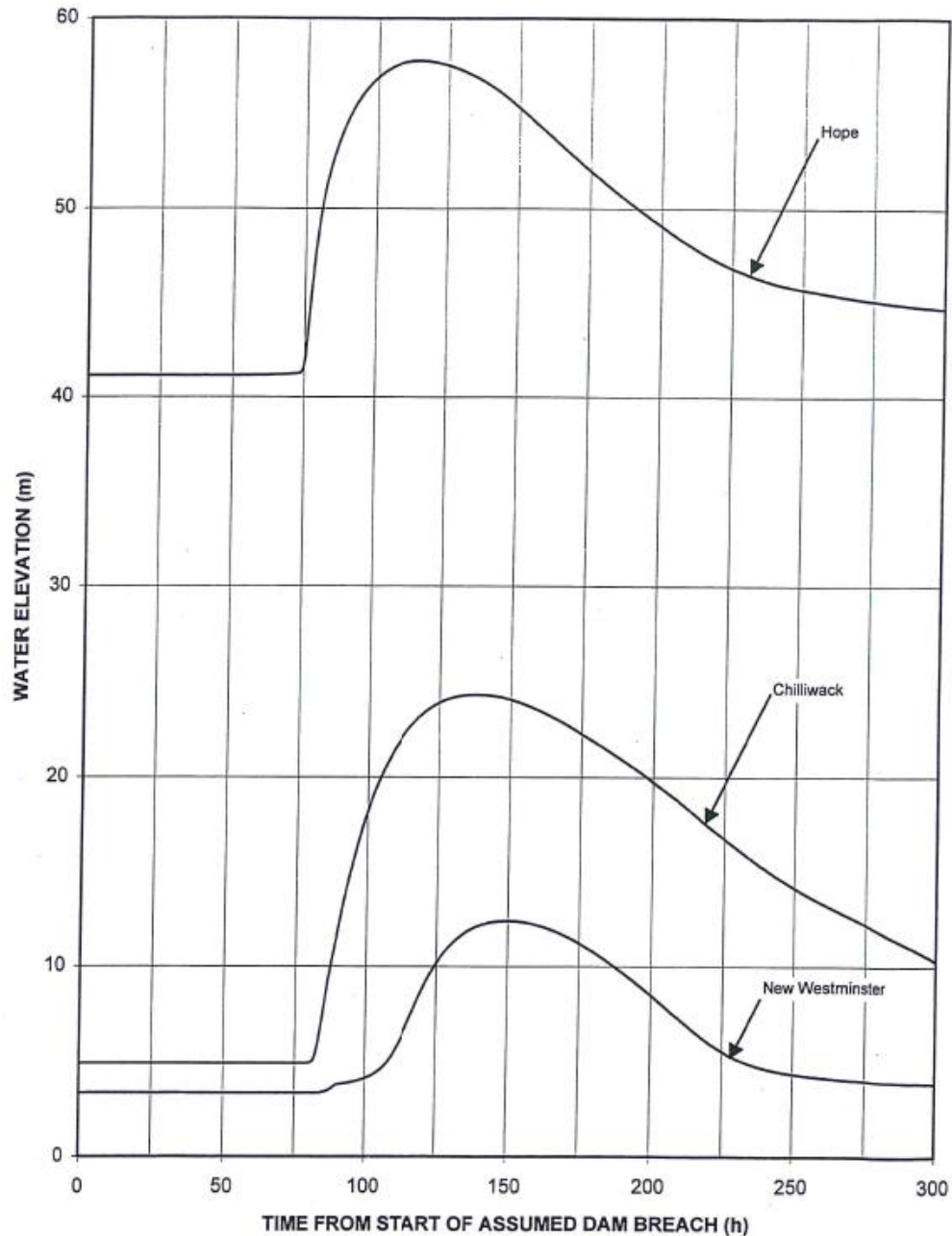


Figure 7. Flood Discharge Hydrographs resulting from assumed Skins Lake DAM 3 Breach

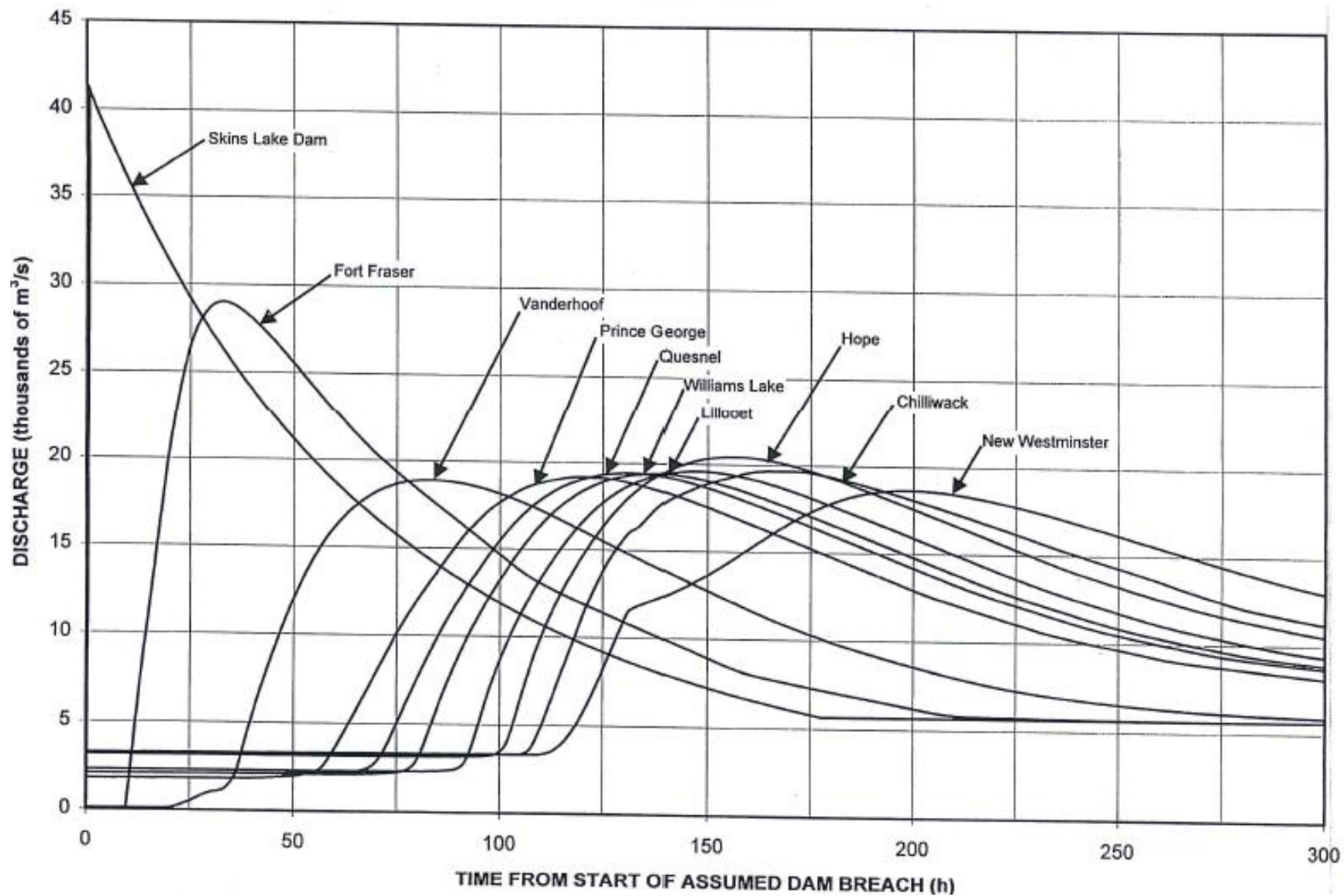


Figure 8. Flood Elevation resulting from assumed Skins Lake DAM 3 Breach

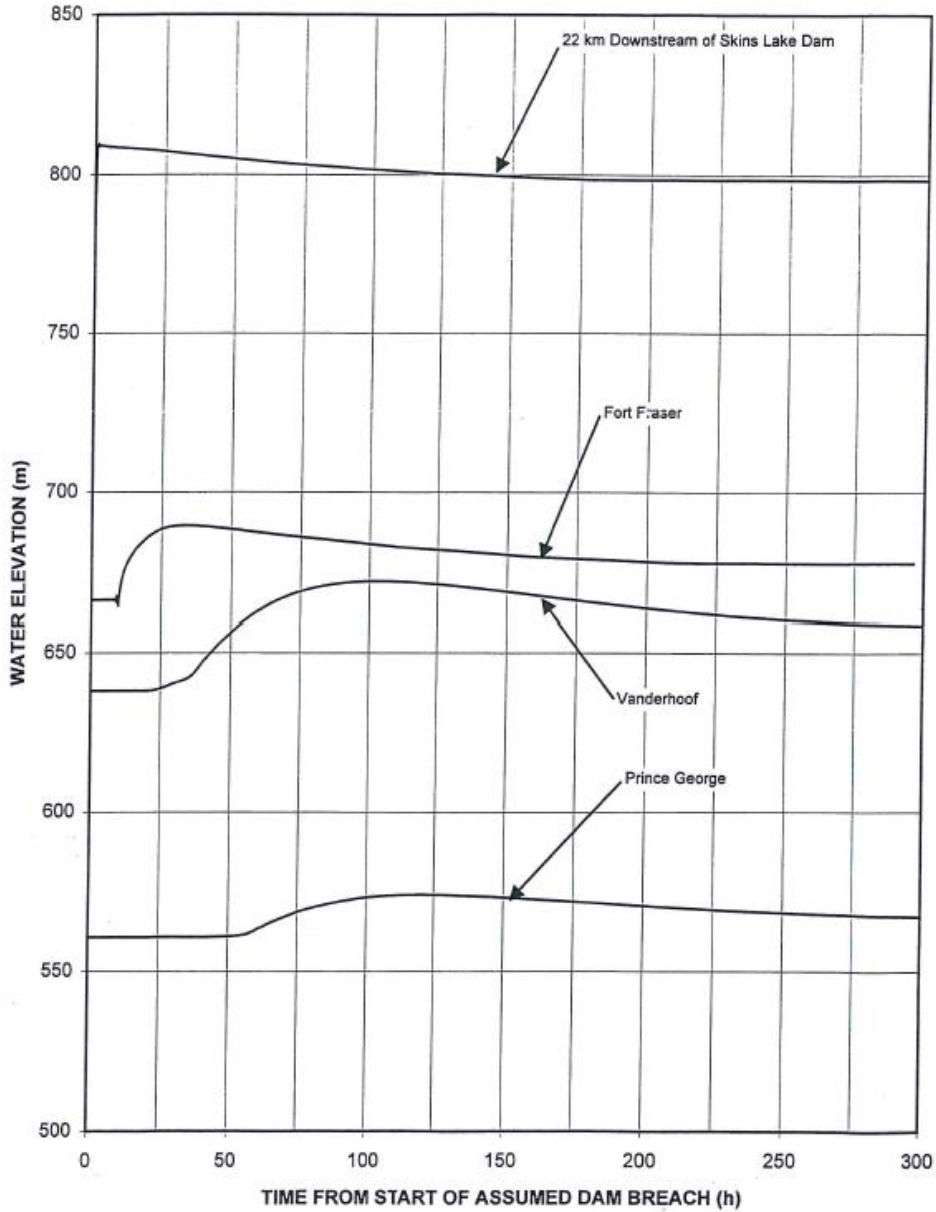


Figure 9. Flood Elevation resulting from assumed Skins Lake DAM 3 Breach

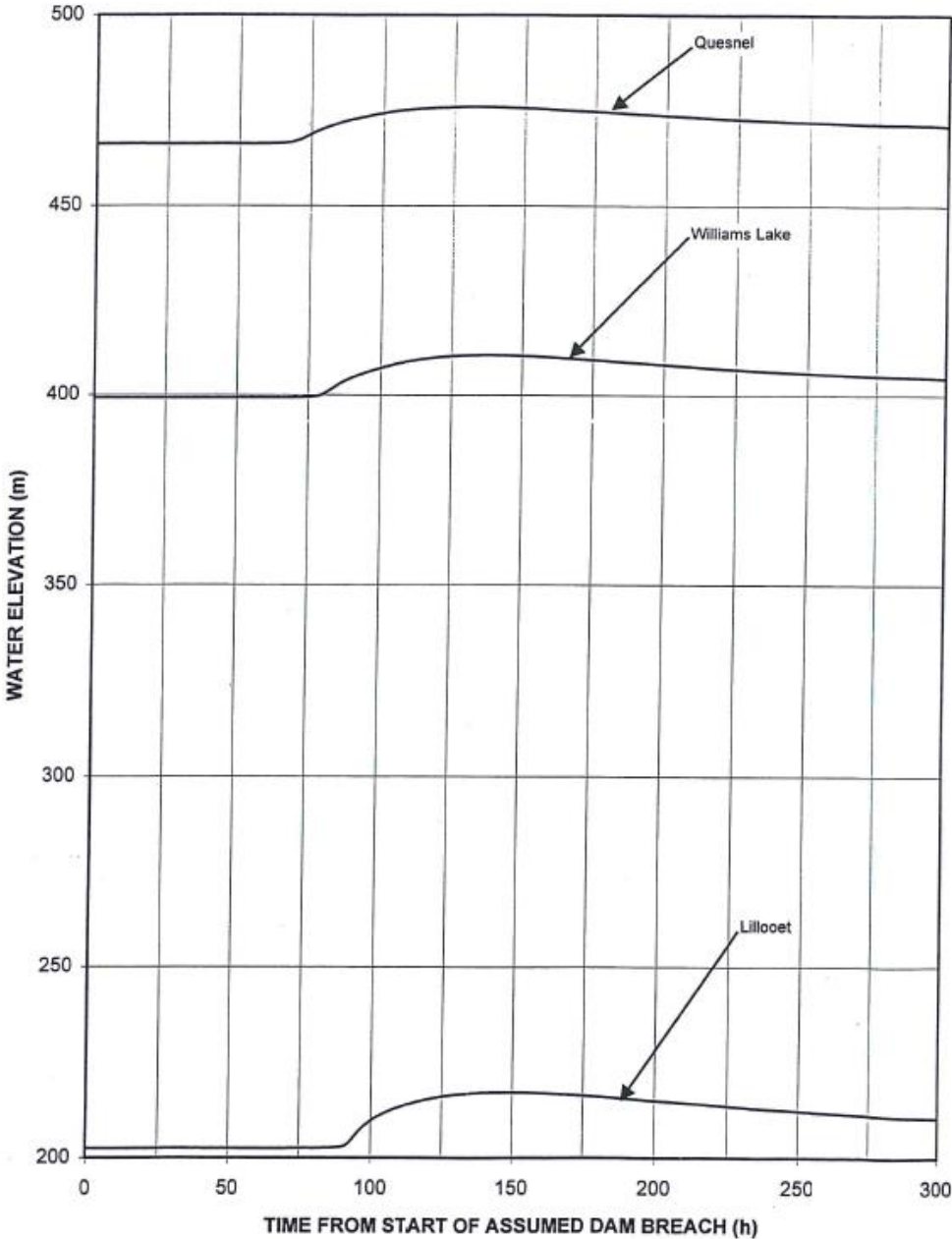


Figure 10. Flood Elevation resulting from assumed Skins Lake DAM 3 Breach

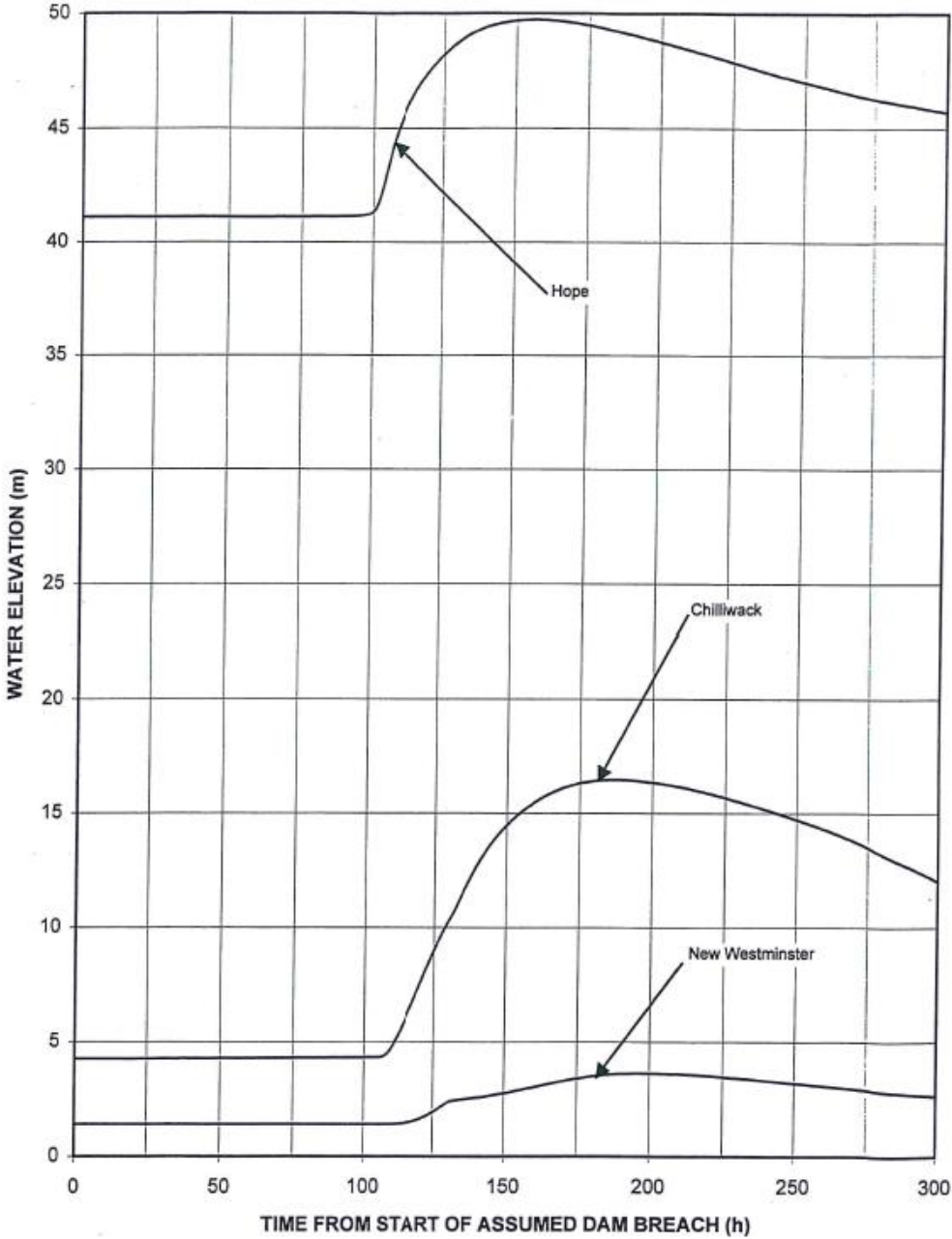


Figure 11. Flood Discharge Hydrographs resulting from assumed Extra Flood Release (All Areas)

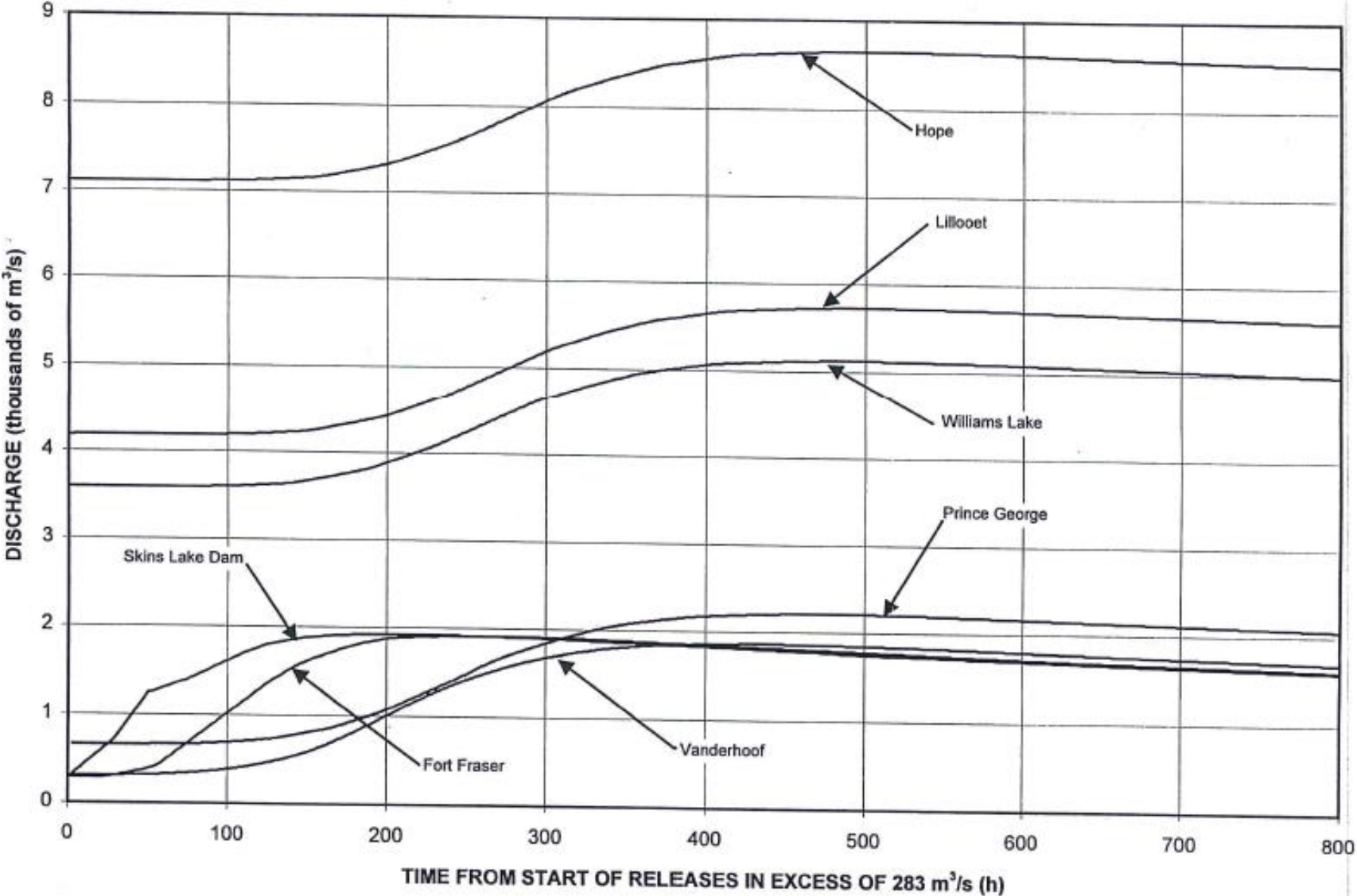


Figure 12. Flood Elevation resulting from Extreme Flood Release (Skins Lake, Fort Fraser, Vanderhoof & Prince George)

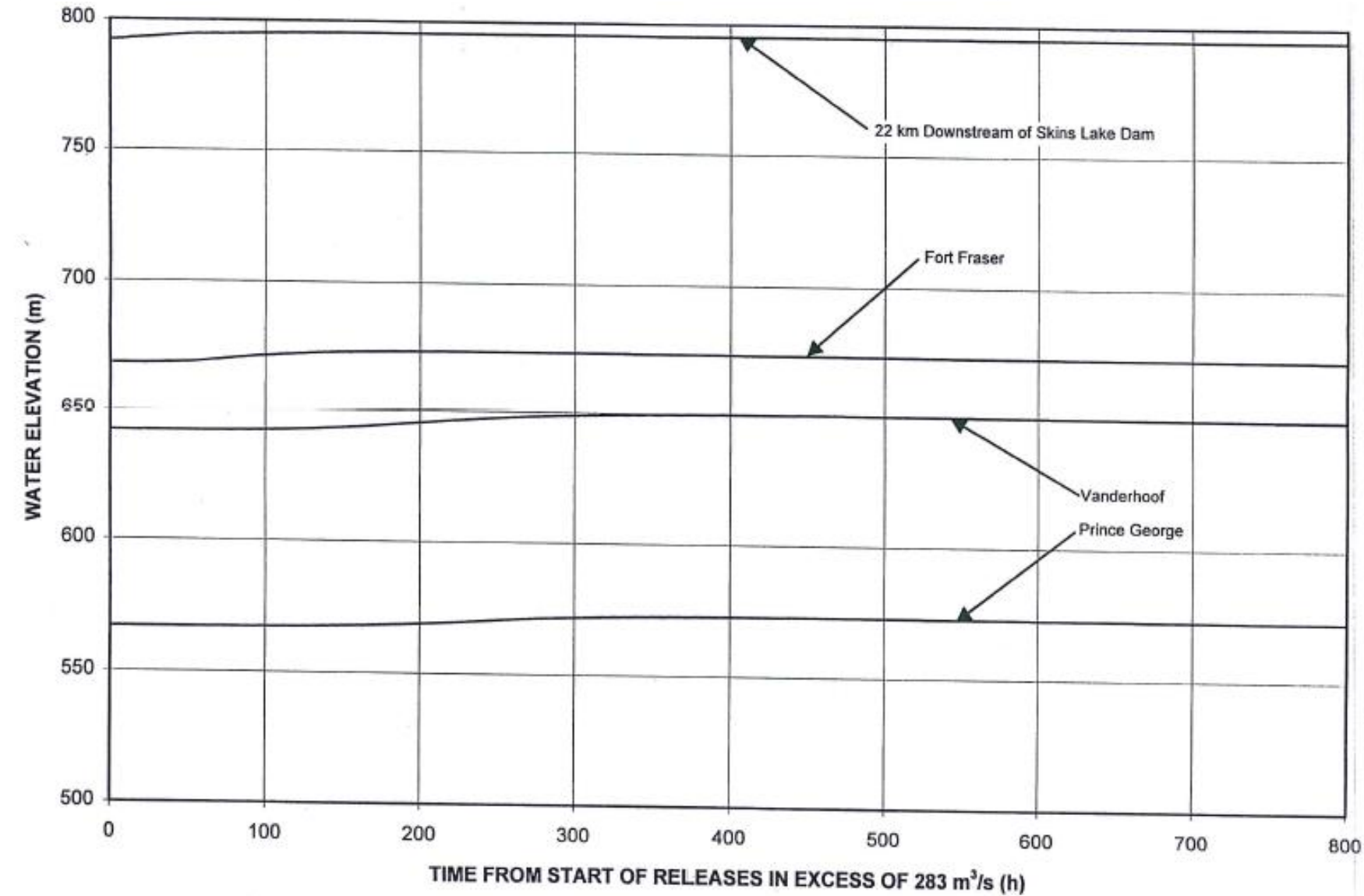
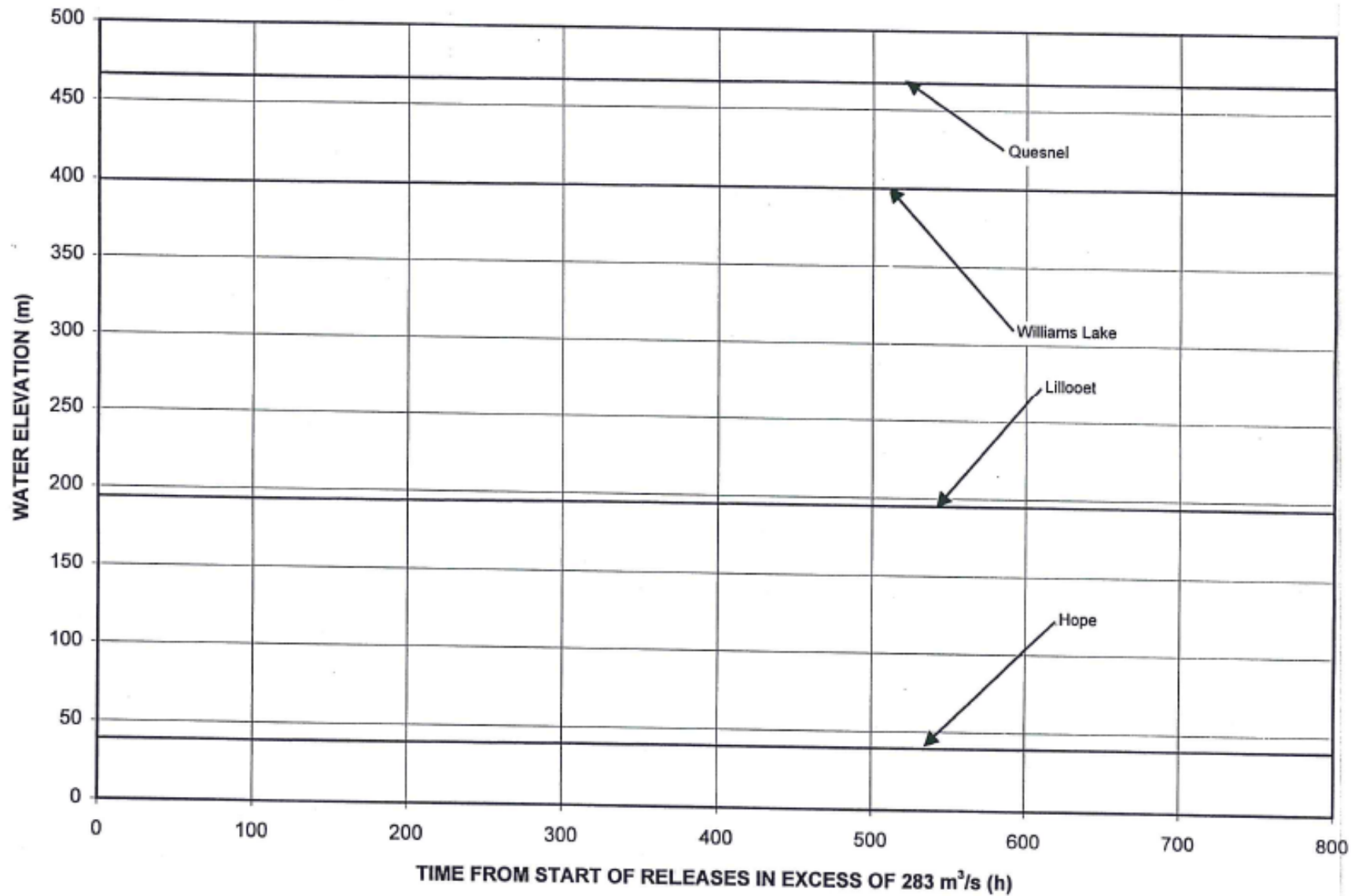


Figure 13. Flood Elevation resulting from Extreme Flood Release (Quesnel, Williams Lake, Lillooet & Hope)



APPENDIX F – GUIDANCE FOR DETERMINING THE EMERGENCY LEVEL

| Event | Situation | Emergency level* |
|------------------------|---|------------------|
| Earth spillway flow | Reservoir water surface elevation at spillway crest or spillway is flowing with no active erosion | 1 |
| | Spillway flowing with active gully erosion | 2 |
| | Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise | 2 |
| | Spillway flowing with an advancing headcut that is threatening the control section | 3 |
| | Spillway flow that is flooding people downstream | 3 |
| Embankment overtopping | Reservoir level is 1 foot below the top of the dam | 2 |
| | Water from the reservoir is flowing over the top of the dam | 3 |
| Seepage | New seepage areas in or near the dam | 1 |
| | New seepage areas with cloudy discharge or increasing flow rate | 2 |
| | Seepage with discharge greater than 10 gallons per minute | 3 |
| Sinkholes | Observation of new sinkhole in reservoir area or on embankment | 2 |
| | Rapidly enlarging sinkhole | 3 |
| Embankment cracking | New cracks in the embankment greater than ¼-inch wide without seepage | 1 |
| | Cracks in the embankment with seepage | 2 |
| Embankment movement | Visual movement/slippage of the embankment slope | 1 |
| | Sudden or rapidly proceeding slides of the embankment slopes | 3 |
| Instruments | Instrumentation readings beyond predetermined values | 1 |
| Earthquake | Measurable earthquake felt or reported on or within 50 kilometers of the dam | 1 |
| | Earthquake resulting in visible damage to the dam or appurtenances | 2 |
| | Earthquake resulting in uncontrolled release of water from the dam | 3 |
| Security threat | Verified bomb threat that, if carried out, could result in damage to the dam | 2 |
| | Detonated bomb that has resulted in damage to the dam or appurtenances | 3 |
| Sabotage/ vandalism | Damage to dam or appurtenance with no impacts to dam function | 1 |
| | Modification to the dam or appurtenances that could adversely impact the functioning of the dam | 1 |
| | Damage to dam or appurtenances that has resulted in seepage flow | 2 |
| | Damage to dam or appurtenances that has resulted in uncontrolled water release | 3 |

* Level 1: Nonemergency unusual event, slowly developing

* Level 2: Potential dam failure situation, rapidly developing

* Level 3: Urgent; dam failure appears imminent or is in progress

APPENDIX G – INUNDATION MAPS FOR DAM BREACH AND EXTREME FLOOD (Web Link)

The Inundation Maps are located at our stakeholder Nechako Reservoir website (Get Involved Nechako) at the following link:

<https://www.getinvolvednechako.ca/dam-safety/>

The maps reference geographical locations from Skins Lake to Vancouver (Map Sheets # 02_01 to 02_55).