

# Sustainable management of contaminated sites

## Presentation 4.1 Phase 4 - Remediation management

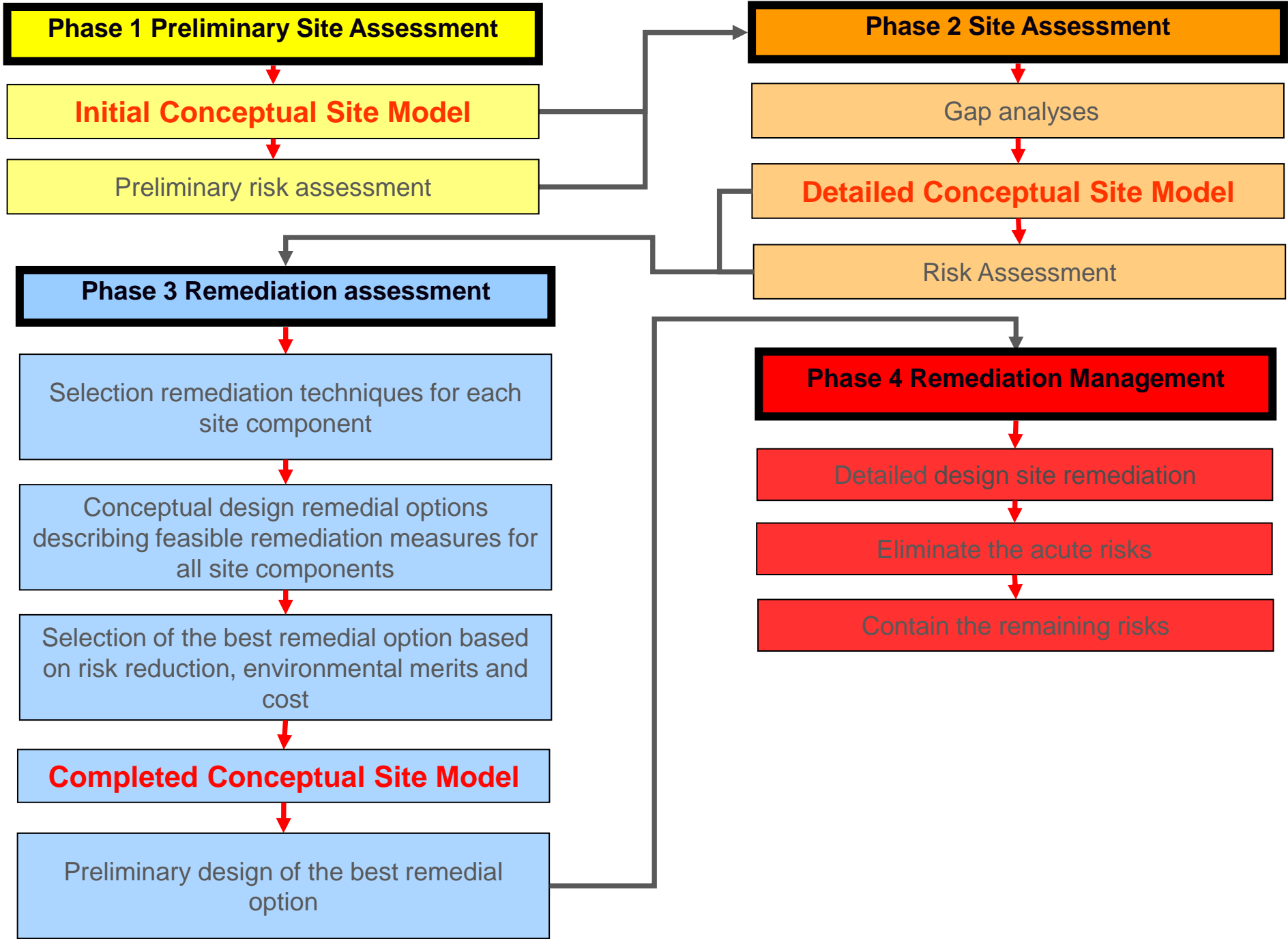
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# Content

- Introduction
- Objectives
- Remediation strategy
- Implementation
- Process





# Introduction

- Detailed design best remedial option
  - ✓ Already done in Phase 3
  - or
  - ✓ To be done by contractor
- Selection of tendering method
  - ✓ Item based – detailed design done in Phase 3
  - ✓ Lump sum – detailed design in TOR of Phase 4
  - ✓ Design and construct - detailed design in TOR of Phase 4
- Tendering
- Selection of tenderer
- Contracting
- Management and monitoring
- Closure



# Remediation objectives

1. To eliminate, reduce, and contain the environmental risks
  - Types of environmental risks are:
    - ✓ Impact human health by exposure to contaminants
    - ✓ Impact the ecosystem by exposure to contaminants
    - ✓ Migration of COC by wind and water erosion processes
    - ✓ Migration of COC to the groundwater by seepage or infiltration
    - ✓ Migration of COC in the groundwater by natural groundwater flow and flow enhanced by pumping/ drainage
2. Remediation by removing or altering the (chemical and physical) properties of the properties of contaminants
3. Detailed remediation design should be focused on the most cost-effectivity



# Remediation strategy

- Risk based approach
- Phased implementation
  - ✓ Eliminate the direct risks on the short-term
  - ✓ Remediate potential risks on the mid-term
  - ✓ Contain and monitor the latent risks on the long-term
- Dynamic work plan
  - ✓ Plan some extra time
  - ✓ Have at least 10% for unforeseen/contingency
  - ✓ Have a fallback scenario



# Implementation

## Start by elimination of direct risks

- Remove the source
  - ✓ Excavate, repack and destruct hazardous waste from source area(s)
- Cut of the receptor's pathways
  - ✓ Control erosion
- Protect the receptors
  - ✓ Fence source areas
  - ✓ Restrict land-use



# Implementation

## Containing potential risks

- Maintain fencing
- Maintain restricted land-use
- Implement erosion control measures
- Pump & treat contaminated groundwater
- Restore vegetation cover





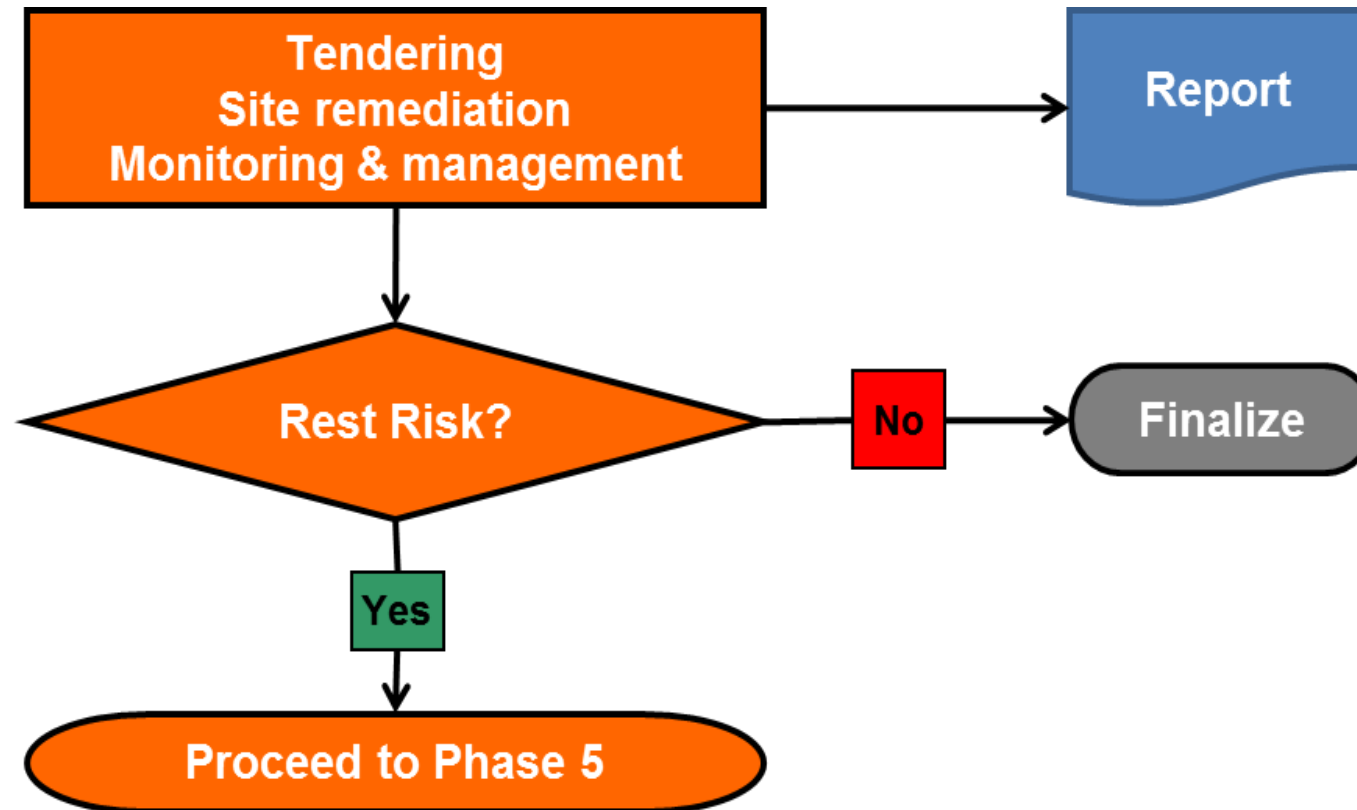
# Implementation

## Monitor the latent risks

- Install buffer zone and monitor
- Monitor the soil and groundwater quality
- Maintain erosion control measures
- Maintain vegetation cover



# The Process Phase 4



# Thank you!

# Questions?

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