

Table H-1. Example Uncertainty Management Matrix for Long-Term Environmental Stewardship

Expected Condition	Reasonable Failure	Probability of Occurrence	Time to Respond	Impact	Monitoring Plan	Contingency Plan
Cover prevents infiltration and subsequent leachate development.	Burrowing animals or plant roots will breach cover integrity.	High. Operations of other landfills indicate that over time this is a common intrusion scenario.	Short for animals. In the case of plants, it takes time to establish a deep root system.	Significant since cover integrity will be lost and leachate is likely to carry contaminants to the groundwater.	Site inspection every 3 months to ensure integrity of cover.	A bio-intrusion barrier could deter burrowing animals. Since lead times are quite short for this pathway, it may be better to install this barrier at the onset (robust design). Plant removal upon detection should mitigate root intrusion.
Access and institutional controls will prevent excavation through cover.	Humans will dig in the area of the landfill, breaching integrity of the cover.	Low. Additional controls (i.e., land use restrictions and a fence) are in place to prevent human intrusion.	Short for direct contact of humans, longer for loss of cover effectiveness with respect to infiltration	Same as above. In addition, intrusion into the soil would likely result in dermal contact with radioactive contaminants, posing an unacceptable risk to human health.	Site inspection will include surveillance of cover condition, evaluation of fence integrity and maintenance of land use controls..	Reevaluation of remedy will be conducted if humans breach the integrity of the cover and land use controls are not functional. Options may include more sophisticated fence designs, site security, and armoring
Contaminants in the groundwater will naturally attenuate to levels below Maximum Contaminant Levels (MCLs) within a 20-year timeframe.	Contaminants do not attenuate naturally to levels below MCLs within the required timeframe.	Low. Based on modeling of site conditions, contaminant characteristics, and the general trend established by existing monitoring data, MCLs will be attained within a 20-year time frame.	Long. Monitoring data will indicate if the current trend in contaminant reduction changes. Based on these data, the site manager will have advance warning if end objectives will not be met in 20 years.	High. If groundwater remediation cannot be reached in 20 years, regulators will require a different more costly remediation approach. 2. Low. Land use restrictions and alternate drinking supply prevent ingestion.	Wells within the plume will be sampled every three months to ensure that natural attenuation is reducing contaminant concentration. Sentinel wells will be monitored quarterly to detect any escape near receptor wells.	If data indicate significant negative deviation from predicted trends in plume concentrations, an extraction type of remedy