

Alberta Dam Safety Regulation

Case Study 3

Javid Iqbal, Dam Safety Manager
Alberta Environment and Parks
October 09, 2019



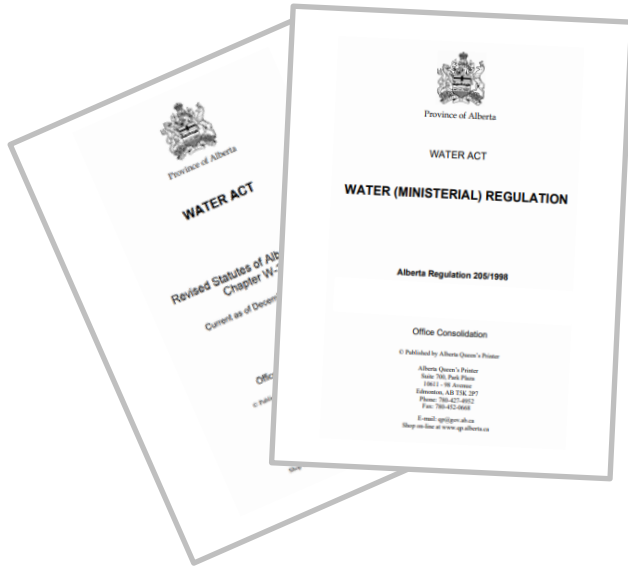
Objective

To share key regulatory upgrades of Alberta's dam safety regulatory framework and some details regarding implementation plan



History of Dam Safety Regulation in Alberta

Previous Regulatory Framework



Non-prescriptive requirements, and technical standards and procedures

Non-enforceable guidelines and details on requirements and implementation of the regulation

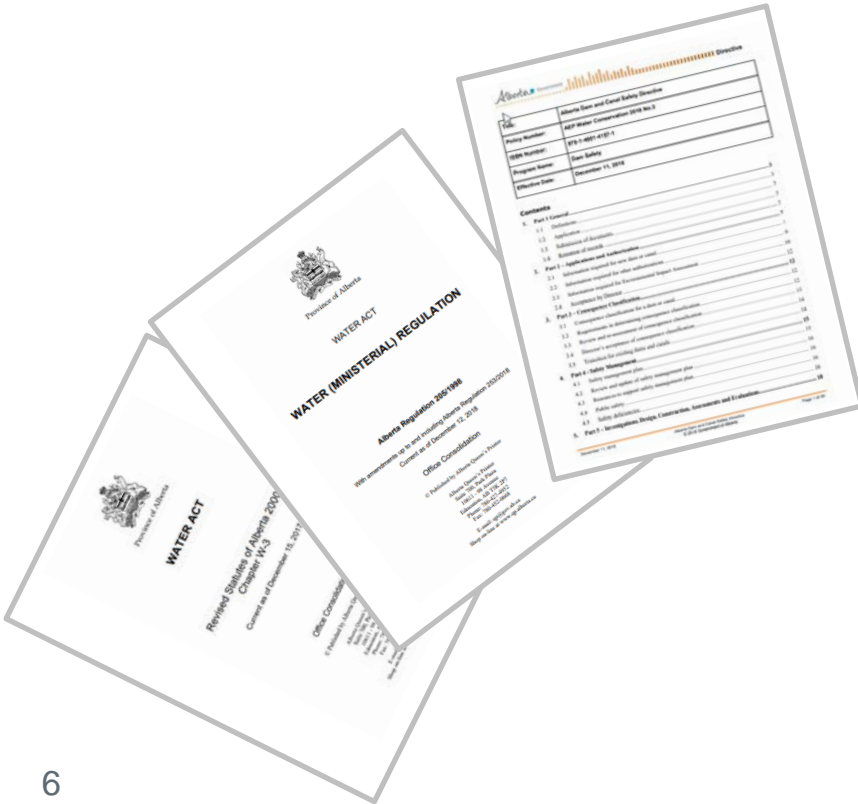
Applied to both tailings and water dams

Regulatory jurisdiction defined by height and capacity



Upgraded Regulatory Framework

Upgraded Regulatory Framework



Prescriptive requirements;
Non-prescriptive technical standards and procedures

Enforceable directive with details on requirements
and implementation of the regulation

Applied to both tailings and water dams using a
lifecycle approach

Regulatory jurisdiction defined by consequence
classification, height and capacity

Overview of Changes

Previous

Part 6 Dam and Canal Safety

- 26 Plans and operation
- 27 Site assessments
- 28 Safety assessments
- 29 Reporting of site or safety assessment
- 30 Safety evaluation
- 31 Safety directives
- 32 Suspension, cessation, abandonment, decommissioning
- 33 Providing information
- 34 Instrumentation

Current

Part 6 Dam and Canal Safety

- 26 Interpretation
- 27 Application of the Part
- 28 Safety Directive
- 29 Dam and canal safety — general responsibilities and accountabilities
- 30 Investigations, design, construction, assessments and evaluations
- 31 Operation, maintenance and surveillance
- 32 Emergency management
- 33 Further notifications to Director
- 34 Decommissioning, closure, abandonment, etc.
 - 34.1 Consequence classification
 - 34.2 Orders by Director to mitigate or avert failure
 - 34.3 Risk assessments
 - 34.4 Documents from qualified professionals

Authorizations

Previous

Current

| | | | |
|--|-----------------|---|-----------------|
| New Dam/Canal | Required | New Dam/Canal | Required |
| Rehabilitation/Major Repairs | Required | Rehabilitation/Major Repairs | Required |
| Cessation/Suspension | Required | Cessation/Suspension | Required |
| Abandonment, Decommissioning | Required | Decommissioning, Closure, Abandonment | Required |
| <i>Referral to Dam Safety was at the discretion of the Director.</i> | | Any project that falls within the regulatory jurisdiction must be referred to Dam Safety for review. | |

Authorizations (Approvals/ Licences)

Activity

W Water Act activities

APPROVALS

 **W** Water Act activities
dam safety activities

R 1(4) An activity includes,

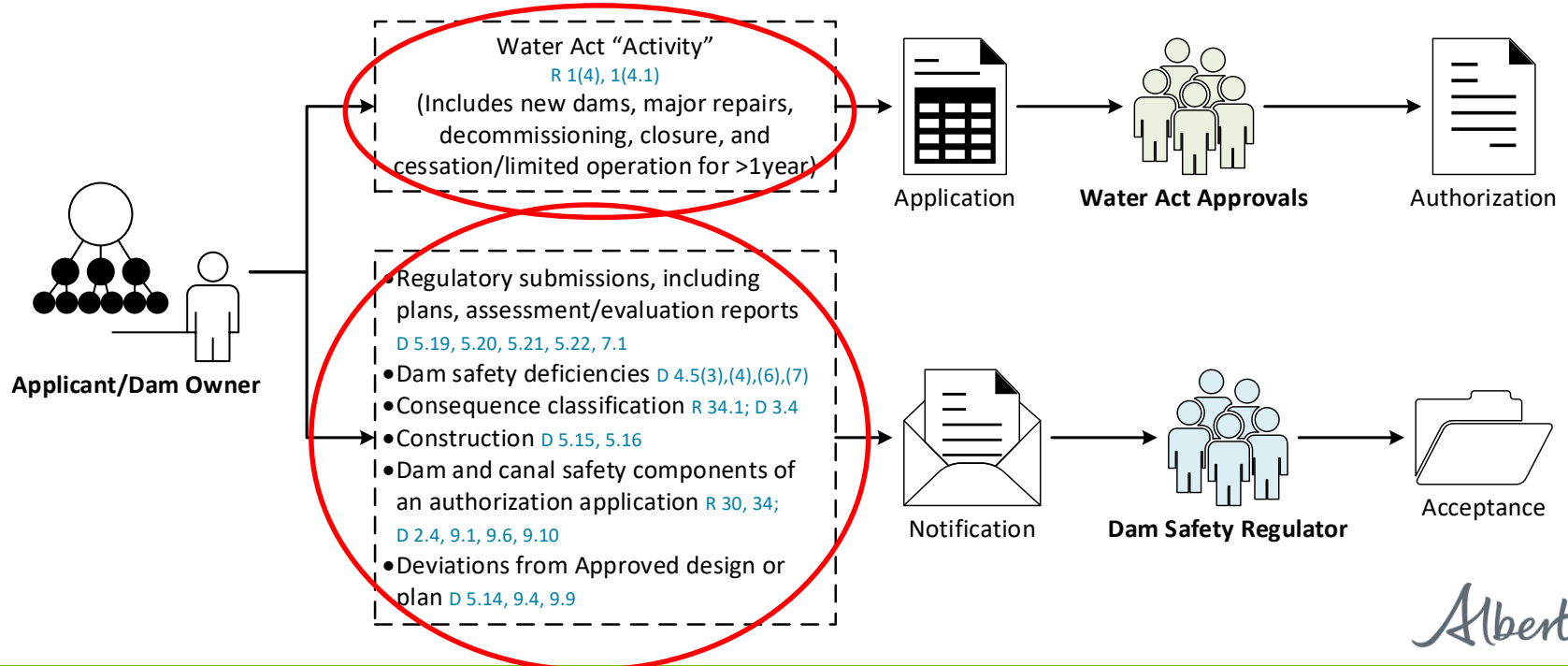
- anything conducted by the licensee in or on the works that is the subject of a licence and that is owned or operated by the licensee, **and**
- that impairs the rights of other water users or causes significant adverse effects on the aquatic environment, human health, property **and** public safety

R 1(4.1) in relation to a dam or canal, includes any act that has the potential to cause,

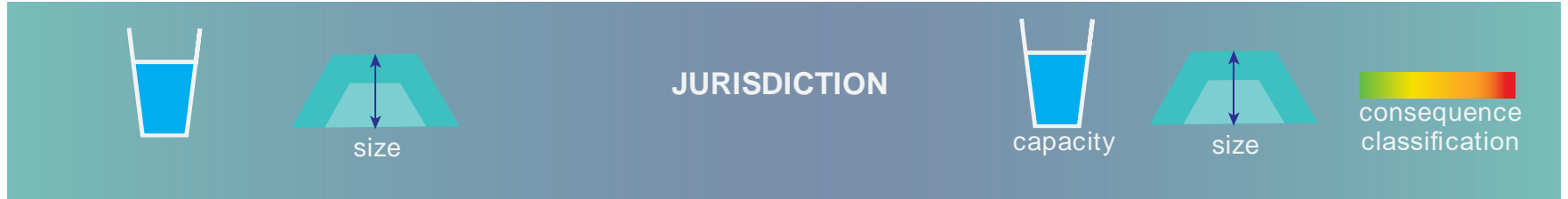
- an increase in risk to the factors at risk, or a change in
 - consequence classification, or
 - the most recently approved design

Authorizations

Approval vs. Acceptance

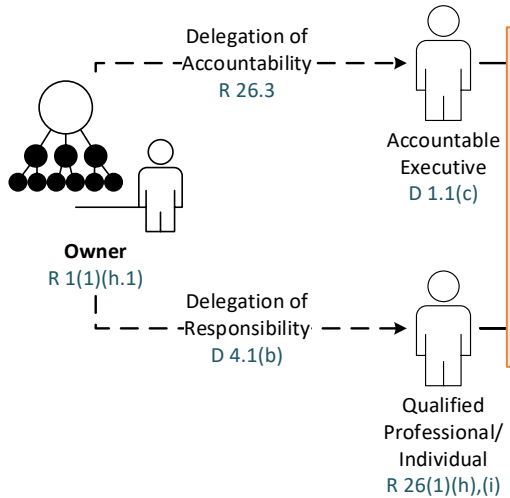


Regulatory Jurisdiction



Accountability and Responsibility

| | | |
|--------------------|----------------|---|
| undefined | ACCOUNTABILITY |  dam owner |
| person responsible | RESPONSIBILITY |  dam owner  qualified professional qualified individual |

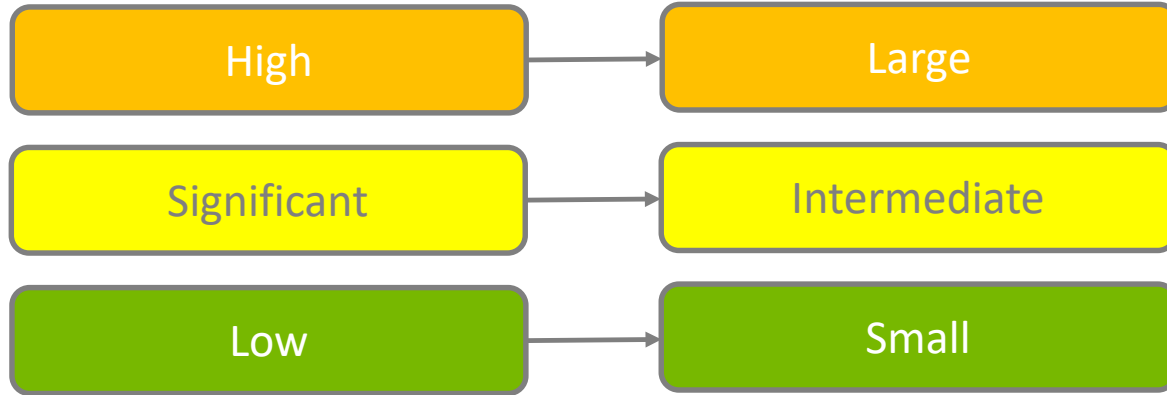


“Owner” – shall exercise reasonable care and demonstrate due diligence to avoid or obviate any risk to factors at risk that exceeds that which is inherent having regard to what the dam or canal is designed for or approved

Water (Ministerial) Regulation, Section 29 (2)

Regulatory Requirements

1979-1999

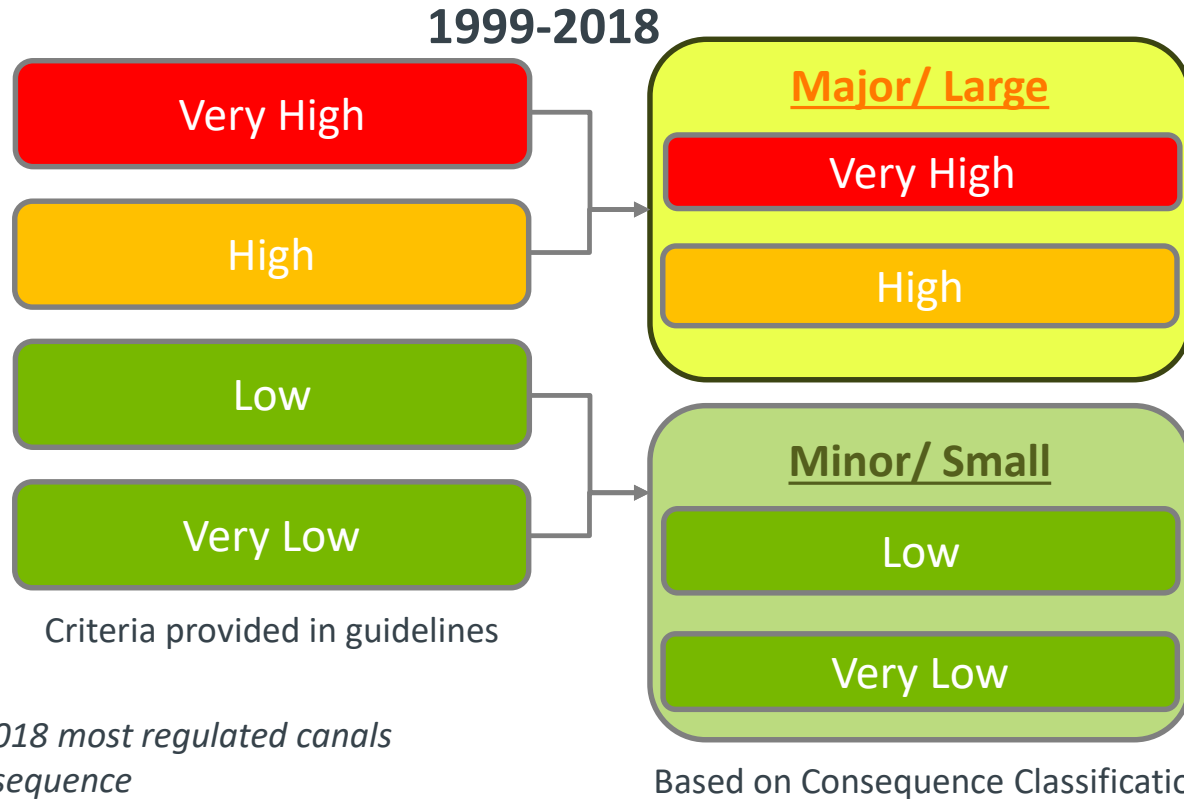


Criteria provided in guidelines

Based on:

- Height
- Storage

Regulatory Requirements



Note: 1999-2018 most regulated canals were low consequence

Regulatory Requirements

2018 - Present

Extreme

Very High

High

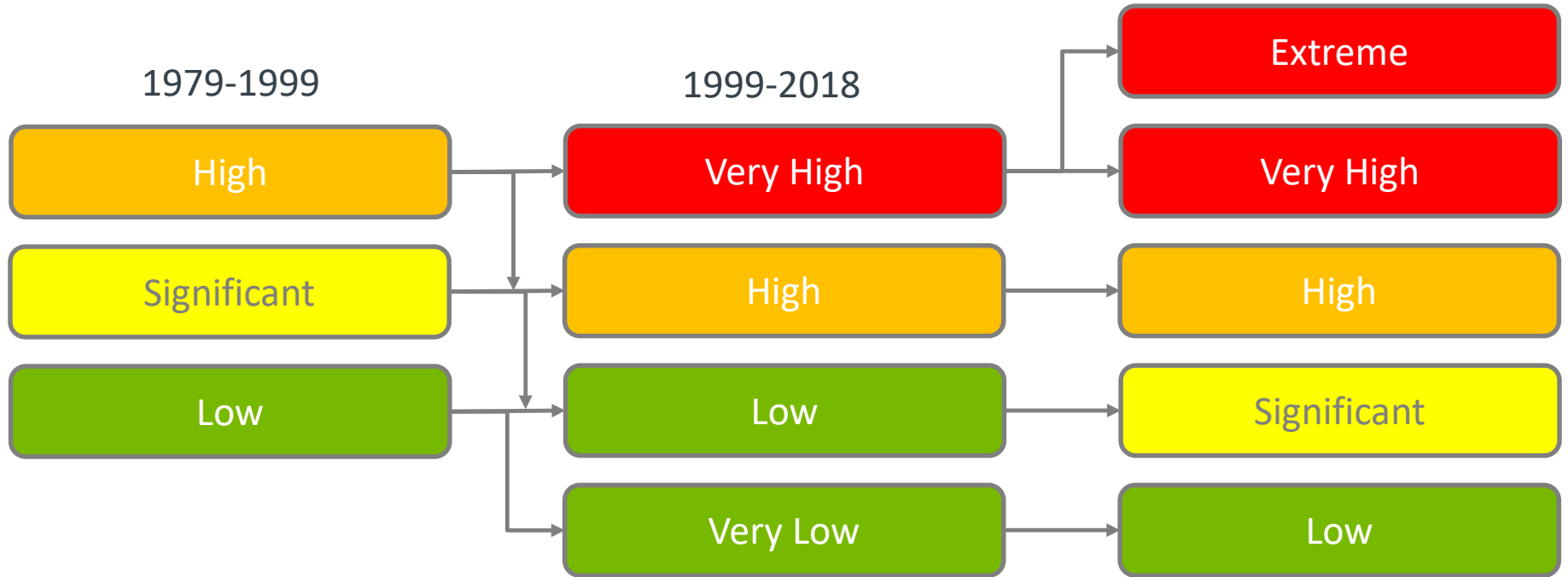
Significant

Low

Note: Default min. CC for Tailings
Dams is Significant

Regulatory Requirements

2018- Present



Regulatory Requirements



Consequence Classification

“factors at risk” – includes the public, environment, cultural values, economy, land/property

Water (Ministerial) Regulation, Section 1(1)(m.1)

Incremental consequences of failure – is “risk to factors at risk”

Dam and Canal Safety Directive, Section 3.2

“Risk” – is to be determined through the use of a risk assessment that has regard to the probability and severity of harm or damage to factors at risk

Water (Ministerial) Regulation, Section 26 (4)

Consequence Classification

Dam and Canal Directive – Part 3

- Three types of approaches are acceptable:

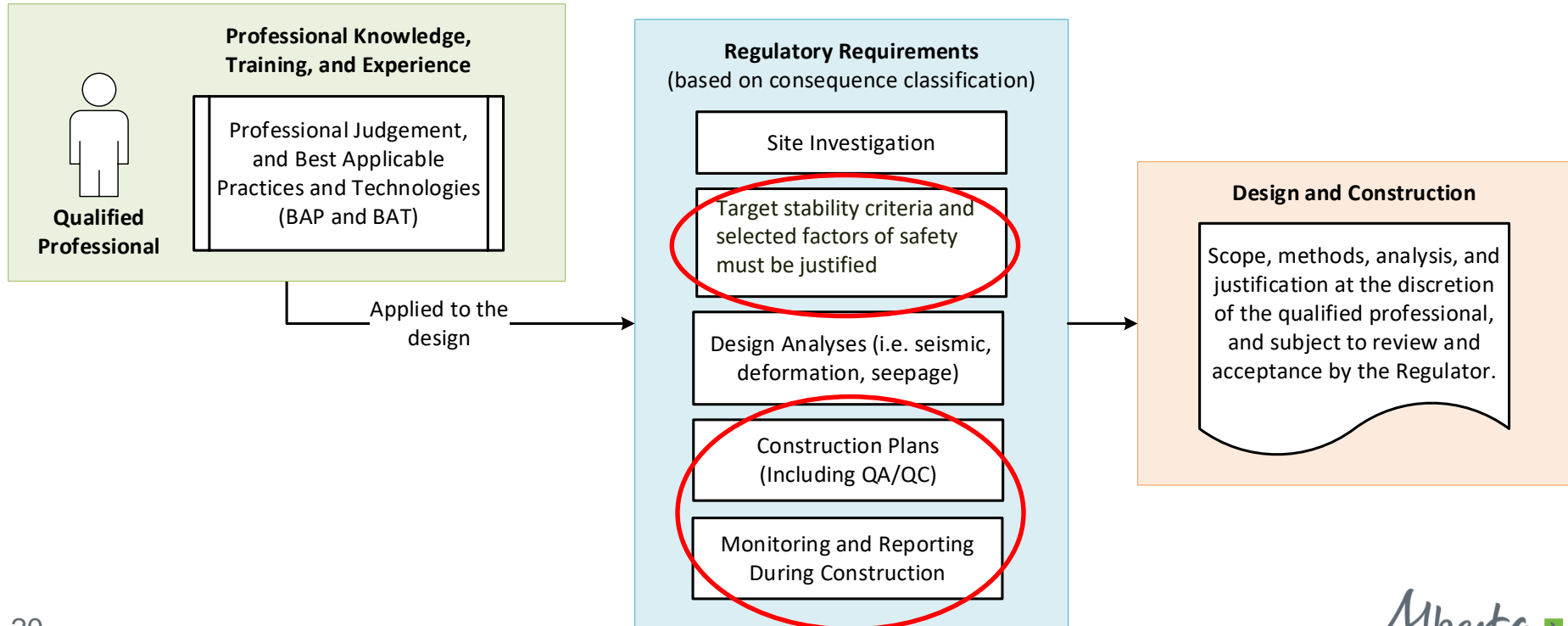
| | Description | Application |
|---------------------|---|---|
| Preliminary | Tabletop analysis to characterize the downstream reach of an uncontrolled release | <ul style="list-style-type: none">• To approximate a classification• To identify downstream changes that may impose a change in risk• To provide a visual understanding of downstream area |
| Qualitative | Engineering evaluation using simplistic data and conservative assumptions to determine open-channel flows and elevations at downstream cross-sections | <ul style="list-style-type: none">• Preliminary approach lacks precision and provides too general of an approximation• Some detailed information is required for emergency management purposes |
| Quantitative | Detailed breach inundation study using high-quality input data, and scientific analyses to assess environmental and economic losses | <ul style="list-style-type: none">• Qualitative approach is inaccurate or too conservative• Impacts of failure require greater clarity• Breach inundation information is required for emergency management purposes |

Consequence Classification

Water (Ministerial) Regulation – Part 6, Section 34.1

- A consequence classification must be assigned to all dams and accepted by the Director
- Any change to the classification must be reported to the Director
- Must be reviewed periodically
 - Extreme/Very High – every 5 years
 - High – every 7 years
 - Significant – every 10 years
 - Low – at the discretion of a qualified professional/Director

Design and Construction



Justification of Target Stability Criteria

Standards-based

Justification for proposed FOS used for design, assessments, and evaluations

- Annual Performance Reviews (APR)
- Periodic independent assessments and evaluations

Performance-based

Justification for proposed Quantifiable Performance Objectives (QPO)

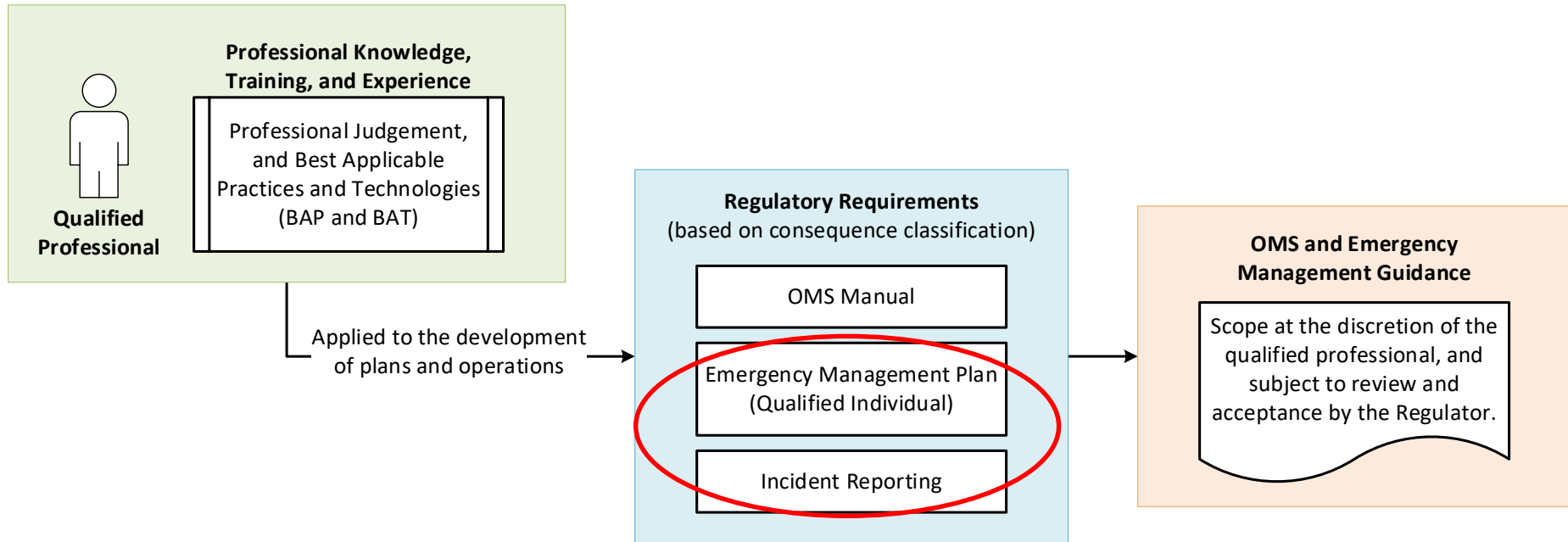
- Implement Observational Method at minimum
- Annual Performance Reviews (APR)
- Periodic independent assessments and evaluations

Risk-informed

Justification for proposed approach and criteria

- Must use a systematic process analysis and evaluation (i.e. FMEA or similar technique)
- A decision as to whether or not the risk in question is tolerable relative to existing risk management measures

Operations, Maintenance, Surveillance



Plans Required

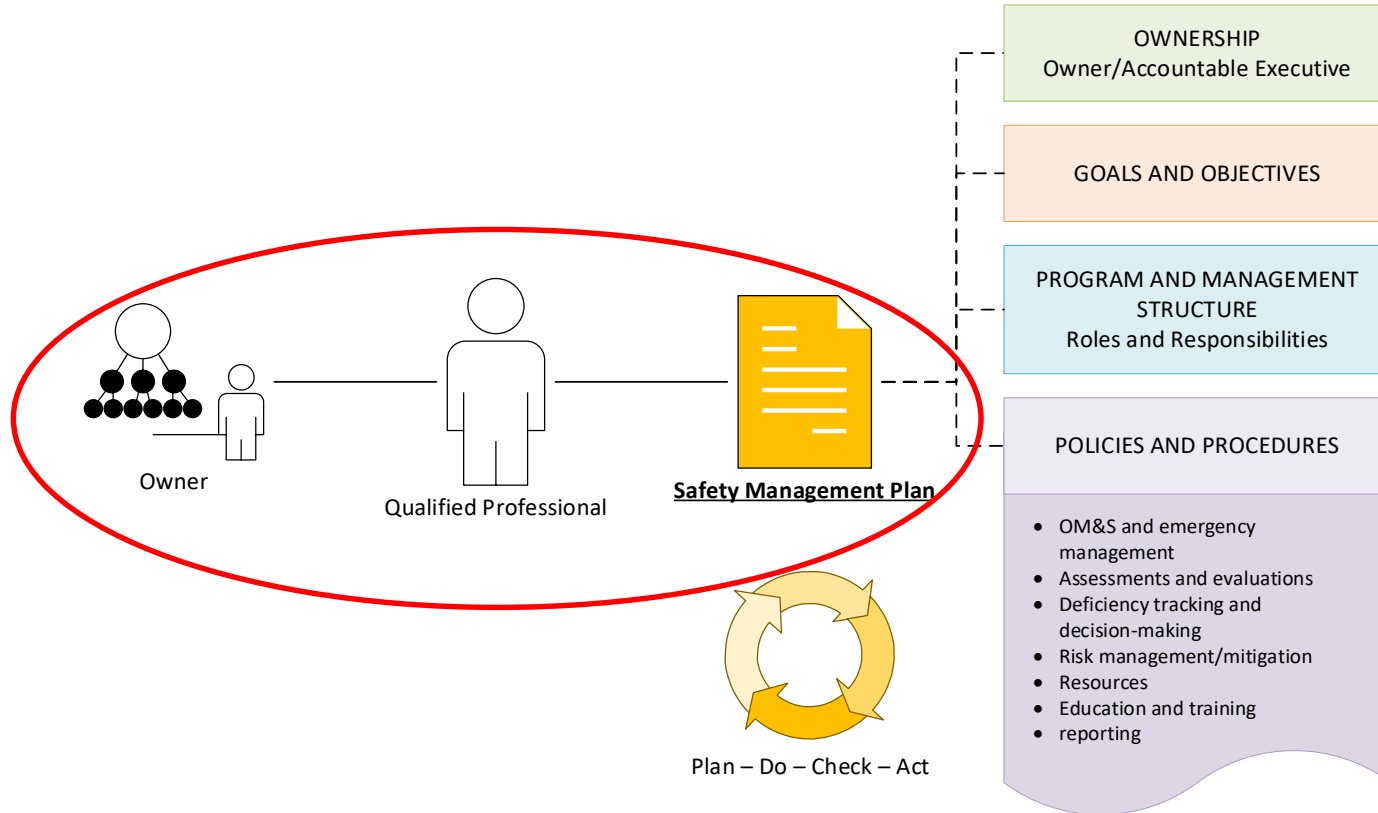
| <u>Consequence Classification</u> | <u>Safety Management Plan</u> | <u>Emergency Management Plan</u> | | <u>Operation, Maintenance, and Surveillance Manual</u> |
|-----------------------------------|--|----------------------------------|--|--|
| | | Emergency Preparedness Plan | Emergency Response Plan and Flood Action Plan ¹ | |
| Extreme | every 5 yrs. | every 5 yrs. ² | every 5 yrs. ² | every 5 yrs. ³ |
| Very High | | | | |
| High | every 7 yrs. | every 7 yrs. ² | every 7 yrs. ² | every 7 yrs. ³ |
| Significant | Requirements are based on potential significant environmental and economic losses and are established on a case by case basis. <i><u>If a plan is required, it must be reviewed a minimum of every 10 years.</u></i> | | | |
| Low | Not required in general; however, may be required in some cases due to potential environmental and economic losses. | | | |

¹ Flood Action Plans (FAP) are often included as part of the Emergency Response Plan (ERP).

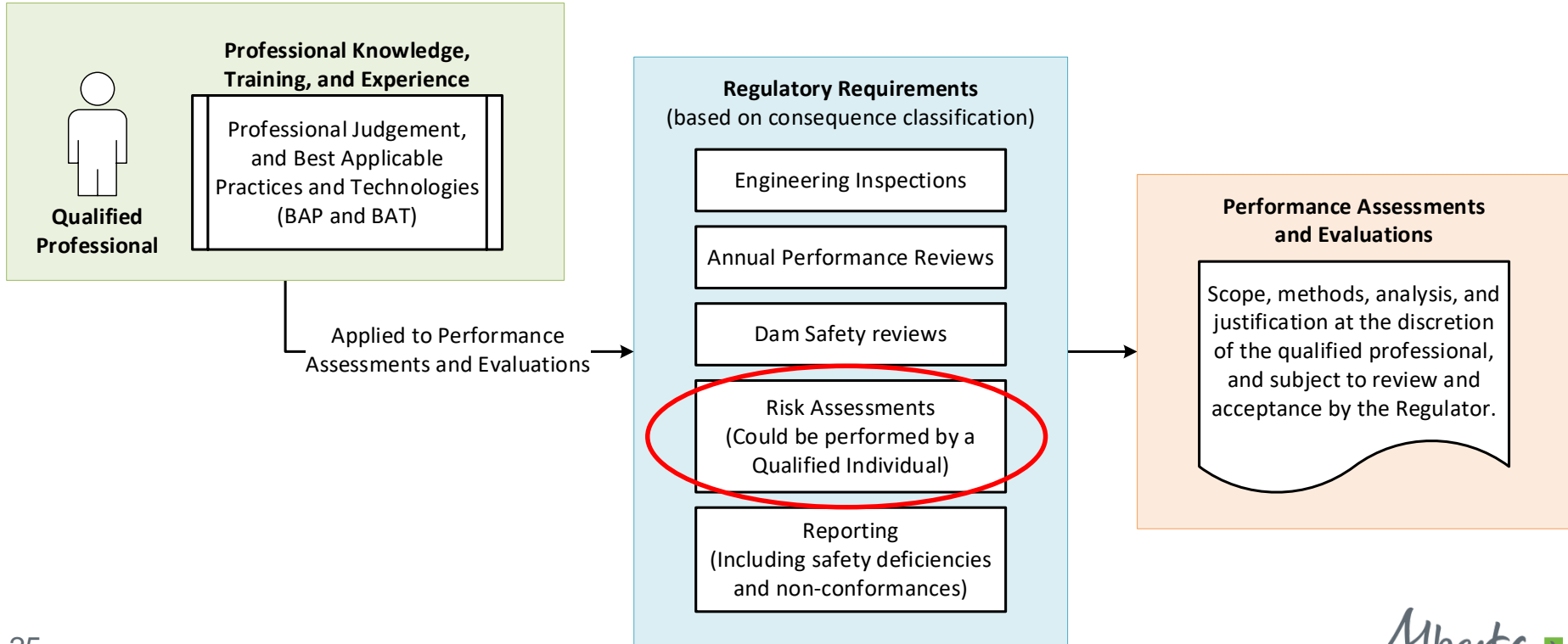
² The Emergency Management Plan (EMP) must be reviewed when there is a major repair or significant change to the operations, maintenance or surveillance of the dam or canal, or when there is a change to the consequence classification. Updates to the Emergency Preparedness Plan (EPP) must be submitted to the Director.

³ The OMS Manual must be reviewed when there is a major repair or significant change to the operations, maintenance or surveillance of the dam or canal, or when required by the Director.

Safety Management Plan



Assessments and Evaluations



Risk Assessment

What

A “systematic process of analysis and evaluation of risk that involves use of formal failure mode and effects analysis or similar technique”

Water (Ministerial) Regulation, Section 34.3

When

- There is a critical safety deficiency
- A quantifiable performance objective is not met
- Required by the Director

Dam and Canal Safety Directive, Section 5.22

Minimum Requirements

- **Performed and documented** by a **qualified individual**
- **Must identify all potential** and credible failure modes
- **Scope and level of details** commensurate with complexity of the structure and risk to factors at risk
- **Categorize risk** using sound Eng. principles & judgments
- **Assess** the level of **residual risk** and **tolerability of residual risk**
- Recommend appropriate **risk management** or mitigation

Water (Ministerial) Regulation, Section 26(4)

Dam and Canal Safety Directive, Section 5.22

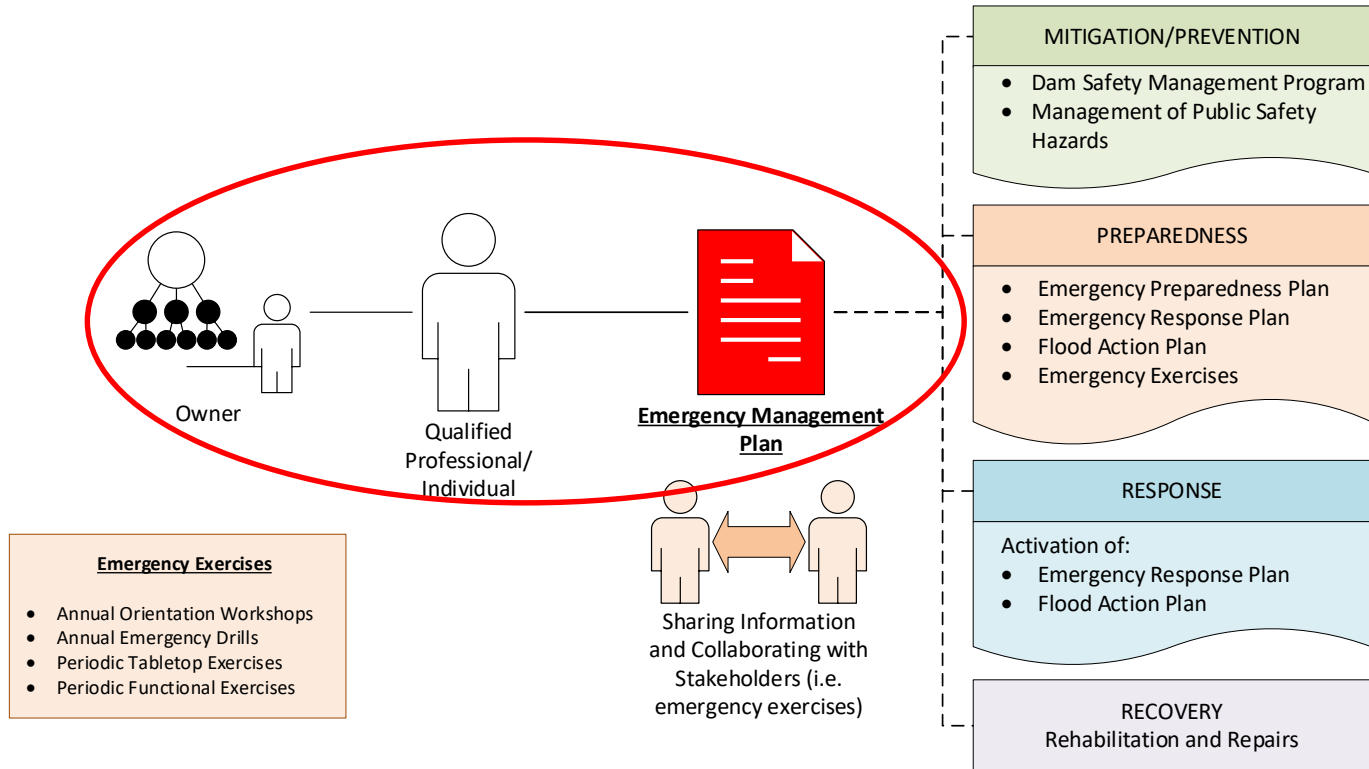
Assessments and Evaluations

| Consequence Classification | Assessments | | | Evaluations | |
|-----------------------------------|--|---|--|--------------------------------------|--|
| | Inspections/ Investigations | Engineering Inspection¹ | Risk Assessment² | Dam Safety Review² | Annual Performance Review² |
| Extreme | Regular and ongoing in accordance with the Operation, Maintenance, and Surveillance Manual | Annually | Required when: <ul style="list-style-type: none"> – there is an outstanding critical safety deficiency, – an established Quantifiable performance objective is not met, or – when required by the Director. | every 5 yrs. | Required if the structure: <ul style="list-style-type: none"> – is under construction or rehabilitation, – is in the post-construction period, – has a critical dam safety deficiency, or – when required by the Director. |
| Very High | | | | every 7 yrs. | |
| High | | | | every 10 yrs. | |
| Significant | | | | | |
| Low | Only required at the request of the Director or a qualified professional | | | | |

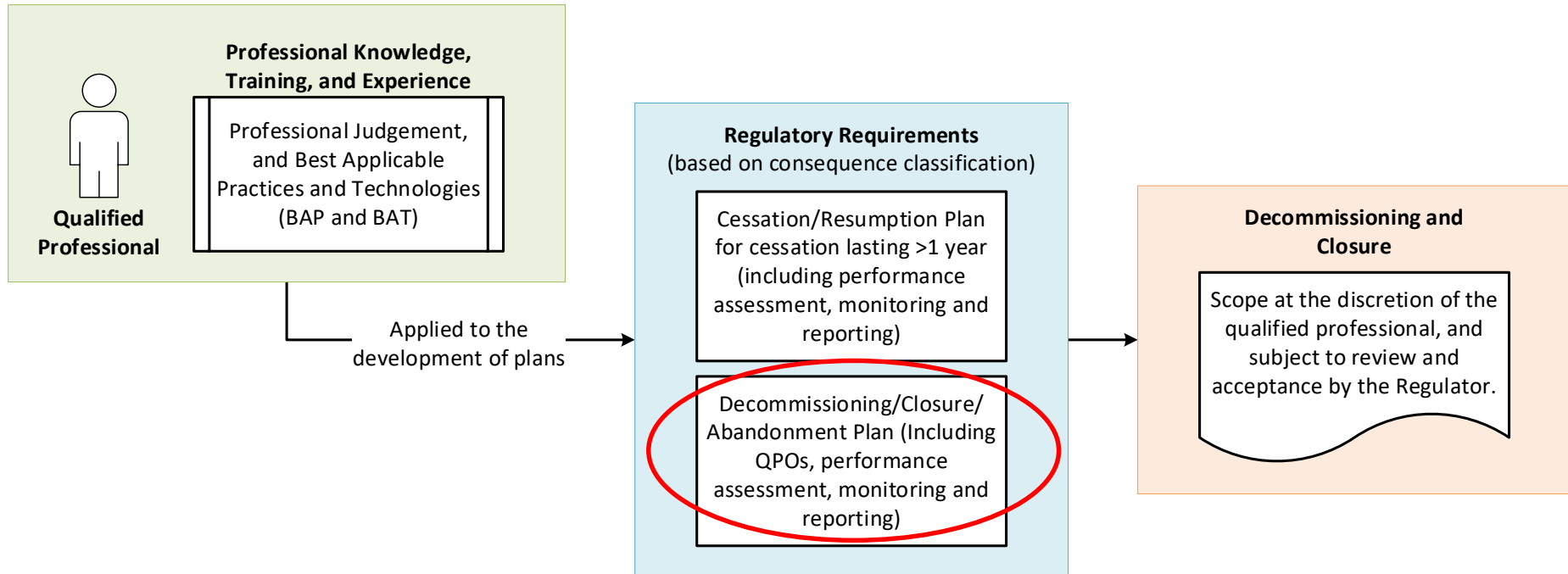
¹ Submit the inspection report within 90 days to the Director only if a new dam safety or critical dam safety deficiency is found during the inspection.

² Risk Assessments, Dam Safety Reviews, and Annual Performance Reviews must be submitted to the Director within 90 days of finalizing the report.

Emergency Management Plan



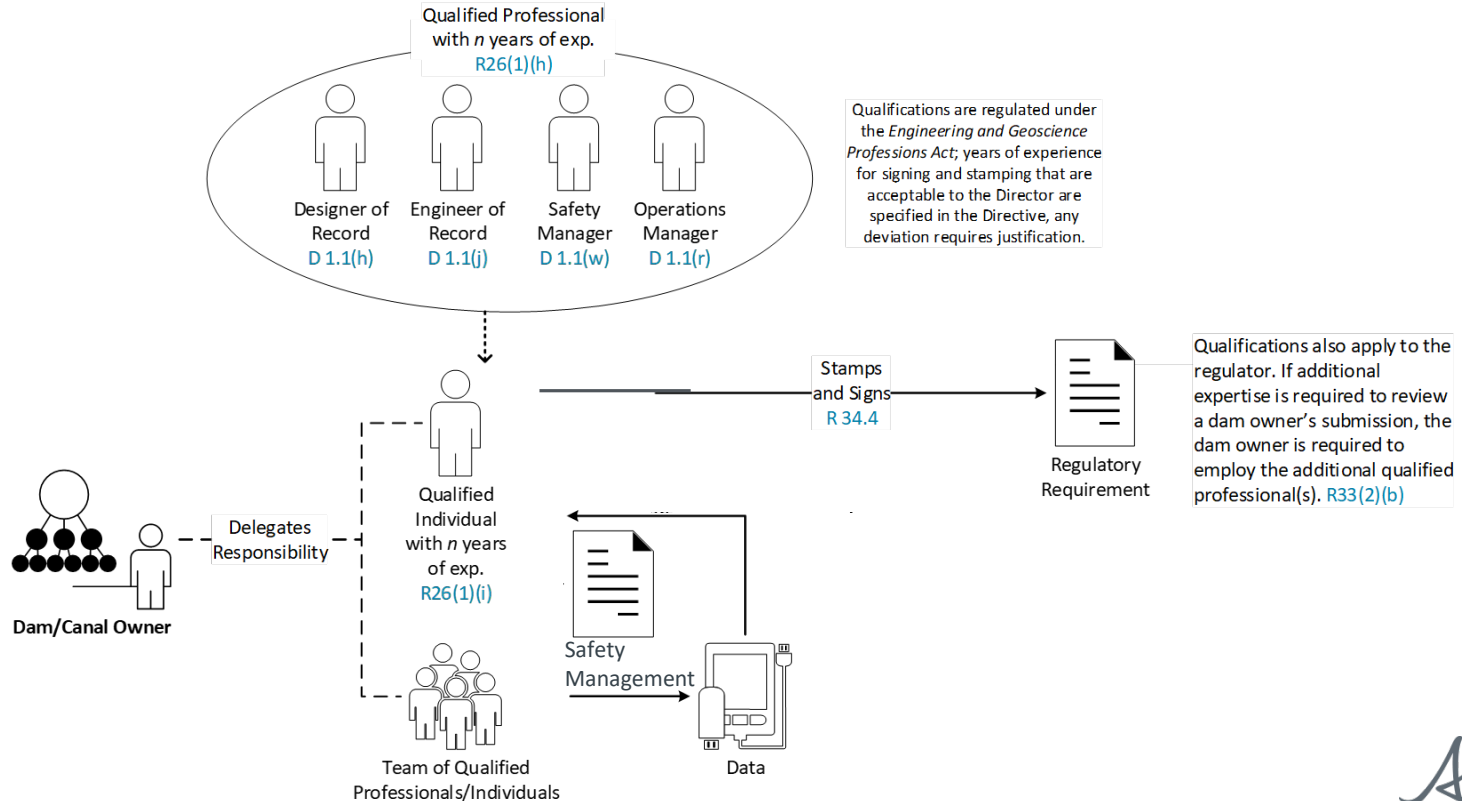
Decommissioning, Closure & Abandonment





Implementation

Qualified Individuals/ Professionals

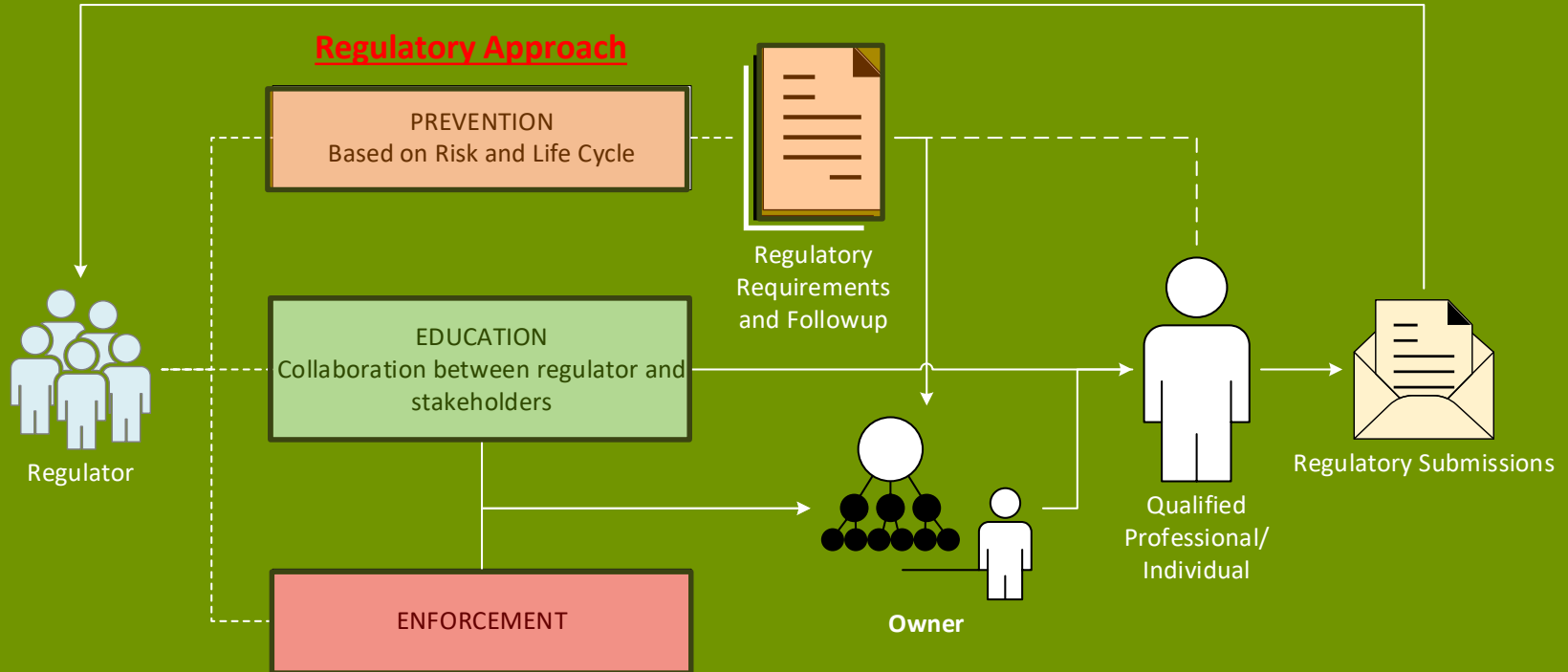


Transitional Provisions

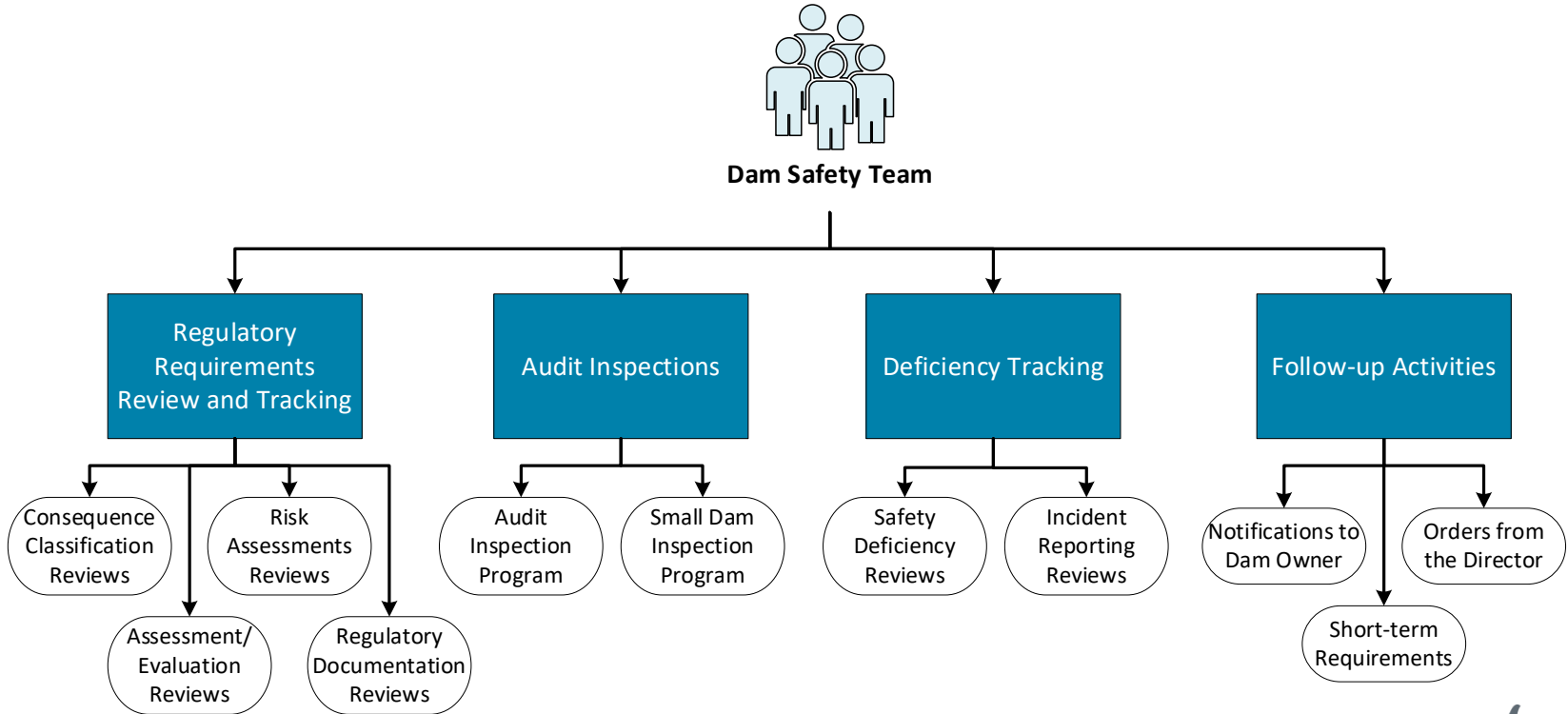
Water (Ministerial) Regulation – Part 8, Section 71.1

- In effect from December 12, 2018
- Provisions are provided for structures that are:
 - previously approved
 - under construction
 - Just completed
- Provisions are also provided for compliance with the new Directive

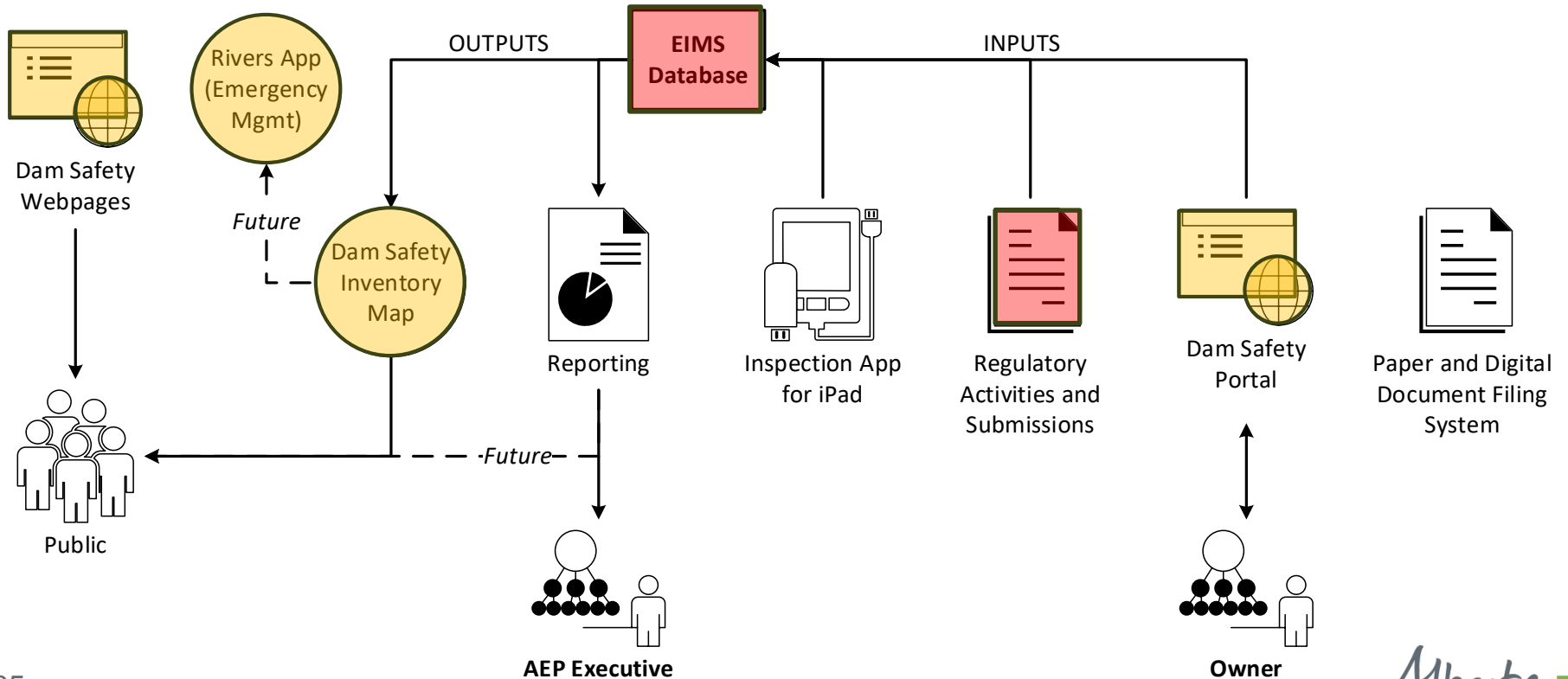
Strategic and Management Planning



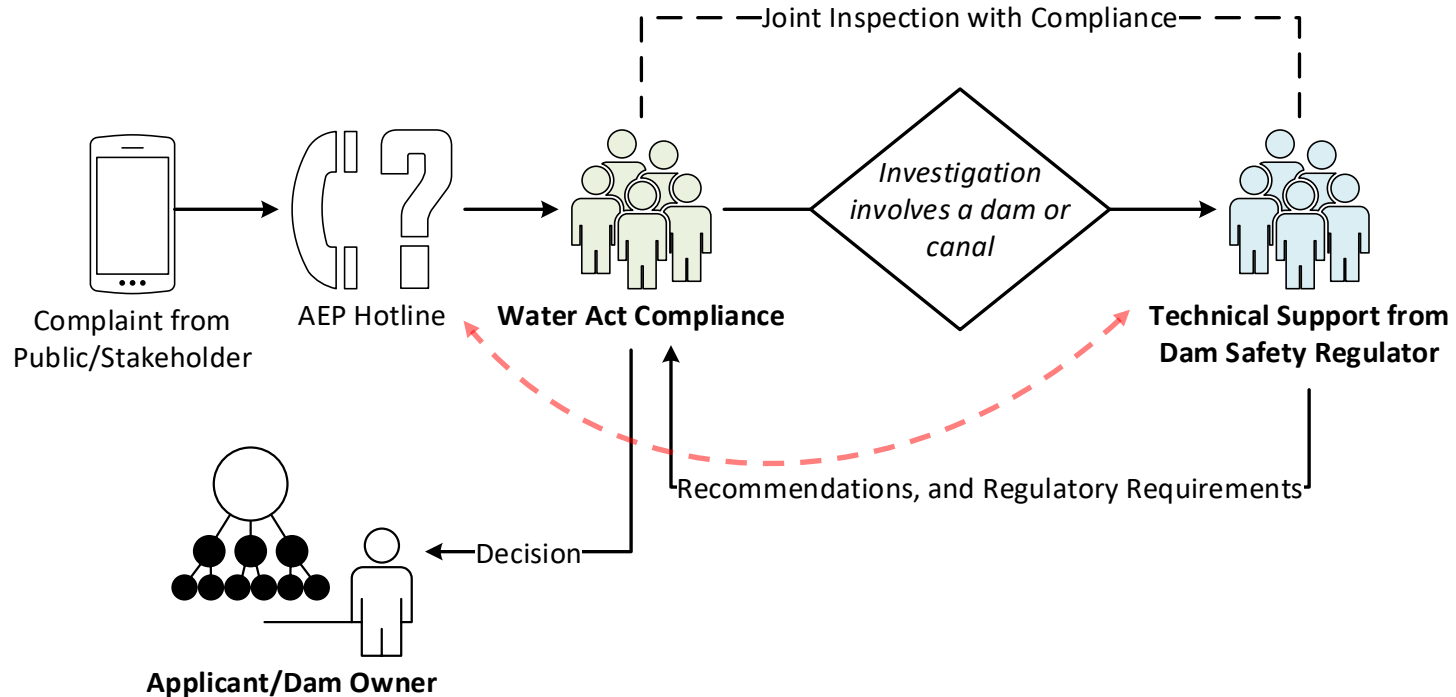
On-going Monitoring



Tracking and Follow-ups



Compliance



Ongoing Development

In Progress:

- Policy on basis for acceptance of risk tolerability for dam safety management as well as decommissioning and closure
- Updating guidelines for OMS, emergency management and small dams

For Future Consideration:

- Developing guidelines for risk assessment process and outcomes to ensure consistency

Thank you