Low Level Radioactive Waste Repository – Construction Management Plan

Honeymoon Uranium Mine

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Revision History			
Date	**Version**	**Summary of Change**	**Author**
19 Jul 11	0.1	Initial draft version.	Melita de Vries
11 Aug 11	1.0	Final.	Melita de Vries
30 Aug 11	1.1	PIRSA and EPA amendments	Andrew Tonkin
30 Aug 11	2.0	Final	K Levingstone

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1 Background

Uranium One has been granted approval under clause 2.9.1 of the Code of Practice and Safety Guide on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing (ARPANSA 2005) based on a licence (LM5) issued under the *Radiation Protection and Control Act 1982*.

Routine operational activities at Honeymoon Mine will generate a number of low level radioactive solid waste streams. Typical low level solid wastes include the following:

- Organic Crud, produced in the Solvent Exchange Process
- Contaminated materials (i.e. rags, worn parts, filters, filter bags, pumps, pipe work, soils and PPE)
- Laboratory wastes
- Drilling chips and samples.

These waste streams are considered Category A waste based on the description of wastes in the Code of Practice for the near-surface disposal of radioactive waste in Australia (NHMRC 1992).

Uranium One is planning to construct a low level radioactive solid waste repository (repository) to store these waste streams. In order to construct the repository Uranium One is required to obtain an 'Authorisation to Construct' from the South Australian Environment Protection Authority (SA EPA), Radiation Protection Branch.

1.1 Purpose of Report

The purpose of the following document is to provide the SA EPA, Radiation Protection Branch with construction details that facilitate the issuing of 'Approval to Construct' the low level radioactive solid waste repository at Honeymoon Mine. Note that a separate document containing details of operation will be provided prior to operation of the facility.

2 Location

The location of the repository is west of the mine site adjacent proposed repositories for low level radioactive gypsum waste and non radioactive waste (domestic waste). These repositories have not yet been constructed.

The location was selected based on the consideration of the following factors:

- Surface water collection
- Geology and geomorphology
- Hydrology
- Flora, fauna, indigenous and non indigenous heritage
- Proximity to human activity

The area is characterised by low rainfall and is on a slight rise. The location is not within an ephemeral drainage or surface water collection zone and is situated on greater than 140 m of stiff consolidated Quaternary and Tertiary clays within which no water bearing units exist. The site is located outside the Yarramba Paleochannel (yellow Paleochannel sands in Figure 2-1), which removes the risk of leachate seepage into the aquifer system.

No indigenous or non indigenous heritage sites or flora or fauna species of significance have been observed at the location.

The proposed location is considered to be adequately isolated. Honeymoon Mine camp personnel are 300 m from the repository site and are the closest occupants. The nearest pastoral residence is over 10 km away.

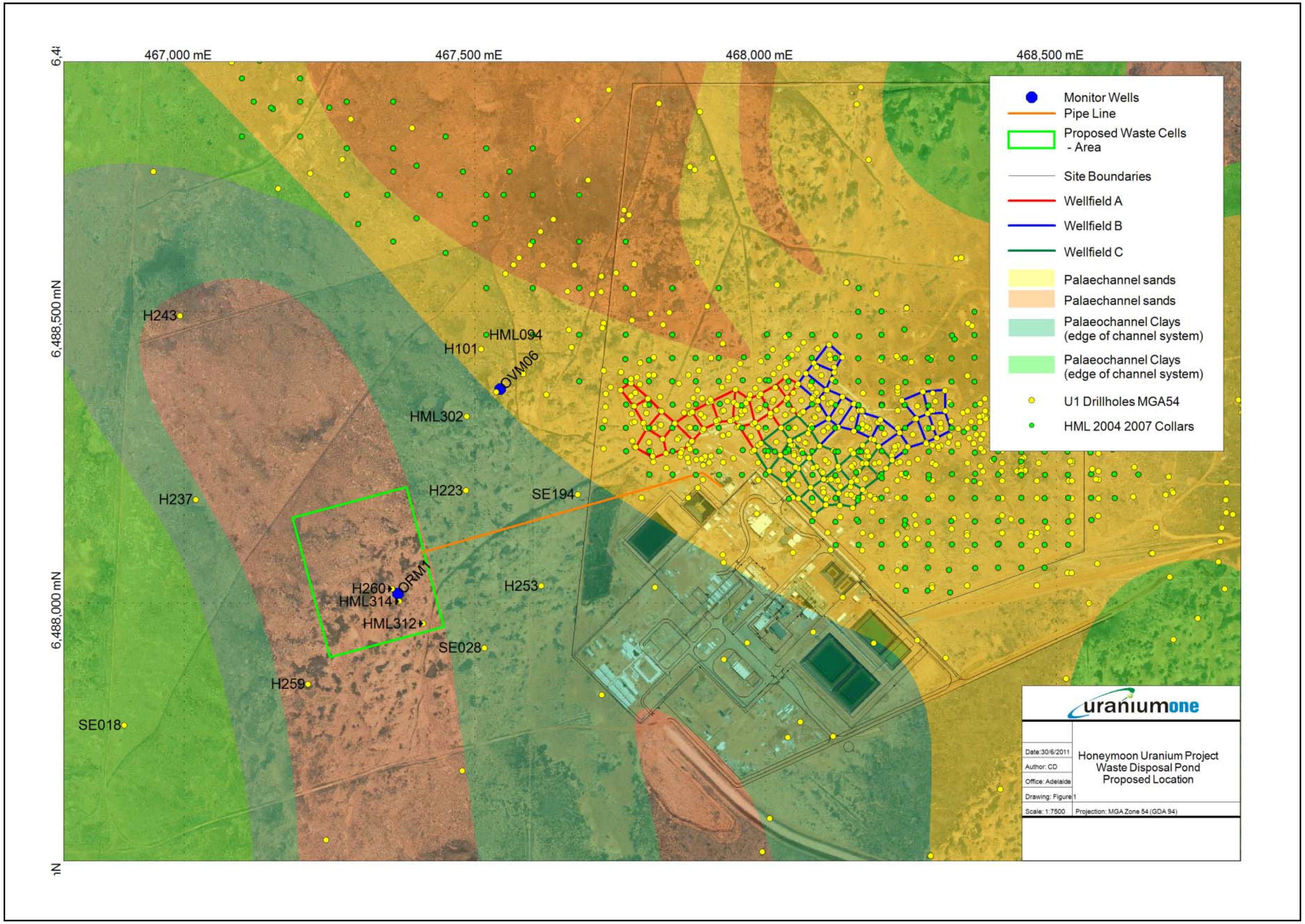


Figure 2-1 Proposed location and layout of all Honeymoon Mine Waste Repositories – Including low level radioactive waste

2.1 Geology and Hydrogeology

A geotechnical investigation at the mine was undertaken to depths of approximately 5 m. The soil was found to be predominantly clay with the following properties (Figure 2-2):

- High plasticity
- High to very high excavation resistance
- Orange brown to red brown in colour
- Calcareous
- Dry and of friable to hard consistency
- Weakly cemented with gypsum inclusions.

No groundwater was observed.

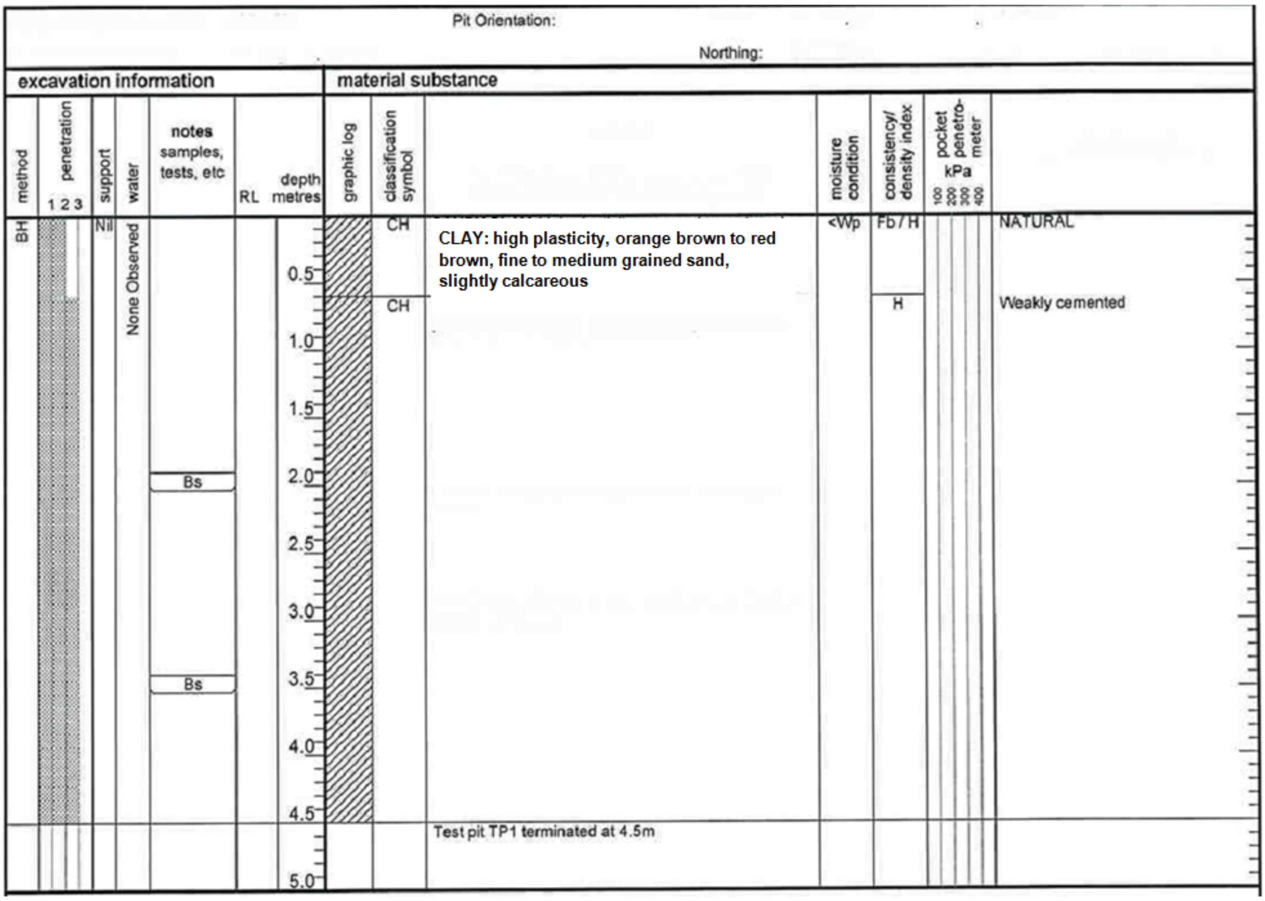


Figure 2-2 Soil profile from geotechnical investigations at Honeymoon Mine for excavation TP1 (Coffey 2008)

The following geotechnical issues were identified as having the potential to affect the proposed repository and have been addressed by Uranium One in the indicated sections:

- Clay has a high resistance to excavation (Section 3.1)
- Permeability of the clay is elevated due to low soil moisture content (Section 3.1)
- High potential for soil cracking due to low soil moisture content (Section 3.1)
- Stability reinforcements required for internal walls (Section 3.3)
- Surface for traffic when wet (Section 3.5).

3 Design

The 250 m by 200 m area containing the repository will be comprised of a number of proposed cells. Only one will be opened at a time (except during decommissioning activities) within which sealed containers will be closely packed around the outside of the repository and loose low level waste (cables, piping, filter bags etc) will be stacked in the centre and the previously excavated clay soil will be used to fill the voids on closure. The number of waste cells will be determined based on actual waste production rates but the facility has been designed based on an annual anticipated waste production rate of 150 m^3 per year with a 10% contingency for each of the 7 years of mine operation.

Each cell will be 30 m by 10 m and between 5 m and 5.5 m deep, providing approx 990 m^3 total storage capacity (taking into account a minimum 2 m cover, see Section 3.7). The repository will be accessed by a road with a 15% fall. The construction drawing of earthworks is provided in 3-1.

The repository has been designed with reference to the Code of Practice for the near-surface disposal of radioactive waste in Australia (NHMRC 1992) and discussions with the SA EPA, Radiation Protection Branch. These include:

- Adequate radiological and safety protection provided to humans, other biota and the environment on closure (Sections 3.7 and 4)
- Structural integrity following closure (Section 3.3 and 3.7)
- Leachate collection system and sump for removal and transfer (Section 3.4)
- Two meters of overburden required for Category A waste (NHRCM 1992) (Section 3.7)
- Adequate cover features to prevent surface water infiltration into the facility (Section 3.4).

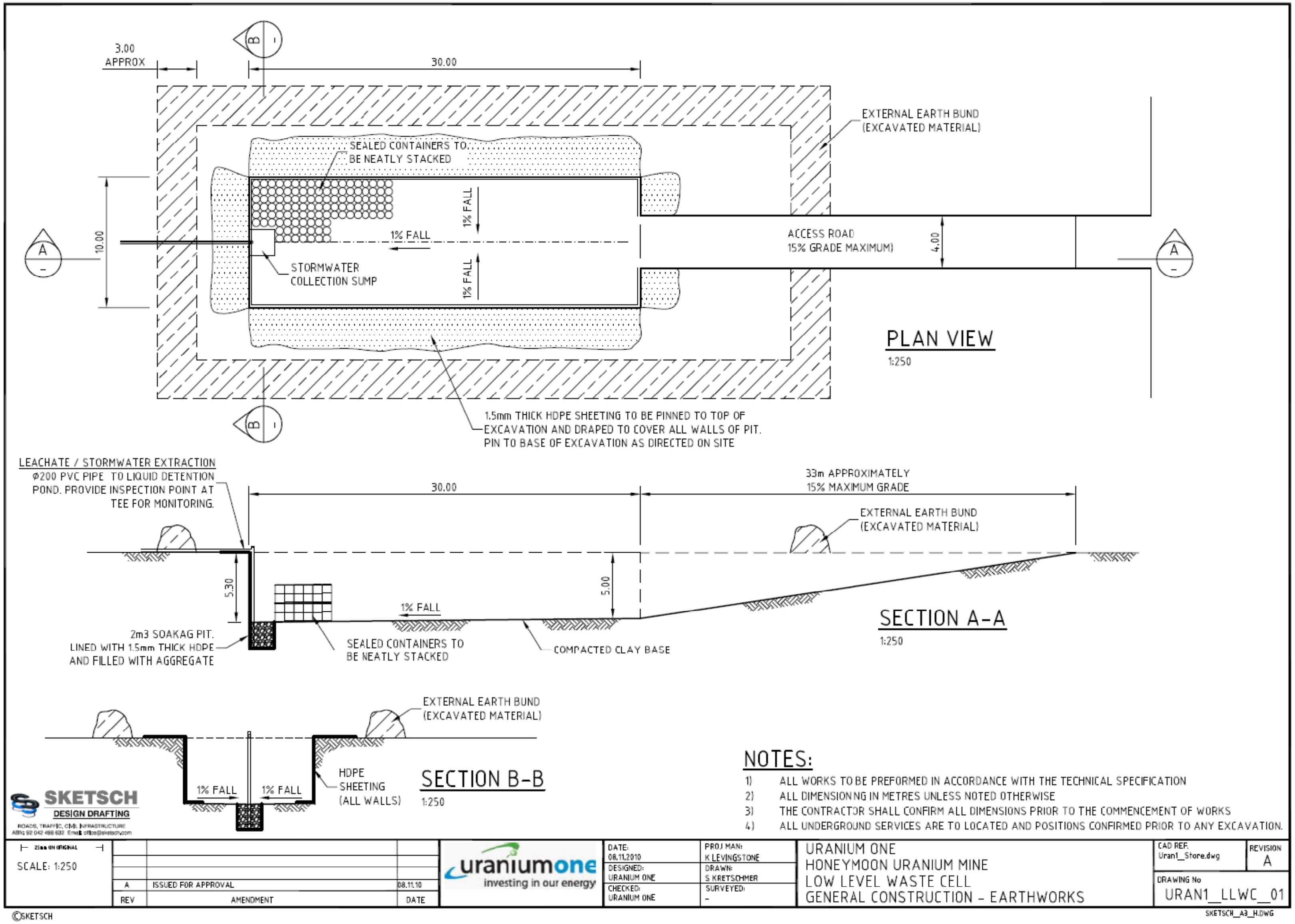


Figure 3-1 General construction details - earthworks

3.1 Excavation and Stockpiling

Excavated clays will be used to create an external earth bund surrounding the repository to limit any windblown dispersion of materials deposited in the repository, prevent surface water infiltration and to prevent inadvertent/unauthorised entry (Figure 3-1 and Figure 3-2.)

Given the clays high resistance to excavation all excavations will be undertaken using a dozer or hydraulic excavator of at least 30 t static mass (Coffey 2008). In addition if cemented bands are encountered the use of a single tyne ripper may be used to facilitate further excavation.

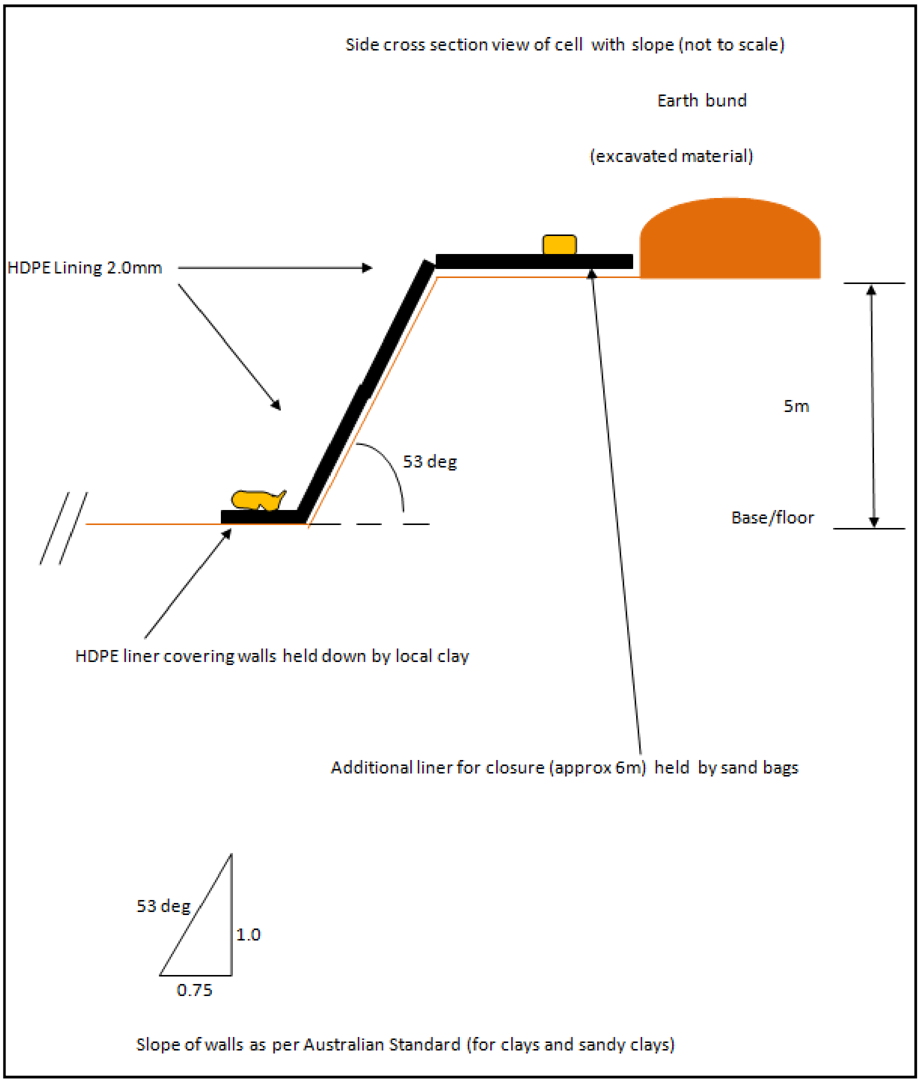


Figure 3-2 Side cross section view of cell showing sloping of wall and the HDPE lining (not to scale)

3.2 Lining

The base of the repository will be compacted clay and the internal walls of the repository will be overlain with a 2.0 mm high density polyethylene (HDPE) liner (Figure 3-2). In order to line the walls, the base of the liner will be secured by weighting the liner with heaped clays along the edges of the pit. If local conditions prevent this from being a viable option, sand bags may be used.

Six meters of additional liner length will be provided on either side of the pit, this will enable additional surface protection over the waste when the liner is sealed on closure.
This additional liner will be draped over the ground surface as the pit is filled and will be held down by sand bags (Figures 3-2 and 3-3).

3.3 Stability

Excavations more than 1.5 m in depth require safety precautions in the form of Sloping (battering) benching or ground support systems such as shoring (OHSW Regulations 2010).

To maintain the stability of the excavation, the internal sides will be reinforced using one of the following potential techniques:

- Benching
- Sloping (Battering)

Benching of the internal walls would involve the construction of 200 mm deep steps (Figure 3-3). Sloping (Battering) the perimeter embankments would provide stability to the walls of the internal cells. A Sloping (battering) angle of 3H:1V was recommended in Coffey (2008) The LLRWR (Figure 3-2) will have angle of approx 0.75V:1H – 1V:1H (Australian standard for clay soils) Shoring systems are mostly made with steel with very few made out of wood, aluminium and fibreglass. Shoring has the potential to interfere with the drums to be stored in the repository and may in some cases need to be removed.

The construction drawings indicate a guide to the method of reinforcement. The appropriate reinforcement technique will be undertaken by the contractor to comply with Australian standards.

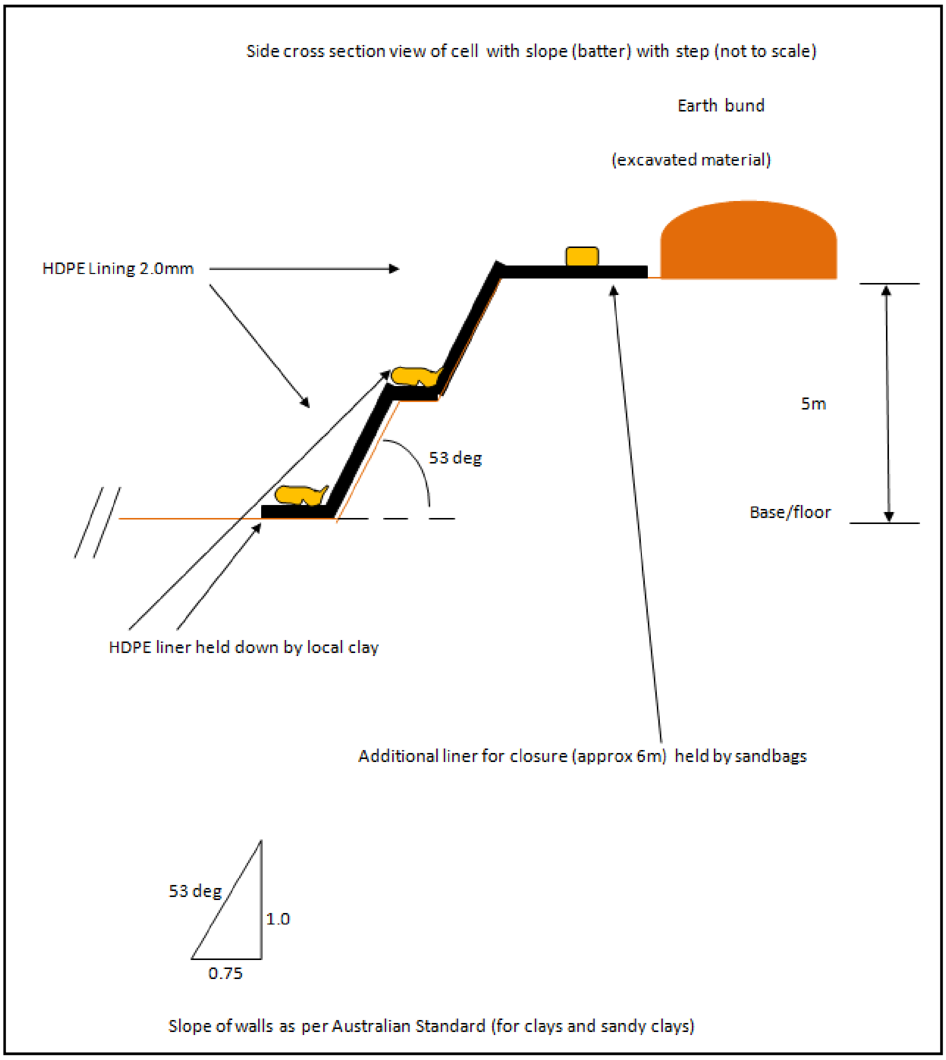


Figure 3-3 Side cross section view of cell with slope and benching showing an example profile with benching and a HDPE liner (not to scale)

3.4 Stormwater and Leachate Management

A leachate sump will be constructed to collect any surface water, rain or fluid from the waste repository. The leachate sump will consist of a 2 m^3 soak pit and will exist in the western edge of the repository. A 1% fall will ensure any water is drawn towards the sump system. The soak pit will be lined with 2.0 mm HDPE liner and filled with course aggregate. A vertical PVC pipe will enable the presence of seepage to be detected and extracted through the use of a submersible pump to the liquid disposal pond. The submersible pump will be used in conjunction with the gypsum return fluids pipework, which will transfer leachate back to the liquid disposal pond. See Figure 3-1 for details

Drainage of surface waters into the facility via the access road will be minimised by the construction of a low earthen bund along the entrance.

3.5 Traffic

A 4 m wide access road will be constructed in the eastern side of the repository, approximately 33 m long at a 15% grade. This access road will be used during construction and waste emplacement.

3.6 Security

A fence will be constructed outside the waste facilities to secure the site from unauthorised entry.

3.7 Waste Emplacement & Closure Summary

Operational and closure activities will be covered in operational and closure management documents, however typical closure steps will include:

- 200L drums of low level waste will be placed around the perimeter of the pit.
- Loose materials, pipe work and electrical materials and loose materials are place in the centre of the pit.
- Any contaminated soil is then used to fill remaining voids.
- The HDPE liners will then be folded over to cover waste and prevent surface water ingress.
- Stockpiled excavated clays will be used to ensure the minimum 2 m cover is achieved for Category A waste disposal.
- Fill will be compressed and a 300 mm sub-surface mound of topsoil created for future settlement. Access road will be filled
- A concrete tombstone will be installed to identify the area with as a closed radioactive waste facility
- Security fencing will be removed only at the end so maybe removed from all cells.

The construction drawing of waste cell closure is provided in Figure 3-4.

Waste facilities will be closed and rehabilitated according to the requirements set out in the Honeymoon Uranium Mine Operational Mining and Rehabilitation Program (2011) (Uranium One 2011) and Radiation and Radioactive Waste Management Plan (2011) (RMP and RWMP 2011).

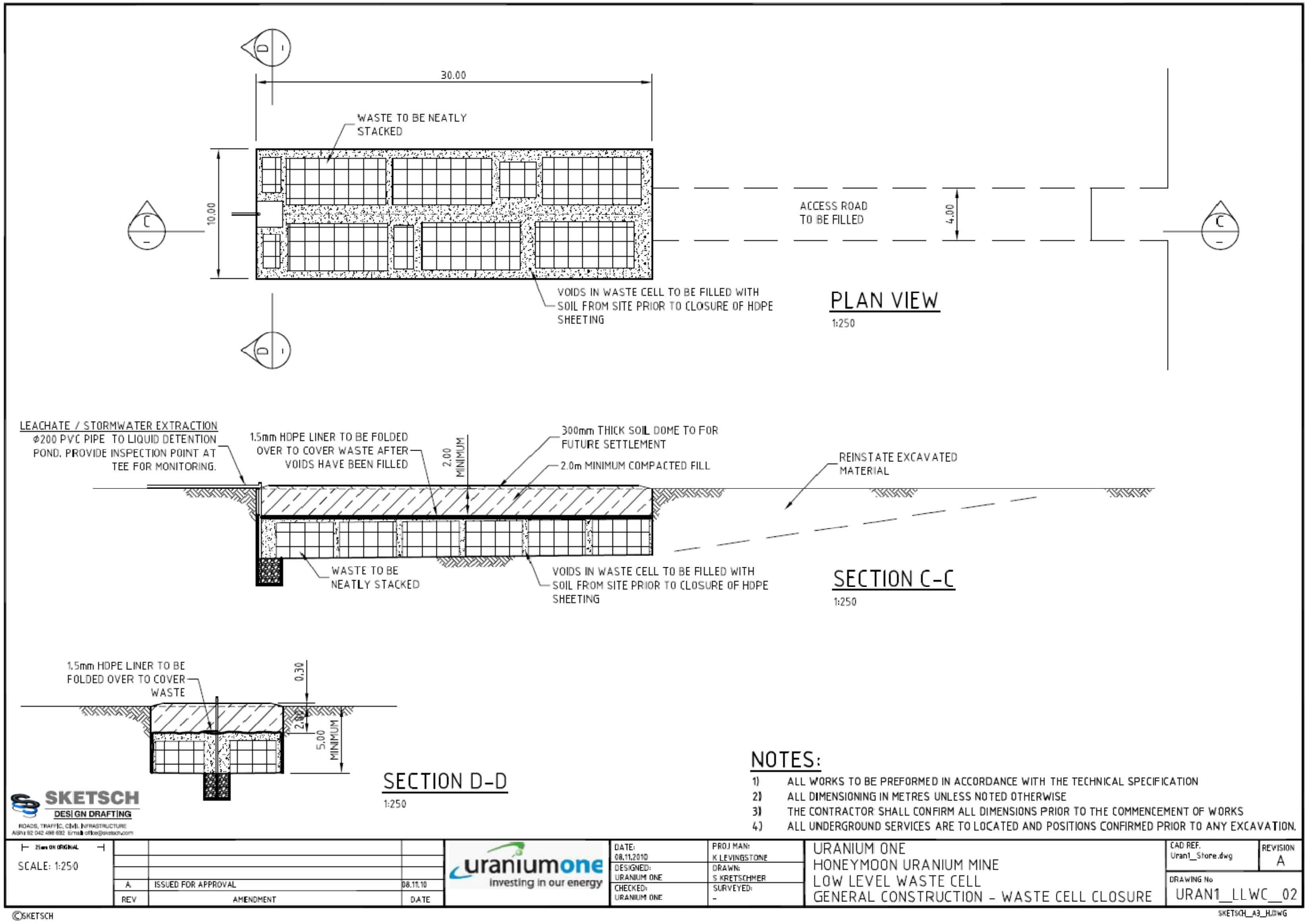


Figure 3-4 General construction details – waste cell closure

4 Construction Monitoring Program

Construction reporting for each cell will be undertaken using verification of the construction of the cell.

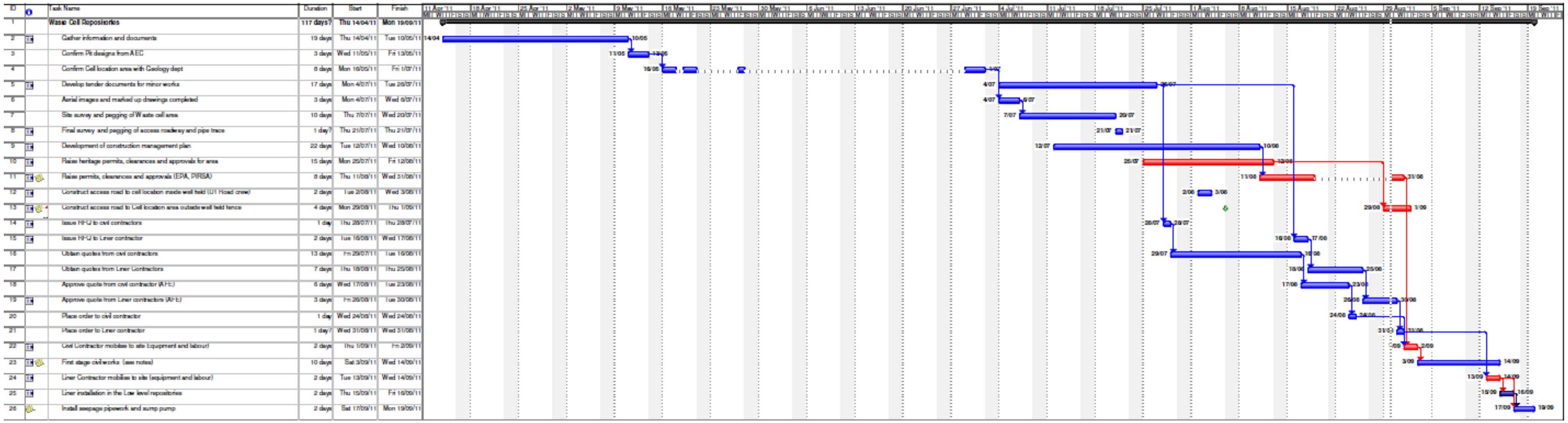
5 Construction Timing

A Gantt chart is provided in Appendix A. Briefly, construction of the repository is anticipated to occur in August 2011. See Gantt chart for more detail.

References

ARPANSA 2005	Code of Practice and Safety Guide on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, RPS No. 9 ARPANSA 2005
Coffey (2008)	Honeymoon Uranium Project Near Cockburn, South Australia Geotechnical Investigation, Report 06388/AA-AD Coffey Geotechnics Pty Ltd 2008
NHMRC 1992	Code of practice for the near-surface disposal of radioactive waste in Australia (1992). Radiation Health Series No. 35. National Health and Medical Research Council
RMP and RWMP 2011	Radiation Management Plan & Radioactive Waste Management Plan, Honeymoon Uranium Mine, Version 6.0 Uranium One 2011
SafeWork SA (2007)	Safeguard Trenching and Excavation, Information. SafeWork SA Government of South Australia 2007
Uranium One 2011	Honeymoon Uranium Project Mining and Rehabilitation Program, Uranium One Australia Pty Ltd, 2011

A. Appendix A – Gantt chart



ID	Task Name	Duration	Start	Finish
1	**Waste Cell Repositories**	**117 days?**	**Thu 14/04/11**	**Mon 19/09/11**
2	Gather information and documents	19 days	Thu 14/04/11	Tue 10/05/11
3	Confirm Pit designs from AEC	3 days	Wed 11/05/11	Fri 13/05/11
4	Confirm Cell location area with Geology dept	8 days	Mon 16/05/11	Fri 1/07/11
5	Develop tender documents for minor works	17 days	Mon 4/07/11	Tue 26/07/11
6	Aerial images and marked up drawings completed	3 days	Mon 4/07/11	Wed 6/07/11
7	Site survey and pegging of Waste cell area	10 days	Thu 7/07/11	Wed 20/07/11
8	Final survey and pegging of access roadway and pipe trace	1 day?	Thu 21/07/11	Thu 21/07/11
9	Development of construction management plan	22 days	Tue 12/07/11	Wed 10/08/11
10	Raise heritage permits, clearances and approvals for area	15 days	Mon 25/07/11	Fri 12/08/11
11	Raise permits, clearances and approvals (EPA, PIRSA)	8 days	Thu 11/08/11	Wed 31/08/11
12	Construct access road to cell location inside well field (U1 Road crew)	2 days	Tue 2/08/11	Wed 3/08/11
13	Construct access road to Cell location area outside well field fence	4 days	Mon 29/08/11	Thu 1/09/11
14	Issue RFQ to civil contractors	1 day	Thu 28/07/11	Thu 28/07/11
15	Issue RFQ to Liner contractor	2 days	Tue 16/08/11	Wed 17/08/11
16	Obtain quotes from civil contractors	13 days	Fri 29/07/11	Tue 16/08/11
17	Obtain quotes from Liner Contractors	7 days	Thu 18/08/11	Thu 25/08/11
18	Approve quote from civil contractor (AFE)	6 days	Wed 17/08/11	Tue 23/08/11
19	Approve quote from Liner contractors (AFE)	3 days	Fri 26/08/11	Tue 30/08/11
20	Place order to civil contractor	1 day	Wed 24/08/11	Wed 24/08/11
21	Place order to Liner contractor	1 day?	Wed 31/08/11	Wed 31/08/11
22	Civil Contractor mobilise to site Equipment and labour)	2 days	Thu 1/09/11	Fri 2/09/11
23	First stage civil works (see notes)	10 days	Sat 3/09/11	Wed 14/09/11
24	Liner Contractor mobilise to site (equipment and labour)	2 days	Tue 13/09/11	Wed 14/09/11
25	Liner installation in the Low level repositories	2 days	Thu 15/09/11	Fri 16/09/11
26	Install seepage pipework and sump pump	2 days	Sat 17/09/11	Mon 19/09/11

Figure A-1 Waste cell general schedule

Microsoft Office
Project - Waste Cell g