Australian Government
Australian Radiation Protection and Nuclear Safety Agency

arpansa

RESRAD in Australia

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RESRAD training in Australia

A training course on the RESRAD suite of codes was held at Yallambie from **12-16 October 2015**. Two experts in the software, Charley Yu and Dave LePoire, from Argonne National Laboratory, USA, provided the training in **RESRAD (onsite), RESRAD-OFFSITE and RESRAD-BUILD**.

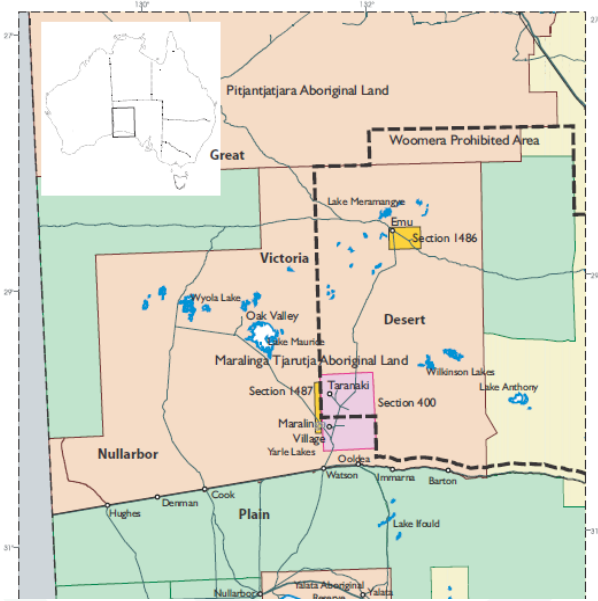
The training was provided for approximately 20 participants, with representatives from:

- ARPANSA – including RHS, OCEO and RSB
- state and federal government
- industry
- consulting

RESRAD training in Australia

Example – Maralinga and Oak Valley Assessment (2011)

- Maralinga was the site of British Nuclear weapons testing in the 1950s
- Oak Valley is NW of Maralinga, and his home to an indigenous population
- Weapons tests -https://www.arpansa.gov.au/understanding-radiation/sources-radiation/more-radiation-sources/british-nuclear-weapons-testing
- Technical report - https://www.arpansa.gov.au/sites/default/files/legacy/pubs/technicalreports/tr158.doc



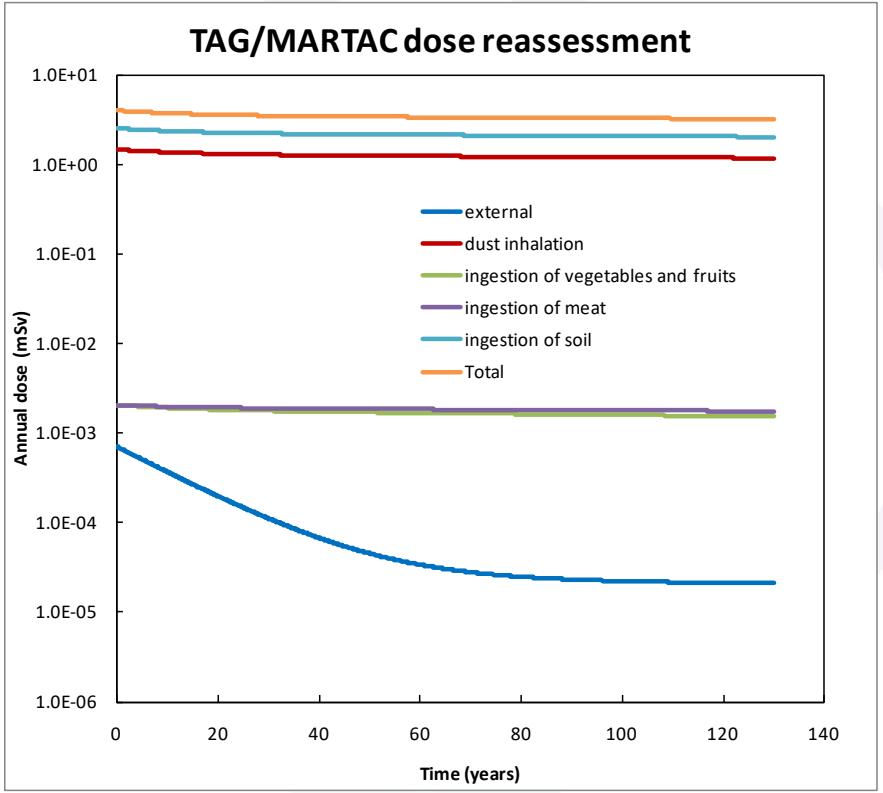
Example – Maralinga and Oak Valley Assessment (2012)

Scenario parameters (generally conservative):

- Dwelling in centre of contaminated zone, with agricultural area adjacent for Maralinga. Dwelling 20km north of the Maralinga zone for Oak Valley.
- Thickness to contaminated zone was 2cm
- Dust loading of 1.5 mg m^{-3}
- 100% Consumption of locally grown food (except milk) for Maralinga, 10% local food consumption for Oak Valley
- Rate of soil ingestion of 10g per day
- Am241 of 3 kBq m^{-2} and Pu239 of 21.6 kBq m^{-2} for Maralinga, Am241 of 0.2 kBq m^{-2} and Pu239 of 1.4 kBq m^{-2} for Oak Valley
- For other parameters default values were used

Example – Maralinga and Oak Valley Assessment (2012)

- Dose to 10 yo child estimated at 4mSv in Maralinga, while only 0.03 mSv for Oak Valley
- Highest contributions from dust inhalation and soil ingestion
- Less than the established criteria of 5mSv
- Given the conservative nature of the assessment, confident that the criteria would not be exceeded

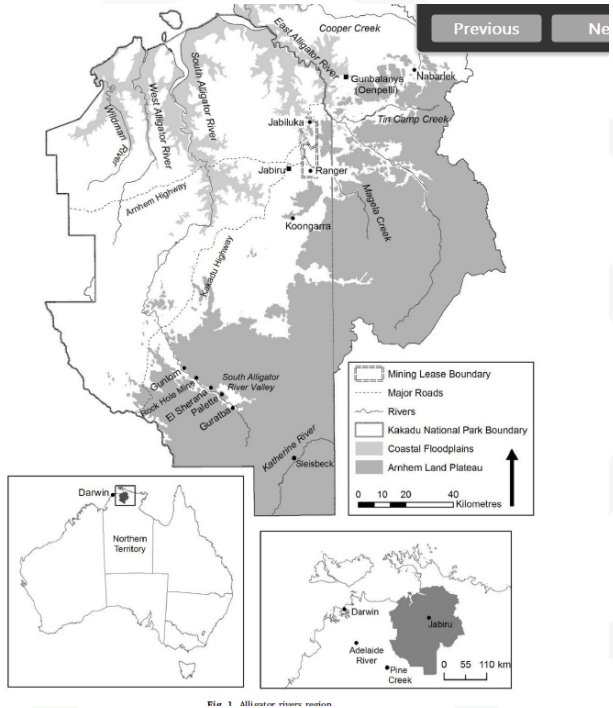


Example – Rehabilitation at Ranger Uranium mine

- Assessment undertaken by Department of Environment - Supervising Scientist, who are based in Darwin, NT.
- Modelling the dispersion of radon-222 from a landform covered by low uranium grade waste rock
- RESRAD-offsite was used
- Assess potential doses to local population
- https://www.sciencedirect.com/science/article/pii/S0265931X18302765

Example – Rehabilitation at Ranger Uranium mine

- Mine site is located in NT
- Mining and milling on site for past 40 years
- Current Mine schedule:
  - Cease operations by 2021
  - Remediated by 2026



Example – Rehabilitation at Ranger Uranium mine

- Modelled as a series of 1km x 1km sources
- Based on hypothetical remediated landform, with waste rock used as cover to create the landform
- Weather data for site was collated from many years of data to create STAR file

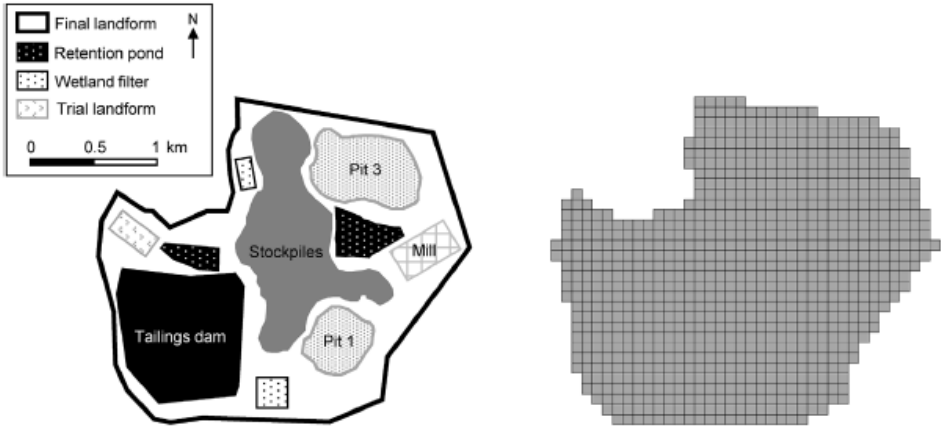
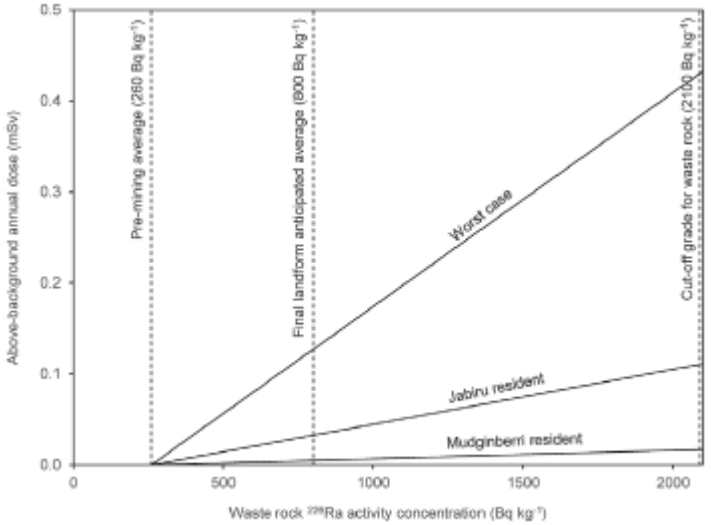


Fig. 2. Conceptual landform overlaid on existing mine site features (left) and its representation in the modelling (right).

Example – Rehabilitation at Ranger Uranium mine

- New ICRP 137 dose factors for Radon were used
- Predicted doses for various scenarios
  - Dose increase may be measureable at some population areas, but is within general variations of natural background
  - Not predicted to be above 1 mSv per year for any populations
  - No observable adverse health effects predicted



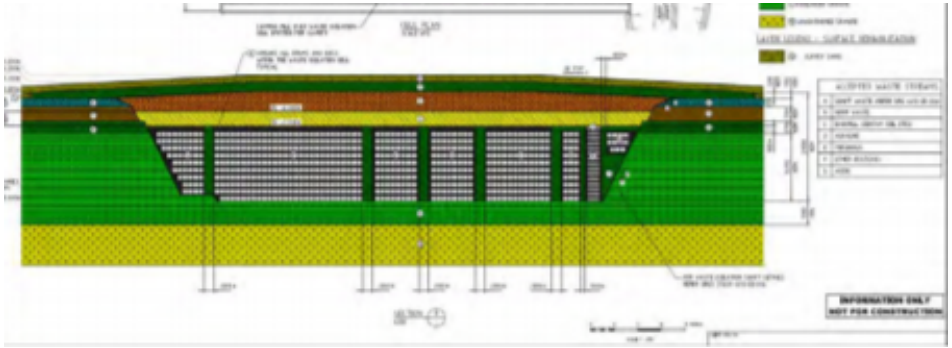
Example – Proposal for low-level disposal facility (Tellus Holdings)

- Proposal for waste facility in Western Australia
- Low-level radioactive waste
  - Some bulk waste
  - Disused sealed sources
  - Not waste for nuclear fuel cycle
- Chemical waste disposal
- Post-closure assessment used RESRAD-onsite

Example – Proposal for low-level disposal facility (Tellus Holdings)

Scenarios assessed

- Intrusion near the shaft of higher activity
- Intrusion on top of waste
- Living on exposed waste
- Recreational visitor post closure



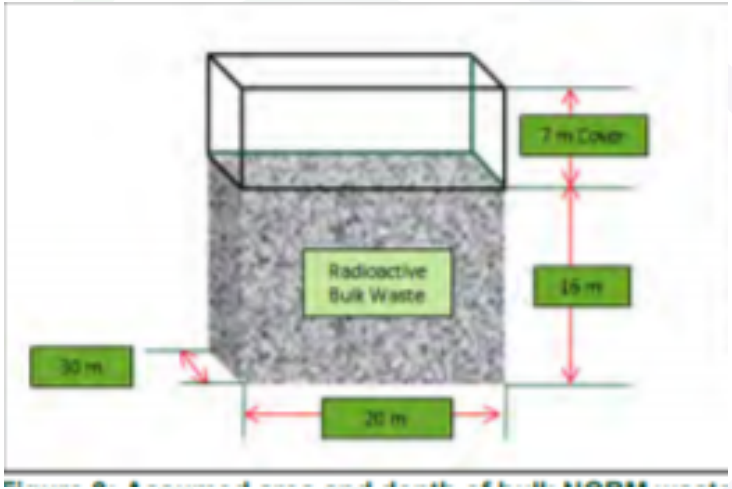
Example – Proposal for low-level disposal facility (Tellus Holdings)

Results

- Potential large doses for intrusion scenario, particularly if living on top of waste
- Very low dose for recreational visitor

Need for Re-assessment

- Using OFFSITE to predict doses at various distances from exposed/unexposed waste
- Use RESRAD to better inform Waste Acceptance criteria



Future uses of RESRAD in Australia

- Assessment of waste facilities, assist with determining Waste Acceptance Criteria/Activities
  - Tellus holdings – low-level long term disposal
    - Some re-assessment is likely to be required
    - Sandy ridge facility - http://www.tellusholdings.com/project_sandy_ridge.html
    - Have used RESRAD for some aspects of their current proposed facility
      http://www.tellusholdings.com/pdf/2016/sr-per/sr-per_a-14_radiation-assessments.pdf
  - National Radioactive Waste Management Facility
    - ARPANSA would likely undertake an independent assessment of an application. This may include a RESRAD assessment to look at potential doses to surrounding population
    - https://radioactivewaste.gov.au/
  - Off-shore oil-gas decommissioning
    - Lots of pipes with NORM scale, impact on environment needs to be assessed

Benefits of RAMP

- RESRAD is now part of a greater systematic program in RAMP.
- User groups such as this one
  - Find out what is happening with RESRAD.
- Provides a mechanism for ARPANSA to engage with other users in Australia.
  - RESRAD is used by other state agencies
  - Currently, at least to my knowledge, there is no Australian User group for RESRAD or formal communication between users
- Potential for Australian RAMP meeting (possibly 2021), which would likely include training and sessions on RESRAD

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THANK YOU

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