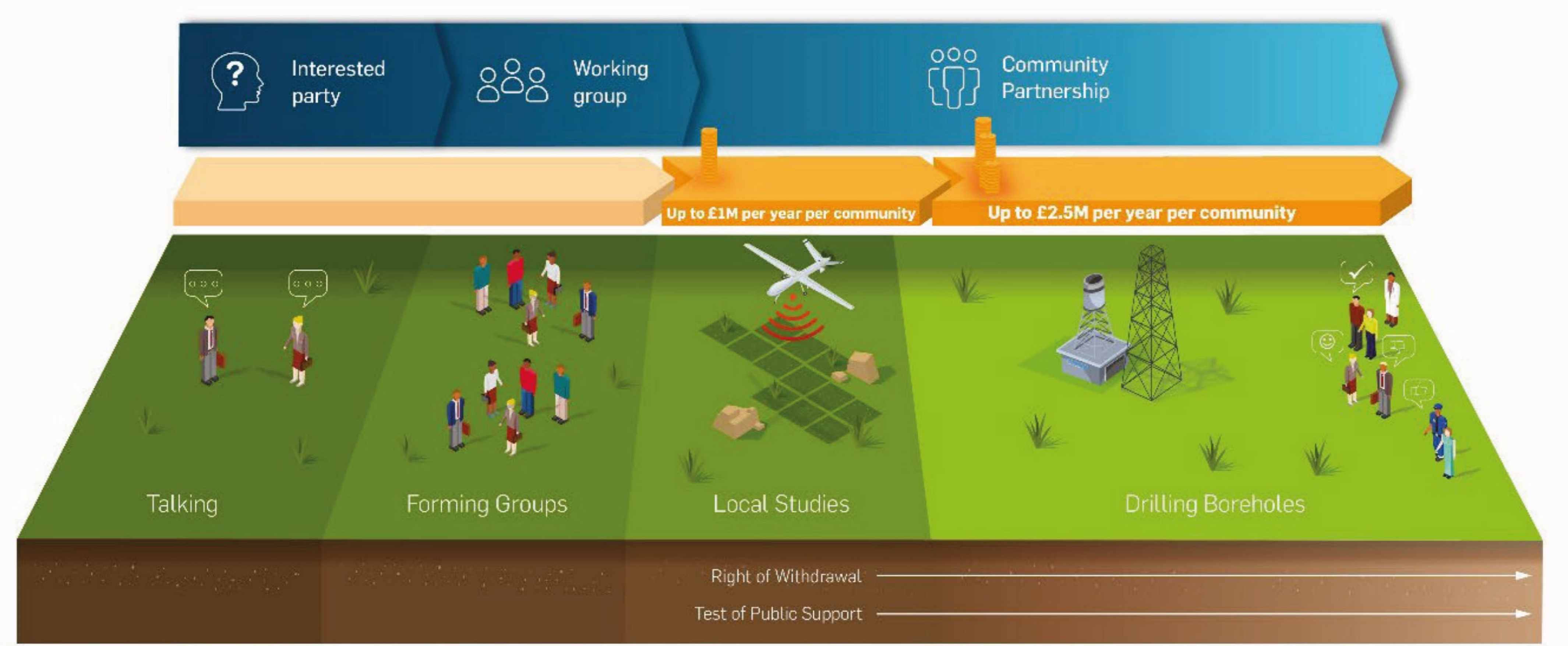
RWM: Siting process

16 September 2020

Radioactive Waste Management

Working together to protect the future

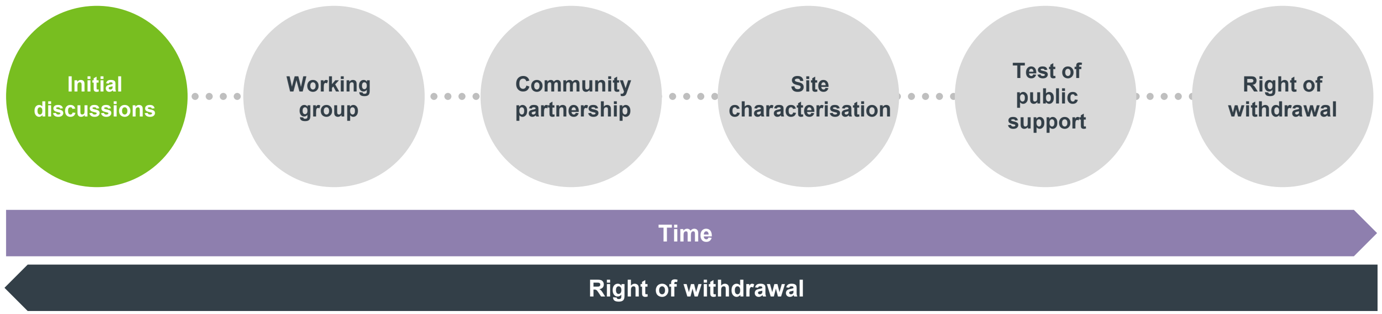
Siting process



Initial discussions

Any person or group of people who wish to propose an area for consideration can approach RWM for initial discussions and to find out more about geological disposal.

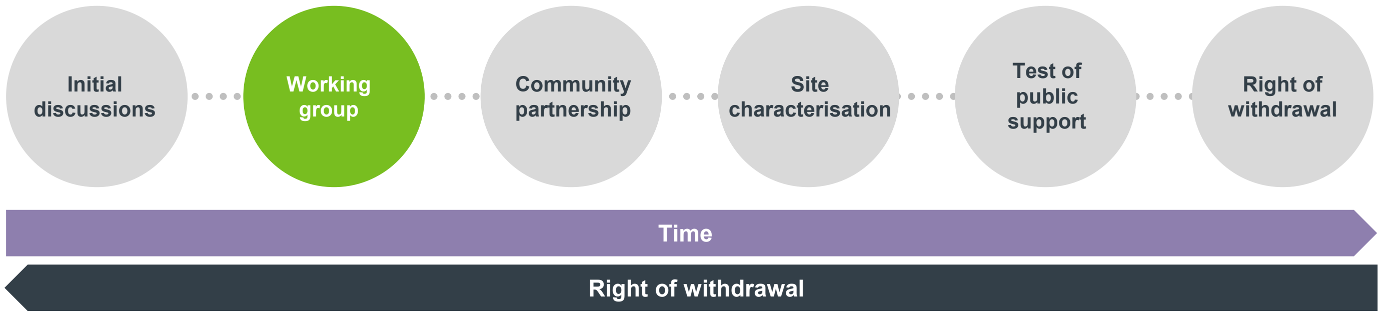
After agreement that the proposal merits further consideration, discussions are opened up more widely in the community.



Working Group

The Working Group will consist of at least the Interested Party, RWM, an independent chair and facilitator.

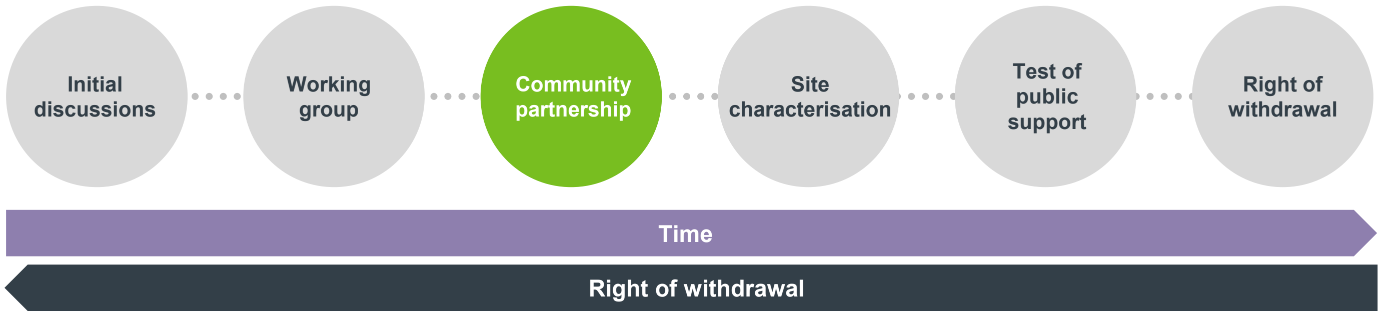
All relevant principal local authorities must be informed, and invited to join a Working Group. Local authorities do not need to join a Working Group at this stage. They will receive financial support to allow them to take part, if they decide to, so that they can understand the issues, questions and concerns that a community has.



Community Partnership

The Working Group could then establish a Community Partnership, formed of community members and organisations, RWM and at least one relevant principal local authority.

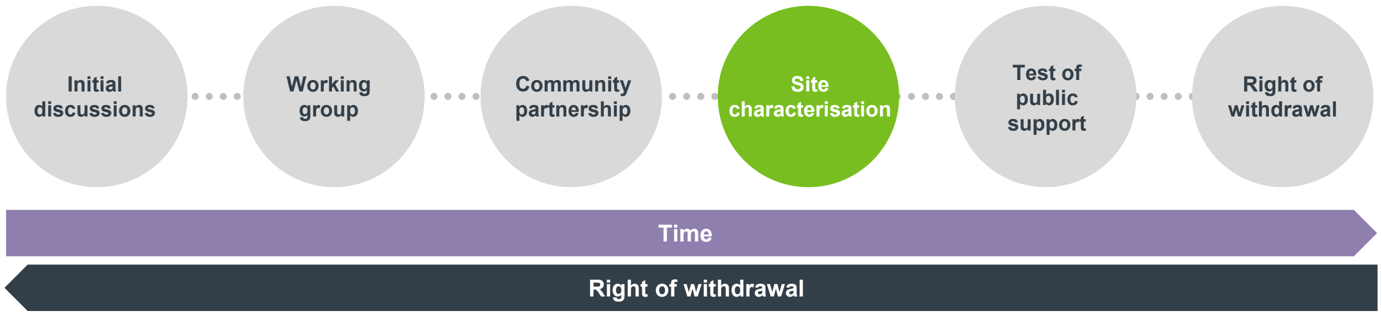
An important job for a Community Partnership is to share information with the community and find answers to any questions that they may have as well as developing the community vision for the future.



Site characterisation

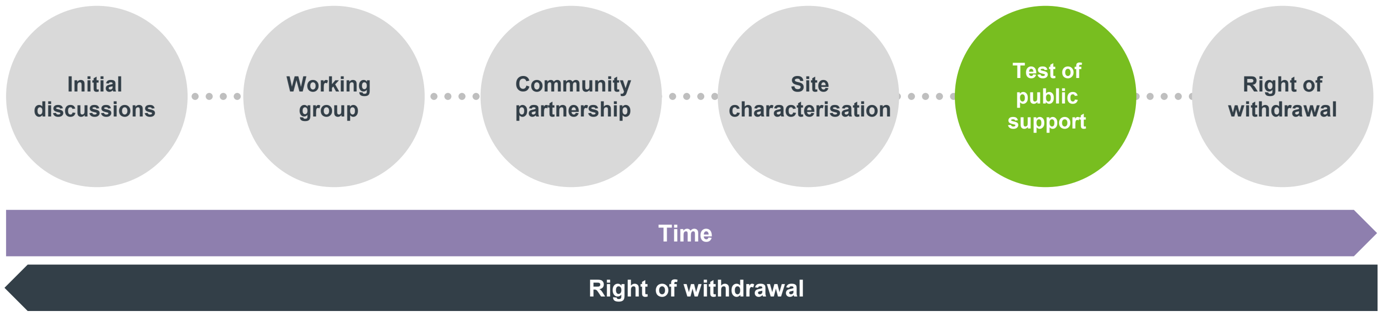
There is an in-depth process of site characterisation to understand if a specific site is suitable for a GDF.

This is a key source of data, rock-cores and groundwater for the research programme.



Test of public support

Before a final site is selected for a GDF, the potential host community must demonstrate it is willing to host a GDF by having a Test of Public Support.

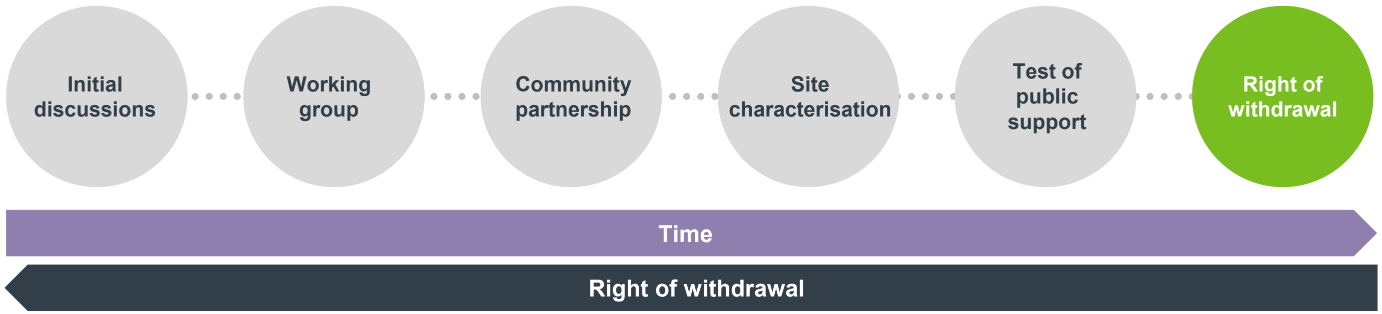


Right to withdrawal

At any point, up to a Test of Public Support, a community may withdraw from the siting process.

The decision to withdraw a community would be taken by the relevant principal local authorities on the Community Partnership but, in areas with two tiers of local authority involved, both would have to agree for the community to be withdrawn.

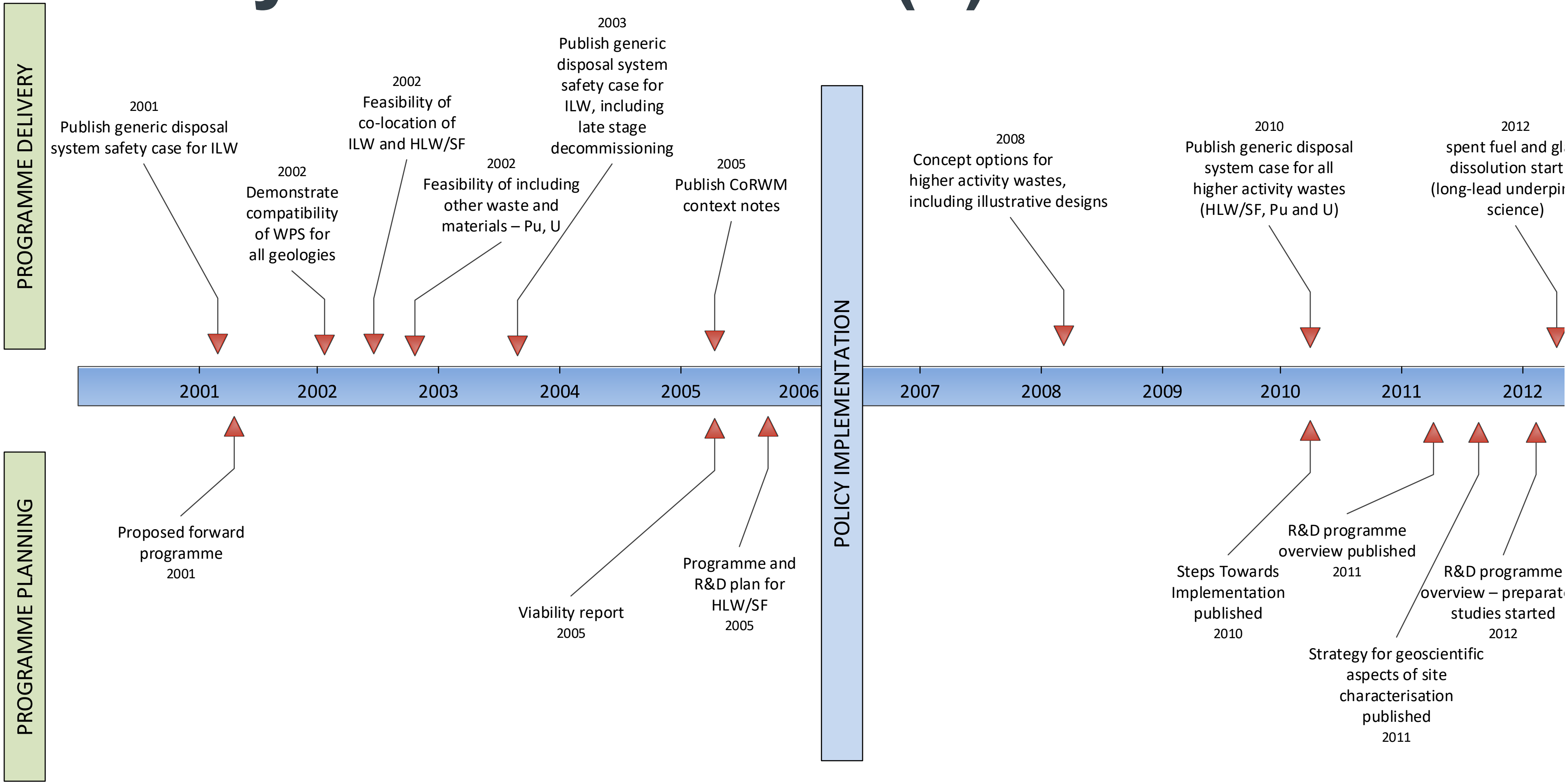
RWM also has the ability to withdraw.



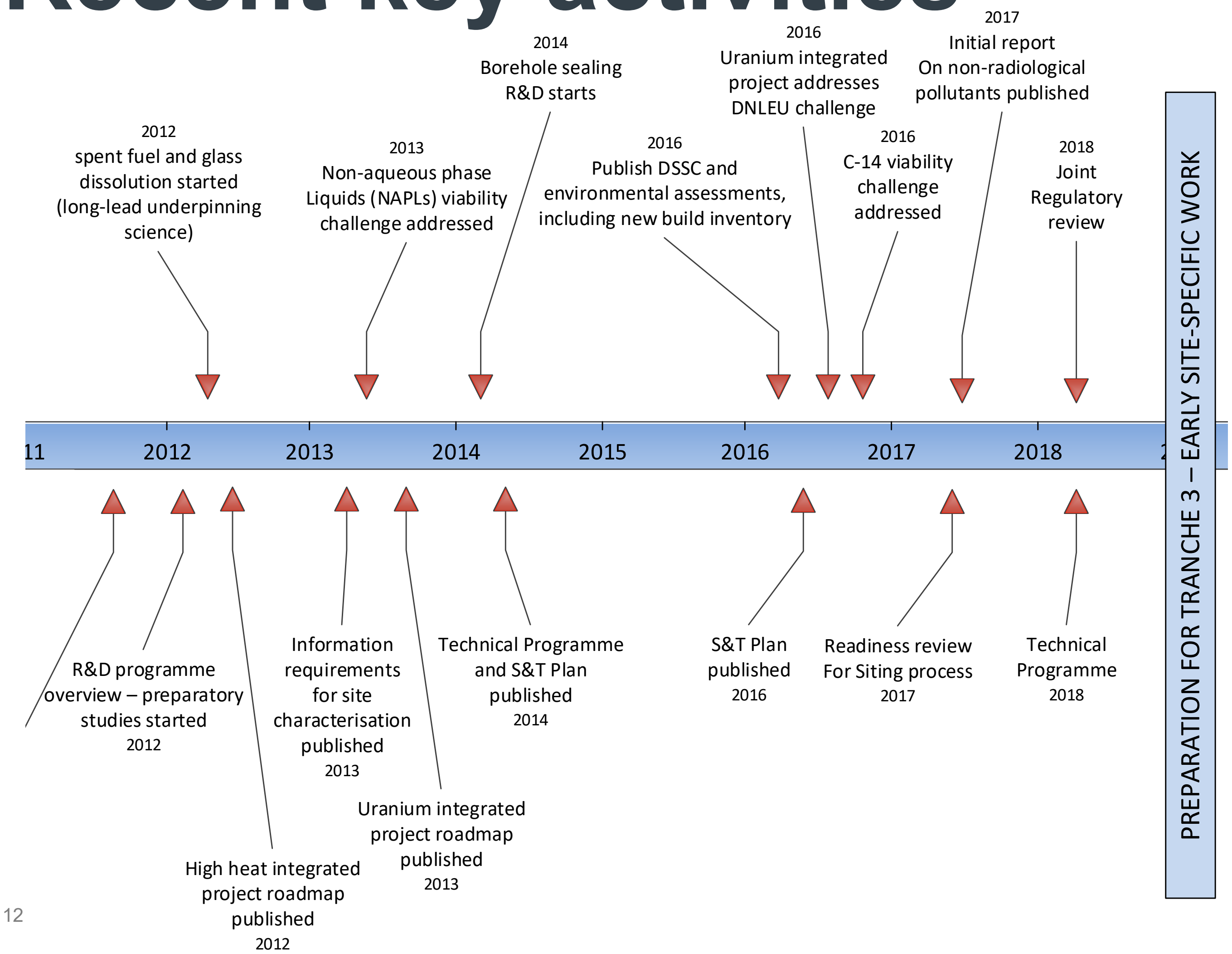
RWM: Research & development programme

16 September 2020

Past key achievements (1)

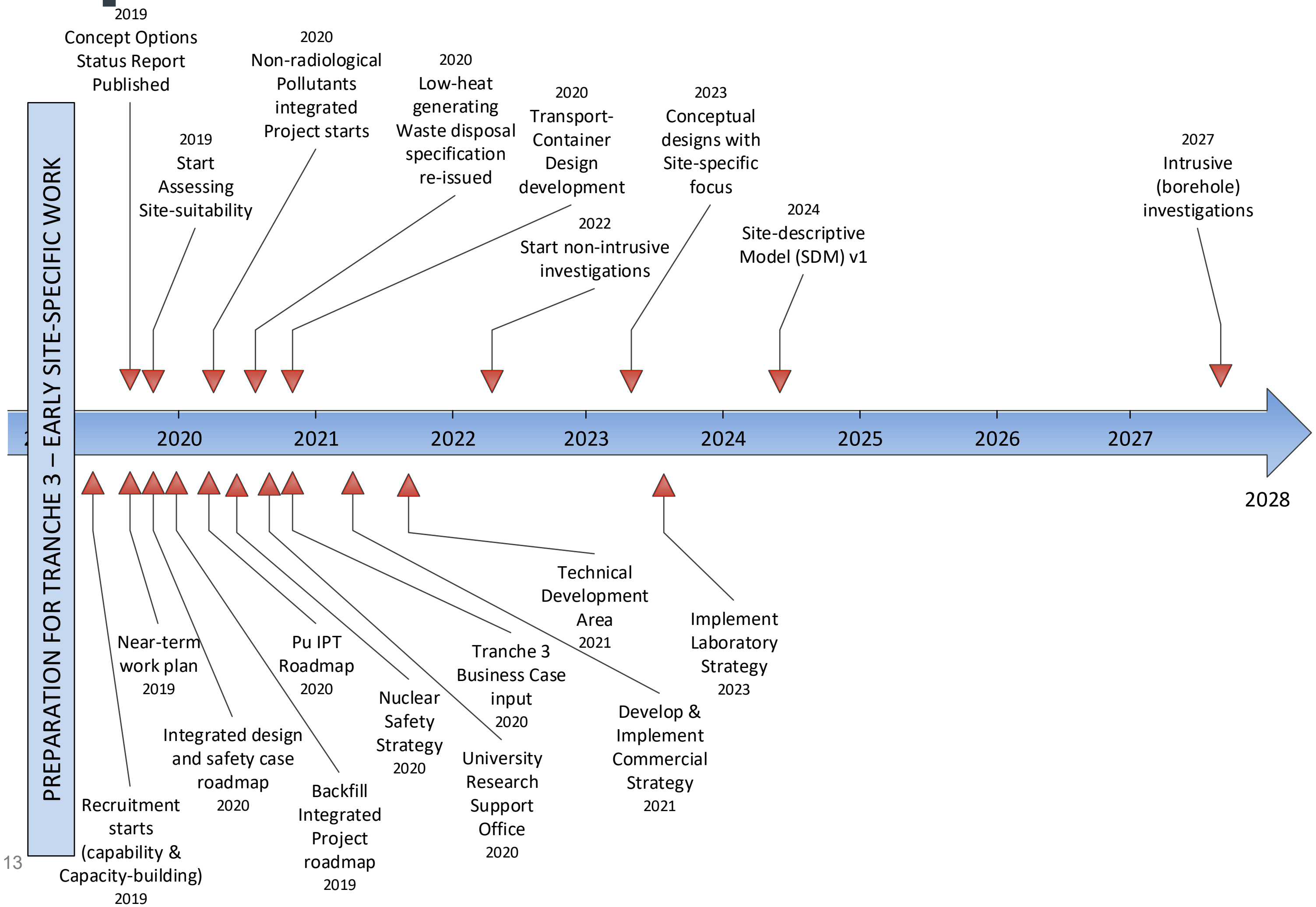


Recent key activities



- Progress in areas highlighted in 2010 and 2016 generic safety cases.
- Integrated projects addressed key uncertainties.
- Closure of viability challenges.
- Early work to support site-characterisation.
- Start of detailed planning for GDF delivery.

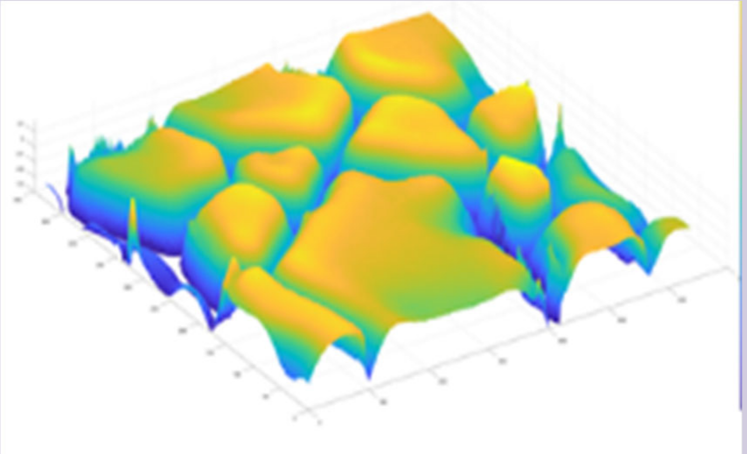
…present and future



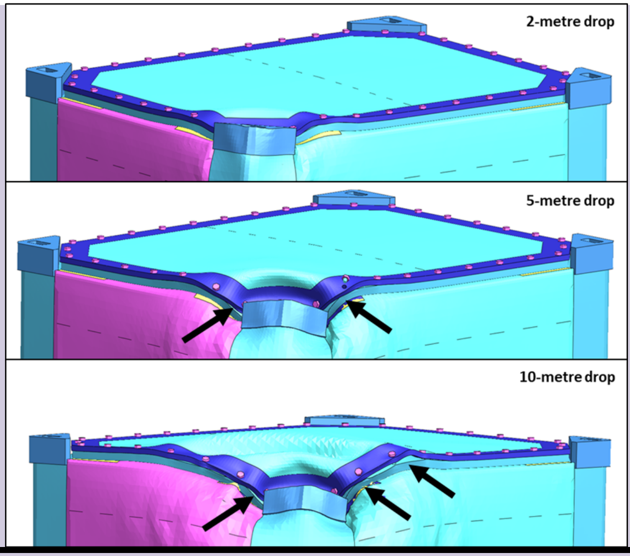
- Transformation into an infrastructure delivery organisation…
- …for delivery of one of Europe's largest environmental projects.
- Operating until ~2200
- Operational safety case with first of a kind challenges
- Post-closure safety case covering ca. 1 million years.

The four complementary approaches

3D map of several grains of $Gd_{0.15}Ce_{0.85}O_2$



Fundamental understanding

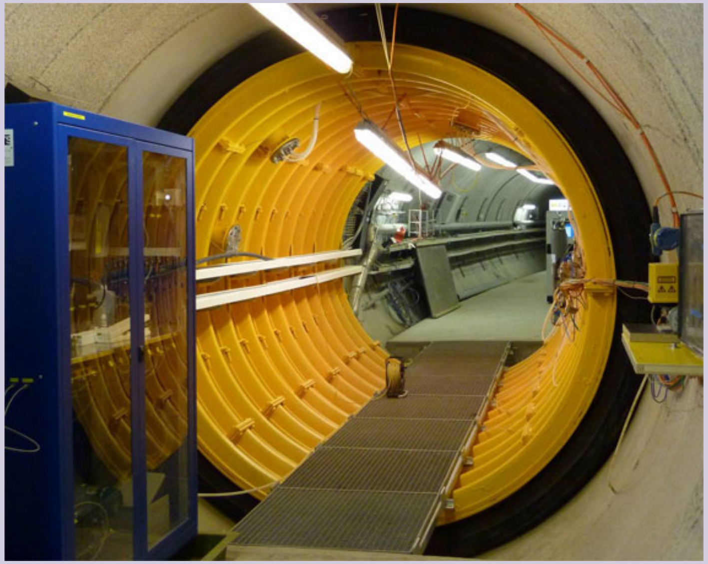


FEA Modelling of a dropped 2m Box, showing progressive damage with height

Process understanding through modelling

Natural analogues

60 million year old obsidian showing limited de-vitrification



Scale-up and demonstration

Colloid Formation & Migration Expt. – Grimsel Test Site

Needs driven - An example

CLAIM: A concept for sealing site investigation boreholes in accordance with environmental protection requirements has been developed at the generic R&D stage

Sub-CLAIM: Any changes to the properties of the borehole sealing system over the required time period will be acceptable

Sub-CLAIM: Requirements on the borehole sealing system can be determined for a given borehole

Sub-CLAIM: Required properties of the borehole sealing system can be achieved at the time of emplacement

ARGUMENT: Boreholes can be appropriately characterised (logged) such that zones of high and low permeability can be discriminated and appropriate sealing solutions utilised.

ARGUMENT: The permeability of the sealed borehole will be low enough such that a fast pathway cannot be formed

EVIDENCE: Seals can be placed with precision such that the integrity of bentonite seals is not challenged by high-flow zones

EVIDENCE: Borehole Sealing Phase 4 Project gives confidence that the UK supply chain can conduct borehole sealing in the full range of potential geologies

EVIDENCE: Borehole Sealing Phase 4 Project demonstrates that seals can be delivered to boreholes to adequate quality

EVIDENCE: Bentonite is not used to seal high permeability zones (grout is used) as it could be eroded

EVIDENCE: Borehole Sealing Phase 4 Project provides confidence that boreholes can be sealed in a range of geologies, including those in which the borehole could deform by creep, without the tool becoming stuck.

EVIDENCE: Laboratory and large scale (rig-hall) studies have shown that the techniques proposed for sealing boreholes address rock-seal interface and damaged zones

2020 S&T Plan WBS

- **Biosphere (10)**
  - General Biosphere Methodology (10.1)
  - Environmental Impact Assessment (10.2)
  - Radioecology (10.3)
  - Non-Human Biota (10.4)
  - Non-Radiological Pollutants (10.5)
  - Estuarine and Marine Systems (10.6)
  - Historical, Current and Future Climate (10.7)
  - Near Surface Hydrology (10.8)
- **Criticality Safety (20)**
  - Transport Criticality Safety (20.1)
  - Operational Criticality Safety (20.2)
  - Post-Closure Criticality Safety for LHGW (20.3)
  - Post-Closure Criticality Safety for HHGW-Spent Fuel (20.4)
  - Post-Closure Criticality Safety for HHGW- Plutonium and HEU (20.5)
  - Criticality Safety Assessments (20.6)
- **Engineered Barrier Systems (EBS) and their Evolution (30)**
  - EBS for LHGW (30.1)
  - EBS for HHGW (30.2)
  - Clay-Based EBS (30.3)
  - Cement-Based EBS (30.4)
  - Plugs and Seals (30.5)
  - Thermal Modelling of Heat-Generating Processes (30.5)
- **Gas Pathway (40)**
  - Gas in the Disposal System Safety Case (40.1)
  - Development of Generic Knowledge Base on Gas Generation (40.2)
  - Development of Generic Knowledge Base on Gas Migration and Reaction (40.3)
  - Development of Gas Related Conceptual Models and Numerical Solutions (40.4)
- **Geosphere (50)**
  - Develop Generic Understanding of Potential Implications of Past, Present and Future Large-Scale Natural Processes for a UK GDF (50.1)
  - Develop Generic Understanding of GDF-Induced Impacts on the Geosphere (50.2)
  - Development of Geosphere Conceptual Models and Numerical Solutions (50.3)
  - Preparatory Geosphere Studies to Facilitate Site-Specific Characterisation and Investigation (to include Thermal, Mechanical and Chemical, etc processes) (50.4)
  - Groundwater Tools, Techniques and Methods (50.5)
- **Modelling and Treatment of Uncertainty (70)**
  - Analytical Advice Provision (70.1)
  - Modelling and Treatment of Uncertainty (70.2)
- **Groundwater Pathway for Radionuclide & Non-radionuclide Species (80)**
  - Development and Maintenance of Thermodynamic Models (80.1)
  - Develop Generic Understanding of the Behaviour of Radionuclide and Non-Radionuclide Species in a GDF System (80.2)
  - Develop Understanding of Radionuclide Behaviour in the EBS (80.3)
  - Develop Understanding of Radionuclide Behaviour in the Geosphere (80.4)
  - Develop Understanding of Other Influences on Radionuclide Behaviour (80.5)
  - Develop Capability, Infrastructure, and Skills Required and Non-Radionuclide Research (80.6)
  - Representation of Radionuclide in Assessment Models (80.7)
  - Develop Understanding of the Behaviour of C-14 (80.8)
- **Waste Container Evolution (90)**
  - Material Science Studies in Support of Waste Container Development (SF, HLW, ILW, LLW) (90.1)
  - Develop Models for LHGW and HHGW Container Evolution Using Data Derived from Generic Stage Work Scope (90.2)
- **Waste Package Accident Performance (100)**
  - Impact Accident Performance (100.1)
  - Fire Accident Performance (100.2)
  - Combined Fault Accident Performance (100.3)
- **Wasteform Evolution (110)**
  - HLW Glass (110.1)
  - Non-Cementitous ILW/ LLW Wasteforms (110.2)
  - Plutonium, Uranium and Other Wasteforms (110.3)
  - Spent Fuel (110.4)
  - Graphite (110.5)
- **Social Science (210)**
- **Environmental Safety Case (220)**
  - Post-Closure Safety Production (220.1)
  - Operational Environmental Safety Assessment (220.2)
- **Concepts Options and Alternatives (310)**
- **Waste Inventory Characterisation (320)**
- **Sub-Surface Facilities Design and Operational Safety (410)**
- **Surface Facilities Design and Operational Safety (420)**
- **Transport System and Containers Design and Safety (430)**
- **Site Characterisation (510)**
- **Strategic Waste Programmes (610)**

Working with the RSO

- Investing in future capability.
- Complementary capabilities, including social science and manufacturability.
- Working collaboratively, sharing research needs and enabling our academic partners.
- Addressing key risks, opportunities and uncertainties in our Technical Programme.
- Reassuring stakeholders through our world-class UK academic capability and integrity.
- Delivering best value to the UK – working smarter.