Senate Standing Committee on Economics
ANSWERS TO QUESTIONS ON NOTICE
Department of Industry, Science, Energy and Resources
National Radioactive Waste Management Amendment (Site Specification, Community Fund and Other Measures) Bill 2020 [Provisions]
30 June 2020

AGENCY/DEPARTMENT: DEPARTMENT OF INDUSTRY, SCIENCE, ENERGY AND RESOURCES

TOPIC: Question 1 - National Radioactive Waste Management Amendment (Site Specification, Community Fund and Other Measures) Bill 2020 [Provisions]

REFERENCE: Question on Notice

QUESTION No.: 1

Page 4 of your supplementary submission stated:
In 2017, forty-two discrete Commonwealth-owned sites were assessed using a desktop multi-criteria site assessment tool. This tool was also used for the current shortlisted sites and considers technical, economic, social and environmental criteria.

Could the Department of Industry provide a desktop analysis for each of the 42 sites.

ANSWER

The Department has attached three documents relating to the desktop analysis for the 42 Commonwealth-owned sites which indicate that there were no suitable Commonwealth-owned sites on which to host the National Radioactive Waste Management Facility.

Attachment A – *Desktop analysis – 42 Commonwealth-owned sites*
This document contains the desktop analysis using the multi-criteria site assessment (MCSA) framework for the 42 Commonwealth-owned sites.

Attachment B – *National Radioactive Waste Management Facility – Site Selection Framework, May 2015*
This document explains the MCSA Framework which was used in the desktop analysis.

Attachment C – *Assessment of Potential Commonwealth Owned Sites, September 2017*
This report provides a written summary of the desktop analysis which was undertaken.

Desktop Analysis of 42 Commonwealth-owned Sites

Criteria and Weighting

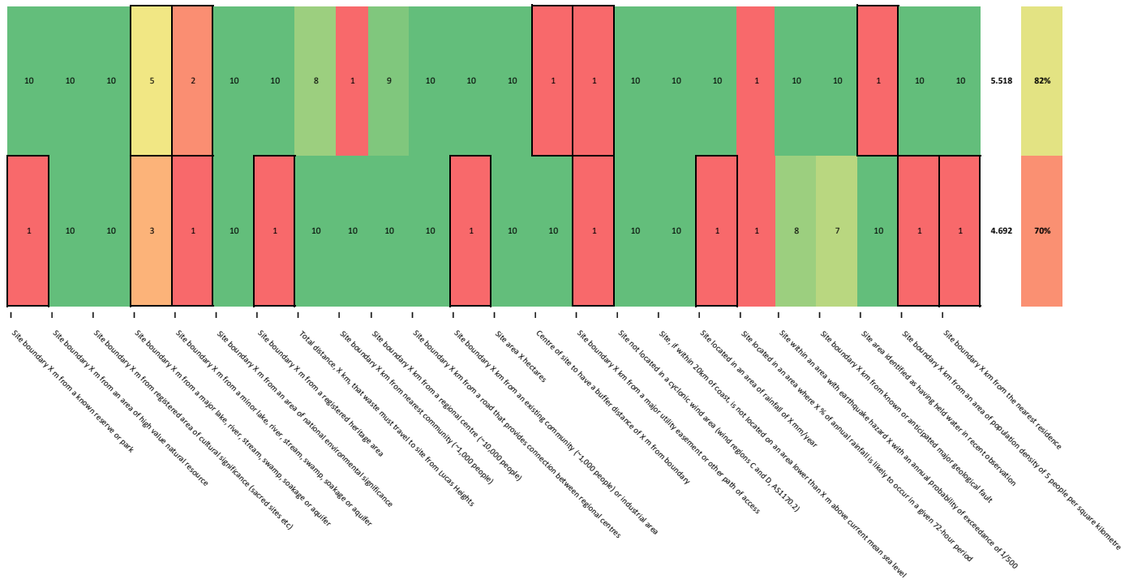
Site Name	Site Number (300 series)	Site Area	State / Territory	Comments	Assessor Notes	CWB-1 4.0%	CWB-2 5.0%	CWB-4 10.0%	EP-1 4.2%	EP-2 1.4%	EP-3 5.6%	EP-4 2.8%	EQ-1 2.0%	EQ-3 2.5%	EV-1 3.3%	EV-2 3.3%	HSS-1 1.6%	HSS-3 2.4%	HSS-4 1.6%	HSS-5 1.6%	SE-1 1.8%	SE-2 1.8%	SE-3 1.8%	SE-4 1.8%	SE-5 1.8%	SE-6 1.8%	SE-7 1.8%	SE-8 1.8%	SE-9 1.8%	Total Score (out of 6.75)		Department Notes
Jindalee Receiver Site - MT Everard	301	1160	NT	EQ-1 Site is distant from Lucas Heights SE-6 Site is 12km from a known geological fault SE-9 Site is 3km from residential marked buildings	Appears to be an existing airfield	10	10	10	10	9	10	10	6	10	10	10	10	10	10	10	10	10	10	1	10	4	10	10	5	6.296	93%	Mountainous landscape (Mt Everard). Currently in use for communications facility and landfill (waste disposal) by Defence.
Brymaroo Satellite Airfield - Oakey	302	268	QLD	EP-2 Adjacent Caines Creek HSS-4 Odd shape site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Productive farming land, structures on site	10	10	10	7	2	10	10	10	10	10	10	8	10	1	10	10	10	7	1	10	10	10	1	1	5.796	86%	Less than 20km from New Acland Coal Mine, 20 km from Oakey Airport. 4km from main highway (Warrego Hwy). 11km east of Irvingdale town. Surrounding properties used for pastoral/agricultural purposes. Used for pilot training exercises.
Jindalee Transmitting Site - Harts Range	303	1030	NT	EP-2 Adjacent Ongeva Creek EQ-1 Site is distant from Lucas Heights SE-6 10km from a known geological fault	Structures on site	10	10	10	8	4	10	10	6	1	10	10	10	10	10	10	10	10	10	1	10	3	10	7	10	5.935	88%	The site is located on/near Harts Range - previously nominated for the NRWMF in 2005.
East Coonawarra	304	121	NT	CWB-1 Near a reserve EP-1 Site is noted as holding water EP-2 Site is noted as holding water EQ-1 Site is distant from Lucas Heights HSS-1 Nearby community HSS-4 Small site HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-7 Site is noted as holding water SE-8 In an area of higher population SE-9 Adjacent residential buildings		1	10	10	3	2	10	10	3	10	10	10	1	10	1	1	1	10	1	1	10	10	1	1	1	4.44	66%	Within 10km of Darwin International Airport
Defence Establishment - Berrimah	305	166	NT	CWB-1 Near a reserve EP-1 Stream passes through site EP-2 Stream passes through site EQ-1 Site is distant from Lucas Heights HSS-1 Nearby community HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-8 In an area of higher population SE-9 Adjacent residential buildings	Lots of existing structures on site (nearby small community)	1	10	10	5	2	10	8	3	10	10	10	1	10	7	1	1	10	1	1	10	10	10	1	1	4.726	70%	Potential Heritage Values Within 10km of Darwin International Airport
Defence Establishment Howard Springs North	306	378	NT	CWB-1 Near a reserve EP-1 Site is noted as holding water EP-2 Site is noted as holding water EQ-1 Site is distant from Lucas Heights HSS-1 Nearby community HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-7 Site is noted as holding water SE-8 In an area of higher population SE-9 Adjacent residential buildings		4	10	10	5	2	9	10	3	10	10	10	1	10	8	1	1	10	1	1	10	10	1	1	1	4.7	70%	Less than 1km from a college. 5km from Howard Springs town centre.
Defence Establishment Howard Springs South	307	310	NT	EP-1 Stream passes through site EP-2 Stream passes through site EQ-1 Site is distant from Lucas Heights HSS-1 Nearby community HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-7 Site is noted as holding water SE-8 In an area of higher population SE-9 Adjacent residential buildings	Structures on site, surrounded by residential area	10	10	10	4	2	10	10	3	10	10	10	3	10	10	1	1	10	1	1	10	10	1	1	1	5.018	74%	Site is bordered by Stuart Highway and suburban town McMinns Lagoon (population 715, 2011 census).
Leanyer Bombing Range	308	2150	NT	CWB-1 Part reserve, Buffalo Creek Management Reserve EP-1 Stream passes through site EP-2 Stream passes through site EQ-1 Site is distant from Lucas Heights HSS-1 Directly adjacent community HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-2 On the coast SE-3 High rainfall region SE-7 Site is noted as holding water SE-8 In an area of higher population SE-9 Adjacent residential buildings	On the coast. Lots of water.	1	10	10	1	2	10	10	3	10	10	10	1	10	10	1	1	6	1	1	10	10	1	1	1	4.428	66%	Right next to Karama town and Shoal Bay Waste Management Facility
JORN Radar 1 Receiving Site	309	2960	QLD	EP-1 Stream passes through site EP-2 Lots of channelised drainage EV-1 Very Remote	Many water paths	10	10	10	7	1	10	10	8	1	6	10	10	10	10	10	10	10	10	1	10	10	10	10	10	5.939	88%	Number of mountains and national parks surrounding.
Woodstock	310	655	QLD	EP-1 Stream passes through site EP-2 Stream passes through site HSS-5 Near an easement for a gas pipeline SE-1 Cyclonic Wind Region SE-8 In an area of higher population SE-9 Adjacent residential buildings		10	10	10	6	1	10	10	7	8	10	10	10	10	10	1	1	10	4	1	10	10	10	1	1	5.446	81%	Train tracks run parrallel the Flinders Highway (site sits between Calcium - Lime Stone mine site, and Woodstock - town centre, stations). Flinders highway is also the main access road to the town. Gas and water pipelines disect the area. Woodstock is also located at the head of the catchments for the Ross River (Ross River Dam being a major source of water for Townsville), and the Majors Creek/Haughton catchment Less than 8Km from Woodstock town centre.

Macrossan Camp	311	381	QLD	EP-2 Stream passes through site EP-4 Prohibited heritage area HSS-4 Odd shaped site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Runway on site with other structures	10	10	10	9	1	10	1	7	10	10	10	9	10	1	10	10	10	7	1	10	10	10	1	1	**5.57**	**83%**	Commonwealth Heritage Listed. Located in town centre Hughenden.
Frenchville Rifle Range	312	200	QLD	CWB-1 Directly adjacent Mount Archer National Park EP-2 Stream passes through site HSS-1 Directly adjacent community HSS-4 Narrow site HSS-5 Near an easement (unknown) SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-6 12km from a known geological fault SE-8 In an area of higher population SE-9 Adjacent residential buildings	On the edge of a densly populated area	1	10	10	9	1	10	10	9	10	10	10	1	10	1	1	1	10	1	1	10	3	10	1	1	**4.834**	**72%**	small arms firing range. Near base of Mount Archer. In/near to Frenchville and Norman Gardens.
Bohle River Transmitting Station	313	347	QLD	CWB-1 Conservation Park adjacent and Bohle River Fish Habited Area EP-1 Stream passes through site EP-2 Stream passes through site EP-4 Conservation Park adjacent and Bohle River Fish Habited Area HSS-1 Adjacent a community HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-2 Near the coast (5km) SE-3 High rainfall region SE-8 In an area of higher population SE-9 Adjacent residential buildings	Large structure on site, densley populated area	1	10	10	2	1	10	2	7	10	10	10	1	10	10	1	1	2	1	1	10	10	10	1	1	**4.402**	**65%**	Bohle River = fishing river. Major flooding of the river occurred 1991, 1998, 2000, 2007, 2008 and 2014. Site includes three above ground diesel storage tanks.
MT Vince Rifle Range - Mackay	314	148	QLD	EP-2 Stream passes through site EP-3 Reserve or feature in close proximity HSS-1 Adjacent a community HSS-4 Small site HSS-5 Near an easement SE-1 Cyclonic Wind Region SE-3 High rainfall region SE-8 In an area of higher population SE-9 Adjacent residential buildings	Heavily wooded site amongst productive farming area	10	10	10	8	1	2	10	8	10	10	10	1	10	1	1	1	10	1	1	10	10	10	1	1	**4.81**	**71%**	
Jennings Stores Depot - ADI	315	847	NSW	CWB-1 Girraween National Park directly adjacent EP-2 Streams pass through site HSS-1 Adjacent a community SE-3 High rainfall region SE-8 Near an area of higher population SE-9 Adjacent residential buildings	Site is a prohibited area	2	10	10	10	1	10	10	10	10	10	10	5	10	10	10	10	10	4	2	10	10	10	1	1	**5.648**	**84%**	
Defence Communication Station - Transmitter	316	2020	NSW	EP-2 Streams pass through site, water on site HSS-5 Near an easement SE-7 Lots of water observations on site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Lots of standing water on site, structure on site	10	10	10	9	1	10	10	10	9	10	10	10	10	10	1	10	10	9	1	10	10	1	1	1	**5.747**	**85%**	
Defence Communication Station - Receiver	317	1040	NSW	EP-1 Adjacent many water reservoirs, water passes onto site EP-2 Streams pass through site, water on site SE-8 In an area of higher population SE-9 Adjacent residential buildings		10	10	10	5	6	9	10	10	8	10	10	10	10	10	10	10	10	10	1	10	10	10	6	1	**5.982**	**89%**	15.7 km southeast of Morundah. Reciever station (ASD) is 19ha in size. Boree Creek population 212 (2011 censuse).
Narrabri	318	1220	NSW	EP-2 Streams pass through site HSS-1 Near several communities SE-7 Lots of water observations on site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Structures on site	10	10	10	8	1	10	10	10	10	9	10	6	10	10	10	10	10	7	1	10	10	1	5	1	**5.813**	**86%**	Potential Heritage values. the site hosts the Telescope Compact Array and visitors centre. 25km from Narrabri town - includes airport, Universty of Sydney plant breeding institute etc. Around 25km in the other direction is Wee Waa Airport. Prone to flooding and fire. Narrabri Coal Seam Gas Project - Pilliga Forest / Yarrie Lake. Narrabri is an important centre for rail freight. Site sits closer to Wee Waa station before Baan Ba station.
Parkes	319	170	NSW	EP-2 Water bodies adjacent to site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Telescope on site, small site	10	10	10	10	3	10	10	10	10	10	10	7	10	10	9	10	10	8	1	9	10	10	2	1	**6.066**	**90%**	Potential Heritage values. 30km from Northparkes Mines (copper and gold mine0. 5km on three sides from Newell hwy (linking QLD to VIC), Coobang road, Renshw mcGirr Way. Australian transcontintental railway line - Train stations - Nanardine and Alectown West (15km from train tracks) - note, passenger/freight transport has decreased since the 1980s. Undergoing process to create an 'inland port' for freight?
Marrangaroo Depot	320	1190	NSW	CWB-1 Newnes State Forest adjacent EP-1 Water bodies on site EP-2 Streams pass through site EP-4 Near Blue Mountains National Park HSS-1 Adjacent a community HSS-5 Near an easement SE-3 High rainfall region SE-5 Higher earthquake hazard SE-8 In an area of higher population SE-9 Adjacent residential buildings	Site is a prohibited area	3	10	10	5	1	7	5	10	10	10	10	1	10	10	1	10	10	1	2	6	8	10	1	1	**4.8**	**71%**	1.5 Km from Great Western Highway. Train tracks go parralel to this highway. Marrangaroo is a few km west of Lithgow . Depot is 5km north of Lithgow, foothills of Blue Mountains. Defence owns 1533 hectares and leases approx. 177ha from State Forests. until 1980s, used for storage of ammunication and chemical weapons. Disposal of ordnance sometimes, involving the use of burning areas and burial pits/landfilling. Landfill located in west-central portion, used to dispose of domestic refuse and other non-hazardous material. Depot also contains weapons ranges and above ground fuel storage tank.

Proof & Experimental Estab - Graytown	321	56	VIC	CWB-1 Heathcote-Greytonw National Park is adjacent EP-1 Streams and water bodies on site EP-2 Streams and water bodies on site EP-4 Pukapunyal heritage area (prohibited area) adjacent HSS-3 Site is not 100ha HSS-4 Site is not 100ha SE-6 20km from a known geological fault SE-8 In an area of higher population SE-9 Adjacent residential buildings	Adjacent a prohibited area	1	10	10	3	1	10	1	10	10	10	10	8	1	1	10	10	10	8	2	10	4	10	1	1	**4.714**	**70%**	Potential Heritage values. Within Puckapunyal Military Area (training facility). Graytown = testing for military ammunition and weapons systems. Entire PMA identified as an important bird area - largest known population of bush stone-curlews in Victoria. Endagered swift parrots also etc. 40km from Hume Hwy.
Avalon Airfield	322	1760	VIC	HSS-1 Adjacent a community HSS-5 Gas pipeline and electricity transmission lines adjacent SE-2 On the Coast SE-6 Near a known geological fault (1km) SE-7 Water observations on site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Site is Avalon Airport!	7	10	10	7	7	10	10	10	10	10	10	1	10	10	1	10	5	9	2	7	1	1	1	1	**5.22**	**77%**	Melbourne city. Airport. Major highway
Exmouth Area A - VLF Transmitter Station	323	2280	WA	CWB-1 Jurabie Coastal Park, Ningaloo Marine Park adjacent EP-1 Lots of water bodies on site EP-4 Adjacent a hertiage area EQ-1 Remote from Lucas Heights HSS-1 Adjacent a community SE-1 Cyclonic Wind Region SE-2 On the coast SE-6 Known geological fault on site SE-8 In an area of higher population	Lots of structures on site	6	10	10	2	10	10	1	1	10	8	10	6	10	10	10	1	1	10	1	7	2	10	5	10	**4.918**	**73%**	Potential Heritage Values. (Note: note sure where exactly Area A sits) Exmouth (population as of 2011: 2393) 45km to the North. Other nearby = Cape Range National Park and world-heritage listed Ningaloo Marine Park. Defence site includes antenna field and associated infrastucture (admin building and power station). Also bulk storage and distribution of fuel from above ground and underground storage tanks (some tanks decommissioned).
Kalgoorlie Rifle Range	324	179	WA	EP-2 Streams and water bodies on site EP-3 Karkurla National Park EP-4 Registered heriatage area nearby EQ-1 Site is distant from Lucas Heights HSS-1 Adjacent a community HSS-4 Irregular shape site HSS-5 Near an easement SE-5 In an area of higher earthquake potential SE-8 In an area of higher population SE-9 Adjacent residential buildings	Rifle range on site Kulkurla National Park	10	10	10	10	6	4	1	4	10	10	10	1	10	2	1	10	10	10	1	1	8	10	1	1	**4.886**	**72%**	
Richmond - Fuel Farm, Dental, Medical	325	100	NSW	EP-1 Lots of water bodies on site EP-2 Streams and water bodies on site EP-4 RAAF Base HSS-1 Adjacent a community HSS-4 Small site HSS-5 Near an easement SE-3 High rainfall region SE-6 14km from a known geological fault SE-7 Water observations on site SE-8 In an area of higher population SE-9 Adjacent residential buildings		7	10	10	4	3	10	1	10	10	10	10	1	10	1	1	10	10	3	1	7	3	10	1	1	**4.804**	**71%**	Richmond RAAF base surrounded by East richmond town, Hawkesbury and Windor. Train track runs parralel Hawkesbury valley Way (border of the RAAF base).
DSTO ST Kilda Transmitting Station	326	233	SA	CWB-1 Reserve nearby HSS-1 Adjacent a comunity HSS-5 Gas pipeline through middle of site SE-2 On the coast SE-6 Known geological fault 12km away SE-7 Water observations on site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Swamp/coastal environment	6	10	10	8	10	10	10	9	10	10	10	1	10	10	1	10	2	10	2	7	3	1	1	1	**5.244**	**78%**	2Km from St Kilda, less than 1km from tramway museum, 3km from Waterloo Corner.
DSTO Edinburgh	327	1270	SA	EP-2 Minor streams pass thorugh site HSS-1 Adjacent a large community HSS-5 Near an easement (Railway adajcent) SE-6 Known geological fault 6km away SE-8 In an area of higher population SE-9 Adjacent residential buildings	Lots of strucutres on site	10	10	10	9	7	10	10	9	10	10	10	1	10	10	1	10	10	10	2	7	2	10	1	1	**5.692**	**84%**	5km from Edinburgh Airport, 30km from Adelaide airport.
Ginninderra Experiment Station, CSIRO	328	221	ACT	CWB-1 Within a CSIRO Nature Reserve EP-1 Minor water courses on site EP-2 Minor water courses on site EP-4 Barton Highway HSS-1 Nearby community HSS-5 Near an power easement SE-3 High rainfall region SE-5 Higher earthquake hazard potential SE-6 Near a known geological fault (18km) SE-8 In an area of higher population SE-9 Adjacent residential buildings		2	10	10	6	2	10	1	10	10	10	10	1	10	10	1	10	10	6	2	5	4	10	1	1	**4.872**	**72%**	
Ginninderra Experiment Station, CSIRO	329	234	ACT	CWB-1 Within a CSIRO Nature Reserve EP-1 Minor water courses on site EP-2 Minor water courses on site EP-4 Barton Highway HSS-1 Nearby community HSS-4 Odd shape site HSS-5 Near an power easement SE-3 High rainfall region SE-5 Higher earthquake hazard potential SE-6 Near a known geological fault (18km) SE-8 In an area of higher population SE-9 Adjacent residential buildings		1	10	10	5	3	10	1	10	10	10	10	1	10	3	1	10	10	6	2	6	4	10	1	1	**4.71**	**70%**	
Ginninderra Experiment Station, CSIRO	330	239	ACT	CWB-1 Within a CSIRO Nature Reserve EP-2 Minor water courses on site EP-4 Barton Highway HSS-1 Nearby community HSS-4 Odd shape site HSS-5 Near an power easement SE-3 High rainfall region SE-5 Higher earthquake hazard potential SE-6 Near a known geological fault (18km) SE-7 Site is noted as holding water SE-8 In an area of higher population SE-9 Adjacent residential buildings		1	10	10	9	2	10	1	10	10	10	10	1	10	1	1	10	10	6	2	5	4	1	1	1	**4.652**	**69%**	

Exmouth Area C - Naval HF Receiving Station	331	3830	WA	EP-2 Minor water courses on site EQ-1 Site is distance from Lucas Heights SE-1 Cyclonic Wind Region SE-6 Near a know geological fault (6km)		10	10	10	10	2	10	10	1	3	7	10	10	1	7	10	1	10	10	1	7	2	10	10	10	5.398	80%
Exmouth Area B - Admin & HF Transmitter	332	2050	WA	CWB-1 Adjacent a reserve (Bundegi Coastal Park) EP-2 Site is noted as holding water EP-4 Prohibited area on site, adjacent a reserve EQ-1 Site is distant from Lucas Heights HSS-1 Nearby community SE-1 Cyclonic Wind Region SE-2 Adjacent the coast SE-5 Higher earthquake hazard SE-6 Near a known geological fault SE-8 In an area of higher population SE-9 Adjacent residential buildings		7	10	10	10	1	10	6	1	10	8	10	1	10	10	10	1	1	10	1	7	2	10	1	1	4.994	74%
JORN Radar 1 Transmit Site	333	16920	QLD	EP-1 Extensive water channels EP-2 Extensive water channels		10	10	10	5	2	10	10	8	9	7	10	10	10	10	10	10	10	10	1	10	10	10	10	10	6.102	90%
Wyoming Satelite Airfield - Oakey	334	121	QLD	EP-1 Water body on site EP-2 Water body on site HSS-4 Shape of site SE-7 Water detected on site SE-8 8km from a town centre SE-9 8km from a town centre	Small airstrip on site	10	10	10	4	3	10	10	10	10	10	10	9	10	1	9	10	10	7	1	10	10	1	3	2	5.576	83%
Wallangarra Stores Depot	335	133	QLD	CWB-1 Near Girraween National Park EP-2 Water bodies on site HSS-4 Shape of site SE-3 High rainfall SE-7 Water detected on site SE-8 In an area of higher population SE-9 Adjacent residential buildings		1	10	10	8	1	10	10	10	10	10	10	7	10	1	10	10	10	3	2	10	10	1	1	1	5.232	78%
Oakey Aiport	336	473	QLD	EP-1 Minor water body on site EP-2 Minor water body on site HSS-1 Nearby community HSS-5 Near piperlines and transmission lines SE-3 Higher earthquake hazard SE-7 Water deteced on site SE-8 In an area of higher population SE-9 Adjacent residential buildings	Airport	10	10	10	4	3	10	10	10	10	10	10	1	10	10	1	10	10	6	1	10	10	1	1	1	5.392	80%
Twofold Bay Ordnance Loading Area	337	151	NSW	CWB-1 East Boyd State Forest EP-2 Water course on site HSS-1 Nearby community (Wonboyn) HSS-4 Shape of site SE-3 Higher rainfall area SE-8 In an area of higher population SE-9 Adjacent residential buildings		1	10	10	8	1	10	10	10	10	9	10	6	10	1	10	10	10	3	1	10	10	1	2	10	5.345	79%
Whyalla (Cultana Training Area)	338	194200	SA	EP-2 Many water courses on site SE-6 Geological faults pass through site SE-9 Adjacent residential buildings	Coastal	10	10	10	10	6	10	10	9	10	10	10	10	10	10	10	10	10	10	1	10	2	10	10	1	6.206	92%
Woomera (Nurrungar Test Area)	339	14900	SA	EP-2 Water courses on site	Woomera Prohibited Area	10	10	10	7	1	10	10	8	1	9	10	10	10	10	7	10	10	10	1	10	10	10	10	10	5.99	89%
Woomera (Airfield, Technical Area, Woomera Village)	340	4700	SA	EP-2 Water courses on site HSS-5 Roads for township	Woomera Prohibited Area Woomera Airfield	10	10	10	10	1	10	10	8	1	9	10	10	10	10	1	10	10	10	1	10	10	10	10	10	6.02	89%

Woomera (Small arms test range)	341	119	SA	EP-1 Water bodies near site EP-2 Water bodies near site HSS-4 Shape of site HSS-5 Access roads SE-7 Some water observations	Built strucutres on site Woomera Prohibited Area	5.518	82%
Lucas Heights	342	533	NSW	CWB-1 Adajcent Heathcote National Park EP-1 Water courses and bodies on site EP-2 Water courses and bodies on site EP-4 Holesworthy Base HSS-1 Nearby communities HSS-5 Access Road, electricty transmission line SE-3 Higher rainfall SE-8 In an area of higher population SE-9 Adjacent residential buildings	Adjacent Holesworthy	4.692	70%



Note:
Preliminary assessment only. Scores <7 have been identified above.

EQ-3 should have been set at a population around 250 rather than 1,000 but NEXIS did not contain this level of detail. As a result most remote sites scored 1 - not considered an issue.

SE-4 returns a 1 or 2 for all sites due to design of metric - Not considered an issue.

Red items present a potential risk

Orange items present a potential consideration for GA in subsequent assessment

Department of Industry & Science

National Radioactive Waste Management Facility
Site Selection Framework

May 2015

Executive Summary

The Australian Government is seeking to acquire a voluntarily nominated site on which to build a National Radioactive Waste Management Facility (the Facility) to manage low level and intermediate level waste generated in Australia.

The overall process to develop the Facility will take place in accordance with the *National Radioactive Waste Management Act*, 2012 (*NRWM Act*). Under the *NRWM Act* the Government has declared a nationwide process inviting landholders to nominate their land for consideration as a potential site for the Facility.

The Minister has approved the *Radioactive Waste Management: Nominations of Land: Guidelines and Nomination Form*, 2015 as the approach that he intends to follow to inform him of any action that he decides is to be taken under the *NRWM Act*. The Department will assist and advise the Minister as part of this process.

The Department has engaged GHD to develop a MCSA Framework to be applied to all nominated sites for the entire project through to a preferred site.

The MCSA Framework includes details on the development, and application, of a MCSA model that will be applied to the nominated land resulting in a ranked list of sites.

This MCSA Framework sets out the process that the Department will use to initially assess nominations for their suitability. It will also be used in subsequent phases of the project, as further details are made available through site characterisation.

The outcomes of this MCSA process will be part of the information provided to the Minister for him to consider when making a decision under the *NRWM Act* including decisions made under sections 9 and 14.

Independent Advisory Panel

The Department has established an Independent Advisory Panel to provide it with a broader understanding of technical and community issues associated with managing Australia's radioactive waste.

The Independent Advisory Panel has provided independent advice on the development of the MCSA Framework including advice that best reflects stakeholder and community values.

It should be emphasised that the Independent Advisory Panel provides advice to the Department and is not a representative or decision-making body.

Voluntary Site Nominations

The *NRWM Act* allows for volunteer nominations for suitable sites to be put forward.

In December 2014 the Minister declared that nominations could now be made under Section 7 of the Act, which initiated the nation-wide call for volunteer sites closing on 5 May 2015.

The assessment of volunteer nominations will commence on 6 May 2015.

Multi Criteria Site Analysis Model

The MCSA is a desktop method that will be used in order to perform a comparative evaluation of the nominated sites in order to produce a shortlist of suitable sites for consideration by Government.

The decision to develop a MCSA Framework for site selection is based on the need to implement a robust, equitable and defensible process to shortlist an unknown number of offered (nominated) sites. The principles of repeatability, transparency, and fairness have been applied to the development of the assessment model.

A MCSA model has been developed in conjunction with Geoscience Australia that partially automates the assessment process.

The model consists of a set of objectives, attributes, criteria and metrics that form that basis for assessment. These were developed through reference to applicable codes/standards/guidelines, international examples of similar siting assessments, discussions with Department Staff and through a series of workshops held with members of the Independent Advisory Panel.

To reassure stakeholders that sites are being assessed objectively, the criteria for the comparative evaluation have been made public before the call for nominations phase closes.

Assessment and Recommendations

The assessment process includes the evaluation of quantitative criteria using the model developed in conjunction with Geoscience Australia. The model includes nation-wide data sets appropriately matched with the identified criteria.

It also includes the evaluation of qualitative criteria. This part of the assessment will require data to be collected on each of the sites nominated (including information provided with nominations). A separate structure has been developed to assess these sites to maximise the repeatability of the scoring process.

A site selection report will be developed that outlines the process undertaken, the overall ranking of the sites and will include a risk assessment. The risk assessment is a key element of the report and provides context to decisions makers on the ranking process.

The site selection report will be used by the Department to make recommendations on the final shortlist. The Minister will consider relevant information before announcing a shortlist of nominated sites. There will be a 60-day public comment period following the Minister's announcement and during this period any concerns raised by interested parties will be captured and taken into consideration.

Subsequent Stages

Following shortlisting of sites by the Minister, site characterisation will begin (Phase 2). The purpose of site characterisation is to explore the suitability of sites for the proposed facility in greater detail and to eventually arrive at a preferred site. The same assessment framework based on the criteria of Phase 1 will be utilised to support the selection of a preferred site; the data sourced for this will be site-based.

The development of the Detailed Business Case will follow characterisation. The Detailed Business Case is one of the final steps for Government approval of the project and, once obtained, allows for detailed design, licensing, construction and operation of the facility.

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1. Introduction

1.1 Context

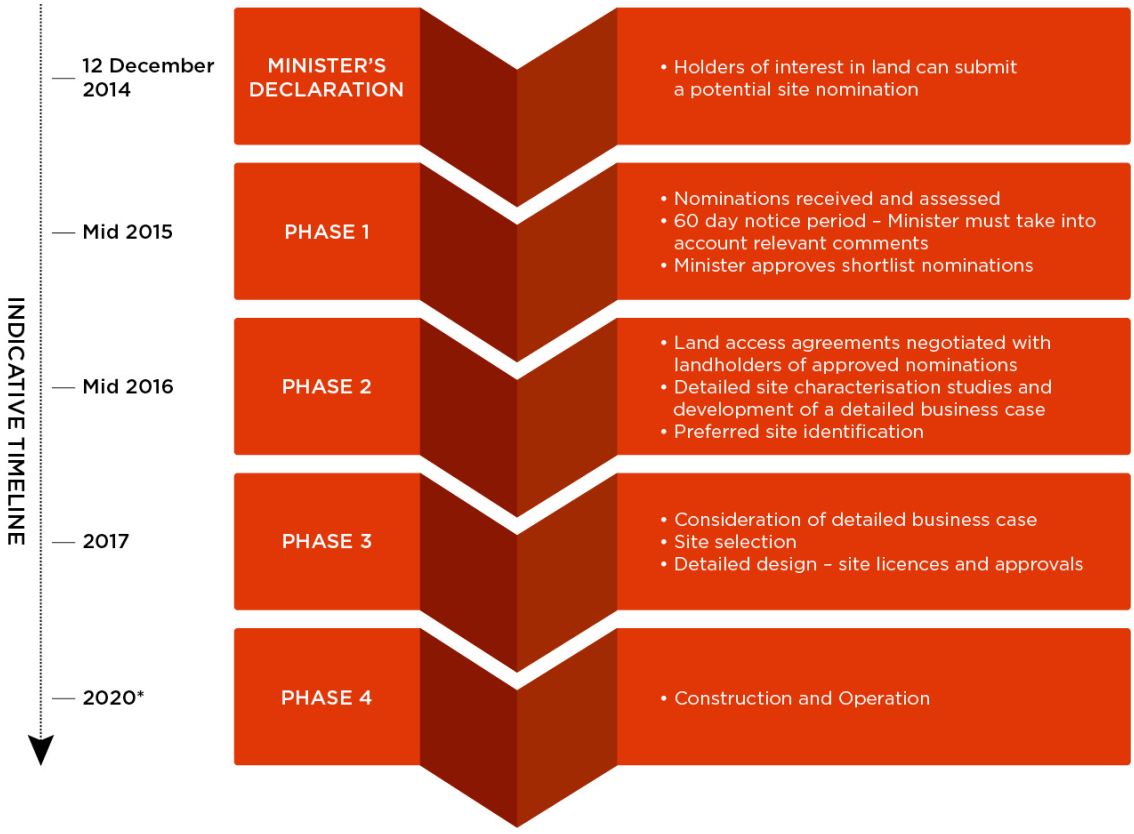
The Australian Government is seeking to acquire a voluntarily nominated site on which to build a National Radioactive Waste Management Facility (NRWMF) to manage low level waste (LLW) and intermediate level waste (ILW) generated in Australia.

The overall process to develop the NRWMF will take place in accordance with the *National Radioactive Waste Management Act*, 2012 (*NRWM Act*). Under the *NRWM Act* the Government has declared a nationwide process inviting landholders to nominate their land for consideration as a potential site for the NRWMF.

The NRWMF will accommodate the disposal of LLW and may also include long-term storage for ILW. Only Australian produced radioactive waste will be accepted by the NRWMF.

Figure 1, below, sets out the various phases of development of the NRWMF. Phase 1 involves the nationwide nomination process to identify of a range of suitable sites including an assessment process of all nominated sites. This will lead to subsequent phases including the selection of a preferred site that will eventually accommodate the NRWMF.

Figure 1 Phases of Development of NWRMF



*Indicative only - is dependent on licences and approvals.

This document is primarily concerned with Phase 1 relating to the nomination and assessment of sites.

The initial steps followed to date are:

- Declaration by the Minister that nominations can be made under Section 7 of the *National Radioactive Waste Management Act, 2012 (NRWM Act).*
- Development of a Multi Criteria Site Assessment (MCSA) model. This model or framework includes clearly defined objectives, attributes, criteria and scoring metrics.
- Development of weightings that are to be applied for all criteria.
- Receipt of volunteer nominations for suitable sites under the *NRWM Act* to be included in the MCSA.

After the Completion of the above, the following will occur:

- Phase 1 Assessment – all sites assessed using assessment criteria and weightings to establish a ranked list of sites leading to a shortlist of sites (as determined by the Minister).

1.2 Purpose of this Document

This document sets out the process that will be followed to arrive at a ranked list of suitable sites, which the Minister may shortlist to go through to Phase 2.

The purpose of the Framework is to provide high-level guidance and direction to the project team through the initial stages of site assessment.

The document has been written for site selection decision makers and to inform stakeholders and other interested parties of the process that will be followed in Phase 1.

1.3 Multi-Criteria Site Analysis

A MCSA process will be used in order to undertake an objective comparative evaluation of the offered sites against pre-determined objectives, criteria and weightings. This process will be used in Phase 1 to lead to a ranked list of suitable sites. Drawing upon the results of this analysis, the Minister may decide upon a shortlist of suitable sites.

Following the shortlisting of sites, site characterisation investigations (Phase 2) will be undertaken on the shortlist to allow a preferred site to be identified. The same MCSA process will be used during this phase of work. Once the identification of a preferred site has been completed, the process for gaining approvals (site and construction licensing, environmental etc.) will be undertaken including design, construction and commissioning that will lead to the eventual operation of the site.

A MCSA approach has been selected to assist with the complex decision making process involved in selecting a site for the facility. The advantage of using a MCSA decision process is that the outcome can be clearly documented to meet the highest levels of transparency, and it allows both the qualitative and quantitative assessment of sites to be undertaken under the same assessment model.

The MCSA process provides a logical and well-structured approach to evaluating sites and is a reliable assessment method that is mostly automated. It is an efficient assessment tool designed to handle large amounts of data of different sources and types.

The MCSA is one facet of the overall process in selecting a suitable site. However, one of the fundamental characteristics of the MCSA approach is that it has been guided by advice from an Independent Advisory Panel (IAP) established to assist the Department in relation to the NRWMF. The IAP provides a broad range of scientific, engineering and socio-economic experience and expertise that has been drawn upon in the development, testing and finalisation of the MCSA Framework.

1.4 Relevant Documentation

A number of key documents have been produced by various organisations for the management of radioactive waste including some specifically written around the selection of a suitable site for the waste management facility project.

Additionally, there are some international organisations that have prepared papers regarding the use of Multi-Criteria Analysis for the assessment of similar site based considerations.

A small example of these documents include:

- Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia, National Health and Medical Research Council, 1992,
- Safe Storage of Radioactive Waste, National Store Project: Methods for Choosing the Right Site, Department of Industry, Science and Resources, 2001,
- Multi-Criteria Analysis: A Manual, Department for Communities and Local Government: London, 2009,
- Proposed Commonwealth Radioactive Waste Management Facility, Northern Territory, Synthesis Report, Department of Resources, Energy and Tourism, 2009
- Management of Radioactive Waste in Australia, Australian Nuclear Science and Technology Organisation, 2011,
- Regulatory Guide: Licensing of Radioactive Waste Storage and Disposal Facilities v2, ARPANSA March 2013,
- Generic Conceptual Design (National Radioactive Waste management Facility), ENRESA, 2013. (This provides a conceptual design for a near surface LLW Disposal Facility and a collocated LLILW Storage Facility), and
- Regulatory Guide: Siting of Controlled Facilities v2, ARPANSA, August 2014.

These, and other resources listed within this Framework, will be used to inform the current process with. That is, they will be used to broaden insight and understanding and facilitate the development of an approach that is suitable within the current Australian context.

Further details of the relevant literature are outlined in Section 3.

1.5 Assumptions

The work undertaken to develop a preferred site using the model of a MCSA assumes:

- That Consistent with the Initial Business Case, the decision to proceed with the management of radioactive waste in a centralised facility in Australia has been made and that this will be achieved through the provision of a near-surface facility designed to accommodate the disposal of solid LLW and the storage of ILW that has been or will in the future be produced in Australia.
- The facility will only address Australian LLW and ILW.
- Operation of the *NRWM Act* will lead to the submission of a number of sites that will be suitable for consideration to locate the facility.
- Those stakeholders with a direct interest in the management of radioactive waste in Australia will be willing and able to work with the project team.

1.6 Guiding Principles

The decision to develop a MCSA for site selection is based on the need to implement a robust, equitable and defensible process to shortlist an unknown number of offered (nominated) sites. As such, the principles outlined below are applied to each step of the process.

- **Repeatable**: The process must be repeatable in both process and outcome. A repeatable process indicates that the approach is objective and consistent in its treatment of applicable data. Specifically, the assessment of nominated sites against criteria must be consistent between sites and hence repeatable, thereby demonstrating the robustness of the approach.
- **Transparent**: The process must be transparent given the significance and potential impact of the project. Transparency and disclosure of assessment criteria that are applied are intended to lead to public and stakeholder confidence in the assessment method and in the nomination process.
- **Defensible**: The approach must be defensible against review. While it is recognised that there is unlikely to be one clearly correct answer, the process used must stand up to peer review.
- **Fair**: The *NRWM Act* has been developed around procedural fairness and subsequently all related tasks must also apply this principle.

1.7 Stakeholder Engagement

Critical to the success of the entire project is undertaking a comprehensive stakeholder engagement process implemented at the inception of the project. The purpose of this is to create stakeholder ownership / stewardship of the MCSA process and manage and understand fears, concerns and/or objections to the siting process and enable the Department to address and mitigate these.

The process will support community ownership of the siting process with a view to enhancing the net benefit to the community selected to host the Facility.

Further detail of this process has been developed as a separate consultancy by KREAB, who have been engaged by the Department.

2. The National Radioactive Waste Management Facility Project

2.1 The Need

Australia currently stores approximately 4,048.28m^3 of LLW and 551.5m^3 of ILW[1] that has been generated from a variety of sources[2].

The waste is stored either by Commonwealth Agencies such as the Australian Nuclear Science and Technology Organisation (ANSTO) at Lucas Heights and the Commonwealth Science and Industrial Research Organisation at Woomera or at civilian/research sites or medical facilities.

Waste residues from the reprocessing of spent fuel from ANSTO's HIFAR reactor is expected to return to Australia by the end of 2015. This will see 65m^3 of ILW return to be stored. Additionally, approximately 500m^3 of LLW and the same volume of ILW will result from decommissioning of the HIFAR reactor. Future decommissioning volumes of a similar order are anticipated along with general waste from the ongoing civilian/research/medical sectors (such as the OPAL reactor).

A number of reasons exist that define the need for a national approach to radioactive waste management in Australia:

- Radioactive waste is currently stored at multiple sites around Australia (both Commonwealth and State managed). No single form of governance or control (security/safety) is in place across the sites. All of these sites are interim measures with no long-term disposal solution in place.
- Policy and international commitments require that a long term and full life cycle solution be in place to manage the radioactive waste of the nuclear science industry in Australia. Continued operation under the existing arrangements is not compliant with Australian or international conventions or policy.
- Approvals granted in Australia for the construction of interim facilities have been contingent on progression towards a long-term solution in the form of a national waste management facility.
- Without such a facility, a risk exists that the nuclear science industry may be forced to cease operations. This will impact jobs, scientific research and development and the supply of nuclear medicines to Australia. It will also result in Australia falling behind other technology developed countries if the current nuclear program is forced to close. Failure to manage the radioactive waste already generated in Australia will leave a burden for future generations.

Given the strong need for a consistent national approach to radioactive waste management the Australian Government has made a commitment to ILW storage and LLW disposal through the development of the NRWMF.

Australia has also adopted International radioactive waste management principles and criteria. In essence, these principles and criteria are designed to isolate radioactive wastes from the biosphere for appropriate time periods.

[1] Initial Business Case – Long Term Management of Australia's Radioactive Waste, JacobsSKM, December 2014

[2] Conceptual Design for a Near Surface Low Level Waste (LLW) Disposal Facility and Collocated above Ground Long-Lived Intermediate Level Waste (LLILW) Storage Facility in Australia, Enresa, 2013

2.2 The Facility

The dispersed nature of existing storage presents an opportunity to rationalise the multiple storages into a single facility designed for international best practice and governed by the *NRWM Act*. The facility would be operated with powers under the *NRWM Act* that provide increased levels of safety including guarantees over the life of operation of the Facility as well as the subsequent period of institutional control.

The NRWMF will accommodate the disposal of LLW and may also include storage for ILW for Australian wastes.

It will provide capacity for long-term management of radioactive waste that is currently in storage and for future anticipated generated waste. It may provide for storage of ILW until a permanent disposal solution is developed.

Options for the NRWMF outlined in the Initial Business Case (IBC) are:

- Engineered, above ground management facility for LLW disposal and ILW storage,
- Engineered above ground management facility for LLW disposal, with ILW management to continue under current arrangements, and
- Near surface engineered trenches for LLW disposal, with ILW management to continue under current arrangements.

2.3 Selecting a Site

As a site has not yet been identified, the initial part of the project to deliver these works involves the selection of a suitable site that will eventually house the NRWMF. This will be achieved through the *NRWM Act* through a voluntary call for nomination of potential sites and subsequent assessment for suitability.

The *NRWM Act* allows for volunteer nominations for suitable sites through two processes. The process is two staged:

- Section 5 of the *NRWM Act* provides for public comment and Land Council nominations (from the Northern Territory). The comment period for this first stage expired on 10 November 2014, and
- Suitable sites were not put forward which has initiated Section 7 of the *NRWM Act, which* provides for a nation-wide call for volunteer sites.

In December 2014, the Minister declared that nominations could be made under Section 7 of the Act that enables general nominations to be made.

The nominated sites will be assessed against criteria to allow a ranking of suitable sites to be determined. Following this, physical characterisation of the shortlisted sites will be undertaken leading to selection of a preferred site and then the preparation of a Detailed Business Case (DBC).

This document outlines the site selection process in more detail.

3. Related Acts, Regulations and Guidelines

3.1 Overview

Details of the documentation to be utilised throughout the NRWMF project are highlighted below.

3.1.1 Legislation

Relevant legislation includes:

- *Australian Radiation Protection and Nuclear Safety (ARPANS) Act*, 1998,
- *Australian Radiation Protection and Nuclear Safety Regulations*, 1999,
- *Environmental Protection and Biodiversity Conservation (EPBC) Act* 1999,
- *National Radioactive Waste Management (NRWM) Act*, 2012, and
- *Australian Nuclear Science and Technology Organisation (ANSTO) Act*, 1987.

3.1.2 Business Case

- Revised Initial Business Case – Long Term Management of Australia's Radioactive Waste, JacobsSKM, April 2014

3.1.3 Criteria

Relevant references in the development of criteria are:

- Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia, National Health and Medical Research Council (NHMRC), 1992,
- Safe Storage of Radioactive Waste – The National Store Project: Methods for choosing the right site: A public discussion paper, Dept. of Industry, Science and Resources, 2001,
- Regulatory Guidance for Radioactive Waste Management Facilities: Near Surface Disposal Facilities; and Storage Facilities, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), 2006,
- Safety Guide: Classification of Radioactive Waste, ARPANSA, April 2010,
- Regulatory Guide: Licensing of Radioactive Waste Storage and Disposal Facilities v2, ARPANSA, 2013, and
- Regulatory Guide: Siting of Controlled Facilities v2, ARPANSA, August 2014.

3.1.4 Multi-Criteria Analysis

Details of previous Multi-Criteria Analysis used as a reference are:

- Assessing the Options, Future Management of Used Nuclear Fuel in Canada, Nuclear Waste Management Organization, 2004 (Canada),
- Understanding the Choices, The Future Management of Canada's Used Nuclear Fuel, Nuclear Waste Management Organization, 2004 (Canada), and,
- Managing Our Radioactive Waste Safely, CoRWM's Recommendations to Government, Committee on Radioactive Waste Management, 2006 (UK).

3.1.5 Other Associated Documents

Details of associated documents referred to in this report or related to the works are:

— Radioactive Waste Management Project, Communication Strategy, Department of Industry and Science, 2014, and,

— National Radioactive Waste Management Project, Project Plan, Department of Industry and Science, 2014.

3.2 Key Legislation

Details of the key components of the legislation and standards are outlined below for reference.

3.2.1 National Radioactive Waste Management Act

The *NRWM Act* came into effect on 4 April 2012.

The Act establishes a legislative framework for siting a facility on nominated land. There are two volunteer nomination processes within the Act:

— The first allows for Land Council nominations of Aboriginal land on behalf of its Traditional Owners.

— If, for any reason, a facility cannot be sited on nominated Aboriginal land, a nation-wide process for siting a facility will be initiated.

Under both processes, extensive consultation will be undertaken. The Act will ensure that the selected site undergoes full environmental, heritage and other approval processes.

After siting, the Act allows for a facility to be established to manage radioactive waste generated by Australia's medical, industrial, agricultural and research use of nuclear materials.

The Act promotes the consistent, safe and responsible management of radioactive waste, in accordance with Australia's obligations as a party to the *Joint Convention on the Safety of Spent Fuel Management* and on the *Safety of Radioactive Waste Management*.

3.2.2 Australian Radiation Protection and Nuclear Safety Act

The Commonwealth legislation that is relevant to the regulation of radiation and nuclear activities are:

— *Australian Radiation Protection and Nuclear Safety (ARPANS) Act, 1998,* and

— Australian Radiation Protection and Nuclear Safety Regulations, 1999.

The *ARPANS Act* and regulations exist to protect the health and safety of people and to protect the environment from the harmful effects of radiation.

An application to site a controlled facility (the NRWMF in the context of this project) must address all of the relevant matters specified in the *ARPANS Act* and Regulations as well as providing any additional relevant information requested by the CEO of ARPANSA.

The *ARPANS Act* refers to a number of relevant publications that look at the holistic safety of a Radioactive Waste facility including:

— The Code of Practice for the Disposal of Radioactive Wastes by the User, NHMRC, 1985,

— The Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia, NHMRC, 1992,

— The Recommendations for Limiting Exposure to Ionizing Radiation and National Standard for Limiting Occupational Exposure to Ionizing Radiation, ARPANSA, 2002,

— The Code of Practice for the Security of Radioactive Sources, ARPANSA, 2007,

— The Code of Practice for the Safe Transport of Radioactive Material, ARPANSA, 2008,

— The National Directory for Radiation Protection, ARPANSA, 2011, and

— Holistic Safety Guidelines, ARPANSA, 2012.

It should be noted that not all of these would apply to the first phase of the project.

3.3 Environmental Protection and Biodiversity Conservation Act

The *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* is the Government's key instrument of environmental legislation.

The *EPBC Act* focuses federal interests on the protection of matters of national environmental significance, with states and territory governments taking responsibility for state and local matters.

It allows relevant governments to protect the environment and conserve Australian biodiversity, enhance the protection of important natural and cultural places and promote ecologically sustainable development through a developed framework.

It does this by providing a streamlined national environmental assessment and approvals process. In particular it provides the legal framework to protect and manage matters of national environmental significance.

One such matter defined in the *EPBC Act* is 'Nuclear Actions'.

The approval process starts with a referral to the minister regarding the action to be taken. The minister then makes a decision whether an approval is required under the *EPBC Act*. Following this, the action may be:

— A 'controlled action', requiring an assessment and approval under the *EPBC Act*

— A 'not controlled action, particular manner' where further approval is not required if the action is undertaken in accordance with the manner specified (different from the referral)

— A 'not controlled action' where further approval is not required if the action is undertaken in accordance with the referral

It is anticipated that the NRWMF would be a 'controlled action' requiring certain assessments and approvals before approval under the *EPBC Act* would be provided.

3.4 Details of Key Guidelines and Standards

Some of the relevant guides and standards that apply specifically to siting a radioactive waste facility are outlined below. These have been drawn upon to develop the criteria that nominated sites will be assessed against for suitability. This is not a complete review and should not be taken as a definitive consideration. The purpose is to develop a sufficient understanding to guide the MCSA process to a level that is appropriate to enable an effective and relevant screening of nominated sites.

3.4.1 ARPANSA Radiation Health Series – Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia (1992)

This document, formerly prepared by the NHMRC and now under control and review by ARPANSA, provides a basis for the near-surface disposal of LLW to ensure that there are no detrimental effects to the environment or to humans. The code outlines a number of considerations but specifically discusses requirements for the selection of suitable sites. The criteria and also "other factors" are shown below.

Table 1 ARPANSA/NHMRC Site Selection Criteria

Site Selection Criteria
The facility site should be located in an area of low rainfall, should be free from flooding and have good surface drainage features, and generally be stable with respect to its geomorphology
The water table in the area should be at a sufficient depth below the planned disposal structures to ensure that groundwater unlikely to rise to within five metres of the waste, and the hydrogeological setting should be such that large fluctuations in the water table are unlikely
The geological structure and hydrogeological conditions should permit modelling of groundwater gradients and movement, and enable prediction of radionuclide migration times and patterns
The disposal site should be located away from any known or anticipated seismic, tectonic or volcanic activity that could compromise the stability of the disposal structures and the integrity of the waste
The site should be in an area of low population density and in which the projected population growth or the prospects for future development are also very low
The groundwater in the region of the site which may be affected by the presence of a facility should ideally not be suitable for human consumption, pastoral or agricultural use
The site should have suitable geochemical and geotechnical properties to inhibit migration of radionuclides and to facilitate repository operations

Table 2 ARPANSA/NHMRC Site Selection – Other Factors

Site Selection Criteria – Other Factors
The site for the facility should be located in a region which has no known significant natural resources, including potentially valuable mineral deposits, and which has little or no potential for agriculture or outdoor recreational use
The site should have reasonable access for the transport of materials and equipment during construction and operation, and for the transport of waste into the site
The site should not be in an area which has special environmental attraction or appeal, which is of notable ecological significance, or which is the known habitat of rare fauna or flora
The site should not be located in an area which is of special cultural or historical significance
The site should not be located in reserves containing regional services such as electricity, gas, oil or water mains
The site should not be located in an area where land ownership rights or control could compromise retention of long-term control over the facility

3.4.2 ARPANSA Regulatory Guide – Siting of Controlled Facilities (v2)

This regulatory guide is used throughout the process of licensing of a controlled facility. As licensing of a facility is of critical importance, any site characteristics that are outlined in this document must be addressed throughout the project to avoid the risk of not obtaining a licence.

The document outlines details of the safety case and safety assessment that forms a key part of the licensing process.

The document also outlines features of a site that are of key importance to the site selection process, as tabulated below.

Table 3 ARPANSA Features for Site Characterisation

Item	Consideration
Geology	Faulting and fracturing
	Volcanic activity
	Landslides, subsidence and erosion
	Permafrost
	Soil and rock type and capacity
	Liquefaction potential
	Groundwater
Geomorphology	Surface water and topography
Ecology	Vegetation and wildlife
	Threatened and endangered species
Meteorology	Wind, rain, temperature, humidity and pressure
	Daily and seasonal variability
	Climate change
Demographics	Population and projections
	Seasonal or other occupation
	Projected land uses
	Drinking and other water uses
	Special needs groups
Services	Electricity, gas, water and Sewerage
	Communications
	Emergency services
	Proximal hazardous materials
	Services nearby that may require emergency response
Radiological Baseline	Naturally Occurring Radioactive Materials (NORM)
Events	Severe weather (floods, thunderstorms, cyclones, hail)
	Tsunami
	Earthquakes and fault displacements
	Fires
	Inadvertent intrusion

3.4.3 ARPANSA Safety Guide – Classification of Radioactive Waste

This guide focuses on the classification of radioactive waste and outlines how different waste types affect handling, storage or disposal requirements. Details of siting requirements are not discussed, however it does give guidance on the type of facility suitable for ultimate disposal for each category of waste.

3.4.4 International Atomic Energy Agency (IAEA) Safety Series

The IAEA has created a large volume of Safety Fundamental, Safety Requirements and Safety Guides applying to nuclear safety across a variety of topics. Critical to storage and disposal and in particular to siting of facilities are the following documents:

- Fundamental safety principles (SF-1),
- Site evaluation for nuclear installations (NS-R-3),
- Storage of radioactive waste (WS-G-6.1),
- Disposal of radioactive waste (SSR-5),
- Near surface disposal facilities for radioactive waste (SSG-29), and
- Safety assessment for facilities and activities (GSR part 4).

Of most relevance is the ‘Site Evaluation for Nuclear Installations’ that outlines the following considerations for site characteristics, being:

- Earthquakes and surface faulting,
- Meteorological events,
- Flooding,
- Geotechnical hazards,
- External human induced events,
- Population distribution,
- Use of land and water, and,
- Ambient radioactivity from naturally occurring radioactive material (NORM).

4. Site Selection Framework

4.1 Overview

The following outlines the key steps that have been undertaken to prepare for Phase 1 of the Project. This process will conclude with a ranking of suitable sites.

Also included below, for context, are the proceeding Site Characterisation and Detailed Business Case phases (Phases 2 and 3).

To develop the MCSA it was necessary to undertake the following:

- **Selection of Criteria:** Determine the criteria that are relevant to the siting of the facility and which would be used in ranking the sites including establishing a process for ranking against the criteria. Described in Section 5.
- **Determination of Weightings:** Against each of the criteria, determine weightings that reflect their relative importance to the project including a sensitivity analysis and rationalisation of weightings. Described in Section 6.

The MCSA Framework will then be used to assess the sites during Phase 1:

- **Assessment of Sites:** Undertake the Assessment and summarise the outcome in a comprehensive document. Described in Section 7.

Following Phase 1 assessment, subsequent phases will continue to use the MCSA framework and will further refine the assessment of sites based on the detailed gathered:

- **Site Characterisation:** To confirm the desktop studies and refine the scoring for the shortlisted sites a detailed site based assessment will be undertaken to determine a preferred site. Described in Section 8.
- **Detailed Business Case:** Including an EIS to address the requirements of the *EPBC Act* and actions to address the *ARPANS Act* and other work as part of the regulatory approval process. Described in Section 9.

Figure 2, below, demonstrates this process.

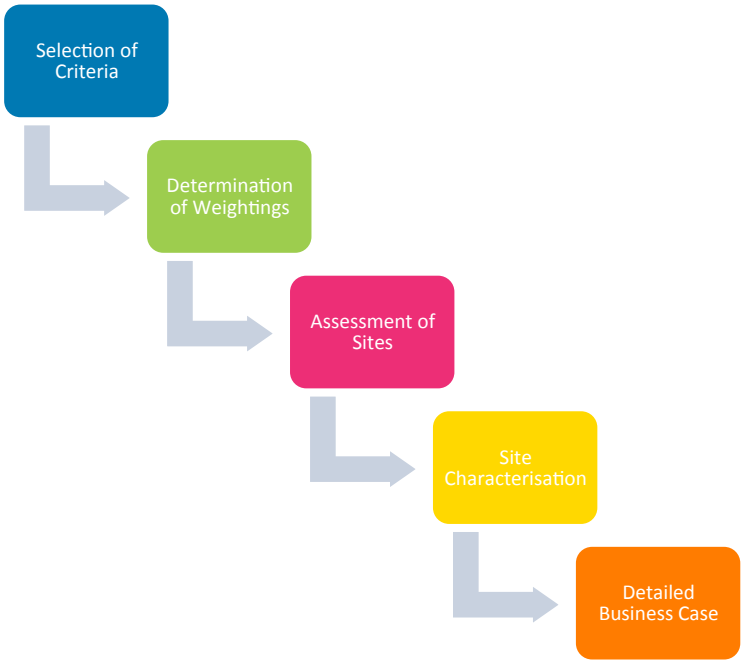


Figure 2 Site Selection Framework Overview

4.2 Key Deliverables

The following deliverables are provided as part of this process:

- **Site Selection Framework**: this document,
- **Site Selection Report**: This document will report on the outcome of this part of the MCSA process and will nominate the ranking of suitable sites for the Facility including a detailed risk assessment.

Draft versions of each of the above will or have been utilised for the purposes of engagement and review and approvals.

4.3 Independent Advisory Panel (IAP)

The Department has established an IAP. The purpose of the IAP is to provide the Department with a broader understanding of technical and community issues associated with managing Australia's radioactive waste. Two subgroups support the process: a technical subgroup and a socio-economic subgroup.

The IAP provides independent technical and project implementation advice for identifying a site and establishing a national facility including developing a site identification methodology that best reflects stakeholder and community values.

The IAP provides advice to the Department in developing a framework to shortlist potentially suitable volunteered sites. Sites are assessed against a broad range of factors including technical, economic, social and environmental.

It should be emphasised that the IAP provides advice to the Department and is not a representative or decision-making body.

4.4 Process Flowchart

The following chart outlines the proposed ordering of tasks included in this Framework and the interaction between various parts of the project.

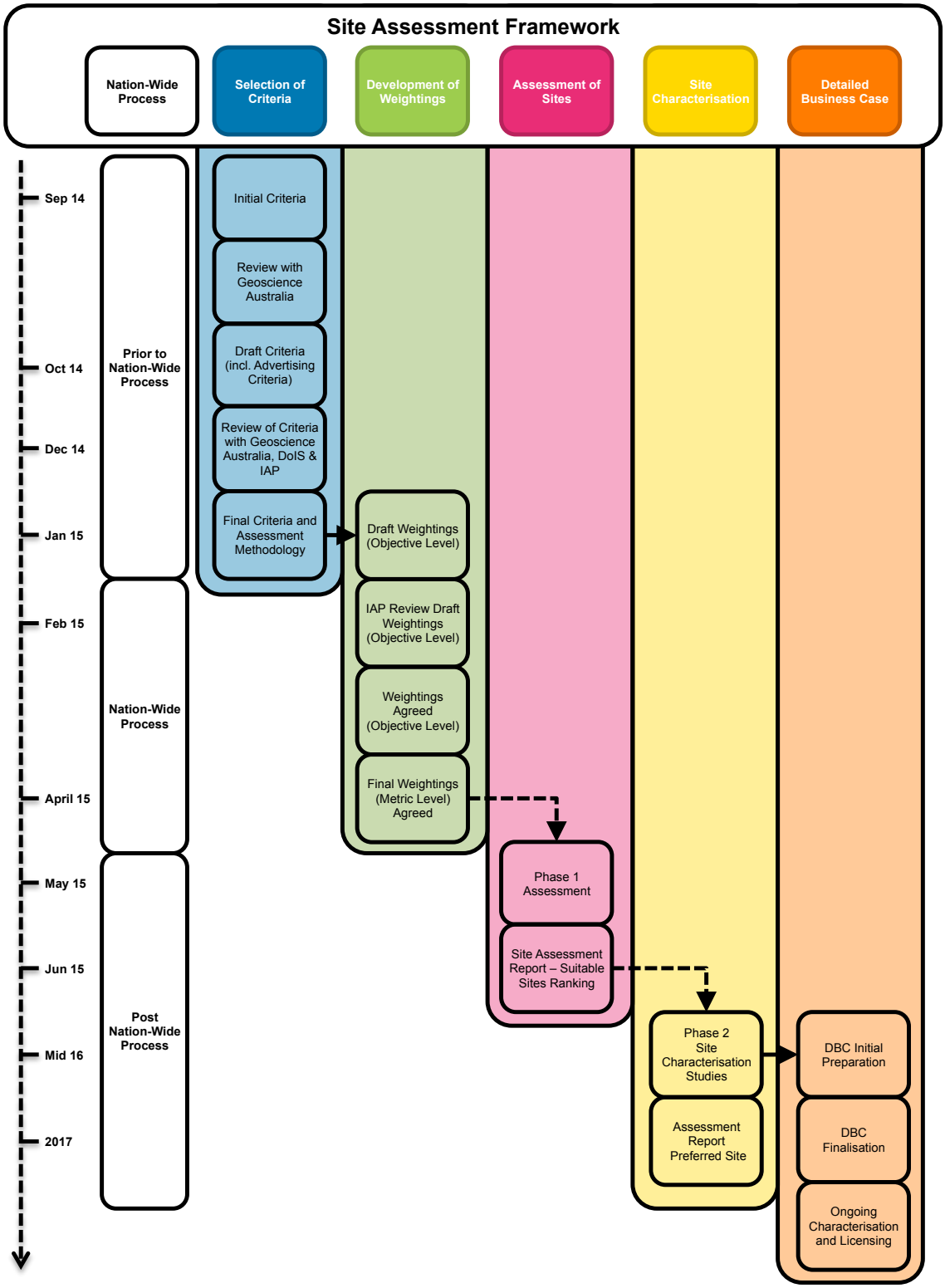


Figure 3 Site Assessment Process

5. Site Selection Criteria

5.1 Development and Agreement of Criteria

Development of the Phase 1 assessment criteria (for site selection) was completed through several steps as outlined below.

Figure 4 Selection of Criteria

Assessment criteria were developed from a number of key sources including, but not limited to, the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia,* NHMRC, 1992 as well as *Regulatory Guide: Licensing of Radioactive Waste Storage and Disposal Facilities v2*, ARPANSA, 2013, and *Regulatory Guide: Siting of Controlled Facilities v2*, ARPANSA, August 2014.

5.1.1 Initial Criteria

The initial development of criteria began prior to the announcement that the volunteer nomination process was to proceed to a nation-wide call for sites.

The first stage of developing criteria included a draft set of objectives for the NRWMF. Under each objective, a list of attributes and criteria was also drafted.

These draft criteria were sourced initially by:

- Reference to applicable codes, standards and guidelines as outlined in Section 3;
- Reference to international examples of similar siting assessments;
- Reference to project specific documents including the *Synthesis Report*, 2009 and the *Concept Design Report,* 2013; and,
- Discussions with Department Staff.

5.1.2 Review with Geoscience Australia (GA)

A review was undertaken with GA to determine what data was available at a national level that would be suitable for use in assessing sites. Critical to this component was finding data that was detailed enough, was consistent across the nation and was accessible.

Following the review GA prepared a listing of measurable criteria and the proposed data sources. A series of workshops were held to develop the criteria further, and refine metrics to be utilised in the assessment.

5.1.3 Draft Criteria

Draft Assessment Criteria were developed and presented to the Department for review. The presentation outlined:

- The categorisation of each criterion;
- The hierarchy of criteria (Objectives, Attributes, Criteria and Metrics, refer below for details); and,
- Each criterion along with its assessment method.

5.1.4 Review of Draft Criteria with GA, Department and IAP

Following issue of the draft criteria a workshop with IAP members (the 1st IAP Workshop) was held to review the objectives, attributes and criteria in detail. Feedback was taken from the IAP members and changes made to the objectives, attributes, criteria and metrics.

After the changes had been made further work was undertaken to finalise the MCSA model including detailed reviews of the metrics and scoring method and validation of the data sources.

5.1.5 Final Criteria

The final criteria were prepared on the basis of feedback received and are included in this document in Section 5.2.

The Department have approved the final criteria to be used in assessment. This approval is based on the information contained in this document and from the advice provided to the Department by the IAP at the first two IAP Workshops.

Provenance of Objectives and Criteria

The Objectives and Criteria have been developed from a number of sources. The following is a brief summary of their origin and the background for their inclusion:

— Health, Safety and Security

- This objective relates to the health and safety of both workers and the public. It also includes the security of the Facility.
- These criteria are referenced in nearly all Australian and International guidelines and are a critical part of the licensing process for the facility.
- The criteria have been developed in line with the high level objectives outlined in the *Code of Practice for the Near-Surface Disposal of Radioactive Waste in Australia*, NHMRC, 1992 and *Regulatory Guide: Siting of Controlled Facilities v2*, ARPANSA, August 2014.
- The underlying approach to achieving this objective is through the design, construction and operational phases of the project, however there are elements of the siting process that can have an impact on the success of this objective; these criteria have been included for site identification.

— Environmental Protection

- This objective relates to the protection of the natural environment in which the Facility would be located.
- The items within this objective and the objective itself generally relate to the requirement to achieve *EPBC Act* approval for the project.
- One matter defined in the *EPBC Act* is 'Nuclear Actions', which the development of NRWMF would be classed, as well as being a 'Commonwealth Action'.
- The criteria relating to this objective are site specific and hence are including in this phase of the project. Detailed site characterisation is required to confirm acceptance for a number of the metrics, however.
- As with the previous objective, fully satisfying the intent of Environmental Protection will fall to the approvals process and will be tied in with design, construction and operation of the Facility.

— Community Well-being

- This objective is related to protection of community assets or areas that are utilised by the community, either directly or in-directly.
- Community well-being is considered in a number of the guides referenced, however the objective and subsequent criteria were further developed in consultation with the IAP.
- The criteria relating to this objective are site specific and hence are including in this phase of the project. Detailed characterisation is required to confirm acceptance for a number of the metrics.

— Equity

- This objective is related to the need for fairness in the consideration of the placement of the facility including consideration of those not directly affected (such as at the site's location). Consideration must include all communities that may be potentially impacted.
- Equity is considered in a number of the guides referenced, however the objective and subsequent criteria were further developed in consultation with the IAP.
- Equity is affected by siting and must be considered in this initial phase of the project.
- Equity was seen as a critical consideration if acceptance of, and support for, the facility was to be achieved.

— Economic Viability

- This objective is related to the economic viability of the project and includes consideration of construction and ongoing operational cost of the Facility.
- Considerations relating to the cost of the facility are important at the site selection stage as the location and features of the site can have an impact on the acquisition cost or on the construction and operation of the facility.
- This objective and the criteria have been developed with the Department.
- The objective also includes consideration of the longer-term sustainability of the Facility.

— Stable Environment

- This objective is related to the stability of the site (in terms of successful ongoing operation) in which the Facility will be located. The objective identifies that while the facility must not impact the environment there also should not be environmental factors that impact the operation of the facility, now or in the future.
- The majority of these criteria relate to the recommendations outlined in the *Code of* Practice *for the Near-Surface Disposal of Radioactive Waste in Australia,* NHMRC, 1992.
- The document, *Regulatory Guide: Siting of Controlled Facilities v2*, ARPANSA, August 2014, also includes reference to a number of these criteria.
- These criteria will be explored in greater detail at the site characterisation stage and further into design and licensing.

A description of each criterion associated with these objectives is outlined in Appendix D.

5.1 Data Sources & Criteria Assessment Responsibility

There are a variety of data sources required to assess the sites. GA has provided the bulk of this data and where they do not hold the information they have obtained it from another agency or body. As the criteria were developed, a gap analysis was undertaken to clarify where GA can provide the required information and where it will be necessary to engage others.

The data is available from a variety of sources including public databases, GA GIS and local/state authorities. The data sources are set out in the detailed criteria in Appendix B.

It is important to note that when the criteria were developed, an assessment model was developed with them. The model outlines what measures will be employed for each of the criteria as well as what score could be achieved from the range of anticipated measures.

For instance, for a criterion of *low rainfall*, the metric may be *mm/year*. The model developed may score a site that is <10mm/year as a 10, scaling back to a 1 if the site receives more than 100mm/year.

Varying methods of scoring a site have been adopted depending on the criteria and metric used as well as the available data source.

The explanation of how the measure will be scored is provided to ensure a clear and unambiguous approach to interpreting and assessing the criteria, for the sake of consistency and robustness of assessment.

Further detail on assessment is provided in Section 7.

5.2 Site Selection Criteria

5.2.1 Criteria Hierarchy

The criteria have been developed with the following hierarchy in mind:

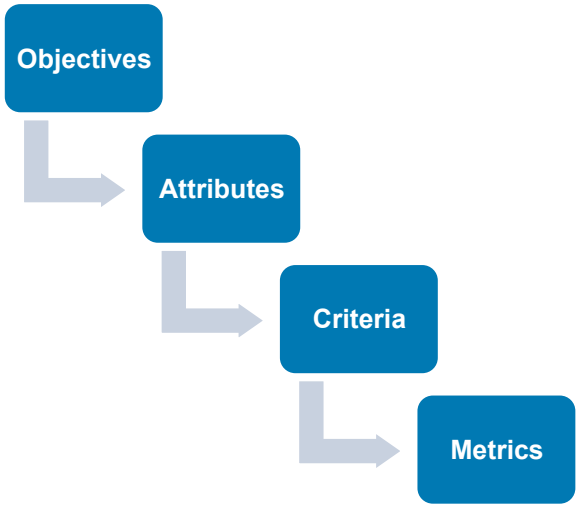


Figure 5 Hierachy of Criteria

A description of each of these levels of the hierarchy, with examples for information purposes only, is outlined below.

Table 4 Heirarchy of Criteria

	Description	Example
Objectives	The Objectives are high-level statements outlining the aims for the selection of a site.	Protection of the environment
Attributes	The Attributes are more specific statements of requirements that describe the Objectives in more detail relating to specific attainable outcomes. There may be more than one Attribute per Objective.	Minimise risk of contamination of ground water
Criteria	The criteria are specific aspects that are related to the Attribute and ultimately the Objective and set a standard that needs to be met in order that the Attributes can be satisfied. There may be more than one Criterion per Attribute.	Water table depth having sufficient clearance from facility
Metrics	The metrics are specific measurable items. There will only be one Metric per Criteria.	Water table >5m below natural surface level

5.2.2 Consultation in Development of Criteria

The criteria developed for the MCSA process are outlined below. These criteria have been developed through:

— Consultation with GA regarding the availability of data on a nationwide level for use as a desktop assessment tool;

— Review of relevant literature as outlined in Section 3; and

— Consultation with the IAP at the 1st IAP Workshop in Canberra on 10 and 11 February 2015 and at the 2nd IAP Workshop in Cronulla on 31st March and 1st April 2015.

5.2.3 Objectives and Attributes

The following table outlines the high-level objectives and attributes sought for a site at the Identification stage. A full list of objectives and attributes applying to the whole project is provided at Appendix C.

Table 5 Site Selection Objectives and Attributes

Objectives	Sub-Objectives	Attributes
Health, Safety & Security	Public Health & Safety	Proximity to community and industrial development
	Security	Proximity to public and private roads
Environmental Protection	Environmental Impact	Proximity to lakes, rivers, streams, swamps, soakages and aquifers
		Matters of national environmental significance defined in the EPBC Act
Community Well-being	Land Use & Natural Resources	Community resources
		Natural economic resources
		Change in land use
	Cultural and Historical Impact	Potential cultural and historical impacts (people, culture, history and artefacts)
Equity	Social Impacts	Number of people affected through the construction, transport of waste and operation of the facility
		Community benefit from construction and operation of facility
		Community attitude
Economic Viability	Costs	Construction cost – locality factor
		Proximity to existing infrastructure
		Land acquisition cost
Stable Environment	Climatic Characteristics	Extreme weather events such as tropical cyclones, extreme temperatures or rain
		Annual rainfall
	Geological Characteristics	Proximity to known or anticipated seismic, tectonic or volcanic activity
		Proximity to major geological fault
		Erosion
	Physical Site Characteristics	Flooding, surface drainage and geomorphology
	Social and Planning Characteristics	Low population density and low projected population growth or prospect of future development

5.2.4 Site Selection Assessment Criteria and Metrics

The detailed site selection assessment criteria are now established. These are outlined in the tables below in the form of the Criteria and Metric for each of the six Objectives.

X, used below, represents the actual data that is measured.

Table 6 Health, Safety & Security – Criteria and Metrics

Criteria	Metric	Ref
What is the separation distance from existing, or likely future, community or industrial developments?	Site boundary X km from an existing community (~1,000 people) or industrial area	HSE-1
	Site is not located in an area that is a known or likely future community or industrial use	HSE-2
	Site area X hectares	HSE-3
	Centre of site to have a buffer distance of X m from boundary	HSE-4
What is the separation distance from existing accesses or pathways that could be used as an access by potentially disruptive parties?	Site boundary X km from a major utility easement or other path of access	HSE-5

Table 7 Environmental Protection – Criteria and Metrics

Criteria	Metric	Ref
What is the separation distance from any lake, river, stream, swamp, soakage or aquifer?	Site boundary X m from a major lake, river, stream, swamp, soakage or aquifer	EP-1
	Site boundary X m from a minor lake, river, stream, swamp, soakage or aquifer	EP-2
Is the site within an area of national environmental significance such as world or national heritage places, RAMSAR wetlands, listed threatened species and ecological communities, protected migratory species, Commonwealth marine areas?	Site boundary X m from an area of national environmental significance	EP-3
	Site boundary X m from a registered heritage area	EP-4

Table 8 Community Well-being – Criteria and Metrics

Criteria	Metric	Ref
What is the separation distance from nature conservation reserves, water supply reserves or parks?	Site boundary X m from a known reserve or park	CWB-1
Is the site located on or near high value natural resources (incl. farming, mineral, water or other resources)?	Site boundary X m from an area of high value natural resource	CWB-2
Is the site located within an area that is likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future?	Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future	CWB-3
Is the site located in an area where development may impact culture and history?	Site boundary X m from registered area of cultural significance (sacred sites etc.)	CWB-4

Table 9 Equity – Criteria and Metrics

Criteria	Metric	Ref
What is the distance radioactive waste would need to be transported to the site from all current and future sources?	Total distance, X km, that waste must travel to site from Lucas Heights	EQ-1
	Extent that waste may travel to site through built-up areas	EQ-2
What is the distance to the nearest community which could receive benefits from the construction and operation of the facility?	Site boundary X km from nearest community (~1,000 people)	EQ-3
Is there evidence of potential community support or opposition for the facility?	Level of community support or opposition	EQ-4

Table 10 Economic Viability – Criteria and Metrics

Criteria	Metric	Ref
To what extent does the site location add a premium to the construction and operational cost?	Site boundary X km from a regional centre (~10,000 people)	EV-1
To what extent does the site have reasonable access for the transport of radioactive waste into and out of the site from all current and future Australian sources?	Site boundary X km from a road that provides connection between regional centres (National Highway, Arterial Road or Sub-Arterial Road)	EV-2
To what extent does the site location add a premium to the purchase cost?	Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)	EV-3

Table 11 Stable Environment – Criteria and Metrics

Criteria	Metric	Ref
What is the separation distance to areas subject to known or anticipated extreme climatic events?	Site not located in a cyclonic wind area (wind regions C and D, AS1170.2)	SE-1
	Site, if within 20km of coast, is not located on an area lower than X m above current mean sea level	SE-2
What is the annual rainfall and rainfall pattern at the site?	Site located in an area of rainfall of X mm/year	SE-3
	Site located in an area where X % of annual rainfall is likely to occur in a given 72-hour period	SE-4
What is the separation distance from known or anticipated seismic, or tectonic activity?	Site within an area with earthquake hazard X with an annual probability of exceedance of 1/500	SE-5
What is the separation distance from known or anticipated major geological faults?	Site boundary X km from known or anticipated major geological fault	SE-6
What is the separation distance from areas known to be flooded or have held surface water?	Site area identified as having held water in recent observation	SE-7
What is the adjacent population density?	Site boundary X km from an area of population density of 5 people per square kilometre	SE-8
What is the separation distance from an existing permanent residence (other than that of the nominator)?	Site boundary X km from the nearest residence	SE-9
What is the separation distance from an area that is likely to experience significant population growth in the future?	Site not located in an area that is likely to experience population growth	SE-10

5.3 Changes to Advertised Criteria

Following discussion with the IAP, two changes to the assessment of the Stable Environment were made from the advertised criteria (those listed within the *Nominations of Land: Guidelines and Nomination Form*). The following is a summary of the changes and the reasoning:

- Stable Environment
  - What is the separation distance from known or anticipated volcanic activity?
    - This criterion has been removed from the assessment.
    - The data available to assess sites was not consistent or definitive in terms of the risk of volcanic activity in the future.
    - This criterion will be considered as part of the risk assessment process after the MCSA is completed.
  - What is the separation distance from an area known for erosion or at risk of future erosion?
    - This criterion has been removed from the assessment.
    - A proxy to measure this criterion was originally proposed as the distance from the coast. However erosion involves more than just coastal erosion and surface erosion is likely to be a bigger concern for the siting process.
    - As assessing surface erosion is a complex task, involving consideration of many factors (slope, surface features, rainfall and run-off, soil types etc.) it will not be possible to assess at this stage.
    - This criterion will be considered as part of the site characterisation of shortlisted sites.

6. Criteria Weightings

6.1 Development of Weightings

While the assessment of individual criteria may be scored objectively using available data and in line with the assessment metrics, this approach tackles only part of the MCSA method.

To enable a choice between alternatives to be made, the MCSA also seeks to assign importance or "weight" to individual criteria.

For example, while depth of groundwater and the distance that waste may have to travel to the site are both relevant criteria for assessing a site, it is clear that these criteria are not necessarily of equal importance when deciding between sites.

This is where the development and assignment of weights to criteria comes into play.

High-level weightings and the establishment of detailed metric weightings were prepared in conjunction with and reviewed by the IAP.

Similar to the development of the criteria, weightings have been developed in a multi-step process as outlined below.

Figure 6 Determination of Weightings

6.1.1 Draft Weightings (Objective Level)

Draft weightings at the Objective level were prepared taking into consideration:

- The relative importance of the Objectives to each other;
- The anticipated importance of Objectives to associated stakeholders; and
- The expected performance of measures of criteria in determining a suitable site.

The draft weightings formed the starting point for discussion with the IAP at the first workshop.

6.1.2 IAP Review Draft Weightings (Workshop 1)

As part of the first IAP workshop, the draft objective level weightings were reviewed and updated. They are outlined in Section 6.2.1.

The IAP, in the development of these weightings, considered each of the objectives and assigned their agreed weightings. These weightings are used to differentiate between sites and do not reflect the absolute importance of the objective.

The following reasoning was used in this process:

- The items of Community Well-being and Equity were assigned the greatest importance.
- The item of Health, Safety and Security was given lower importance. However, it should be noted that this objective is most likely to carry much greater influence at later stages in the project's life, particularly during design and licensing, and the weighting was assigned to reflect this.
- The item of Economic Viability was also allocated lower importance; it was agreed that while the benefits of the project are important to Australia, it was also recognised that cost considerations must still be considered. The items relating to ongoing sustainability of the facility were considered essential but were noted as not being part of this phase of work.

— The items of Stable Environment and Environmental Protection were assigned medium importance; it was recognised that these objectives have some bearing on site selection but that they can also be influenced at later stages of the project through the design and licensing process. The weighting reflects this relative importance to the project.

6.1.3 Objective Weightings Agreed

The weightings reviewed at the first IAP workshop only applied at the Objective level.

These weightings were included in the nomination documents, in terms of relative importance. The following information was provided to potential nominators:

Table 12 Objective Importance

Objective	Relative Importance
Community Well-being	High
Equity	High
Stable Environment	Medium
Environmental Protection	Medium
Health, Safety & Security	Low
Economic Viability	Low

6.1.4 Final Weightings (Detailed)

After the high level objective weightings had been determined, the distribution of the objective weight amongst the related criteria was carried out. This occurred prior to the closure of the nomination period and before any sites were considered to ensure that the principles outlined above were met.

A process to identify the model's sensitivity to different scores and weightings was undertaken at the second IAP workshop where discussion around the MCSA model, weightings and outcomes from the model occurred.

The IAP considered each metric weight amongst the objectives and the following reasoning was applied:

— Health, Safety and Security

- The site area was assigned the highest weight, as it would provide the Facility with the best operational environment.
- Subsequently the metric related to providing a buffer within the site was rated highly.
- The lowest weight was applied to proximity to communities as it is considered, from a Health and Safety perspective, to be of lower risk.

— Environmental Protection

- Proximity to major water bodies or courses and areas of environmental significance were weighted the highest in this criterion.

— Community Well-being

- The most significant issue at site selection was identified as being the potential for impacts on culture and history.
- The subsequent metrics were assigned a fairly even weight with community use weighted higher than reserves given the expectation that environmental metrics would consider the parks and reserves more completely.

— Equity

- The level of community support was seen as one of the most important aspects to the site selection process and hence was assigned the highest proportion of the weight for this criterion.
- The impact on communities from the transport of waste was considered of high importance but the overall distance of transport was not. Hence a large proportion was assigned to the impact on communities and less to the overall distance for transport.
- In contrast, the impact on communities through proximity was assigned a lower proportion but was still assigned relatively high weight when compare to metrics within other objectives.

— Economic Viability

- All metrics within this criterion were assigned equally distributed weighting to reflect the same level of importance to the assessment.

— Stable Environment

- All metrics within this criterion were assigned equally distributed weighting to reflect the same level of importance to the assessment.

The final weightings are included in this document in the following section.

6.2 Site Selection Weightings

The weightings agreed are identified below.

6.2.1 Objective Weightings

Weightings, at the objective level, are outlined below. These weightings are used to differentiate sites and do no reflect the absolute importance of the objective.

Table 13 Objective Weightings

Objective	Weight
Health, Safety & Security	8%
Environmental Protection	14%
Community Well-being	25%
Equity	25%
Economic Viability	10%
Stable Environment	18%
Total	**100%**

6.2.2 Metric Weightings

The distribution of the agreed objective weight amongst the related metrics is outlined below. These are the final weightings and have been chosen prior to the closure of the nomination period.

Table 14 Metric Weightings

Criteria	Metric	Weight
Health, Safety & Security		
What is the separation distance from existing, or likely future, community or industrial developments?	Site boundary X km from an existing community (~1,000 people) or industrial area	**1.6%**
	Site is not located in an area that is a known or likely future community or industrial use	**0.8%**
	Site area X hectares	**2.4%**
	Centre of site to have a buffer distance of X m from boundary	**1.6%**
What is the separation distance from existing accesses or pathways that could be used as an access by potentially disruptive parties?	Site boundary X km from a major utility easement or other path of access	**1.6%**
Environmental Protection		
What is the separation distance from any lake, river, stream, swamp, soakage or aquifer?	Site boundary X m from a major lake, river, stream, swamp, soakage or aquifer	**4.2%**
	Site boundary X m from a minor lake, river, stream, swamp, soakage or aquifer	**1.4%**
Is the site within an area of national environmental significance such as world or national heritage places, RAMSAR wetlands, listed threatened species and ecological communities, protected migratory species, Commonwealth marine areas?	Site boundary X m from an area of national environmental significance	**5.6%**
	Site boundary X m from a registered heritage area	**2.8%**
Community Well-being		
What is the separation distance from nature conservation reserves,	Site boundary X m from a known reserve or park	**4.0%**

water supply reserves or parks?		
Is the site located on or near high value natural resources (incl. farming, mineral, water or other resources)?	Site boundary X m from an area of high value natural resource	**5.0%**
Is the site located within an area that is likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future?	Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future	**6.0%**
Is the site located in an area where development may impact culture and history?	Site boundary X m from registered area of cultural significance (sacred sites etc)	**10.0%**
Equity		
What is the distance radioactive waste would need to be transported to the site from all current and future sources?	Total distance, X km, that waste must travel to site from Lucas Heights	**2.0%**
	Extent that waste may travel to site through built-up areas	**6.0%**
What is the distance to the nearest community which could receive benefits from the construction and operation of the facility?	Site boundary X km from nearest community (~1,000 people)	**2.5%**
Is there evidence of potential community support or opposition for the facility?	Level of community support or opposition	**14.5%**
Economic Viability		
To what extent does the site location add a premium to the construction and operational cost?	Site boundary X km from a regional centre (~10,000 people)	**3.3%**
To what extent does the site have reasonable access for the transport of radioactive waste into and out of the site from all current and future Australian sources?	Site boundary X km from a road that provides connection between regional centres (National Highway, Arterial Road or Sub-Arterial Road)	**3.3%**
To what extent does the site location add a premium to the purchase cost?	Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)	**3.3%**
Stable Environment		
What is the separation distance to areas subject to known or anticipated extreme climatic events?	Site not located in a cyclonic wind area (wind regions C and D, AS1170.2)	**1.8%**
	Site, if within 20km of coast, is not located on an area lower than X m above current mean sea level	**1.8%**
What is the annual rainfall and rainfall pattern at the site?	Site located in an area of rainfall of X mm/year	**1.8%**
	Site located in an area where X % of annual rainfall is likely to occur in a given 72-hour period	**1.8%**
What is the separation distance from known or anticipated seismic, or tectonic activity?	Site within an area with earthquake hazard X with an annual probability of exceedance of 1/500	**1.8%**
What is the separation distance from known or anticipated major geological faults?	Site boundary X km from known or anticipated major geological fault	**1.8%**
What is the separation distance from areas known to be flooded or have held surface water?	Site area identified as having held water in recent observation	**1.8%**
What is the adjacent population	Site boundary X km from an area of population	**1.8%**

density?	density of 5 people per square kilometre	
What is the separation distance from an existing permanent residence (other than that of the nominator)?	Site boundary X km from the nearest residence	**1.8%**
What is the separation distance from an area that is likely to experience significant population growth in the future?	Site not located in an area that is likely to experience population growth	**1.8%**

7. Assessment of Sites

7.1 Assessment Overview

The assessment of the submitted sites will proceed as indicated in the figure below.

Figure 7 Assessment of Sites

7.1.1 Definition of Submitted Sites

The first step involves receiving the details of the site to define it (such as coordinates, title or address).

Details of nominated sites will be provided to GHD and GA in both electronic and hard copy format.

A listing of all sites along with their coordinates and address or other distinguishing features will be developed by GHD.

7.1.2 Compliance Check

The Department will undertake a compliance check of all received nominations. Compliance will be checked against the submission requirements of the *Nominations of Land: Guidelines and Nomination Form* and the *NRWM Act*.

Specifically, title searches will be undertaken to ensure that the nominator has the legal right to submit the nominated site.

Sites that are not compliant will not proceed through Phase 1 Assessment.

Compliance will be checked in parallel with the start of Phase 1 Assessment due to the tight timeframe for assessment.

7.1.3 Assessment

At the end of assessment the remaining sites would receive a detailed weighted assessment against the agreed criteria and metrics. The agreed weightings would be applied to establish an overall score for the site allowing a ranking of the sites to be produced.

This is a desktop study and no physical site investigation will be undertaken at this stage.

Assessment will be undertaken through the use of an assessment tool, developed by GA, in a GIS environment as well as manually.

7.1.4 Site Selection Report

The culmination of the work completed to date, the *Site Selection Report*, will summarise the Phase 1 process including the assessment and will outline the ranking of each compliant site relative to the others.

The report will conclude with a recommendation of suitable sites.

7.2 Definition of Sites

The nomination form required details of the nominated site to be submitted. This can come in a variety of forms, namely:

— Survey points,

— Geographical coordinates,

— Any of the following (as appropriate):

  - Portion number;
  - District, division, section and block;
  - Certificate of title;
  - Plan and lot number;
  - Volume and folio number;
  - Lot on plan;
  - Title identifier;
  - Parcel identifier;
  - Deposited plan;
  - Title diagram; and
  - Registered plan,

— Geographic reference (WKT) obtained from the GA tool.

As the assessment will be undertaken in the GA assessment tool, GHD will convert all non-WKT references. This may be a time consuming task depending on the level of information provided by the nominator. At the end of this process, all sites will be entered into the assessment tool as WKT references, ready for assessment.

7.3 Compliance Check

The *Nominations of Land: Guidelines and Nomination Form* outlined the requirements for submissions. These are summarised as:

Nominations must:

— Be in writing;

— Be made to the Minister;

— Specify the land nominated; and,

— Contain evidence that the interest in the land held by the Nominator or Nominators of the land is as required.

Nominations were to be received before 5:00pm (Australian Eastern Standard Time) on Tuesday 5 May 2015.

The *NRWM Act* establishes that the Minister has absolute discretion to consider, or not, a nomination. This includes sites that do not necessarily meet the requirements above.

A critical component, however, and one that is not likely to meet with discretion, is the ownership of land and the right to submit a nomination.

The initial compliance check undertaken by the Department will include a land title search to determine that the nominator meets the requirements of the Act in regard to land ownership.

7.4 Phase 1 Assessment

7.4.1 Overview

The flowchart, below, outlines the stages of the assessment process undertaken following receipt of site nominations.

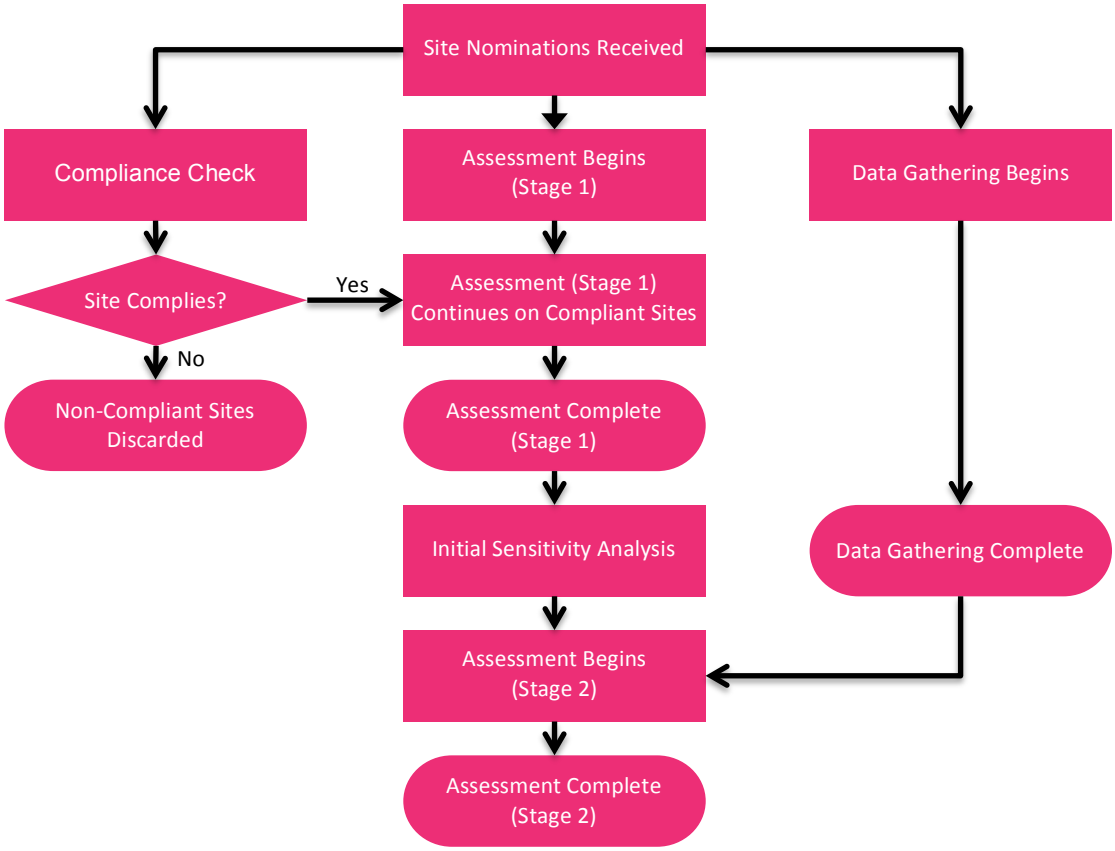


Figure 8 Flow Chart for the Assessment of Sites

7.4.2 Two-Stage Assessment

As highlighted in the flowchart above, a two-stage assessment process is followed.

The two-stages take account of criteria that will be readily assessable upon receipt of nominations (Stage 1) and criteria that will require additional research and data gathering to occur (Stage 2).

Stage 1

All sites are assessed against the majority of metrics (those that have data already available). The metrics that are not assessable at this stage due to the data gathering exercise are scored a 5.

The metrics that will not be assessable during Stage 1 are the Qualitative Metrics (Refer Section 7.4.5).

Sensitivity Analysis

Following completion of the Stage 1 assessment a draft MCSA Ranking of sites will be available. The ranking will be subject to a sensitivity analysis to determine the sensitivity of the outcome. The Qualitative Metrics will be subjected to a range of mock scores and the resultant

change in ranking of sites will be observed. This will guide the data gathering process, as metrics that are sensitive (i.e. they affect the ranking) will require deeper data gathering.

Stage 2

Following the collection of data and assessment of sites for the Qualitative Metrics, the MCSA will be updated.

The Stage 2 Assessment will complete with a finalised ranking of sites accounting for all available data at the time of assessment.

7.4.3 Assessors

The Department, with assistance from GHD, is responsible for assessment and scoring for each individual criterion is outlined in this document.

The overall collation of the scores will be undertaken by GHD.

For the quantitative assessment, GHD will utilise the assessment tool developed by GA. This covers the majority of the metrics.

For the qualitative assessment, a panel of assessors will be utilised as outlined in Section 7.4.5 onwards.

7.4.4 Scoring Rules

The following rules will apply to the assessment:

- The nominated assessor(s) for each site will score each metric between a 1 and a 10 in accordance with the details set out in this document.
- Metrics will be expressed such that a score of 10 will relate to the metric positively meeting the overarching Criterion and Objective.
- Should a site return a number of scores against a particular metric, the lowest score for each metric will be taken.

Property versus Site

Nominators will ultimately be nominating a property identified by a title, lot number, address etc.

The nominated property has the opportunity to be many times larger than the required 100ha set out in the *Nominations of Land: Guidelines and Nomination Form.*

To avoid unfairly assessing a nominator of a large property, the scoring process will be undertaken as follows:

- GHD will undertake an initial review of the entire property nominated. A site of approximately 100ha will be chosen that is likely to achieve the highest score possible for the particular property.
- Subsequent assessment against metrics will be undertaken against this ‘site’ only and not the entire property.

7.4.5 Qualitative Scoring Process

The majority of the criteria and metrics are automatically scored in accordance with a set scoring method; a quantitative assessment.

There are some metrics that must be assessed separately as they cannot be assigned a number. These metrics are outlined below and details on the specific scoring method provided.

Table 15 Qualitative Metrics

Ref	Metric
HSS-2	Site is not located in an area that is a known or likely future community or industrial use
CWB-3	Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future
EQ-2	Extent that waste may travel to site through built-up areas
EQ-4	Level of community support or opposition
EV-3	Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)
SE-10	Site not located in an area that is likely to experience population growth

As outlined in Section 7.4.2, a two-stage assessment process will be undertaken. Depending on the availability of information the Qualitative Metrics may not be included in the first stage of assessment. If they are not included they will be assigned a default score of 5 at that stage.

To assess a site against the subjective criteria, data will need to be collected.

The following sections outline the scoring method and data collection method for each of the Qualitative Metrics.

7.4.6 HSS-2 Future Community Use

"Site is not located in an area that is a known or likely future community or industrial use"

Scoring Method

Table 16 Scoring Method for HSS-2

Score	Descriptor	Indicator
8-10	Area is not a known community or industrial use, and is highly-unlikely to be in the future	✓ Current use of site not community or industrial use ✓ Site is remote ✓ Area has a very low population density ✓ Development/land use planning shows no consideration of site (Council) ✓ Strategic Land Use shows no consideration of region (State/Territory)
6-7	Area is not a known community or industrial use, and is unlikely to be in the future	✓ Current use of site not community or industrial use ✓ Development/land use planning shows no consideration of site (Council) ✓ Strategic Land Use shows no consideration of region (State/Territory)
5	Area is not a known community or industrial use and future use is not know	✓ Current use of site not community or industrial use ✓ No evidence to confirm or deny future use
2-4	Area is not a known community or industrial use, but has possibility to be a community or industrial use in the future	✓ Current use of site not community or industrial use ✓ Development/land use planning shows consideration of site (Council) ✓ Strategic Land Use shows consideration of region (State/Territory)
1	Area is a known community or industrial use, or is highly-likely to be in the future	✓ Current use of site is community or industrial use ✓ Development/land use planning shows consideration of site (Council) ✓ Strategic Land Use shows consideration of region (State/Territory)

Data Collection

Responsibility: Department of Industry and Science

Sources: Local Council (Planning), State/Territory (Planning)

Data to be Sourced: Strategic Land Use Plans, Development Plans, Council Zoning and Planning Documents, State/Territory Planning Policies, State/Territory Regional Planning Policies or Plans and other related documents.

7.4.7 CWB-3 Expansion for Community or Industrial Use

"Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future"

Scoring Method

Table 17 Scoring Method for CWB-3

Score	Descriptor	Indicator
8-10	Area is highly-unlikely to be expanded upon for community/industrial/natural/agricultural use in the future	✓ Development/land use planning shows no consideration of site (Council) ✓ Strategic Land Use shows no consideration of region (State/Territory) ✓ No identified need for land by farming/agricultural bodies ✓ Site characteristics show no potential for farming/agricultural use
6-7	Area is unlikely to be expanded upon for community/industrial/natural/agricultural use in the future	✓ One or Two of the above
5	Unknown if area to be expanded upon for community/industrial/natural/agricultural use in the future	✓ None of the below
2-4	Area is likely to be expanded upon for community/industrial/natural/agricultural use in the future	✓ One of the below
1	Area is highly-likely to be expanded upon for community/industrial/natural/agricultural use in the future	✓ Development/land use planning shows consideration of site (Council) ✓ Strategic Land Use shows consideration of region (State/Territory) ✓ Identified need for land by farming/agricultural bodies ✓ Site characteristics show good potential for farming/agricultural use

Data Collection

Responsibility: Department of Industry and Science

Sources: Local Council (Planning), State/Territory (Planning), and Farming/Agricultural Bodies

Data to be Sourced: Strategic Land Use Plans, Development Plans, Council Zoning and Planning Documents, State/Territory Planning Policies, State/Territory Regional Planning Policies or Plans and other related documents.

7.4.8 EQ-2 Extent Waste Travels Through Built-Up Areas

"Extent that waste may travel to site through built-up areas"

Scoring Method

Table 18 Scoring Method for EQ-2

Score	Descriptor	Indicator
8-10	Waste likely to travel predominately on major roads or highways and through major transport corridors	✓ Major highway ✓ Freeway ✓ Isolated roads or transport routes
6-7	Waste likely to travel through a built-up area before it reaches or after it leaves a main transport corridor	✓ Town centres ✓ Commercial districts
5	Waste likely to travel through a built-up area before it reaches and after it leaves a main transport corridor	✓ Town centres ✓ Commercial districts
2-4	Waste likely to travel through multiple built-up areas before it reaches or after it leaves a main transport corridor	✓ Town centres ✓ Commercial districts
1	Waste likely to travel through multiple built-up areas before it reaches and after it leaves a main transport corridor	✓ Town centres ✓ Commercial districts

Data Collection

Responsibility: GHD

Sources: Google Maps

Data to be Sourced: Surrounding built-up areas, nearest highway and transport corridors, distance/route to likely sources

7.4.9 EQ-4 Level of Community Support

"Level of Community Support or Opposition"

Scoring Method

Table 19 Scoring Method for EQ-4

Score	Descriptor	Indicator
9 – 10	Good evidence of local community and stakeholder support for a NRWMF	✓ Evidence provided in the Nomination Document ✓ Evidence of Local and / or State Planning Authority policies in support ✓ Positive local and regional press and media commentary ✓ Positive feedback from local community representatives / State and Federal MPs
6 – 8	Some evidence of local community and stakeholder support for a NRWMF	✓ Two of the above
4 – 5	Only limited evidence of support and /or no clear evidence of local public and stakeholder opposition for a NRWMF	✓ One of the above ✓ None of the below
2 – 3	Evidence of potential local opposition to a NRWMF	✓ Evidence of Local and / or State Planning Authority policies opposed to a NRWMF ✓ Negative local and regional press and media commentary ✓ Negative feedback from local community representatives / State and Federal MPs
1	Clear evidence of strong regional and / or local opposition to a NRWMF	✓ Evidence of local community action groups or campaigns against a NRWMF ✓ Highly negative media coverage

Data Collection

Responsibility: DoIS

Sources: Regional Development Australia (local committee), Local Government, State Government, Local Press, National Press

Data to be Sourced: Evidence of support or opposition, community sentiment, policy

7.4.10 EV-3 Land Cost

"Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)"

Scoring Method

Table 20 Scoring Method for EV-3

Score	Descriptor	Indicator
9 – 10	Land cost is likely to be significantly less than average land costs	✓ Average land costs in surrounding areas (past sales or valuations) ✓ Remoteness of site ✓ Low turnover of land ✓ Low demand
6 – 8	Land cost is likely to be less than average land cost	✓ One or two of the above
4 – 5	Land cost is approximately the same as average land cost	✓ One of the above ✓ None of the below
2 – 3	Land cost is likely to be higher than average land cost	✓ Two of the below
1	Land cost is likely to be significantly higher than average land cost	✓ High turnover of land ✓ High demand ✓ Close to urban centres ✓ Average land costs in surrounding areas (past sales or valuations)

Data Collection

Responsibility: DoIS

Sources: Nominator, Property Council, Local Government, Local Estate Agents, and Rates Notices

Data to be Sourced: Typical land costs, past sales, past performance of area

7.4.11 SE-10 Population Growth

"Site not located in an area that is likely to experience population growth"

Scoring Method

Table 21 Scoring Method for SE-10

Score	Descriptor	Indicator
9 – 10	Very low chance of population growth	✓ Specific mention of low population growth in strategic land use plan (State or Local Government) ✓ Particularly remote site (in relation to existing urban centres) ✓ Lack of attractors of population growth (e.g. likely economic activity)
6 – 8	Low change of population growth	✓ One of the above
4 – 5	No clear evidence of population growth	✓ None of the below
2 – 3	High change of population growth	✓ One of the below
1	Very high chance of population growth	✓ Specific mention of population growth in strategic land use plan (State or Local Government) ✓ Potential attractors of population growth (e.g. likely economic activity) ✓ Close to existing urban centres

Data Collection

Responsibility: DoIS

Sources: Local Council (Planning), State/Territory (Planning)

Data to be Sourced: Strategic Land Use Plans, Development Plans, Council Zoning and Planning Documents, State/Territory Planning Policies, State/Territory Regional Planning Policies or Plans and other related documents.

7.4.12 Calculating a Weighted Score

The score for each criterion will be weighted as follows:

$$Score_{Weighted} = Score \times Weight$$

Scores for the quantitative criteria will be obtained through the application of the MCSA model developed by GA.

Scores for the qualitative criteria will be obtained through agreement between the nominated assessors for each of the qualitative criteria.

7.4.13 Total Score

The total score for a site will be calculated as the sum of all combined weighted scores. The maximum total score possible will be 10.

$$Total\ Score = \sum_{n=1}^{j} Score_{Weighted}$$

$$Where\ there\ are\ j\ criteria.$$

7.5 Site Selection Report

The *Site Selection Report* will summarise the entire process leading to the shortlist and ranking of sites and will outline the assessment of each site including the overall ranking of sites.

The report covers:

- Criteria (including hierarchy) and metrics
- Weightings
- Assessment methodology
- Summary and detailed assessments of each site from the various sources
- Tabulated scores (unweighted and weighted) for each site
- Final rankings of the sites
- Sensitivity Analysis
- Risk Assessment
- Recommendations

7.5.1 Risk Assessment

The MCSA process for Phase 1 concludes with a ranked list of sites. This represents only part of the considerations to be taken into account in determining a preferred site for the NRWMF and a recommendation cannot be made on this list alone.

With any qualitative or quantitative assessment, assumptions are made that must be communicated in order to provide decision makers with a full understanding of the assessment.

Additionally, information received during the Phase 1 application of the MCSA may warrant further consideration in subsequent applications of the MCSA in later phases.

A risk assessment is a way to formalise and communicate the basis for which the ranking of sites is made, to highlight relevant considerations and potentially affect the final

recommendations of shortlisted sites. It should be noted that the risk assessment is prepared specifically for the MCSA process only.

Examples of considerations during risk assessment include:

- Sites that score 1 for any metric – in some cases, while no provision for exclusion in the MCSA process exists, a score of a 1 may indicate a site that is no longer suitable for assessment,
- Information provided by nominators or through other sources that were not used in assessment but which may have relevance to consideration,
- The data used will have limitations and these must be outlined. There may also be data gaps that are only evident upon examination at the detailed site level.

The risk assessment will provide further information to decision makers on the final ranking of sites provided.

Beyond site selection, parties undertaking site characterisation can use the risk assessment. This may potentially provide priority areas for investigation.

7.5.2 Ranking

Sites will be assigned a preference from 1 to n (where there are n suitable sites assessed). A site assigned the ranking of 1 will have the highest score.

Should two sites have the same score, they will both share the same ranking.

7.6 Final Recommendation

The IAP will be presented with the preliminary results of the assessment at IAP Workshop 3. At this workshop the IAP will review the results and provide input to the risk assessment to be included within the *Site Selection Report.*

A *Site Selection Report* will identify the final ranking and the risk assessment.

The report will be considered by the Department prior to making a recommendation to the Minister.

7.6.1 Minister's Role

The Minister has approved the nomination guidelines as the approach that he intends to follow to inform him of any action that he decides is to be taken under the *NRWM Act*. The Department will assist and advise the Minister as part of this process.

The Minister intends to publish the site identifiers for all nominations, consistent with his intention to conduct a voluntary, open and transparent process.

When making a decision whether to approve a nomination under section 9 of the *NRWM Act*, the Minister may consider all relevant factors including the outcomes this MCSA process.

Procedural fairness requirements in section 10 under the *NRWM Act* will be followed - including notifying the intention to approve one or more nominated sites and provide a period of at least 60 days for public comments to be provided prior to a decision.

7.7 Assessment Rigour

One of the key reasons an MCSA process was chosen was that it would provide rigour to the assessment process through a number of layers of transparency and robustness. These include:

- A clear and unambiguous assessment framework was developed with the aim of achieving repeatability in assessment across parties.
- Independent advice was used to develop criteria for site selection and to ensure a broad set of issues is considered.
- Assisted blind scoring will be used to widen the assessment of criteria to representative groups in the phase after shortlisting and will also avoid any intentional or incidental bias affecting the results.
- Sensitivity analysis will be conducted on the results to determine if any small changes in the assessment or weighting of the sites will impact on the outcome of the overall site selection process.

7.7.1 Score Robustness

The robustness of the scoring will be tested. This is particularly the case when a number of metrics will be assessed qualitatively.

The process for testing the robustness of the score is to utilise more than one assessor and to combine their scores. This will apply to the Qualitative Criteria only.

In this case, a measure known as Cohen's Kappa (k) will be used to test the statistical significance of the agreement on scores for the Qualitative Metrics, amongst the two assessors.

For this project, we are looking for highly robust and repeatable results and thus hoping to achieve a value of $k > 0.75$. Fleiss[3] characterised kappas (k) over 0.75 as *excellent agreement beyond chance*, and lower than 0.75 to 0.40 as *poor agreement beyond chance*.

7.7.2 Sensitivity Analysis

Two ways of testing sensitivity will be utilised to test the sensitivity of both the weightings for a given set of scores as well as the scores for a given set of weightings. Sensitivity analysis studies the uncertainty of the output of the assessment model in terms of the inputs provided.

A highly sensitive model, or one that produces different results for small changes in score or weighting, would not be considered robust.

The methods for testing sensitivity are outlined in further detail, below.

Weighting Sensitivity – Scenario Test

A method of sensitivity analysis will be used to test how the weightings are affected by alternative weighting scenarios.

Scenario testing makes use of a similar method conducted by NWMO, 2004 whereby the criteria were weighted with preference or bias for different objectives. An example would be to compare a set of weightings that favoured sites with a lower social impact versus a set of weightings that favoured sites with a lower environmental impact.

[3] *Statistical methods for rates and proportions*. Feiss, New York, 1981

Sites scores would be run through each scenario to test the sensitivity to these changes in criteria or weightings.

This method is illustrated below where the first example indicates a bias for Objective 3 compared to a bias for Objectives 4 and 6 in the second example.

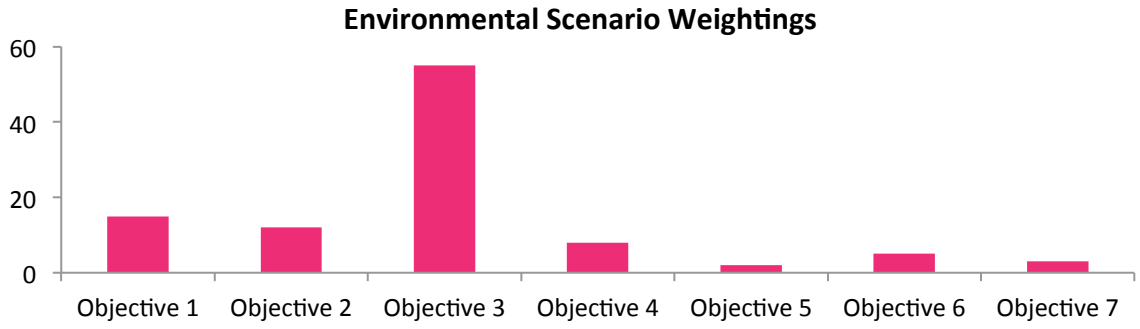


Figure 9 Scenario Testing Criteria – Envrionmental Scenario

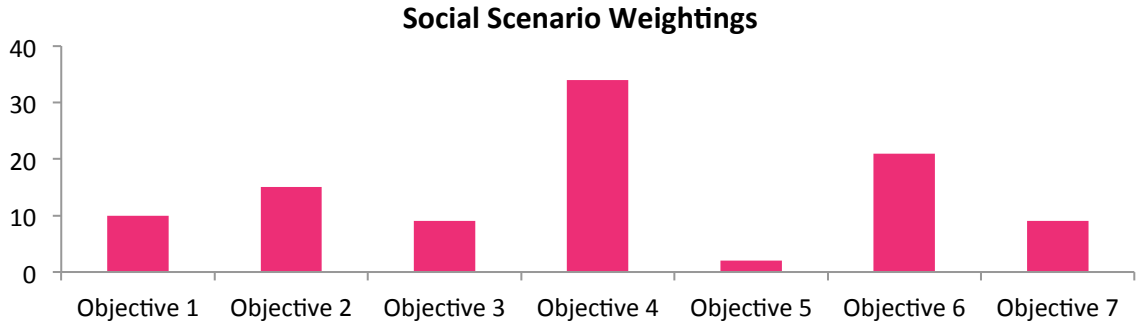


Figure 10 Scenario Testing Criteria – Social Scenario

Analysis of the alternative scenarios for a favourable site may provide insight into the overall assessment process chosen.

Scoring Sensitivity

Sensitivity analysis will also be undertaken on the actual scoring using traditional sensitivity analysis methods.

These methods consist of varying the set of scores by a margin (say +/- 10%) and reviewing the outcome of the assessment. If small changes in score produce large changes in overall site selection (i.e. a change in rank) then the results are sensitive and should be reviewed further.

This sort of analysis can also highlight if the overall site selection outcome is sensitive to a particular metric. This assessment can highlight that scoring may need a particular level of emphasis and further resources or information required to reduce its overall sensitivity.

Outcomes of the sensitivity analysis will be included in the *Site Selection Report* in the risk assessment.

7.8 Assessment Responsibilities

The table below outlines each metric and the data sources to be used in assessment.

The column titled assessor indicates 'GA' where the metric will be assessed using the MCSA tool developed with GA, or a reference to the qualitative criteria where responsibility is outlined.

Table 22 Assessment Responsibilities Matrix

Metric	Assessor	Data Source
Site boundary X km from an existing community (~1,000 people) or industrial area	GA	NEXIS / UCL
Site is not located in an area that is a known or likely future community or industrial use	Refer 7.4.6	
Site area X hectares	GA	Nominator
Centre of site to have a buffer distance of X m from boundary	GA	GIS
Site boundary X km from a major utility easement or other path of access	GA	National Transmission Lines / National Pipelines Database
Site boundary X m from a major lake, river, stream, swamp, soakage or aquifer	GA	GA AusHydro 250k
Site boundary X m from a minor lake, river, stream, swamp, soakage or aquifer	GA	GA AusHydro 250k
Site boundary X m from an area of national environmental significance	GA	CAPAD
Site boundary X m from a registered heritage area	GA	Heritage Registers
Site boundary X m from a known reserve or park	GA	CAPAD
Site boundary X m from an area of high value natural resource	GA	Mines Atlas
Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future	Refer 7.4.7	
Site boundary X m from registered area of cultural significance (sacred sites etc.)	GA	CAPAD
Total distance, X km, that waste must travel to site from Lucas Heights	GA	GIS
Extent that waste may travel to site through built-up areas	Refer 7.4.8	
Site boundary X km from nearest community (~1,000 people)	GA	UCL
Level of community support or opposition	Refer 7.4.5	
Site boundary X km from a regional centre (~10,000 people)	GA	UCL
Site boundary X km from a road that provides connection between regional centres (National Highway, Arterial Road or Sub-Arterial Road)	GA	PSMA
Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)	Refer 7.4.10	
Site not located in a cyclonic wind area (wind regions C and D, AS1170.2)	GA	AS1170.2
Site, if within 20km of coast, is not located on an area lower than X m above current mean sea level	GA	1s DEM, SPAGD – Mainland Coastlines
Site located in an area of rainfall of X mm/year	GA	BOM
Site located in an area where X % of annual rainfall is likely to occur in a given 72-hour period	GA	Rainfall IFD
Site within an area with earthquake hazard X with an annual probability of exceedance of 1/500	GA	Hazards Map
Site boundary X km from known or anticipated major geological fault	GA	
Site area identified as having held water in recent observation	GA	WofS 2014
Site boundary X km from an area of population density of 5 people per square kilometre	GA	NEXIS
Site boundary X km from the nearest residence	GA	NEXIS
Site not located in an area that is likely to experience population growth	Refer 7.4.11	

7.9 Scoring

The table below outlines the scoring method for each Metric. In some cases a quantitative solution is not possible and an interpretation and a qualitative solution will be required.

Table 23 Metric Scoring Basis

Metric	Scoring Method	Scoring Type
Site boundary X km from an existing community (~1,000 people) or industrial area	1 - < 5km 10 - > 20km	Quantitative, Scaled
Site is not located in an area that is a known or likely future community or industrial use	Refer 7.4.5	Qualitative
Site area X hectares	1 - < 100ha 10 - > 1000ha	Quantitative, Scaled
Centre of site to have a buffer distance of X m from boundary	1 - < 400m 10 - > 500m	Quantitative, Scaled
Site boundary X km from a major utility easement or other path of access	1 - < 5km 10 - > 10km	Quantitative, Scaled
Site boundary X m from a major lake, river, stream, swamp, soakage or aquifer	1 - <100m 10 - >5km	Quantitative, Scaled
Site boundary X m from a minor lake, river, stream, swamp, soakage or aquifer	1 - <25m 10 - >5km	Quantitative, Scaled
Site boundary X m from an area of national environmental significance	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Site boundary X m from a registered heritage area	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Site boundary X m from a known reserve or park	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Site boundary X m from an area of high value natural resource	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future	Refer 7.4.5	Qualitative
Site boundary X m from registered area of cultural significance (sacred sites etc.)	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Total distance, X km, that waste must travel to site from Lucas Heights	1 - >3500km 10 - <1000km	Quantitative, Scaled
Extent that waste may travel to site through built-up areas	Refer 7.4.5	Qualitative
Site boundary X km from nearest community (~1,000 people)	1 - > 50 km 10 - < 25 km	Quantitative, Scaled
Level of community support or opposition	Refer 7.4.5	Qualitative
Site boundary X km from a regional centre (~10,000 people)	1 – 1000km 10 - < 100km	Quantitative, Scaled
Site boundary X km from a road that provides connection between regional centres (National Highway, Arterial Road or Sub-Arterial Road)	1 - > 100km 10 - < 25km	Quantitative, Scaled
Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)	Refer 7.4.5	Qualitative
Site not located in a cyclonic wind area (wind regions C and D, AS1170.2)	1 – Wind Region C & D 10 – Wind Region A & B	Quantitative, Binary
Site, if within 20km of coast, is not located on an area lower than X m above current mean sea level	1 - < 5m 10 - >15m	Quantitative, Scaled
Site located in an area of rainfall of X mm/year	1 - >1000mm/year 10 - < 500 mm/year	Quantitative, Scaled
Site located in an area where X % of annual rainfall is likely to occur in a given 72-hour period	1 - > 10% 10 - < 1%	Quantitative, Scaled
Site within an area with earthquake hazard X with an annual probability of exceedance of 1/500	1 - > 0.08g 10 - < 0.05g	Quantitative, Scaled

Metric	Scoring Method	Scoring Type
Site boundary X km from known or anticipated major geological fault	1 - < 2.5 km 10 - > 50 km	Quantitative, Scaled
Site area identified as having held water in recent observation	1 – Held Water 10 – Not Held Water	Quantitative, Scaled
Site boundary X km from an area of population density of 5 people per square kilometre	1 - < 5km 10 - > 20km	Quantitative, Scaled
Site boundary X km from the nearest residence	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Site not located in an area that is likely to experience population growth	Refer 7.4.5	Qualitative

7.9.1 Definitions

- The scoring range is from 1 (least suitable) to 10 (most suitable);
- ‘Quantitative’ scoring type means that the score is assigned based on a measurable and numerical basis.
- ‘Qualitative’ scoring type means that the score is assigned based on a guided judgement.
- ‘Scaled’ scoring type means that the score is proportional to the position within the defined range for the site metric; and,
- ‘Binary’ scoring type means that the score is either assigned a 10 (for a pass) or a 1 (for a fail) on the metric.

8. Site Characterisation

8.1 Purpose

The Phase 2 Assessment (outside the scope of the current phase of the project) would include site-based investigations of the shortlisted sites to:

- Confirm the findings of the desktop assessment undertaken in Phase 1 and further assess the sites against the MCSA Framework.
- Established a preferred site to progress to a Detailed Business Case.

8.2 Interaction with Framework

While the Phase 2 Assessment is outside the scope of the current phase of the project, it is important to consider the future tasks to be undertaken and how details from this Framework will be utilised in subsequent phases.

The Phase 2 Assessment will utilise the developed criteria from this Framework.

8.3 Process

Undertaking the detailed investigations of the sites will require further input from initial data providers (such as GA) and it will also require the engagement of additional technical expertise.

This work could be carried out with the assistance of either a nationally based consultant to undertake assessment across all sites (with the benefit of maintaining consistency) or individual consultants from regions (to minimise costs and provide local context). A range of physical site investigations will be undertaken to provide data to assist in the site evaluation.

The management of the consultancies and the various site investigations (including liaison with land owners and engagement with local communities) will be a critical task during this phase.

9. Detailed Business Case

9.1 Purpose

A Detailed Business Case (DBC) including a Phase 2 assessment will be prepared once a preferred site is nominated.

The Phase 2 Assessment (outside the scope of the current project) will include the preparation of an Environmental Impact Statement for the preferred site that will:

- Assess the findings of the site characterisation study in the context of a developed design for the particular site,
- Assess the suitability of the site in the context of environmental considerations, and,
- Be used to seek approvals such as any EPBC referral or as part of the site licensing the process.

Work to address the requirements of the *ARPANS Act* will also be undertaken at this stage.

9.2 Interaction with Framework

While the Phase 2 Assessment is outside the scope of the current project it is important to consider the future tasks to be undertaken and how details from this Framework will be utilised in subsequent phases.

It is expected that the Phase 2 Assessment will be undertaken in light of the results from previous characterisation studies completed on the site.

9.3 Process

A detailed process to prepare the DBC and associated assessments such as the Environmental Impact Statement (EIS) and work to address the *ARPANS Act* will be developed once a preferred site is chosen.

Appendices

Appendix A – Abbreviations and Acronyms

ANSTO	Australian Nuclear Science and Technology Organisation
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
DBC	Detailed Business Case
Department, DoIS	Department of Industry (Australia, Federal)
EIS	Environmental Impact Assessment
EPBC	Environmental Protection and Biodiversity Conservation
GA	Geoscience Australia
GPS	Global Positioning System
HIFAR	High Flux Australia Reactor
IAEA	International Atomic Energy Agency
IAP	Independent Advisory Panel
IBC	Initial Business Case
ILW	Intermediate Level Waste
LLW	Low Level Waste
MCSA	Multi-criteria Site Analysis
NHMRC	National Health and Medical Research Council
NORM	Naturally Occurring Radioactive Material
NRMW Act	*National Radioactive Waste Management Act, 2012*
NRWMF	National Radioactive Waste Management Facility
NWMO	Nuclear Waste Management Organisation (Canada)
OPAL	Open Pool Australian Lightwater Reactor
RadWaste Facility	Radioactive Waste Management Facility (Generic)
TBA	To Be Advised

Appendix B – Complete Criteria

National Radioactive Waste Management Facility

Site Selection: Objectives, Attributes, Criteria, Metrics & Scoring Approach

5/05/15

Objectives	Sub-Objectives	Attributes	Criteria	Metrics	Ref	Scoring	Scoring Type
Health, Safety & Security	Public Health & Safety	Proximity to community and industrial development	What is the separation distance from existing, or likely future, community or industrial developments?	Site boundary X km from an existing community (~1,000 people) or industrial area	HSS-1	1 - < 5km 10 - > 20km	Quantitative, Scaled
				Site is not located in an area that is a known or likely future community or industrial use	HSS-2		Qualitative
				Site area X hectares	HSS-3	1 - < 100ha 10 - > 1000ha	Quantitative, Scaled
				Centre of site to have a buffer distance of X m from boundary	HSS-4	1 - < 400m 10 - > 500m	Quantitative, Scaled
	Security	Proximity to public and private roads	What is the separation distance from existing accesses or pathways that could be used as an access by potentially disruptive parties?	Site boundary X km from a major utility easement or other path of access	HSS-5	1 - < 5km 10 - > 10km	Quantitative, Scaled
Environmental Protection	Environmental Impact	Proximity to lakes, rivers, streams, swamps, soakages and aquifers	What is the separation distance from any lake, river, stream, swamp, soakage or aquifer?	Site boundary X m from a major lake, river, stream, swamp, soakage or aquifer	EP-1	1 - <100m 10 - >5km	Quantitative, Scaled
				Site boundary X m from a minor lake, river, stream, swamp, soakage or aquifer	EP-2	1 - <25m 10 - >5km	Quantitative, Scaled
		Matters of national enviornmental significance defined in the EPBC Act	What is the separation distance from an area of national environmental significance such as world or national heritage places, RAMSAR wetlands, listed threatened species and ecological communities, protected migratory species, Commonwealth marine areas?	Site boundary X m from an area of national environmental significance	EP-3	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
				Site boundary X m from a registered heritage area	EP-4	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Community Well-being	Land Use & Natural Resources	Community resources	What is the separation distance from nature conservation reserves, water supply reserves or parks?	Site boundary X m from a known reserve or park	CWB-1	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
		Natural economic resources	What is the separation distance from high value natural resources (incl. farming, mineral, water or other resources)?	Site boundary X m from an area of high value natural resource	CWB-2	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
		Change in land use	Is the site located within an area that is likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future?	Site is not located in an area likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future	CWB-3		Qualitative
	Cultural and Historical Impact	Potential cultural and historical impacts (people, culture, history and artefacts)	Is the site located in an area where development may impact culture and history?	Site boundary X m from registered area of cultural significance (sacred sites etc)	CWB-4	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
Equity	Social Impacts	Number of people affected through the construction, transport of waste and operation of the facility	What is the distance radioactive waste would need to be transported to the site from all current and future sources?	Total distance, X km, that waste must travel to site from Lucas Heights	EQ-1	1 - >3500km 10 - <1000km	Quantitative, Scaled
				Extent that waste may travel to site through built-up areas	EQ-2		Qualitative
		Community benefit from construction and operation of facility	What is the distance to the nearest community which could receive benefits from the construction and operation of the facility?	Site boundary X km from nearest community (~1,000 people)	EQ-3	1 - > 50 km 10 - < 25 km	Quantitative, Scaled
		Community attitude	Is there evidence of potential community support or opposition for the facility?	Level of community support or opposition	EQ-4		Qualitative
Economic Viability	Costs	Construction cost - locality factor	To what extent does the site location add a premium to the construction and operational cost?	Site boundary X km from a regional centre (~10,000 people)	EV-1	1 - 1000km 10 - < 100km	Quantitative, Scaled
		Proximity to existing infrastructure	To what extent does the site have reasonable access for the transport of radioactive waste into and out of the site from all current and future Australian sources?	Site boundary X km from a road that provides connection between regional centres (National Highway, Arterial Road or Sub-Arterial Road)	EV-2	1 - > 100km 10 - < 25km	Quantitative, Scaled
		Land acquisition cost	To what extent does the site location add a premium to the purchase cost?	Average land cost of region ($/ha) compared to average land cost of Australia ($/ha)	EV-3		Qualitative

National Radioactive Waste Management Facility

Site Selection: Objectives, Attributes, Criteria, Metrics & Scoring Approach

5/05/15

Objectives	Sub-Objectives	Attributes	Criteria	Metrics	Ref	Scoring	Scoring Type
Stable Environment	Climatic Characteristics	Extreme weather events such as tropical cyclones, extreme temperatures or rain	What is the separation distance to areas subject to known or anticipated extreme climatic events?	Site not located in a cyclonic wind area (wind regions C and D, AS1170.2)	SE-1	1 - Wind Region C & D 10 - Wind Region A & B	Quantitative, Binary
				Site, if within 20km of coast, is not located on an area lower than X m above current mean sea level	SE-2	1 - < 5m 10 - >15m	Quantitative, Scaled
		Annual rainfall	What is the annual rainfall and rainfall pattern at the site?	Site located in an area of rainfall of X mm/year	SE-3	1 - >1000mm/year 10 - < 500 mm/year	Quantitative, Scaled
				Site located in an area where X % of annual rainfall is likely to occur in a given 72-hour period	SE-4	1 - > 10% 10 - < 1%	Quantitative, Scaled
	Geological Characteristics	Proximity to known or anticipated seismic, tectonic or volcanic activity	What is the separation distance from known or anticipated seismic, or tectonic activity?	Site within an area with earthquake hazard X with an annual probability of exceedance of 1/500	SE-5	1 - > 0.08g 10 - < 0.05g	Quantitative, Scaled
		Proximity to major geological fault	What is the separation distance from known or anticipated major geological faults?	Site boundary X km from known or anticipated major geological fault	SE-6	1 - < 2.5 km 10 - > 50 km	Quantitative, Scaled
	Physical Site Characteristics	Flooding, surface drainage and geomorphology	What is the separation distance from areas known to be flooded or have held surface water?	Site area identified as having held water in recent observation	SE-7	1 - Held Water 10 - Not Held Water	Quantitative, Scaled
	Social and Planning Characteristics	Low population density and low projected population growth or prospects of future development	What is the adjacent population density?	Site boundary X km from an area of population density of 5 people per square kilometre	SE-8	1 - < 5km 10 - > 20km	Quantitative, Scaled
			What is the separation distance from an existing permanent residence (other than that of the nominator)?	Site boundary X km from the nearest residence	SE-9	1 - < 1.5km 10 - > 5km	Quantitative, Scaled
			What is the separation distance from an area that is likely to experience significant population growth in the future?	Site not located in an area that is likely to experience population growth	SE-10		Qualitative

Qualitative Assessment

Definitions / Notes:

1 The scoring range is from 1 (least suitable) to 10 (most suitable).

2 'X' within the metric column denotes the distance/number that is the measure of the metric

3 ‘Quantitative’ scoring type means that the score is assigned based on a measurable and numerical basis.

4 ''Qualitative’ scoring type means that the score is assigned based on the basis of a guided judgement.

5 ''Scaled' scoring type means that the score is proportional to the position within the defined range for the site metric

6 ''Binary' scoring type means that the score is either assigned a 10 (for a pass) or a 1 (for a fail) on the metric

Appendix C – Project Level Objectives & Attributes

National Radioactive Waste Management Facility

Table of Values - Objectives, Attributes and Project Phases

5/05/15

Objectives	Sub-Objectives	Attributes	Site Selection	Characterisation	Detailed Business Case	Design / Licensing	Construction	Operation	Post Closure
Health, Safety & Security	Public Health & Safety	Protection of the public against effects of radiation and radionuclides				✓		✓	✓
		Protection of the public against toxicity				✓		✓	✓
		Proximity to community and industrial development	✓	✓					
		Protection of the public from major accidents and events attributable to construction, transport and operation				✓	✓	✓	
	Worker Health & Safety	Protection of workers against exposure to radiation				✓		✓	
		Protection of workers against toxicity				✓		✓	
		Protection of workers against deaths, industrial and occupational diseases and serious injuries during construction, transport and operation				✓	✓	✓	
	Security	Protection of waste material against unauthorised removal or loss				✓		✓	
		Security against threat				✓		✓	
		Proximity to public and private roads	✓	✓		✓			
Environmental Protection	Environmental Impact	Proximity to lakes, rivers, streams, swamps, soakages and aquifers	✓	✓		✓			
		Susceptibility of ecosystems, flora and fauna, and/or the built environment to harmful effects from the release of radionuclides		✓		✓		✓	✓
		Susceptibility of ecosystems, flora and fauna to harmful effects of noise, vibration, dust, light pollution and earth-working		✓		✓	✓	✓	✓
		Matters of national enviornmental significance defined in the EPBC Act	✓	✓		✓			
Community Well-being	Land Use & Natural Resources	Community resources	✓	✓					
		Natural economic resources	✓	✓					
		Change in land use	✓	✓					
		Consumption of natural resources, including energy, construction materials, packaging materials, and water			✓	✓	✓	✓	
	Regional Impact	Visual impact of facility				✓			
	Cultural and Historical Impact	Potential cultural and historical impacts (people, culture, history and artefacts)	✓	✓		✓			
Equity	Social Impacts	Number of people affected through the construction, transport of waste and operation of the facility	✓	✓	✓	✓		✓	
		Community benefit from construction and operation of facility	✓	✓	✓		✓	✓	
		Viability of nuclear industry (research and medicine)			✓				
		Community attitude	✓	✓	✓	✓	✓		
	Intergenerational Fairness	Reduction of legacy waste			✓				
Economic Viability	Costs	Construction cost - locality factor	✓	✓	✓	✓	✓		
		Proximity to existing infrastructure	✓	✓	✓	✓	✓		
		Land acquisition cost	✓	✓	✓		✓		
	Land Ownership	Land tenure (secure title)?		✓	✓				
		Mineral, water, exploration, native title rights, ALRA or interests in the site		✓	✓	✓			
	Economic Sustainability	Provision for ongoing activity costs			✓			✓	✓
Stable Environment	Climatic Characteristics	Extreme weather events such as tropical cyclones, extreme temperatures or rain	✓	✓		✓		✓	✓
		Annual rainfall	✓	✓		✓		✓	✓
		Detrimental climate change		✓		✓		✓	✓
	Geological Characteristics	Proximity to known or anticipated seismic, tectonic or volcanic activity	✓	✓		✓			
		Simple site (not complex geology)		✓		✓	✓		
		Proximity to major geological fault	✓	✓		✓			
		Erosion		✓		✓		✓	✓
		Soil and soil depth (load bearing, adsorption of radionuclides)		✓		✓	✓		
	Physical Site Characteristics	Flooding, surface drainage and geomorphology	✓	✓		✓		✓	✓
	Social and Planning Characteristics	Low population density and low projected population growth or prospects of future development	✓	✓					
Adaptable to future scenarios	Flexibility to technology change	Change in inventory			✓	✓		✓	
		Adaptation during design development (boundary)			✓	✓			
		Retrievability of waste			✓	✓		✓	✓

Appendix D – Criteria Explanations

Criteria	Explanation
What is the separation distance from existing, or likely future, community or industrial developments?	This criterion aims to achieve a site that is not located too close to existing or future communities to avoid impacting these
What is the separation distance from existing accesses or pathways that could be used as an access by potentially disruptive parties?	This criterion aims to achieve a site that is not located too close to pathways that could provide easy access for potentially disruptive parties posing a security concern
What is the separation distance from any lake, river, stream, swamp, soakage or aquifer?	This criterion aims to separate the site from any water bodies our courses to avoid or minimise potential impacts either during construction or operation
What is the separation distance from an area of national environmental significance such as world or national heritage places, RAMSAR wetlands, listed threatened species and ecological communities, protected migratory species, Commonwealth marine areas?	This criterion aims to avoid protected areas as approval under the EPBC Act would not be possible within these
What is the separation distance from nature conservation reserves, water supply reserves or parks?	This criterion aims to avoid other reserves where approval under the EPBC Act would not be possible
What is the separation distance from high value natural resources (incl. farming, mineral, water or other resources)?	This criterion aims to achieve a site that avoids areas that could have other high value activities associated with it
Is the site located within an area that is likely to be expanded upon for community or industrial use or for natural/agricultural use in the foreseeable future?	This criterion aims to achieve a site that is not located too close to existing or future communities to avoid impacting these
Is the site located in an area where development may impact culture and history?	This criterion aims to avoid or minimise potential impacts on culture or history
What is the distance radioactive waste would need to be transported to the site from all current and future sources?	This criterion aims to minimise potential and / or perceived impacts on communities through the transport of waste from likely sources to the final destination
What is the distance to the nearest community which could receive benefits from the construction and operation of the facility?	This criterion aims to maximise the benefit for the adjacent community(s) in which the site may be located
Is there evidence of potential community support or opposition for the facility?	This criterion seeks to account for the level of local support for the facility thereby minimising any sense of imposition of perceived risks without consent
To what extent does the site location add a premium to the construction and operational cost?	This criterion accounts for the premium that may be associated with remote, difficult to access and/or higher cost locations
To what extent does the site have reasonable access for the transport of radioactive waste into and out of the site from all current and future Australian sources?	This criterion accounts for the need to have good transport routes to the site and to avoid the cost of developing these where they are not present
To what extent does the site location add a premium to the purchase cost?	This criterion accounts for the differing costs of land
What is the separation distance to areas subject to known or anticipated extreme climatic events?	This criterion accounts for known climatic conditions that may have a detrimental impact on the facility or may add significant cost to facility design and construction in order to mitigate them

What is the annual rainfall and rainfall pattern at the site?	This criterion accounts for the anticipated rainfall at the site given the impact water has on facility design and subsequent construction costs
What is the separation distance from known or anticipated seismic, or tectonic activity?	This criterion accounts for anticipated major sub-surface activity that would need to be accommodated through increased design of the facility
What is the separation distance from known or anticipated major geological faults?	This criterion accounts for anticipated sub-surface movement that would need to be accommodated through increased design of the facility
What is the separation distance from areas known to be flooded or have held surface water?	This criterion accounts for flooding conditions that would need to be considered in the facility design and have resultant design and construction implications
What is the adjacent population density?	This criterion accounts for the adjacent population density and aims to provide a buffer from higher densities to avoid restrictions on the ongoing operation of the Facility
What is the separation distance from an existing permanent residence (other than that of the nominator)?	This criterion accounts for adjacent occupied buildings and aims to provide a buffer to avoid impact or restrictions on the ongoing operation of the Facility
What is the separation distance from an area that is likely to experience significant population growth in the future?	This criterion accounts for the adjacent future population density forecast and aims to provide a buffer from potential future developments to avoid restrictions on the ongoing operation of the Facility

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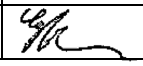
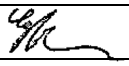
4	B Taplin	G Chamberlain		G Chamberlain		5/5/15

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Australian Government
Department of Industry, Innovation and Science

National Radioactive Waste Management Facility Project

Assessment of Potential Commonwealth Owned Sites

September 2017

Contents

1 Introduction

1.1 Background of nomination process

Under the National Radioactive Waste Management Act 2012 (NWRM Act), a landowner may nominate land to host this facility until a final site is decided upon by the Australian Government.

The Government has always said it remains open to receiving new land nominations, and that each would be assessed on the individual merits of the site.

Three sites have progressed to the second stage of the project (Barndioota and two Kimba sites).

Upon discussion with heads of Department, and based on criteria provided by the Department of Industry, Innovation and Science (the Department), the Department of Finance (Finance) provided a list of land owned by the Commonwealth that could potentially meet the requirements to host a NRWMF. Finance were provided with the broader criteria that sites were assessed against and the minimum requirement of 100ha of land.

They have subsequently provided two lists of Commonwealth owned properties using data from a 2013 land audit that excluded land:

- Zoned as airport, farming zone, mixed use, national park, non-urban agricultural protection zone, residential
- Less than 100 hectares
- Assessed, and having, ecological values.

To understand if any of these sites had potential merit, they were subject to a comprehensive desktop analysis, including scoring them on measures such as technical suitability.

The second-phase assessment of the nominated sites at Barndioota and Kimba are continuing and include an Independent Heritage Assessment (at Barndioota), site-specific technical studies and further public consultation.

1.2 Minister's decision to consider new nominations

The former Minister's announcement to progress a site demonstrated the success of the preceding process as the Barndioota community decided it is willing to continue to engage with the Department and further consider the option of hosting the facility. However, it should be noted that no final decision to site the facility at Barndioota (or Kimba) has been made. A final site will only be selected if there is continued broad community support and it meets Australia's strict environmental and radiation protection regulatory requirements.

In his April announcement, the former Minister also stated that the Government will remain open to considering new expressions of interest for additional facility sites or locations in addition to the site at Barndioota.

The Department had envisaged taking forward two to three sites into the detailed site characterisation phase of the project to be able to determine the most suitable site for the facility. By allowing the process to remain open to new voluntary nominations, the Government may select another one or two sites to participate in ongoing community engagement and detailed site characterisation.

1.3 Purpose of this document

This document sets out a summary of the assessment of potential Commonwealth owned sites. The assessment has been completed in line with the previous Multi-Criteria Site Assessment (MCSA) process to determine the suitability of the sites but a complete assessment in accordance with the *NRWM Act* has not been undertaken.

2 Assessment Process

2.1 Assessment Overview

The assessment of potential sites proceeded in accordance with the previous MCSA assessments undertaken. The process involved a technical assessment of each site against a range of criteria developed (and applied) for the previous site selection process.

After the technical assessment, a risk assessment was conducted to identify any items that would affect the potential suitability of the land.

2.2 Desktop Nature of Assessment

It is important to note that this is a desktop assessment. Existing databases available to Geoscience Australia (GA), as well as searches of publicly available information, are the sources of the information relied upon for assessing each nomination.

The information presented and relied upon within this assessment have been verified to the extent possible in a desktop assessment.

2.3 Definition of Nominated Land

To clearly define the site, additional information was sought from Finance.

Details were provided and entered into the RadWaste DSS and cross-checked for accuracy by GA. Where sites could not be adequately defined by the information provided, they were excluded from assessment.

2.4 Compliance Check

This was not applicable for this assessment.

2.5 Technical Assessment

A technical assessment was undertaken using only the quantitative assessment of the GA RadWaste DSS tool. GA developed the GA DSS to assist with the scoring of sites.

Data used in the assessment by the GA DSS includes the following:

- NEXIS/ UCL (Urban Centre and Locality) from PSMA;
- National Transmission Lines, Onshore Gas Pipelines and Onshore Oil Pipelines from GA;
- Surface Hydrology Polygons and Lines (National and Regional) from GA;
- CAPAD (Collaborative Australian Protected Areas Database 2014) from Department of Environment;
- World Heritage Areas from Department of Environment;
- National Heritage List Spatial Database from Department of Environment;
- Commonwealth Heritage List Spatial Database from Department of Environment;
- Mines Atlas from GA;
- Australian Collaborative Land Use and Management Program (ACLUMP) from ABARES;
- Digital Elevation Model from GA;
- Gridded Average Rainfall from the Bureau of Meteorology (BOM);
- Rainfall IFD from BOM;
- National Hazards Map from GA;
- Neotectonic Features Database from GA; and
- Water Observations from Space (WofS) from GA.

2.6 Risk Assessment

A risk assessment has been carried out, involving identification of potentially significant risk issues and a subsequent assessment of each in terms of the effect on a site's suitability.

The result of this process is a 'suitability rating' for each nomination. The ratings are 'potentially suitable' or 'less suitable'.

2.6.1 How Suitability Was Determined

Not all issues indicated that a nomination was less suitable; but they identified a need for further investigation. Risk items that were confirmed as having a negative impact on the suitability of a nomination caused that nomination to be marked as 'less suitable'.

Risk items from the MCSA assessment have been selected through a review of quantitative scoring. All nominations where a metric achieved a low score of 1, were treated as potential 'Red Flags'.

In general terms suitability ratings were assigned as follows:

- 'Less Suitable' sites are sites that:
  - Fell below the minimum standard for technical criteria;
  - Contained easements and/or key infrastructure including high voltage power lines, underground pipework or airfields;
  - Have large water bodies on site or had the potential to be impacted by water off-site;
  - Had future development potential for alternative uses;
  - Were less than 1km from residences or near higher population centres;
  - Contained heritage or environmental reserves, parks or registered areas;
  - Were adjacent to significant environmental features (such as RAMSAR wetlands, National or World Heritage areas);
- All other sites were rated as 'Potentially Suitable'.

A rating of less suitable was used to differentiate sites with attributes that, while suitable, would be less preferable for the development of the NRWMF because of their additional risk.

Proximity to Community

In the previous assessment, several nominations scored poorly for the metric related to the proximity to communities that would receive benefit from the development. An analysis was conducted which has identified that most nominations have a community of ~200 people less than 100km from the nominated land.

It was determined that a low score in this metric does not affect the suitability of a nomination unless the site is >150km from a smaller community of ~200 people.

Rainfall Intensity

All nominations scored equally poorly for this metric (all receiving a score of one (1)). The metric has identified that most sites will receive a relatively high proportion of rainfall in a 72-hour period, even with low annual rainfall figures.

It has been determined that a low score in this metric does not affect the suitability of a nomination and that future investigation will review the impact of rainfall on flooding and erosion.

3 Sites Details

3.1 Overview

A list of 60 sites for the assessment, made up of over 147 individual parcels of land, was provided by Finance. This information was sourced from a data set developed during a 2013 land audit.

Initial information provided was not adequate to suitably locate the sites for assessment purposes so further information was requested.

Specific title information was subsequently provided on those 60 sites, increasing the number of parcels of land to 267. This data was sources from a land title search Finance has recently undertaken in mid-2016.

The Department and GA merged the two data sets to identify 75 discreet 'sites' from the parcels of land; this was done through the treatment of adjacent/connected land parcels being treated as one contiguous 'site'. Any 'small' parcels of land were excluded from assessment.

Table 1 All Identified Sites

Agency	Name	State/ Territory	Site Reference
Department of Defence	Jindalee Receiver Site - MT Everard	NT	301
Department of Defence	Brymaroo Satellite Airfield - Oakey	QLD	302
Department of Defence	Jennings Stores Depot - ADI	NSW	315
Department of Defence	JORN Radar 1 Transmit Site	QLD	333
Department of Defence	Defence Communication Station - Transmitter	NSW	316
Department of Defence	JORN Radar 1 Receiving Site	QLD	309
Department of Defence	Defence Communication Station - Receiver	NSW	317
Department of Defence	Launcher Site Range - Koolymilka	SA	Excluded
Department of Defence	Proof & Experimental Estab - Graytown	VIC	321
Department of Defence	Jindalee Transmitting Site - Harts Range	NT	303
CSIRO	Woodstock	QLD	310
CSIRO	Narrabri	NSW	318
CSIRO	Parkes	NSW	319
Department of Defence	Wyoming Satellite Airfield - Oakey	QLD	334
Department of Defence	Marrangaroo Depot	NSW	320
Department of Defence	Exmouth Area C - Naval HF Receiving Station	WA	331
Department of Defence	Exmouth Area B - Admin & HF Transmitter	WA	332
Department of Defence	Exmouth Area A - VLF Transmitter Station	WA	323
Department of Defence	Twofold Bay Ordnance Loading Area	NSW	337
Department of Defence	Wallangarra Stores Depot	QLD	335
Department of Defence	Macrossan Camp	QLD	311
Department of Defence	Frenchville Rifle Range	QLD	312
Department of Defence	East Coonawarra	NT	304
Department of Defence	Defence Establishment - Berrimah	NT	305
Department of Defence	Defence Establishment Howard Springs North	NT	306
Department of Defence	DSTO ST Kilda Transmitting Station	SA	326
Department of Defence	Richmond - Fuel Farm, Dental, Medical	NSW	325
Department of Defence	Bohle River Transmitting Station	QLD	313
Department of Defence	Kalgoorlie Rifle Range	WA	324
Department of Defence	Leanyer Bombing Range	NT	308
Department of Defence	MT Vince Rifle Range - Mackay	QLD	314
Department of Defence	Defence Establishment Howard Springs South	NT	307
ANSTO	Lucas Heights	NSW	342
Department of Defence	COCOS Island Married Quarters	WA	Excluded
Department of Defence	Bonshaw Communications Station	ACT	Excluded
Department of Defence	Unknown	NSW	Excluded
Department of Defence	DSTO Edinburgh	SA	327
Department of Defence	Avalon Airfield	VIC	322

Department of Defence	El Alamein - Port Augusta	SA	Excluded
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	329
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	330
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	328
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
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Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Christmas Island	WA	Excluded
Department of Infrastructure	Cocos Islands	WA	Excluded
Department of Defence	Unknown	NSW	Excluded
Department of Defence	Oakey Airport	QLD	336
Bureau of Meteorology	Unknown	QLD	Excluded
Department of Defence	Woomera	SA	339
Department of Defence	Woomera	SA	341
Department of Defence	Woomera	SA	340
Department of Defence	Unknown	SA	Excluded
Department of Defence	Unknown	SA	Excluded
Department of Defence	Unknown	SA	Excluded
Department of Defence	Unknown	SA	Excluded
Department of Defence	Unknown	SA	Excluded
Department of Defence	Whyalla	SA	338
Department of Defence	Unknown	SA	Excluded
Department of Defence	Unknown	SA	Excluded
PM&C	Unknown	SA	Excluded

3.2 Excluded from Assessment

As discussed above, sites that were ‘small’ in size or were not directly adjacent or connected to a larger lot of land parcels were excluded from assessment.

Further, any land parcels not part of the contiguous Australian mainland (e.g. Christmas Island) were excluded.

Where information provided did not adequately define the land parcels for assessment, they were also excluded.

Subsequently, 42 of the 75 sites were identified for further assessment, leaving those sites identified below.

Table 2 Potentially Suitable Sites

Agency	Name	State/ Territory	Site Reference
Department of Defence	Jindalee Receiver Site - MT Everard	NT	301
Department of Defence	Brymaroo Satellite Airfield - Oakey	QLD	302
Department of Defence	Jindalee Transmitting Site - Harts Range	NT	303
Department of Defence	East Coonawarra	NT	304
Department of Defence	Defence Establishment - Berrimah	NT	305
Department of Defence	Defence Establishment Howard Springs North	NT	306
Department of Defence	Defence Establishment Howard Springs South	NT	307
Department of Defence	Leanyer Bombing Range	NT	308
Department of Defence	JORN Radar 1 Receiving Site	QLD	309
CSIRO	Woodstock	QLD	310
Department of Defence	Macrossan Camp	QLD	311
Department of Defence	Frenchville Rifle Range	QLD	312
Department of Defence	Bohle River Transmitting Station	QLD	313
Department of Defence	MT Vince Rifle Range - Mackay	QLD	314
Department of Defence	Jennings Stores Depot - ADI	NSW	315
Department of Defence	Defence Communication Station - Transmitter	NSW	316
Department of Defence	Defence Communication Station - Receiver	NSW	317
CSIRO	Narrabri	NSW	318
CSIRO	Parkes	NSW	319
Department of Defence	Marrangaroo Depot	NSW	320
Department of Defence	Proof & Experimental Estab - Graytown	VIC	321
Department of Defence	Avalon Airfield	VIC	322
Department of Defence	Exmouth Area A - VLF Transmitter Station	WA	323
Department of Defence	Kalgoorlie Rifle Range	WA	324
Department of Defence	Richmond - Fuel Farm, Dental, Medical	NSW	325
Department of Defence	DSTO ST Kilda Transmitting Station	SA	326
Department of Defence	DSTO Edinburgh	SA	327
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	328
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	329
Department of Finance	Ginninderra Experiment Station, CSIRO	ACT	330
Department of Defence	Exmouth Area C - Naval HF Receiving Station	WA	331
Department of Defence	Exmouth Area B - Admin & HF Transmitter	WA	332
Department of Defence	JORN Radar 1 Transmit Site	QLD	333
Department of Defence	Wyoming Satellite Airfield - Oakey	QLD	334
Department of Defence	Wallangarra Stores Depot	QLD	335
Department of Defence	Oakey Airport	QLD	336
Department of Defence	Twofold Bay Ordnance Loading Area	NSW	337
Department of Defence	Whyalla (Cultana Training Area)	SA	338
Department of Defence	Woomera (Nurrungar Test Area)	SA	339
Department of Defence	Woomera (Airfield, Technical Area, Woomera Village)	SA	340
Department of Defence	Woomera (Small Arms Test Range)	SA	341
ANSTO	Lucas Heights	NSW	342

4 Detailed Assessment of Nominated Sites

4.1 Overview

This section provides an overview of the results of the assessment.

Detailed information on the assessment of each site against the qualitative criteria is included below.

4.2 First Pass Multi-Criteria Site Analysis

The 42 sites that were left from the initial exclusion activity were assessed using the RadWaste DSS tool against all quantitative MCSA criteria.

The assessment then focused on criteria that scored less than a 7 out of 10 (except for the criteria EQ-3 and SE-4 discussed earlier).

A risk assessment was undertaken on these criteria to determine the impact this would have on the suitability of the site. Where any criteria for a selected site was considered a 'risk' the site was marked as unsuitable.

The results are indicated below.

Table 3 Suitability Assessment of Potentially Suitable Sites

Site #	Name	State/ Territory	Unsuitable?	Primary Reason
301	Jindalee Receiver Site - MT Everard	NT		
302	Brymaroo Satellite Airfield - Oakey	QLD		
303	Jindalee Transmitting Site - Harts Range	NT		
304	East Coonawarra	NT	Y	Cyclonic Wind, Water Exposure
305	Defence Establishment - Berrimah	NT	Y	Cyclonic Wind, Water Exposure
306	Defence Establishment Howard Springs North	NT	Y	Cyclonic Wind, Water Exposure
307	Defence Establishment Howard Springs South	NT	Y	Cyclonic Wind, Water Exposure
308	Leanyer Bombing Range	NT	Y	Cyclonic Wind, Water Exposure
309	JORN Radar 1 Receiving Site	QLD	Y	Water Exposure
310	Woodstock	QLD	Y	Cyclonic Wind
311	Macrossan Camp	QLD	Y	Prohibited Heritage Area, Shape
312	Frenchville Rifle Range	QLD	Y	Cyclonic Wind
313	Bohle River Transmitting Station	QLD	Y	Cyclonic Wind, Coastal
314	MT Vince Rifle Range - Mackay	QLD	Y	Cyclonic Wind, High Rainfall
315	Jennings Stores Depot - ADI	NSW	Y	High Rainfall
316	Defence Communication Station - Transmitter	NSW	Y	Water exposure
317	Defence Communication Station - Receiver	NSW		
318	Narrabri	NSW		
319	Parkes	NSW		
320	Marrangaroo Depot	NSW	Y	High Rainfall
321	Proof & Experimental Estab - Graytown	VIC	Y	Small Site (<100ha)
322	Avalon Airfield	VIC	Y	Known fault, Population
323	Exmouth Area A - VLF Transmitter Station	WA	Y	Cyclonic Wind, Coastal
324	Kalgoorlie Rifle Range	WA	Y	Within national park
325	Richmond - Fuel Farm, Dental, Medical	NSW	Y	High rainfall, population
326	DSTO ST Kilda Transmitting Station	SA	Y	Coastal
327	DSTO Edinburgh	SA	Y	Population
328	Ginninderra Experiment Station, CSIRO	ACT	Y	Nature reserve, high population
329	Ginninderra Experiment Station, CSIRO	ACT	Y	Nature reserve, high population
330	Ginninderra Experiment Station, CSIRO	ACT	Y	Nature reserve, high population
331	Exmouth Area C - Naval HF Receiving Station	WA	Y	Cyclonic Wind
332	Exmouth Area B - Admin & HF Transmitter	WA	Y	Cyclonic Wind, Coastal
333	JORN Radar 1 Transmit Site	QLD	Y	Water Exposure
334	Wyoming Satellite Airfield - Oakey	QLD		
335	Wallangarra Stores Depot	QLD	Y	High rainfall

336	Oakey Airport	QLD	Y	Population
337	Twofold Bay Ordnance Loading Area	NSW	Y	High rainfall
338	Whyalla (Cultana Training Area)	SA		
339	Woomera (Nurrungar Test Area)	SA		
340	Woomera (Airfield, Technical Area, Woomera Village)	SA		
341	Woomera (Small Arms Test Range)	SA		
342	Lucas Heights	NSW		

4.3 Remaining Sites Assessment

Of the 42 sites, only 12 were identified as being potentially suitable having passed the initial risk assessment process. These sites are identified below with comments on the site provided.

Table 4 Potentially Suitable Sites After Risk Assessment

Site #	Name	State/ Territory	Comment
301	JORN Receiver Site - MT Everard	NT	Majority of site covered by receivers for the Jindalee Operational Radar Network.
302	Brymaroo Satellite Airfield - Oakey	QLD	Appears to be within a productive farming region, with existing structures on site
303	JORN Transmitting Site - Harts Range	NT	Portion of site contains structures associated with the Jindalee Operational Radar Network
317	Defence Communication Station	NSW	Large site with small structures scattered throughout. Some evidence of standing water on site
318	Narrabri	NSW	Most of site has significant structures associated with the observatory
319	Parkes	NSW	Telescope and other structures located on the small site
334	Wyoming Satellite Airfield - Oakey	QLD	Small airstrip on a small site
338	Whyalla (Cultana Training Area)	SA	Coastal site but very large, adjacent to Whyalla
339	Woomera (Nurrungar Test Area)	SA	South of Woomera and the Woomera Prohibited Area
340	Woomera (Airfield, Technical Area, Woomera Village)	SA	Within the Woomera Prohibited Area, contains Woomera township and the Woomera Airfield
341	Woomera (Small Arms Test Range)	SA	Within the Woomera Prohibited Area, contains built structures on site
342	Lucas Heights	NSW	Existing ANSTO site - adjacent Holesworthy

Sites 301 and 334 (among others in the previous assessment highlighted in red) are no longer included in the 2016 data set. It is understood, from discussions with Finance, that if the sites were identified in the 2013 data and are no longer in the 2016 data, then they are not to be considered further.

All remaining sites have an existing use. Except for sites 338, 339, 340, 341 and 342 (those marked green) it is anticipated that a sufficient buffer could not be established between existing activities and the NRWMF (mostly to protect the existing operations underway on the site).

Site 338 is a significantly large site that some further investigation of this would be necessary to identify the potential to host the NRWMF, however there is potential scope for a buffer to be established from any activities or risk items.

Sites 339, 340 and 341 are either adjacent to or within the Woomera Prohibited Zone, mostly within the ‘Continuous Use’ zone. If it can be established that this would not unduly restrict or affect the construction and operation of the facility, then these sites could be further considered.

Site 342 is the existing ANSTO Lucas Heights site. Further development of waste management facilities at this site would exceed the existing ARPANSA licence conditions. It is anticipated that this would also exceed the social license for the site.

4.4 Defence Advice on Assessment

Four of the five sites that remain for consideration, after the assessment process was completed, were Defence sites.

As a result, the Department requested Defence to consider these sites and provide their advice regarding the possibility of hosting the facility.

On 28 July 2017, Defence responded to the Department's request advising that all four sites have an existing use that development of the facility at any of these sites would be incompatible with Defence's primary of use of the sites as follows:

- Development on site 338 would negatively impact Defence operations and capability;
- Development on site 339 could result in the loss of essential Defence capability. Further, the site is of significant cultural importance.
- Site 340 and 341's use will likely increase soon with the introduction of the new air warfare capability. Further, access to parts of this site that are within the 'Red Zone' would be limited to Defence Users at times;

As part of the process, Defence also review an additional 223 Defence owned sites that were not identified previously and advised that there is no Defence owned land that would be suitable to host the facility.

4.5 Lucas Heights

After the HIFAR reactor was decommission at Lucas Heights, intermediate-level waste was sent overseas for reprocessing.

Under contracts signed by the Australian Government in the 1990s, Australia was obliged to ensure that the waste sent overseas was dispatched from France to Australia before December 2015.

To meet this obligation, ANSTO received the intermediate-level waste at ANSTO's Lucas Heights campus for storage in the Interim Waste Store (IWS). The siting, construction and operation of the IWS was subject to regulatory approval by ARPANSA.

The licence granted by ARPANSA, under the *ARPANS Act*, authorises ANSTO to operate the IWS Facility for:

> *"the sole purpose of temporary storage of radioactive waste from reprocessing in France of spent nuclear fuel from the operations of the High Flux Australian Reactor (HIFAR)."*

Further, the license included conditions including the submission of

> *"plans for the removal of waste stored in the facility by 30 June 2020".*

The licence clearly indicates that the waste will temporarily be stored at Lucas Heights, until establishment of the National Radioactive Waste Management Facility. The licensing process also included extensive public consultation, including through the process of obtaining EPBC Act approval.

The use of ANSTO or the Lucas Heights land as a larger storage facility would be a significant departure from the current license, and from the social licence obtaining from the surrounding community.

5 Conclusion

Finance has provided a list of land parcels owned by the Commonwealth that could potentially meet the requirements to host a NRWMF.

To understand if any of these sites had potential merit, they were subject to the comprehensive analysis, including scoring them on measures such as technical suitability.

A list of 60 sites for the assessment, made up of over 147 individual parcels of land, was provided. This information was sourced from a 2013 data set.

Initial information provided was not adequate to suitably locate the sites for assessment purposes so further information was requested.

Specific title information was subsequently provided on those 60 sites, increasing the number of parcels of land to 267. This data was sourced from a land title search Finance had recently undertaken in mid-2016.

The Department and GA merged the two data sets to identify 75 discreet 'sites' from the parcels of land.

After excluding sites that were:

- 'Small' in size and were not directly adjacent or connected to a larger lot of land parcels, any site;
- not part of the contiguous Australian mainland (e.g. Christmas Island); or
- not adequately defined,

42 sites remained and were identified for further assessment. The MCSA process was applied to these 42 sites using only the quantitative criteria.

For each site, the criteria scores were reviewed as part of a risk assessment. Any criteria scoring <7 was reviewed for the impact it may have on the potential suitability for the site. If any single criteria for a site was identified as being a risk, the site was marked as unsuitable.

The risk assessment reduced the potentially suitable sites from 42 down to twelve.

Further, it is understood that two of the twelve sites were removed from assessment due to their removal from the 2016 data.

It was clear that all ten sites have an existing use and except for sites 338, 339, 340, 341 and 342 it is anticipated that a sufficient buffer could not be established between existing activities and the NRWMF.

On 28 July 2017, Defence responded to the Department's request advising that all four of their sites (338, 339, 340 and 341) have an existing use and that development of the facility at any of these sites would be incompatible with Defence's primary of use of these sites.

Defence also review an additional 223 Defence owned sites that were not identified previously and advised comprehensively that there is no Defence owned land that would be suitable to host the facility.

Site 342 is the existing ANSTO Lucas Heights site. Further development of waste management facilities at this site would exceed the existing ARPANSA licence conditions. It is anticipated that this would also exceed the social license for the site.