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| PLANS REVIEW CHECKLIST FOR PROPOSED AND EXISTING DAMS |
| Dam Safety Program |
| Ministry of Forests, Lands and Natural Resource Operations |

January 24, 2017

***This checklist is intended to assist the reviewer to consider all aspects of the proposed or existing dam design and should be used in conjunction with the Plan Submission Guidelines for the Construction and Rehabilitation of Dams and the Canadian Dam Association (CDA) Guidelines and Technical Bulletins. Also, please attach supporting information where applicable.***

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| --- | --- |
| DAM NAME:  |  |
| REVIEW DATE:  |  |
| LOCATION (UTM):  |  |
| DAM OWNER(S):  |  |
| WATER LICENCE No. & STATUS:  |  |
| WATER LICENCE FILE No.:  |  |
| TOTAL LICENCED STORAGE VOLUME: |  |
| DESIGN ENGINEER: |  |
| CONSTRUCTION ENGINEER: |  |
| REVIEWED BY:  |  |
| IF CONSTRUCTED, DATE BUILT:  |  |

1. **Dam Measurements**

|  |  |
| --- | --- |
| HEIGHT (see Sec. 4 Dam Safety Regulations):  |   m |
| CREST LENGTH: |  m |
| MAX. SPILLWAY DISCHARGE: |  m3/s |
| RESERVOIR AREA: |  m2 ( ha) |
| RESERVOIR VOLUME: |  m3 |
| RESPONSIBLE OFFICE- Internal | Victoria Regional Comments? |

1. **Downstream Consequence Classificaton[[1]](#footnote-1)** - *Dam Safety Regulation – Schedule 1*

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| --- | --- |
| Dam Break Study? |  |
| Inundation Mapping? |  |
| Downstream Infrastructure Identified? |  |

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| **PRELIMINARY DOWNSTREAM CONSEQUENCE CLASSIFICATION:** |  |

\*Include completed Consequence Classification Assessment and Rationale

1. **Environmental Assessment Office**

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| --- | --- |
| **Reviewable under the Environmental Assessment Act?** (> 15 m high or under the *Water Sustainability Act*, will be permitted to impound a reservoir containing > 10 million m3 of water above the natural boundary of the streams that supply the water to the reservoir.) |  |

1. **Identification of Hazards & Failure Modes** – refer to Hazards and Failure Modes Analysis in Technical Resources section on Dam Safety Website and CDA resources

|  |  |
| --- | --- |
| Hazards (external & internal) Defined? |  |
| Failure Modes Defined? |  |

1. **Reservoir**

|  |  |
| --- | --- |
| Watershed Area? |  ha (0. km2) |
| Live Storage Capacity? |  |
| Dead Storage Capacity? |  |
| Reservoir Surface Area? |  m2 ( ha) |
| Storage-Capacity & Area Curve Provided? |  |
| Is Reservoir Clearing Required? |  |
| Is Reservoir Clearing Proposed? |  |
| Is Floating Debris Removal Proposed? |  |
| Is a Log Boom Planned/Required? |  |
| Is Log Boom Design Included? |  |
| Landslide Potential (i.e. high, moderate, low)? |  |
| Are Inflow Diversions Planned? |  |

1. **Hydrology**
	1. ***Inflow vs. Outflow***

|  |  |
| --- | --- |
| Design Flood (Return Period) Used? |  |
| Recommended Min. IDF from Table 6-1b CDA Guideline |  |
| Inflow Design Flood Calculated? |  m3/s |
| Spillway Design Capacity? |  m3/s |
| Outlet Design Capacity? |  m3/s (drawdown in ?? hours) |

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| --- | --- |
| **Is Spillway Capable of Passing Inflow Design Flood?** |  |

* 1. ***Freeboard***

|  |  |
| --- | --- |
| Dam Crest Elevation? |  m (local datum) |
| Principle Spillway Sill Elevation? |  m (local datum) |
| Gross Freeboard? |  m |
| Design Flood Surcharge Elevation? |  m |
| Net Freeboard? |  m |
| Average Reservoir Depth? |  m |
| Fetch Length/direction? |  |
| Average Wind Speed? |  |
| Wave Run-Up Calculation? |  |
| Flashboard Provision? |  |
| *Wind tide equation: S=U2 F / 1400 D, where S is in feet above the stillwater level, U is the average wind speed in statute MPH over the fetch (F) distance and D is the average depth of water over the fetch line; or use USGS calculator http://woodshole.er.usgs.gov/staffpages/csherwood/sedx\_equations/RunSPMWave.html.* |

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| **Is the Design Freeboard Sufficient?** |  |

1. **Spillway Design**

|  |  |
| --- | --- |
| Type of Spillway? |  |
| Spillway Width? (recommended 4.0 m minimum for open channel) |  |
| Constructed on Undisturbed Ground? |  |
| Protected Against Erosion within Control, Conveyance & Terminal Sections? |  |
| Protection Material? |  |
| Energy Dissipation Type at SpillwayToe? |  |
| Is Spillway Gated? |  |
| What is the Spillway Capacity if the Gates Fail? |  |
| Alternate Power for Gates? |  |
| Flashboard Provision? |  |
| Concrete Design Specifications? |  |

1. **Seismicity**
	1. ***Seismic Risk Calculation[[2]](#footnote-2):***

|  |  |
| --- | --- |
| Peak Horizontal Ground Acceleration (PHGA) with annual exceedence probability of .0021 (or 1/475)  |  |
| <http://www.earthquakescanada.nrcan.gc.ca/hazard-alea/interpolat/index-eng.php> Note: An approximate Maximum Credible Earthquake (MCE) can be determined by doubling the PHGA for the 1/475 earthquake. |  |

* 1. ***From Dam Design:***

|  |  |
| --- | --- |
| Design Basis Earthquake? |  |
| Maximum Credible Earthquake? |  |
| Design Earthquake Used? |  |
| Usual Min. MDE from Table 6-1b CDA |  |
|  |  |
| **Is Seismic Design Adequate?**  |

1. **Embankment**

|  |  |
| --- | --- |
| Factor of Safety Calculations Provided (static & seismic) Meet or Exceed? (see CDA resources) |  |
| Type (earthfill, rock-fill, etc.)? |  |
| Crest Width (Wm=0.2Hm+3 minimum width in metres)? |  |
| Crest Material? |  |
| Crest Elevation? |  |
| Embankment Fill Design (zoned, homogeneous, core etc.)? |  |
| Embankment Material Specifications? (include details on soil testing and analysis, see CDA resources) |  |
| Embankment Fill Material Compaction Method/Specifications? |  |
| Impervious Core (or Membrane) Specifications? |  |
| Impervious Core Top Elevation? |  |
| Granular Filter Specifications? |  |
| Seepage Control Provisions (cut-off trench, impervious upstream blanket, relief wells, etc.)? |  |
| Seepage Measurement planned or in place (weirs)? |  |
| Erosion Protection Specification (upstream embankment)? |  |
| Upstream Embankment Slope (3:1 minimum)? |  |
| Downstream Embankment Slope (2.5:1 minimum)? |  |
| Embankment Liquefaction Potential? |  |

1. **Concrete Dam**

|  |  |
| --- | --- |
| Type (gravity, buttress, arch, RCC, etc.)? |  |
| All Loads & Combinations Considered (dead, hydrostatic, internal water pressure, rock & soil, ice, earthquake, etc.)? |  |
| Stability Analysis Undertaken (normal stresses, sliding factors?) |  |
| Material strengths specified? |  |
| Drainage Design? |  |
| Overtopping Provisions? |  |

1. **Foundations**

|  |  |
| --- | --- |
| Investigation Undertaken? |  |
| Foundation Characterized (discontinuities, compressibility, permeability, shear strength, liquefaction potential)? |  |
| Liquefaction Potential Assessed? |  |
| Fill Foundation Material Specifications? |  |
| Special Compaction Specifications? |  |
| Key Trench Designed? |  |
| Slopes of Key Trench?  |  |
| Special Compaction Specifications for Key Trench? |  |
| Grouting Proposed? |  |

1. **Outlet Sluice**

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| --- | --- |
| Location of Control Gate & Type? |  |
| Invert elevation at inlet? |  |
| Pipe Diameter? (0.6 m diameter minimum for Inspectability) |  |
| Outlet Pipe Material? |  |
| Pipe Bedding or Casement? |  |
| Compaction Around Pipe? |  |
| Seepage Reduction Measures? |  |
| Trashracks? |  |
| Venting Considered? |  |
| Terminal Structure/Energy Dissipation? |  |
| Cavitation Considered? |  |

1. **Outlet Sluice Gate Control**

|  |  |
| --- | --- |
| Type of control? |  |
| Gate stem diameter? |  |
| Gate stem guides? |  |
| Anchoring for gate stem? |  |
| Vandalism Protection? |  |
| Wave Action Protection? |  |
| Ice Action Protection? |  |

1. **Other Works**

|  |  |
| --- | --- |
| Control Manhole? |  |
| Sedimentation Pass Outlet? |  |
| Riparian Outlet? |  |
| Fisheries Outlet? |  |
| Signage Required? (DS Reg., Sec. 11) |  |

1. **Instrumentation**

|  |  |
| --- | --- |
| Deformation Measurements Planned (settlement, transverse, longitudinal)? |  |
| Piezometers (Standpipe, Pneumatic, Electric)? |  |
| Weirs & Relief Wells? |  |
| Reservoir Level Indicator? |  |
| Survey Monument Prescribed? |  |
| Has Purpose of Instrumentation Been Identified? |  |
| Expected Results Identified? |  |
| Acceptable Limits Identified? |  |
| Instrumentation Construction Schedule Planned? |  |

1. **Construction Supervision Plan**

|  |  |
| --- | --- |
| Construction Supervision Planned? |  |
| Construction Supervisor? |  |
| Management Organization and Responsibilities Provided? |  |
| Engineering Supervision Planned? |  |
| Details of Diversion, Dewatering and Handling Runoff? |  |
| Listing of Construction Activities Related to Critical Construction? |  |
| Key Inspection Times Identified? |  |
| Description of QA testing program? |  |
| Description of Technical Records?  |  |
| Content and Frequency of Construction Progress Reports? |  |

1. **Design Plans and Specifications**

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| --- | --- |
| Project Location and Vicinity Map? |  |
| Site Map of Dam /reservoir Area (1:1000 or larger)? |  |
| Sectional View Along Longitudinal Axis of Dam (1:250 or larger)?  |  |
| Cross-sectional View of Dam at Location of Max. Height (1:75 or larger)? |  |
| Cross-Sectional Views and Profiles of Spillway(s), Outlet Facilities and other Appurtenances (1:50 and 1:100 or larger respectively)? |  |
| Instrumentation, Dewatering Routes or Other Pertinent information? |  |
| Borrow Pit and Spoil Disposal Areas Identified? |  |

1. **Environmental Monitoring Plan**

|  |  |
| --- | --- |
| Environmental Assessment Report? |  |
| Site Inventory of Species at Risk? |  |
| Sensitive Areas Mapping? |  |
| Environmental Monitor Required? |  |
| Timing Windows Provided? |  |
| Mitigative Activities Provided? |  |
| Site Restoration Plan Provided? |  |
| Compensation Planned? |  |

1. **Operation, Maintenance and Surveillance Manual**

|  |  |
| --- | --- |
| Draft Manual Prepared? |  |
| Roles & Responsibilities Identified (name, position, contact information, & duties)? |  |
| Organizational Chart Provided? |  |
| Minimum Knowledge and Competency Requirements Defined? |  |
| General Facilities Description (overview, site conditions, facility components)? |  |
| Summary of Key Dam Features (dimensions, elevations, volumes, capacities)? |  |
| Construction Drawings Attached? |  |
| Construction History? |  |
| Operating Rules (normal, unusual and emergency conditions)? |  |
| Instructions for Proper Operation of all Hydraulic Equipment? |  |
| Surveillance Schedule (*Dam Safety Regulation – Schedule 2)*? |  |
| Listing of Items Requiring Maintenance c/w Procedures and Service/testing Schedule? |  |
| Procedures for Instrument Monitoring, Measuring, and Schedule? |  |
| Instructions for Installation, Calibration, Maintenance and Repair? |  |
| Procedures for Documentation and Follow-up? |  |

1. **Dam Emergency Plan**

|  |  |
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| Draft Plan Prepared? |  |
| Follows “*Guide & Template for Preparing a Dam Emergency Plan (DEP) in British Columbia*”? |  |

1. **Local Emergency Authorities Plan**

|  |  |
| --- | --- |
| Draft Plan Prepared? |  |
| Follows “*Guide & Template for Preparing a Dam Emergency Plan (DEP) in British Columbia*”? |  |

1. See Downstream Consequence Classification Interpretation Guideline for Dam Safety Officers [↑](#footnote-ref-1)
2. “Seismic Risk Calculation” is available from the Pacific Geoscience Centre, Natural Resources Canada, <http://www.pgc.nrcan.gc.ca/seismo/eqhaz/hazcalc.htm> [↑](#footnote-ref-2)