Monitoring Requirements

This fact sheet provides water monitoring requirement information to operational sites. Monitoring provides information that may be used to assure the regulator that the site is being managed in accordance with environmental permits and management plans.

This fact sheet includes information on:

- Development of monitoring objectives and a monitoring plan;
- Surface and groundwater monitoring;
- Maintenance of water balance;
- In-pit sampling and geological mapping;
- Block model updates; and
- Waste rock and tailings dam monitoring.

Designing a monitoring program requires knowledge of the biological, physical and chemical characteristics of the site. Monitoring may be required for the purpose of managing site-based operation, but also may be requested by stakeholders to assure the community that the project is not causing a significant adverse outcome to their community. This type of sampling forms part of the company's "social licence".

Monitoring Objectives and Plan

The proponent and the regulator generally define monitoring objectives prior to commencement of the project. The regulator often needs a level of community consultation in the development application phase, during which the community may be able to request additional monitoring to provide assurances that operations are protecting the local environment.

The objectives of the monitoring plan should include (INAP, 2009):

- Characterisation of baseline conditions – understanding baseline conditions allows the operation to pre-operational conditions;
- Detect or Predict the Onset of AMD – monitoring can indicate if the AMD management plan is being implemented successfully by showing if there are contaminants in the water around sites;
- Verification of Expected Behaviour – monitoring can confirm that an AMD management plan is working as expected;
- Assess Impacts to the Receiving Environment – This kind of monitoring assesses if areas downstream of site/s is being impacted by the operation; and
- Environmental Management – designed to monitor environmental performance such as engineering controls for waste management and tailings dam designs.

Monitoring objectives can be set at the beginning of the project and should change as the operation progresses and the geochemical, physical and biological processes on the site are modified and better understood. Figure 15 shows the steps to develop a monitoring program for sites with AMD (INAP, 2009).

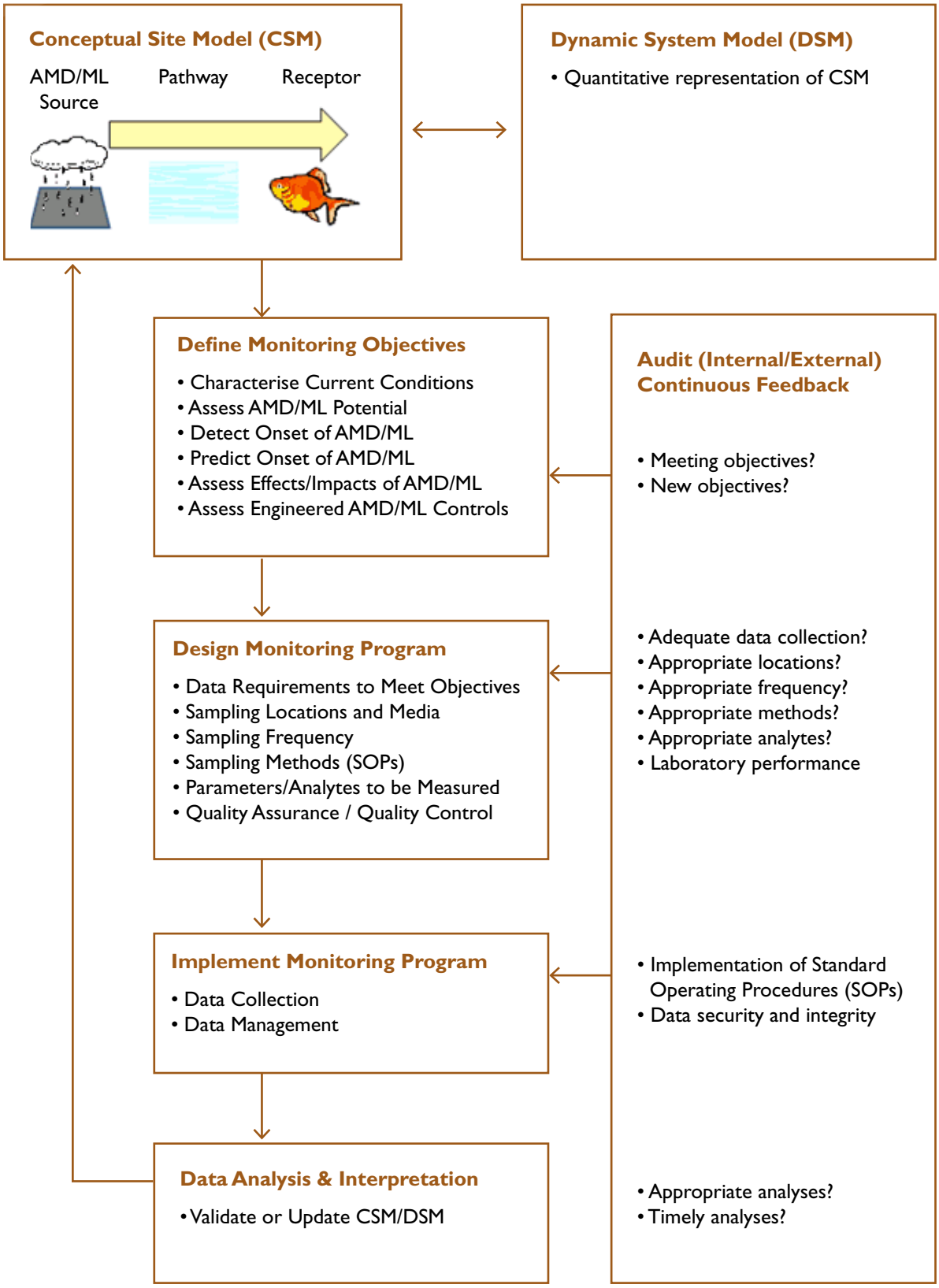

Figure 15 – Steps in the Development of an AMD Monitoring Program (Source: GARD Guide, Chapter 8.3).

Water Monitoring

Water monitoring within a monitoring program generally comprises both surface and groundwater quality data. Surface water quality is generally cheaper and easier to access for regular routine monitoring. Analytes for monitoring are generally chosen by knowledge of the host geology and acid generation theory (MEND, 2001). It is important to understand the water balance of the drainage, including, rainfall, groundwater and run-off (MEND, 2001). Surface water quality 'limits' for contaminants of concern are generally set by the regulator in Tasmania, remaining below these limits is law.

An important aspect of surface water monitoring is the collection of flow data where possible to calculate contaminant loads. Contamination loads are used to estimate any potential environmental impacts downstream. The contaminant loads can be compared to baseline conditions and industry standards.

Groundwater monitoring programs are used to monitor groundwater levels and chemistry. Changes in groundwater are common in mining due to the significant landscape changes that can occur because of both open cut and underground mining. Contamination of local groundwater can be a significant risk, and is very difficult to reverse once it occurs. Tailings dams and waste rock dumps can significantly alter the local water balance, having an effect on the groundwater levels and chemistry.

Maintenance of the Hydrological Model

A hydrological model should have been developed during the feasibility stage and continually updated with changes in the landscape. The surface and groundwater information should report back to the hydrological model, with updates to the site water balance occurring regularly. Continuously changing landscapes during mining operations can alter the water balance of the site, and the water balance may also be effected by significant environmental events such as drought or flood.

Operational Geological Sampling and Block Model Updates

During operations, site geologists generally undertake sampling. These samples should ideally be used to continuously update the site block model. Geology staff generally conduct face mapping in both underground and open cut mines. This information should be digitised and also report back to the site block model.

Waste Rock and Tailings Dam Monitoring

Sensor-based monitoring of both waste rock dumps and tailings dams are both routinely required by the Tasmanian regulator. Sensors which may be required by the regulator in a waste rock dump are: lysimeter, oxygen and temperature sensors. These are designed to measure how much moisture and oxygen is present in the dump, which can indicate if the dump design is working as expected. The temperature sensor is designed to show elevations in temperature, which would indicate a sulfide reaction by an increase in temperature.

Monitoring Requirements

Fact Sheet 5

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