

APPENDIX A

Geoscientific Evaluation Factors

Table A.1 Safety Functions, Performance Objectives and Geoscientific Factors

Safety Functions	Performance Objectives	Evaluation Factors to be Considered
Containment and isolation characteristics of the host rock	<p>1. The geological, hydrogeological and chemical and mechanical characteristics of the site should:</p> <ul style="list-style-type: none"> • Promote long-term isolation of used nuclear fuel from humans, the environment and surface disturbances; • Promote long-term containment of used nuclear fuel within the repository; and • Restrict groundwater movement and retard the movement of any released radioactive material. 	<p>1.1 The depth of the host rock formation should be sufficient for isolating the repository from surface disturbances and changes caused by human activities and natural events.</p> <p>1.2 The volume of available competent rock at repository depth should be sufficient to host the repository and provide sufficient distance from active geological features such as zones of deformation or faults and unfavourable heterogeneities.</p> <p>1.3 The mineralogy of the rock, the geochemical composition of the groundwater and rock porewater at repository depth should not adversely impact the expected performance of the repository multi-barrier system.</p> <p>1.4 The hydrogeological regime within the host rock should exhibit low groundwater velocities.</p> <p>1.5 The mineralogy of the host rock, the geochemical composition of the groundwater and rock porewater should be favourable to retarding radionuclide movement.</p> <p>1.6 The host rock should be capable of withstanding natural stresses and thermal stresses induced by the repository without significant structural deformations or fracturing that could compromise the containment and isolation functions of the repository.</p>
Long-term stability of the site	<p>2. The containment and isolation functions of the repository should not be unacceptably affected by future geological processes and climate changes.</p>	<p>2.1 Current and future seismic activity at the repository site should not adversely impact the integrity and safety of the repository system during operation and in the very long term.</p> <p>2.2 The expected rates of land uplift, subsidence and erosion at the repository site should not adversely impact the containment and isolation functions of the repository.</p> <p>2.3 The evolution of the geomechanical, hydrogeological and geochemical conditions at repository depth during future climate change scenarios such as glacial cycles should not have a detrimental impact on the long-term safety of the repository.</p> <p>2.4 The repository should be located at a sufficient distance from geological features such as zones of deformation or faults that could be potentially reactivated in the future.</p>

Safety Functions	Performance Objectives	Evaluation Factors to be Considered
Repository construction, operation and closure	3. The surface and underground characteristics of the site should be favourable to the safe construction, operation, closure and long-term performance of the repository.	<p>3.1 The strength of the host rock and in-situ stress at repository depth should be such that the repository could be safely excavated, operated and closed without unacceptable rock instabilities.</p> <p>3.2 The soil cover depth over the host rock should not adversely impact repository construction activities.</p> <p>3.3 The available surface area should be sufficient to accommodate surface facilities and associated infrastructure.</p>
Human intrusion	4. The site should not be located in areas where the containment and isolation functions of the repository are likely to be disrupted by future human activities.	<p>4.1 The repository should not be located within rock formations containing economically exploitable natural resources such as gas/oil, coal, minerals and other valuable commodities as known today.</p> <p>4.2 The repository should not be located within geological formations containing exploitable groundwater resources (aquifers) at repository depth.</p>
Site characterization	5. The characteristics of the site should be amenable to site characterization and site data interpretation activities.	5.1 The host rock geometry and structure should be predictable and amenable to site characterization and site data interpretation.

APPENDIX B

Geoscientific Data Sources

Table B.1 Summary of Geoscientific Databases for the Central Huron Area

Database	Description	Scale (Regional / Local)	Used? (Yes/ No)
AFRI	The AFRI database contains the technical results from all exploration work carried out in Ontario. Data includes location, property ownership, type of work done, commodities sought for each assessment file and a link to a pdf version of each file. Spatial data is collected for each file in the form of polygons indicating property outlines.	Regional	Yes
Ambient Groundwater Geochemistry Data (MRD-283)	This release contains the data for all southwestern Ontario. The data include detailed inorganic chemistry for more than 900 water samples.	Regional	Yes
AMIS (Abandoned Mines Information System Database)	AMIS is a database containing information on all known abandoned and inactive mine sites within the province of Ontario. There are currently 5,700 known abandoned mine sites scattered throughout the Province, which contain more than 16,400 mine features.	Regional	Yes
Ausable-Bayfield Conservation Lands	The database contains lands purchased by Ausable Bayfield Conservation Authority in the southern part of the Central Huron area. This database contains conservation lands that were not included in the Land Information Ontario database.	Regional	Yes
CLAIMaps	CLAIMaps contains active claims, alienations and dispositions. Data includes: links to further land tenure information.	Regional	Yes
Earthquakes Canada (NEDB)	The National Earthquake Data Base (NEDB) comprises a number of separate databases that together act as the national repository for all raw seismograph data.	Regional	Yes
Geoscience Data Repository for Geophysical and Geochemical Data	A database with aeromagnetic, gravity and radioactivity data for all Canada.	Regional	Yes
Mineral Deposits Inventory (MDI)	The database contains an overview of mineral occurrences in the province of Ontario. The data includes the occurrence type (mineral or discretionary), primary and secondary commodity, deposit name and a link to the full record on Geology Ontario.	Regional	Yes
Petroleum Well Data	Ontario Oil, Gas and Salt Resources Library digital data set of petroleum well location, class, target, depth, status and operator name. Database also has digital data for petroleum pools in a GIS format and locations and wireline logs for geophysical surveys completed in boreholes in the database.	Regional	Yes
Provincial Groundwater Monitoring Network Program	The Provincial Groundwater Monitoring Information System (PGMIS) is a web-driven application that assists the Ministry of the Environment and stakeholders to monitor the state of the Province's groundwater resources.	Regional	Yes
WWIS (Water Wells)	Database containing water well records throughout Ontario from 1949 to present.	Regional	Yes

Table B.2 Summary of Geophysical Mapping Sources for the Central Huron Area

<i>Product</i>	<i>Source</i>	<i>Type</i>	<i>Line Spacing/ Sensor Height</i>	<i>Coverage</i>	<i>Date</i>	<i>Additional Comments</i>
Waterloo	Waterloo fixed wing magnetic survey	GSC, 2014	926m line spacing 305m sensor height	Eastern portion of Central Huron area	1986	Large overlap with newer survey to the south.
Lake Huron	Lake Huron fixed wing magnetic survey	GSC, 2014	1,900m line spacing 305m sensor height	Western half of Central Huron area	1986	Low resolution survey over Lake Huron
Strathroy	Strathroy fixed wing magnetic survey	Spector, 1999	700 m x 700m m grid 450mASL sensor height	Western half of Central Huron area	1999	Higher resolution than GSC surveys.
South Ontario Radon Survey – Block 2	Southern Ontario Block 2 radiometric survey	GSC, 2014	1000m line spacing 150m sensor height	Entire Central Huron area	2008	Low resolution survey, east-west flight lines
GSC Gravity	Ground gravity measurements	GSC, 2014	6 km (onshore), 1.6 km x 18 km (offshore)/surface	Entire Central Huron area	1945-2007	Bouguer gravity field, first vertical derivative, horizontal gradient and the isostatic residual gravity field were extracted from the GSC gravity compilation. Station locations were extracted from the point data.
PGW Gravity	Ground gravity measurements	PGW, 2015	0.4 km x 2 km/ surface	Entire land portion of Central Huron area	1950s	Higher resolution than GSC coverage, variable station spacing

Table B.3 Summary of Geological Mapping Sources for the Central Huron Area

<i>Map Product</i>	<i>Title</i>	<i>Author</i>	<i>Date</i>	<i>Source</i>	<i>Scale</i>	<i>Coverage</i>	<i>Additional Comments</i>
EDS014	Quaternary Geology, Seamless Coverage of the Province of Ontario	Ontario Geological Survey	1997	OGS	1:1000000	Full	Includes geology and features such eskers, and moraines.
GRS 05	Karst of Southern Ontario and Manitoulin Island	F.R. Brunton and J.E.P. Dodge	2008	OGS	1:50000	Full	Digital data release of karst in Paleozoic rocks
M2225	Physiography of the Southwestern Portion of Southern Ontario	L.J. Chapman and D.F. Putnam	1972	OGS	1:253,440	Full	Preliminary map for Chapman and Putnam (2007)
M2544	Bedrock Geology of Ontario, Southern Sheet	Ontario Geological Survey	1991	OGS	1:1000000	Full	Regional-scale bedrock mapping
MRD-126 REV1	1:250 000 scale bedrock geology of Ontario	Ontario Geological Survey	2011	OGS	1:250000	Full	Bedrock mapping for the Province of Ontario
MRD-128 REV	Surficial geology of southern Ontario	Ontario Geological Survey	2010	OGS	1:50000	Full	Revised surficial geology mapping available in digital format
MRD-207	Bedrock Topography and Overburden Thickness Mapping, Southern Ontario	C. Gao, J. Shiota, R.I. Kelly, F.R. Brunton and S. van Haaften	2006	OGS	1:50000	Full	Bedrock elevation and drift thickness calculated from water well database
MRD-219	Paleozoic Geology of Southern Ontario	D.K. Armstrong and J.E.P. Dodge	2007	OGS	1:50000	Full	Attributed GIS-based Paleozoic geology
MRD-228	Physiography of southern Ontario	L.J. Chapman and D.F. Putnam	2007	OGS	1:50000	Full	Mapping of the physical structure including escarpments; dunes and landforms

Map Product	Title	Author	Date	Source	Scale	Coverage	Additional Comments
MRD-276	Regional structure and isopach maps of potential hydrocarbon-bearing strata for southern Ontario	Ontario Geological Survey	2010	OGS	1:100000 or 1:250000	Full	Digital mapping of Paleozoic hydrocarbon-bearing units including reefs and pools
OFM 0162	Extension of Grenville Basement Beneath Southwestern Ontario	R. M. Easton and T.R. Carter	1991	OGS	1:1013760	Full	Regional-scale basement mapping
Open File Report 401	Isopach of the Salina B Salt, Southwestern Ontario	B.V. Sanford	1977	GSC	1:250000	Partial	Geological mapping and cross sections
P0166	Palmerston sheet, bedrock topography series	P.F. Karrow L.L. Davies W.R. McClymont	1962	OGS	1:50000	Partial	Preliminary bedrock topography mapping of eastern part of the area
P0296	Bedrock topography series, Lucknow-Wingham sheet	P.F. Karrow I. Ben-Tahir D.B. Steele W.D. Morrison	1965	OGS	1:50000	Partial	Preliminary bedrock topography mapping of northern part of the area
P0297	Bedrock topography series, Goderich-Seaforth sheet	P.F. Karrow I. Ben-Tahir D.B. Steele W.D. Morrison	1965	OGS	1:50000	Partial	Preliminary bedrock topography mapping of southern half of the area
P1232	Quaternary geology, Goderich area, southern Ontario	A.J. Cooper W.D. Fitzgerald	1977	OGS	1:50000	Partial	Preliminary Quaternary geology mapping of the western part of the area

Map Product	Title	Author	Date	Source	Scale	Coverage	Additional Comments
P1233	Quaternary geology, Seaforth area, southern Ontario	A.J. Cooper W.D. Fitzgerald J. Clue	1977	OGS	1:50000	Partial	Preliminary Quaternary geology mapping of the eastern part of the area
P1974	Bedrock topography series, Goderich-Seaforth area, southern Ontario	A.J. Cooper	1978	OGS	1:50000	Partial	Preliminary bedrock topography mapping of the southern part of the area
P2450	Drift thickness of the Goderich and Seaforth areas, southern Ontario	A.J. Cooper L.P. Nicks	1981	OGS	1:50000	Partial	Preliminary drift thickness mapping of the southern half of the area
P2757	Petroleum resources map, structure, top pre-Hamilton, Devonian carbonates, Huron County, southern Ontario	Bailey Geological Services Ltd.	1985	OGS	1:100000	Full	Structural mapping based on borehole logs
P2812	Petroleum resources map, structure, top Devonian sulphur water-porosity, Huron County, southern Ontario	Bailey Geological Services Ltd.	1985	OGS	1:100000	Full	Structural mapping based on borehole logs
P2823	Petroleum resources map, isopach top Devonian carbonate to top sulphur water-porosity, Huron County, southern Ontario	Bailey Geological Services Ltd.	1985	OGS	1:100000	Full	Structural mapping based on borehole logs
P2895	Petroleum resources map, structure top Rochester Formation, Huron County, southern Ontario	Bailey Geological Services Ltd.	1985	OGS	1:100000	Full	Structural mapping based on borehole logs

Map Product	Title	Author	Date	Source	Scale	Coverage	Additional Comments
P2957	Quaternary geology, Wingham-Lucknow area, southern Ontario	W.R. Cowan A.J. Cooper J.J. Pinch	1986	OGS	1:50000	Partial	Preliminary Quaternary mapping of the northern part of study area
P3013	Petroleum resources map, isopach top Guelph to top Rochester, Huron County, southern Ontario	Bailey Geological Services Ltd., R.O. Cochrane	1986	OGS	1:100000	Full	Structural mapping based on borehole logs
P3201	Drift Thickness, Lucknow Area, Southern Ontario	R.I. Kelly and T.R. Carter	1993	OGS	1:50000	Partial	Contour mapping based on borehole logs
P3204	Drift Thickness, Wingham Area, Southern Ontario	R.I. Kelly and T.R. Carter	1993	OGS	1:50000	Partial	Preliminary drift thickness mapping northern part of study area
P3206	Bedrock Topography, Lucknow Area, Southern Ontario	R.I. Kelly and T.R. Carter	1993	OGS	1:50000	Partial	Preliminary bedrock topography mapping northern part of study area
P3209	Bedrock Topography, Wingham Area, Southern Ontario	R.I. Kelly and T.R. Carter	1993	OGS	1:50000	Partial	Preliminary bedrock topography mapping northern part of study area
SV 04	Geology of Ontario	M.D. Johnson D.K. Armstrong B.V. Sanford P.G. Telford M.A. Rutka	1992	OGS	Numerous maps with a range of different scales	Full	Chapter 20 details the Paleozoic and Mesozoic geology of Ontario
SV 07	The Subsurface Paleozoic Stratigraphy of Southern Ontario	D.K. Armstrong and T.R. Carter	2010	OGS	Numerous maps with a range of different scales	Full	Reference document for describing Paleozoic rocks