Working for Responsible Management of Tailings Facilities

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MAC Tailings Working Group

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Tailings and Mine Waste Ñ08
October 21, 2008 Vail, Colorado

MAC
The Mining Association of Canada
L'Association minière du Canada

- The Mining Association of Canada has, over the past 12 years, pursued continual improvement in tailings management by its member companies and the broader mining industry

- This presentation outlines the MAC Tailings Management Framework, as put forth in the tailings management trilogy, and provides guidance for its implementation and application

The MAC tailings initiatives began out of realization that

- Tailings present a major business risk to the mining industry
- The risk needs to be better managed
- A series of major tailings failures around the world in the 1990's
  - while individually related to specific technical issues
  - <u>were more fundamentally indicative of need for improved care and management practices by tailings dam and facility owners and operators</u>

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Tailings present a major business risk to the mining industry

- Tailings failures can have major environmental impacts
- And, their impacts on the company reach far beyond the cost of rehabilitating the mess
  - Do you remember those great Canadian mining companies?
    - Cambior
    - Placer Dome
    - Boliden Apirsa (Los Frailes)
  - They no longer exist
    - *Cambior was acquired by Iamgold, Placer Dome was acquired by Barrick, and Boliden - Los Frailes closed in bankruptcy*
  - They never fully recovered public or shareholder confidence after suffering major tailings failures overseas.
    - They are not the only great Canadian mining companies to disappear in the last decade, but their disappearances are said to be related at least in part to their tailings problems
- What are the costs of lost credibility?
  - Difficulty in accessing capital
  - Permitting and approvals hurdles
  - Reduced employee morale, public confidence

These were not the only incidents

- There have been other tailings failures
  - in Canada
  - at Canadian company sites overseas
  - and at other mining company sites internationally
- 83 reported significant tailings dam failures between 1961 and 2004
  - 65 between 1961 and 1996
  - 16 between 1997 and 2004
- Including several causing loss of life
  - El Cobre (Chile, 1965) - > 200 dead, town destroyed
  - Mir (Bulgaria, 1966) - unquantified loss of life
  - Bilbao (Spain, 1969) - unquantified loss of life
  - Mufulira (Zambia, 1970) - 89 miners dead
  - Bafokeng (S. Africa, 1974) - 12 miners dead
  - Mochikoshi #1 (Japan, 1978) - 1 dead
  - Arcturus (Zimbabwe, 1978) - 1 dead
  - Stava (Italy, 1985) - 268 dead
  - Jinduicheng (China, 1988) - 20 dead
  - Merriespruit (S. Africa, 1994) - 17 dead
  - Surigao del Norte (Philippines, 1995) - 12 dead

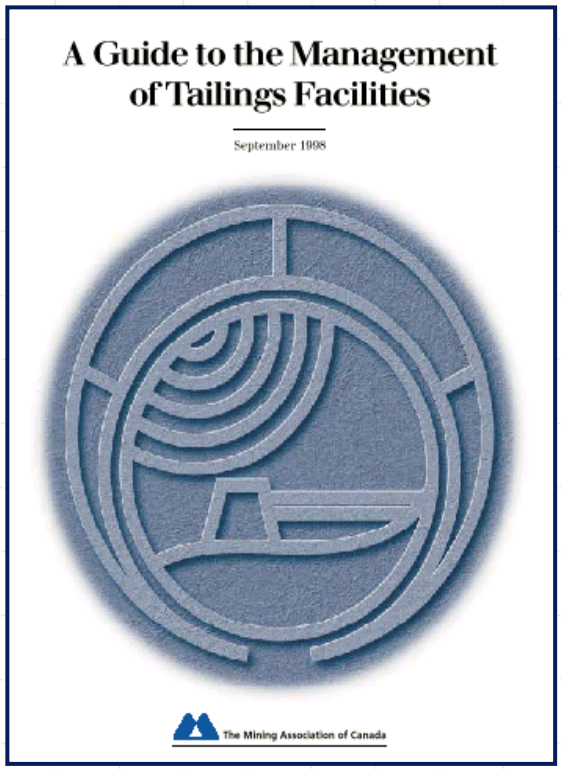
MAC over the past 12 years

- Initiated a Board-level Task Force to investigate and recommend initiatives to address performance of tailings facilities, which led to creation of the **Tailings Working Group**
- Established and continues to support the **Tailings Working Group**
  - works within the industry to promote safe and environmentally responsible tailings management practices
  - with membership and participation encompassing the breadth of Canadian mining companies and engineering companies involved in tailings
  - shares experience across companies
  - provides leadership to the broader mining community
  - developed and encouraged implementation of industry "standards" for responsible management of tailings and water management facilities
- Promoted, and continues to promote responsible tailings management through publications, technical presentations and information exchange workshops
- Supports the efforts of the Canadian Dam Association and the development and implementation of the Canadian Dam Safety Guidelines

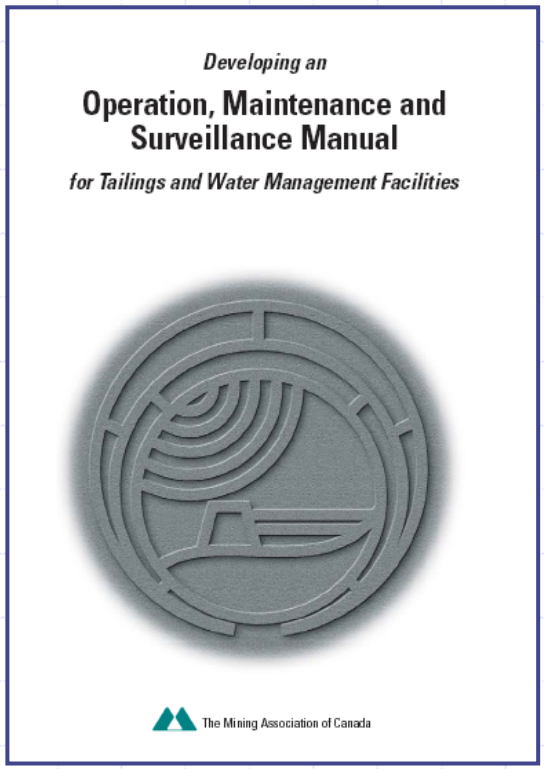
MAC Tailings Working Group

- The most visible thrust of the MAC Tailings Working Group initiative has been the development and publication of a three-volume set of guides, the Tailings Management Trilogy, to improve tailings management
  - "**A Guide to the Management of Tailings Facilities**", initially published in 1998, updated edition to be published in 2008
  - "**Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities**", published in 2003
  - "**A Guide to Audit and Assessment of Tailings Facility Management**", to be published in 2008

The Tailings Working Group Prepared Standards



1998
Updated 2008



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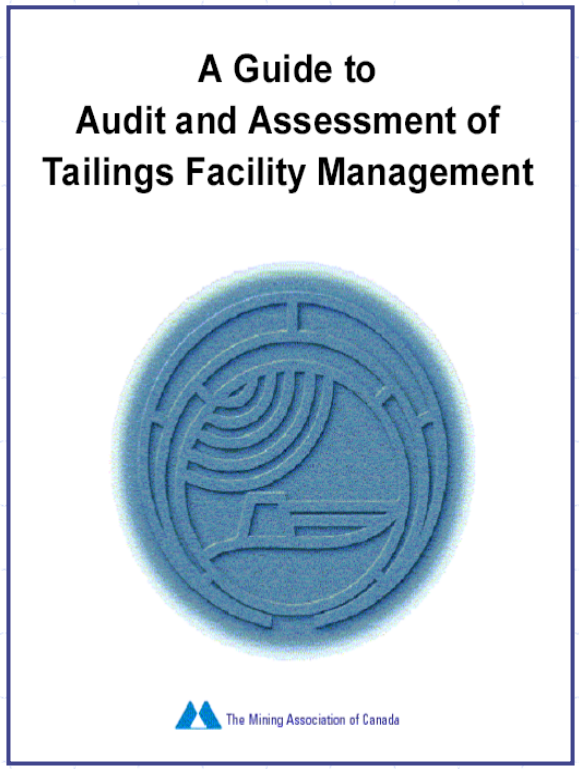


2008

The Tailings Management Guide

- The MAC ***Guide to the Management of Tailings Facilities*** was developed to help companies implement tailings management systems that include environmental, health and safety criteria
- It presents
  - a **tailings management framework** of management principles, policies and objectives
  - **checklists** for implementing the framework through the life cycle of a tailings facility
- ***It is currently being updated – target release: Fall 2008***

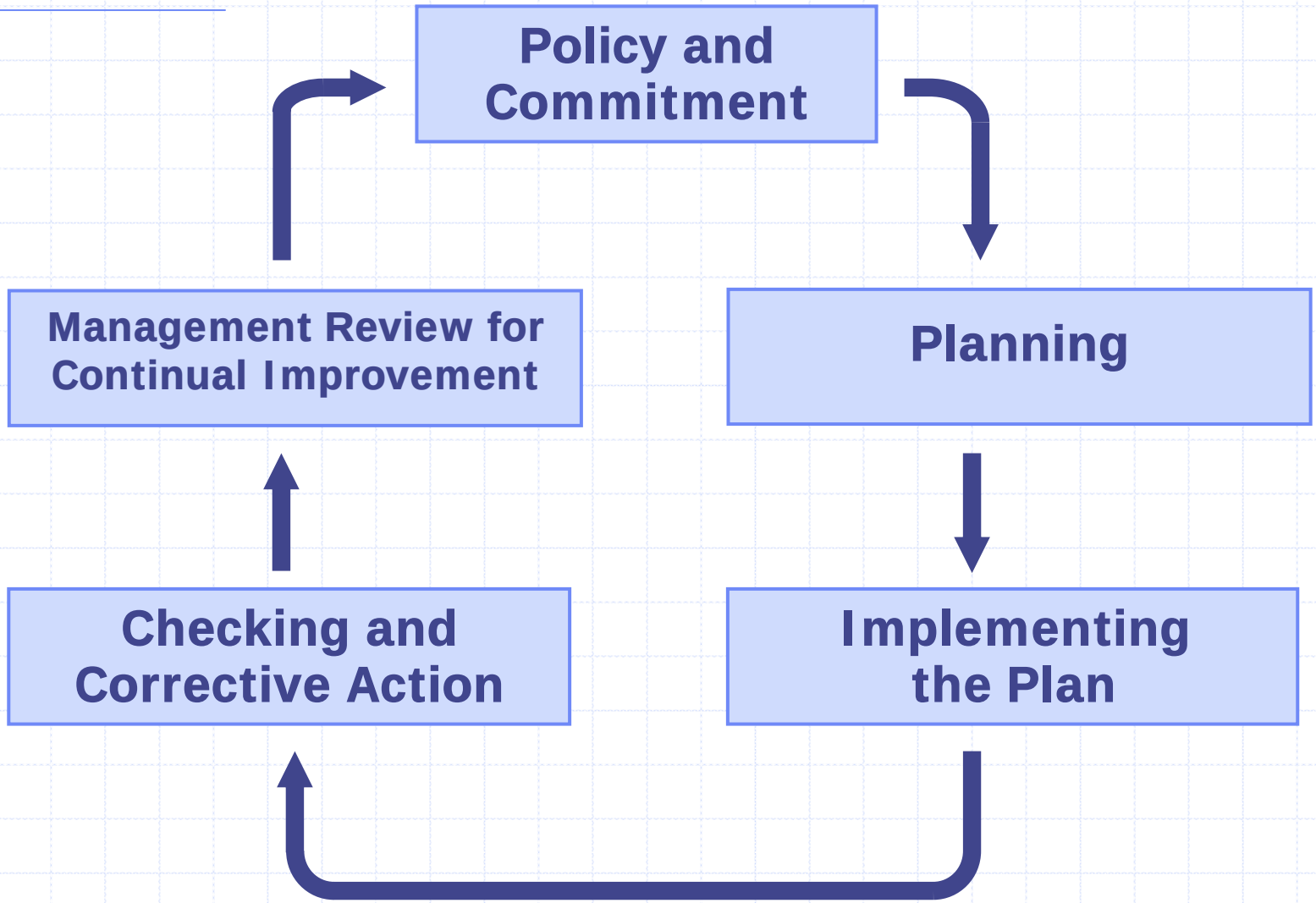
The Tailings Management Framework

- The fundamental objective of the Tailings Management Framework is
  - to apply to tailings management
  - the level of discipline and thoroughness
  - that has normally been applied to engineering of tailings dams
- That is, it establishes the need for
  - identification and documentation of principles, policies, objectives, and regulatory and other criteria, including risk management, for tailings management
  - assignment and documentation of accountability and responsibility for delivery of tailings management, from senior executives to site operators
  - establishment and documentation of requirements for designing, constructing, operating and closing tailings facilities
  - establishment and documentation of requirements for approval of designs and operating procedures, and for making changes to those designs and procedures
  - planning from day one for eventual, acceptable decommissioning and closure
  - ensuring and documenting regular and periodic review and reporting of tailings management performance, in addition to technical performance
  - embedding the principle of continual improvement in tailings management

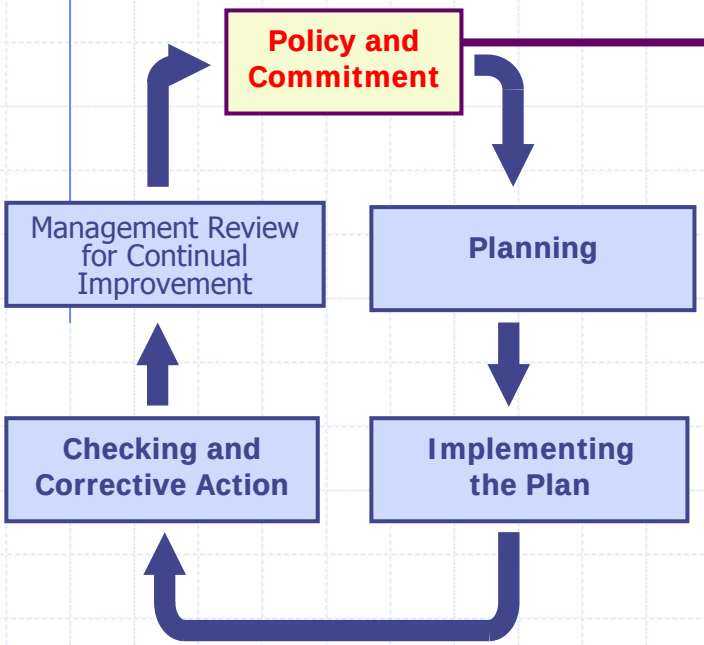
Applying the Tailings Management Framework

- The Framework includes a clear focus on documentation
- This is derived from the need
  - to not only do tailings management 'right'
  - but to establish a basis (documentation) to facilitate due diligence
  - And to be able to demonstrate through documented processes that tailings
    - have been …are …and will be managed 'right'
- It is recognized that
  - each tailings facility is unique
  - the tailings management framework must be customized to meet specific site conditions and requirements
- The *Guide* includes checklist templates to implement that customizing while converting the Framework to an operable, site-specific tailings management system

A Framework to Manage Tailings Facilities



Policy and Commitment



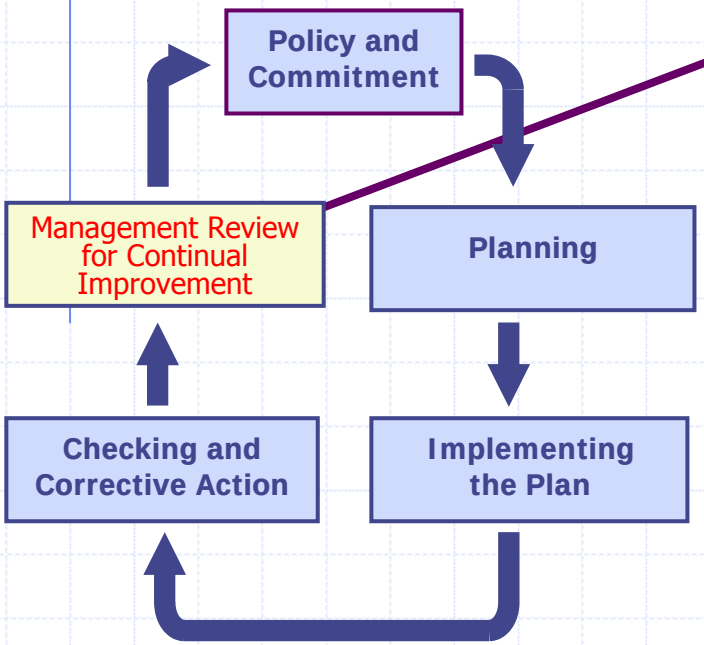
Locate, design, construct, operate and close tailings facilities in a manner such that

- **All structures are stable**
- **All solids and water are managed within the designated areas intended in the design**
- **All structures are in compliance with company standards, the MAC Environmental Policy, legislative requirements and commitments to stakeholders**

Take responsibility through commitments and actions

Ongoing program of review and continual improvement

Management Review For Continual Improvement



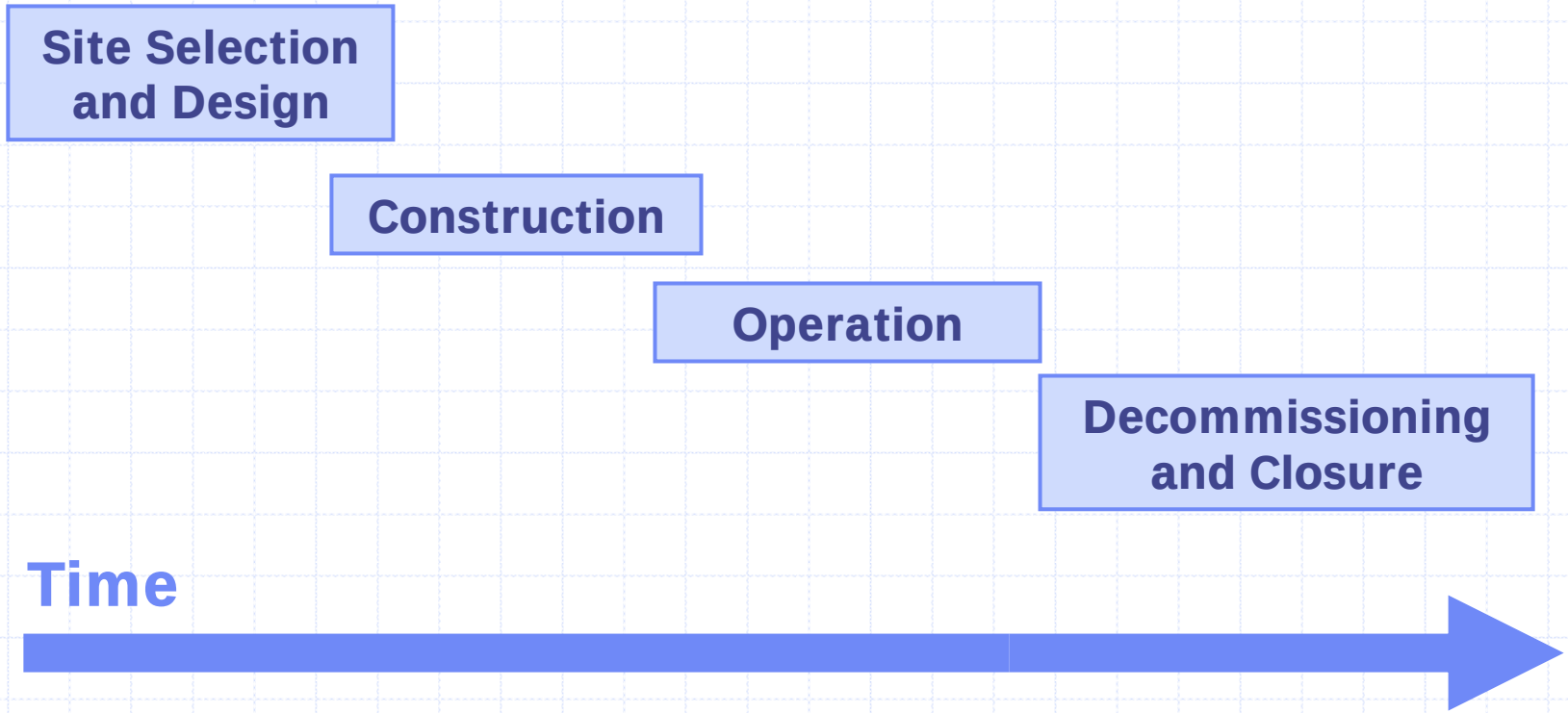
Implement an annual management review of the adequacy of policies, objectives and performance of the tailings management framework

Ensure that the scope of this review is appropriate to the level of identified risk

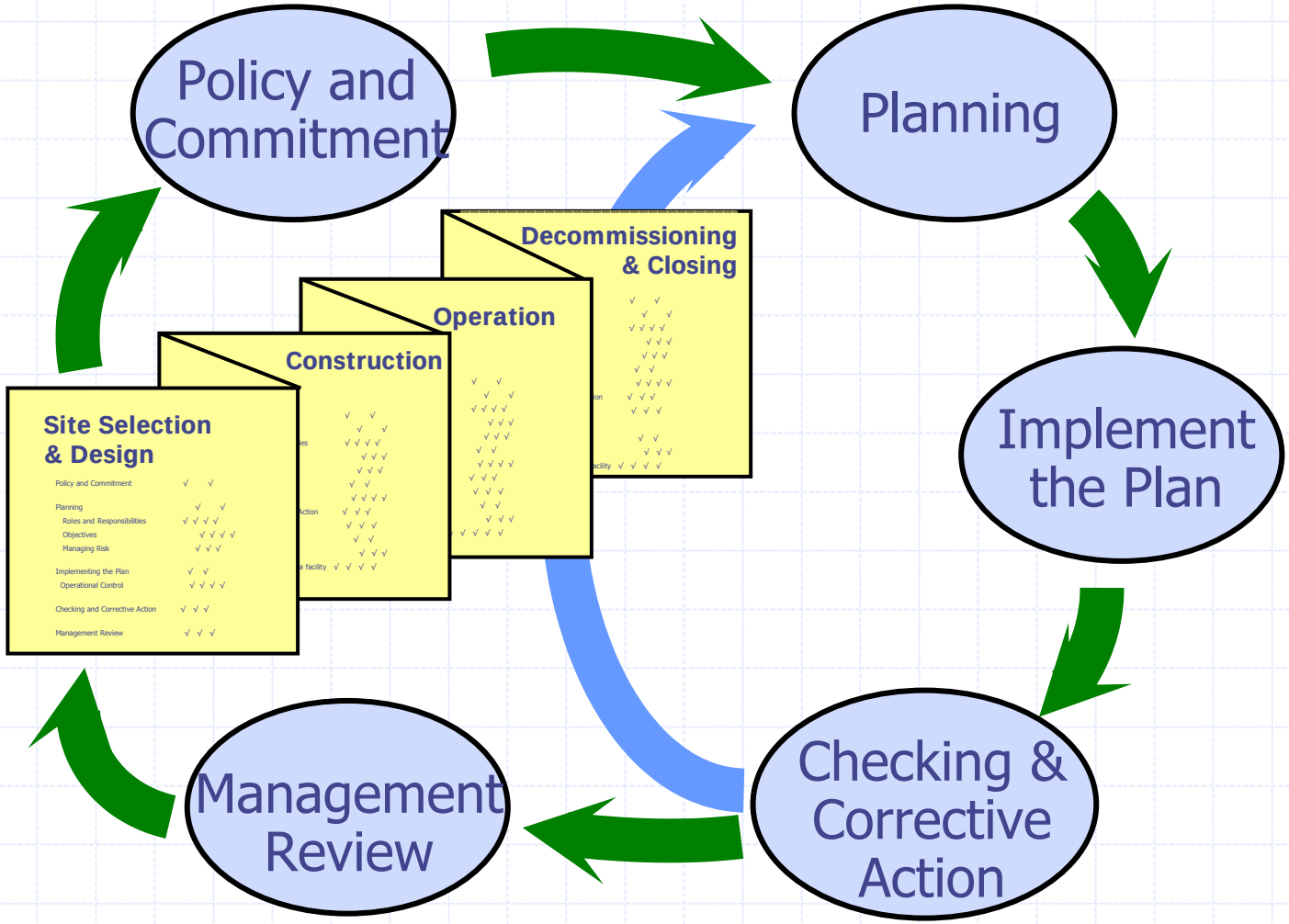
Address possible need for changes

Encourage ongoing environmental and safety research to effect continual improvement

The Tailings Management Framework Applies Through the Full Life Cycle of a Tailings Facility



Application of the Framework through the Life Cycle



How to Use the Guide - Checklists

- The tailings management framework can be applied through the full life cycle of a tailings facility
- Customized checklists are provided to facilitate customizing the Framework into a site-specific tailings management system
- Separate checklist templates are provided for
  - Site Selection and Design
  - Construction
  - Operation
  - Decommissioning and Closing

Checklist For Operating A Tailings Facility

Management Action	Responsibility	Performance Measure	Schedule	Technical Considerations	References
Planning					
OBJECTIVES					
Develop plans to operate in conformance with design, and to:					
• meet legal requirements, operating licences, legislation, policies, codes of practice and commitments to stakeholders;					
• integrate preparation for eventual decommissioning and closure into ongoing operations;					
• blic health and safety;					
• onmental impact; and					
•					
• information dissemination to external					
PLANNING FOR OPERATION					
Review design documents, as-built construction drawings, conceptual operating and closure plans, environmental assessment and commitments to stakeholders.				C D E	
Prepare, review and update on a regular basis detailed plans for operation of the tailings facility:					
• water management plan;				C	
• tailings deposition plan;				C	

For example, is there a water management plan in place?

Assigning responsibility and authority for the management actions to individuals within the organization

Identifying the schedule requirements

Adding references applicable to the site and operations in the form of company standards and procedures, environmental policies, regulatory and permit requirements, commitments to stakeholders and selected documentation

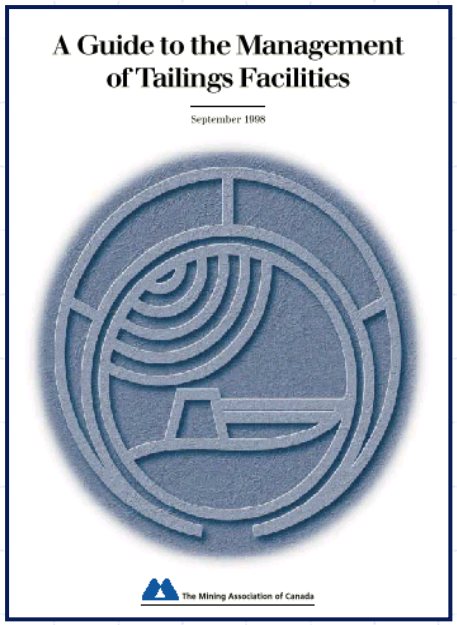
Determining relevant performance measures to ensure that objectives are tracked and met

Referring to checked (√) Technical Considerations as a basis for determining requirements, responsibilities and performance measures

Using the Tailings Management *Guide*

Inputs

- Establish guiding principles
- Create a site specific framework
- Assign responsibilities
- Complete checklists



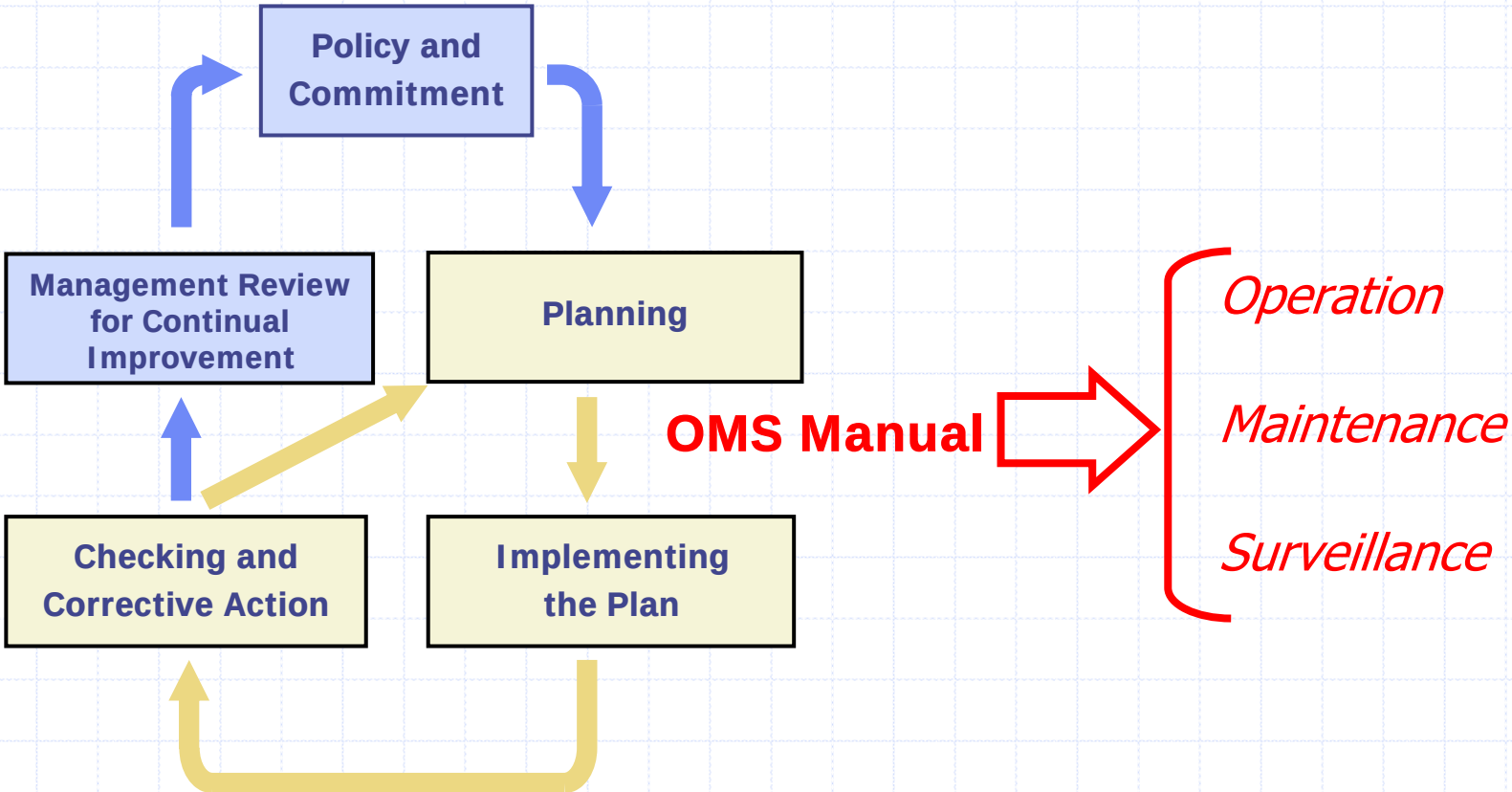
Outputs

- Gap analysis
- Formalized framework
- Management systems
- Position descriptions
- Continual improvement and environmentally responsible management of tailings
- Due diligence

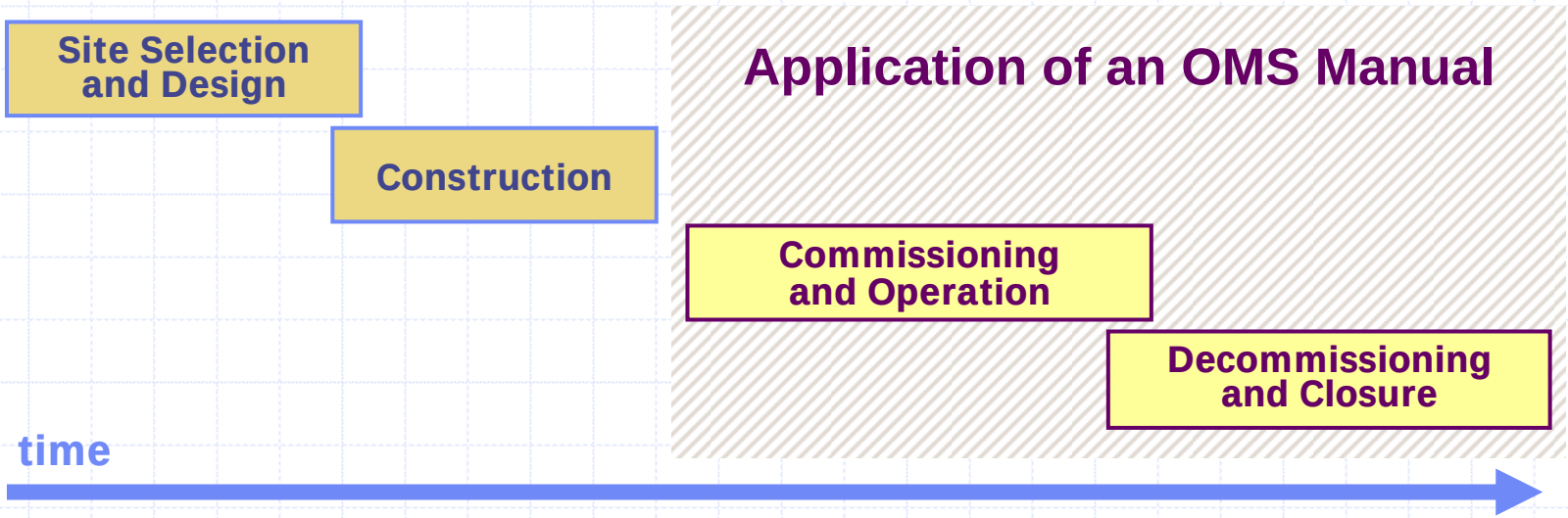
An OMS Manual

- The MAC guide **Developing an Operation, Maintenance and Surveillance Manual for Tailings and Water Management Facilities** was developed to help companies day-to-day tailings management, ensuring
  - roles and responsibilities of personnel assigned to the facility are defined
  - procedures required to operate, to maintain and to monitor performance (surveillance) of a facility, are documented so that the operations
    - meet regulatory and policy obligations
    - function in accordance with design
  - essential information and record-keeping requirements are identified
  - site experience is recorded so that it can be passed on to others
  - procedures and processes for managing risk … and managing change are defined

An OMS Manual fits within the Tailings Management Framework



Planning Context for an OMS Manual



- OMS manuals should be applied at commissioning of a tailings or water management facility
- *Preparation of an OMS manual should begin with the facility design*

Outline of an OMS Manual

- Roles & Responsibilities
- Facility Description
- Operation
- Maintenance
- Surveillance
- Emergency Planning and Response

Roles & Responsibilities

Roles-Responsibilities

Facility Description

Operation

Maintenance

Surveillance

Emergency Planning

- Organization, Structure & Individual Responsibilities
- Competency & Training
- Managing Change

Has someone with fiscal authority been assigned responsibility?

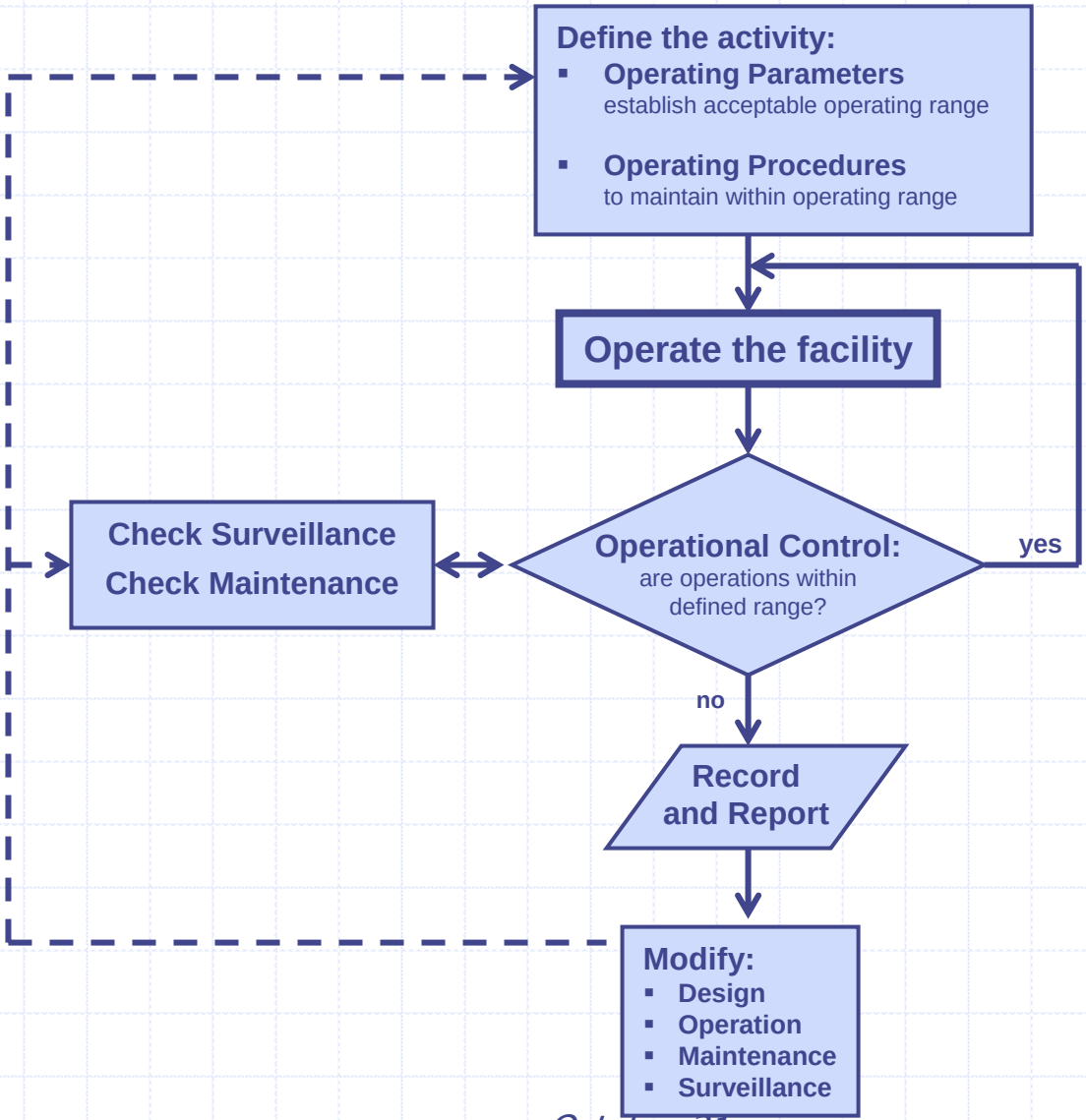
Has the tailings management team been defined? Is a reporting protocol defined?

Is there a training program in place? Is there confirmation of the training?

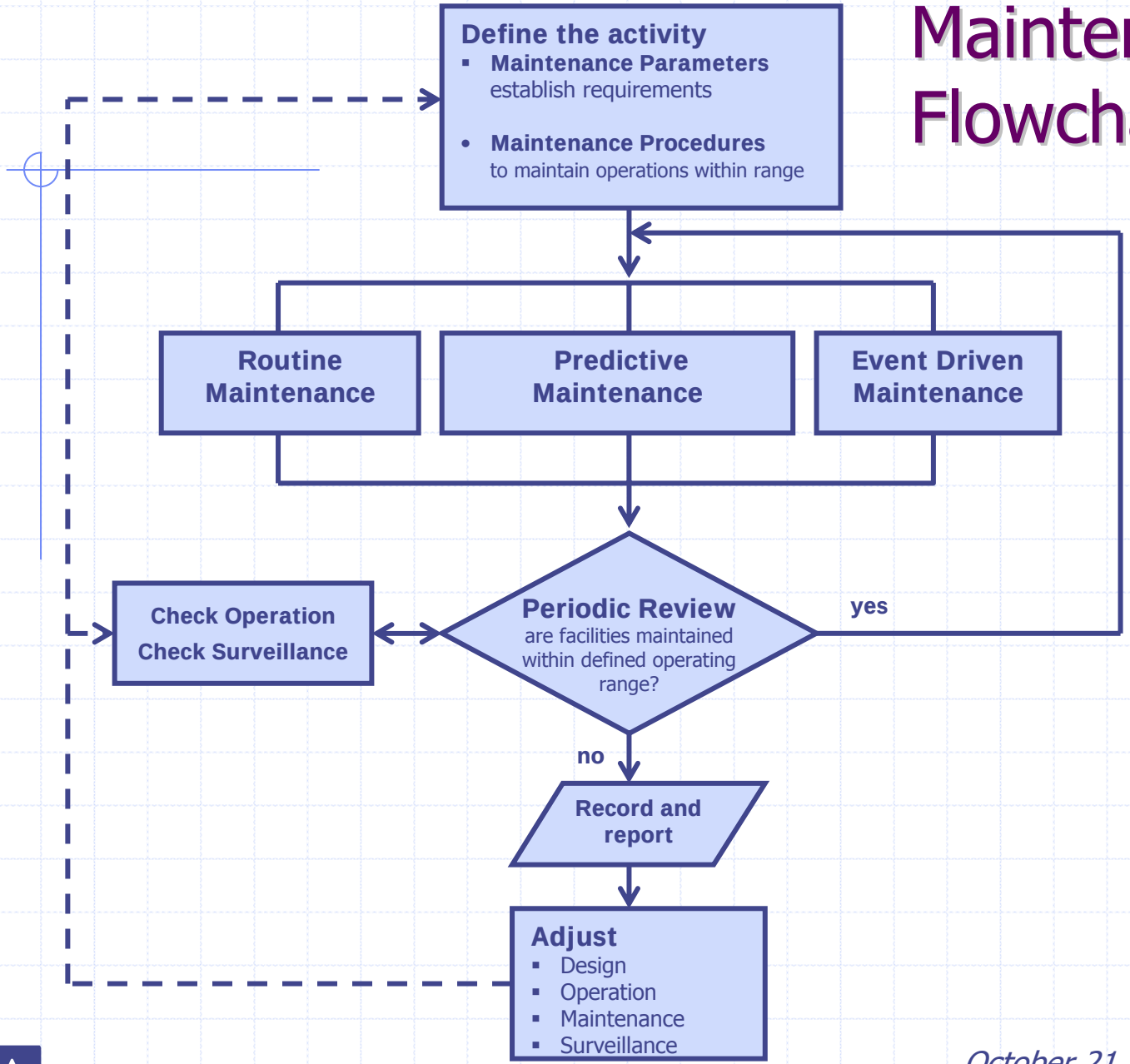
Is there a system in place to track changes as people rotate?

Operation Flowchart

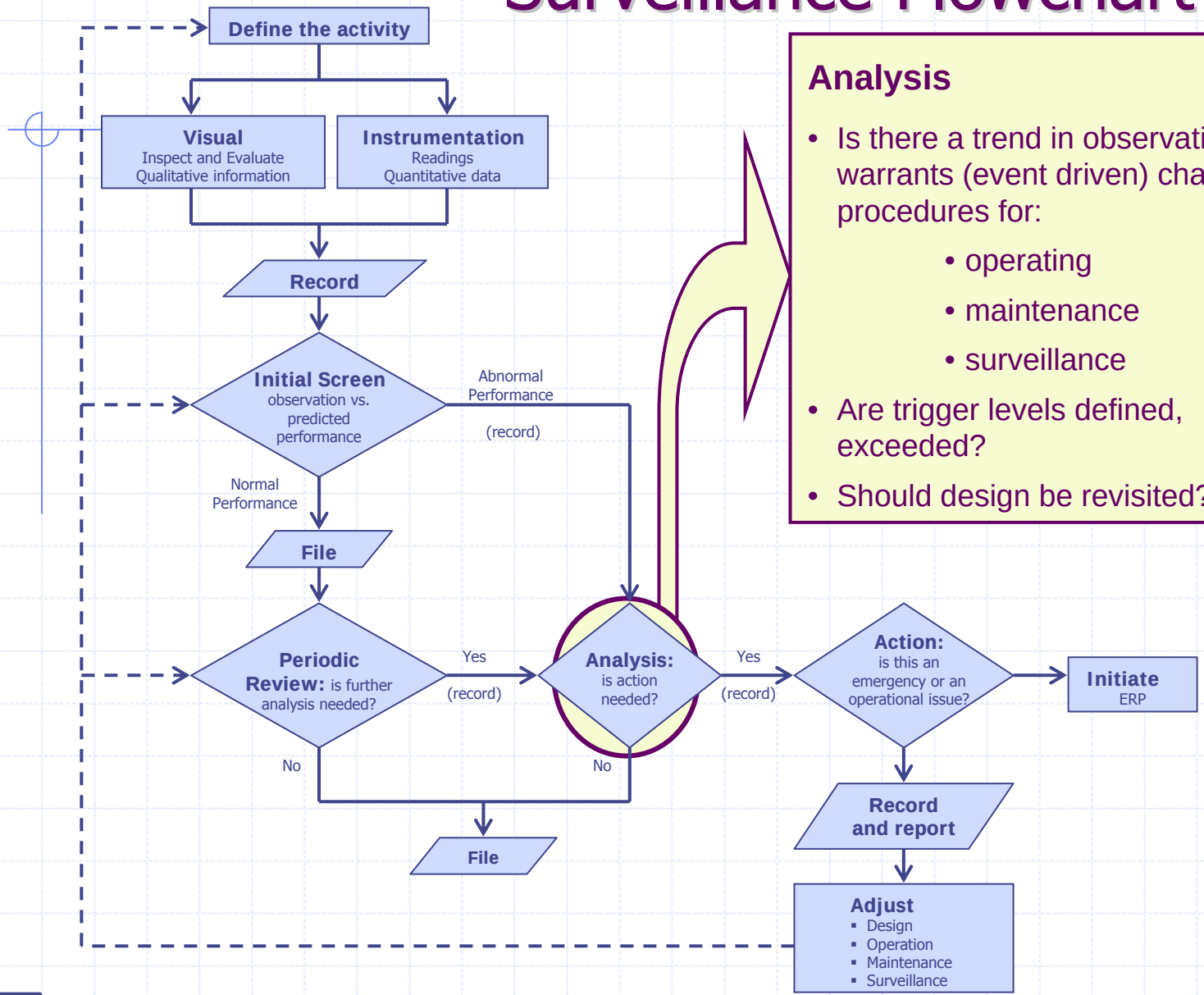
The guide provides flowcharts as a framework for each chapter of your OMS



Maintenance Flowchart



Surveillance Flowchart



Analysis

- Is there a trend in observations that warrants (event driven) change in procedures for:
  - operating
  - maintenance
  - surveillance
- Are trigger levels defined, exceeded?
- Should design be revisited?

OMS & Continual Improvement

- Development and implementation of an OMS Manual is a significant undertaking requiring involvement from individuals throughout and from outside the organization; it is intended to pull together all operating criteria, parameters, and procedures related to structural integrity of the dam
- Evaluation of the OMS manual, its implementation, and its effectiveness should be incorporated into annual tailings management system reviews
- An OMS manual should be updated to correlate performance with expectations, design criteria and operating intent
  - annually, and
  - at times of significant change to facility parameters

Verification of Tailings Management

- MAC Tailings Working Group has developed a **A Guide to Audit and Assessment of Tailings Facility Management**
  - built on the Tailings Management Framework as presented in the *A Guide to the Management of Tailings Facilities*
  - includes both 'Audit' and 'Assessment' methodologies to measure the tailings management performance against the best practices contained in the *A Guide to the Management of Tailings Facilities*
    - site specific
    - step-by-step process
  - provides guidance to
    - auditors / assessors
    - operators (to prepare for an audit or assessment)
    - corporate management
  - supports
    - internal verification
    - External or 3rd party verification
  - planned publication release date – Fall 2008

Verification of Tailings Management, 2

- Two distinct and separate protocols are presented for the verification of tailings management system implementation: audit and assessment
  - **Audit** is formal, systematic and documented examination of an organization's or facility's conformance with explicit, agreed, prescribed criteria; which often include often requirements stipulated in law or regulation or, in the case of this Guide, the MAC tailings management framework
  - **Assessment** goes beyond measuring against stipulated criteria (audit), to incorporate professional judgement in an evaluation of the effectiveness, implementation, application and maintenance of a management system

- The protocols are presented as a series of questions for audit, and guiding statements for assessment, addressing the fundamentals
  - what elements of a tailings management system are in place
  - how they are organized and implemented
  - who has responsibility and accountability

Audit

- Seeks to evaluate and report on conformance or non-conformance with stipulated criteria based on the systematic collection and documentation of competent evidence
- Is not based on opinion, nor is it designed to determine root cause of deficiencies, or to evaluate management system effectiveness
- Examines the implementation of specific tailings management system components to test conformance with the MAC Tailings management framework
- Leads to yes / no responses to provided questions about the tailings management system

Assessment

- Starts with, and goes beyond measuring against stipulated criteria (audit)
- Incorporates professional judgement in an evaluation of the effectiveness, implementation, application and maintenance of the tailings management system
- The guide provides guidance to the rating of management process effectiveness, through illustrative examples of management process markers that
  - meet the minimum accepted threshold expectations, or
  - may be regarded as demonstrating leadership as a "best" practice
- Is driven by a concern for quality of system design and management process implementation
- Can identify system deficiencies and determine their root cause(s) to provide a basis for process improvement

In Summary: The Tailings Management Trilogy

- Has been designed to
  - provide practical tools to help industry manage their tailings and water management facilities responsibly and safely
  - demonstrate this responsible management to regulators and the public
  - reflect the priorities of owners, managers and practitioners whose job it is to improve the safety and environmental performance of the mining industry in Canada and abroad
  - including a commitment to continual improvement in tailings management

- Provides a strong message to tailings facility owners, operators and contractors
  - the key to safe and environmentally responsible management of tailings
    - is consistent application of sound engineering capability
    - within an effective management framework
  - the guides also provide a means to achieve the management side of this formula

Towards Sustainable Mining

- *A strategy for improving the mining industry's performance by aligning its actions with the priorities and values of Canadians.*

- *A process for finding common ground with our communities of interest, to build a better mining industry today and in the future.*

Tailings Working Group and TSM

- Under MAC's Towards Sustainable Mining (TSM) initiative, the Tailings Working Group has developed the following Performance Indicators for tailings management, to assess implementation of key components of the Tailings Management Framework:

1. Tailings management policy and commitment
2. Tailings management system
3. Assigned accountability and responsibility for tailings management
4. Annual tailings management review
5. Operation, maintenance and surveillance (OMS) manual

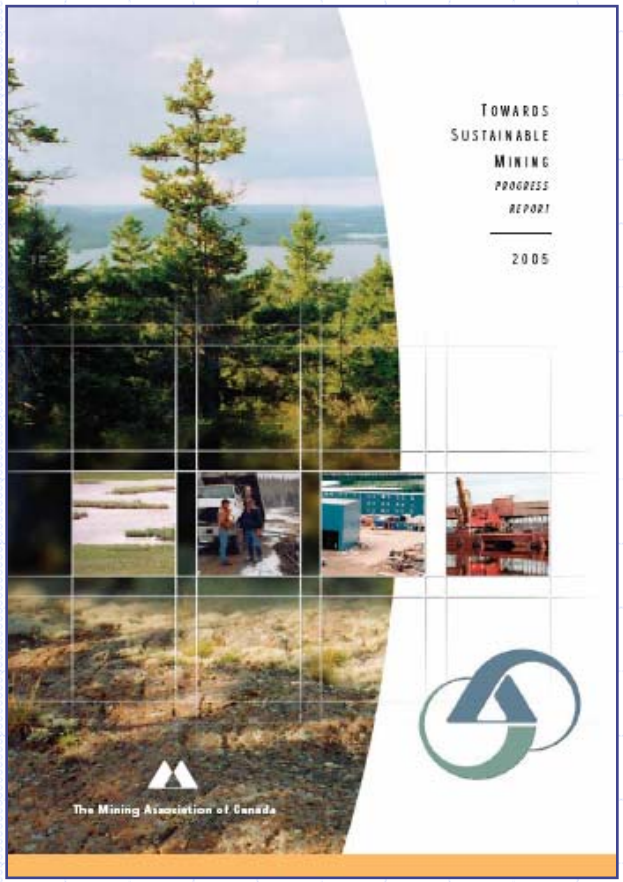
TSM Tailings Management Performance Assessment Criteria

Common performance assessment criteria are applied for all tailings management Performance Indicators

Level	Criteria
1	No systems in place; activities tend to be reactive; procedures may exist but they are not integrated into policies and management systems
2	Procedures exist but they are not fully consistent or documented; systems/ processes planned and being developed
3	Systems/processes, in conformance with the tailings management framework as presented in MAC's A Guide to the Management of Tailings Facilities are developed and implemented
4	Systems/processes have been formally verified
5	Excellence and leadership is demonstrated through validation by external verification

What gets reported to the public?

- MAC members publicly report against these Performance Indicators to assess tailings management practices across the industry
  - Began in 2004 – (publication of environmental releases began in mid- 1990s)
  - Through MAC's TSM report (formerly the MAC Environmental Progress Report)
- Canadian facility-level assessments
- Voluntary reporting of international facility performance (Inmet, IamGold and Breakwater (2009)



- For additional information: www.mining.ca