EXEMPLAR HORIZON SCAN OUTPUT

THEMATIC CLUSTER #1	
TITLE	**Aliens in Antarctica**
Brief Summary (not to exceed 500 words) In the year 2020, an extra-terrestrial spaceship arrived over Antarctica. The Alien visitors established a "base camp" and immediately began terra-forming the continent which resulted in catastrophic loss of ice sheet mass and morphological and physico-chemical transformation of newly exposed bedrock. Subsequent to "preparing" the land, satellite observations confirmed the seeding of alien species into the landscape. Stealth reconnaissance missions to and near Antarctica captured errant alien organisms and it was soon recognized that they were silicon and not carbon based life forms. While there has not been overt aggression by the visitors, attempts to communicate with the aliens to discern their intentions have so far been unsuccessful. Actions by the aliens have begun to alter Antarctica and the Earth System in dramatic ways that are not fully understood. In order to develop a global strategy to respond to this unwelcome intrusion, a sustained science and research program is essential to better understand the long-term effects of alien occupation and alteration of Antarctica.	
SCIENTIFIC QUESTIONS	***The most important and compelling questions with the greatest potential for fundamental impact and advancement of knowledge*** **Notes Added in Explanation**
1) Where did the aliens come from and why did they come to Earth?	Are they from our solar system or beyond?
2) Why did the Aliens choose Antarctica as their base of operation?	What are the special features of Antarctica that made it an ideal location to launch an invasion?
3) How did the terra-forming of Antarctica by the Aliens change the regional physical environment of Antarctica and how has this impacted the Earth System in general?	How did terra-forming change the heat, energy, and carbon budget of planet Earth?
4) How did the introduction of silicon-based life alter the structure and functioning of carbon-based ecosystems?	Are silicon- and carbon-based life forms compatible or will one ultimately prevail, eliminating the other?
5) Is there evidence for interbreeding of alien and earth life forms and if so, what are the ramifications?	If so, are the offspring viable and able to further reproduce suggesting a mixing of gene pools?
TECHNOLGICAL CHALLENGES	***Are there technologies that need to be adapted or created to be able to answer the scientific questions?***
1) Genomic sequencing techniques for silicon-based life.	Carbon-based genomics are inadequate and not directly applicable***.***
2) Methods to remotely detect and quantify kryptonite as the major agent and tracer of terra-forming.	Time series of the progress of terra-forming are essential to predict the likelihood of final outcomes in realistic terms in support of modelling efforts.
3) Assays for the presence of hybrid Si/C DNA sequences in living organisms.	Techniques are needed to understand the physiology, functioning, and re-structuring of

	modified ecosystems and populations.
EXTRORDINARY LOGISTICAL REQUIREMENTS	***Are there logistical and /or infrastructure needs beyond those currently available or planned that will be critical to answering the scientific questions****?*
1) Year-round access continent-wide for real-time monitoring of silicon-based life forms.	A holistic view of the changing continent is essential at a variety of spatial and temporal scales to model future outcomes.
2) On-site sequencing laboratories and facilities to culture and grow alien and hybrid life forms.	Real-time analyses are needed to direct sampling and experimental design in the field based on the latest data.
3) Field-based security for protection against hostile aliens.	While to date the aliens have not been hostile, closer approach may incite more aggressive interactions with deployed humans.
4) Decontamination and biosecurity protocols to prevent the spread of alien based organisms and new diseases beyond Antarctica.	Containment of the alien species is a high priority to try to restrict and control the effects of such introductions.