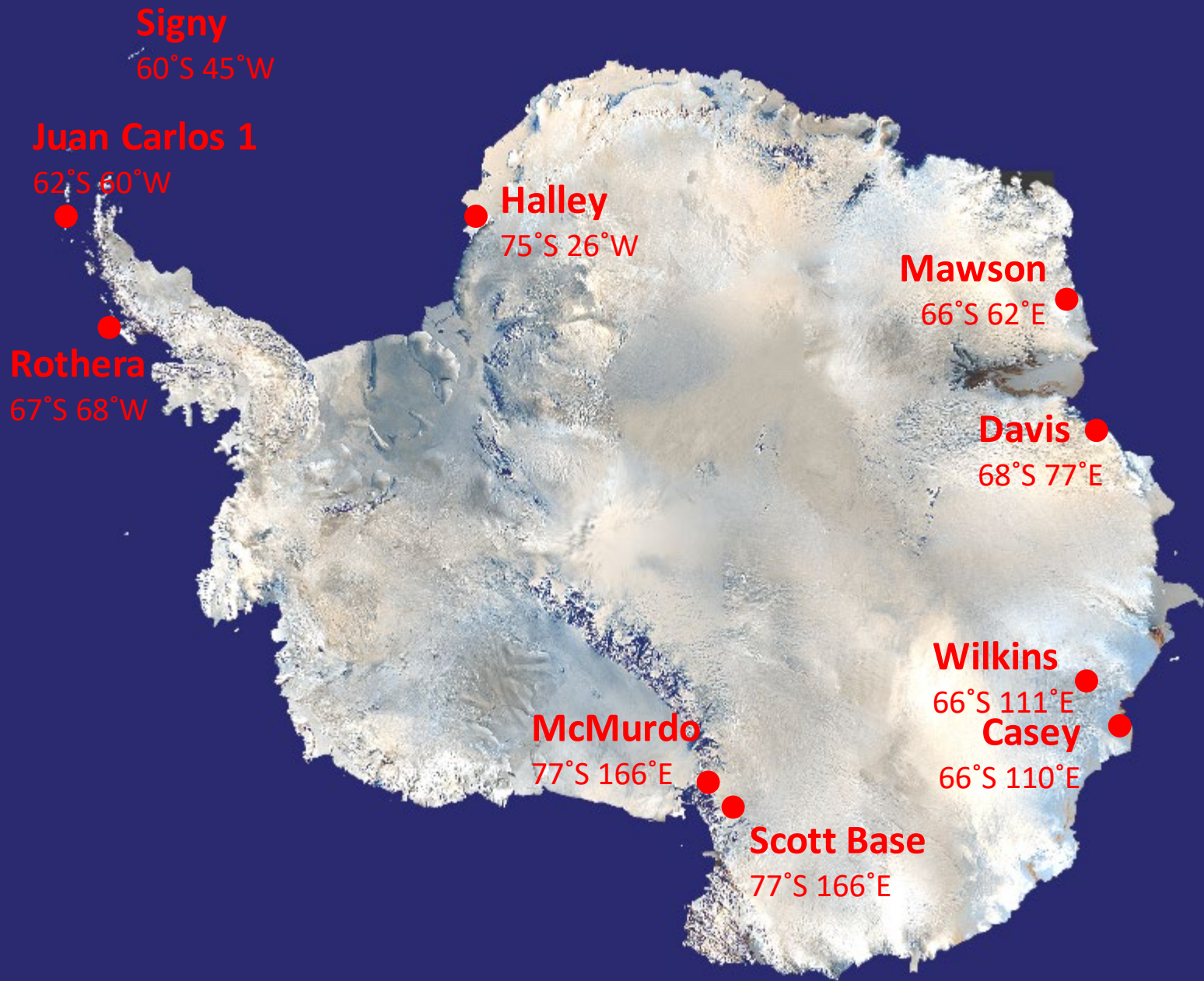


Terrestrial Analogue: Building in Antarctica

Lunar Surface Innovation Consortium



Hugh Broughton Architects
www.hbarchitects.co.uk



HBA Projects in Antarctica



Halley is located on the Brunt Ice Shelf, a 500 feet thick floating ice shelf which is moving at approximately 1200 feet per year towards the sea







Snow accumulation
(c. 5 feet per year)



Ice shelf

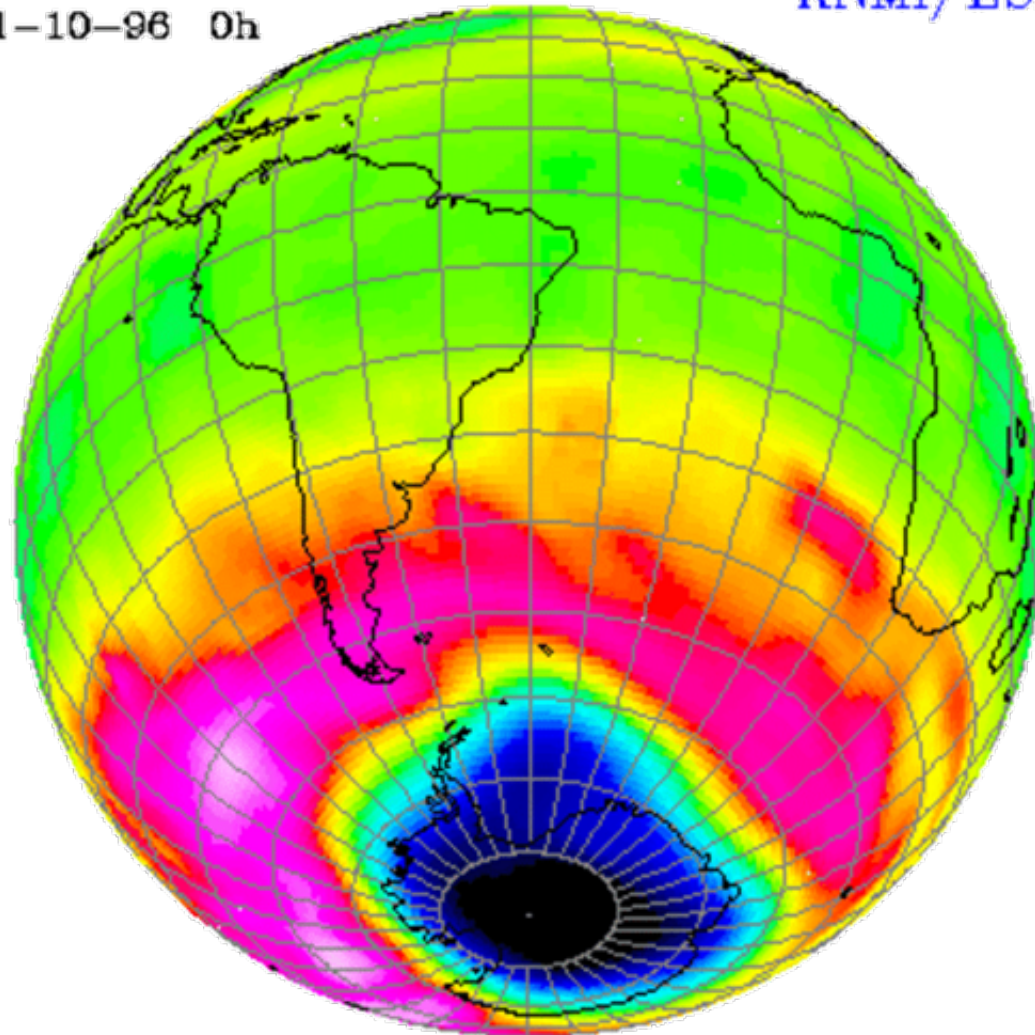
Sea Ice



Halley is where the ozone hole was discovered

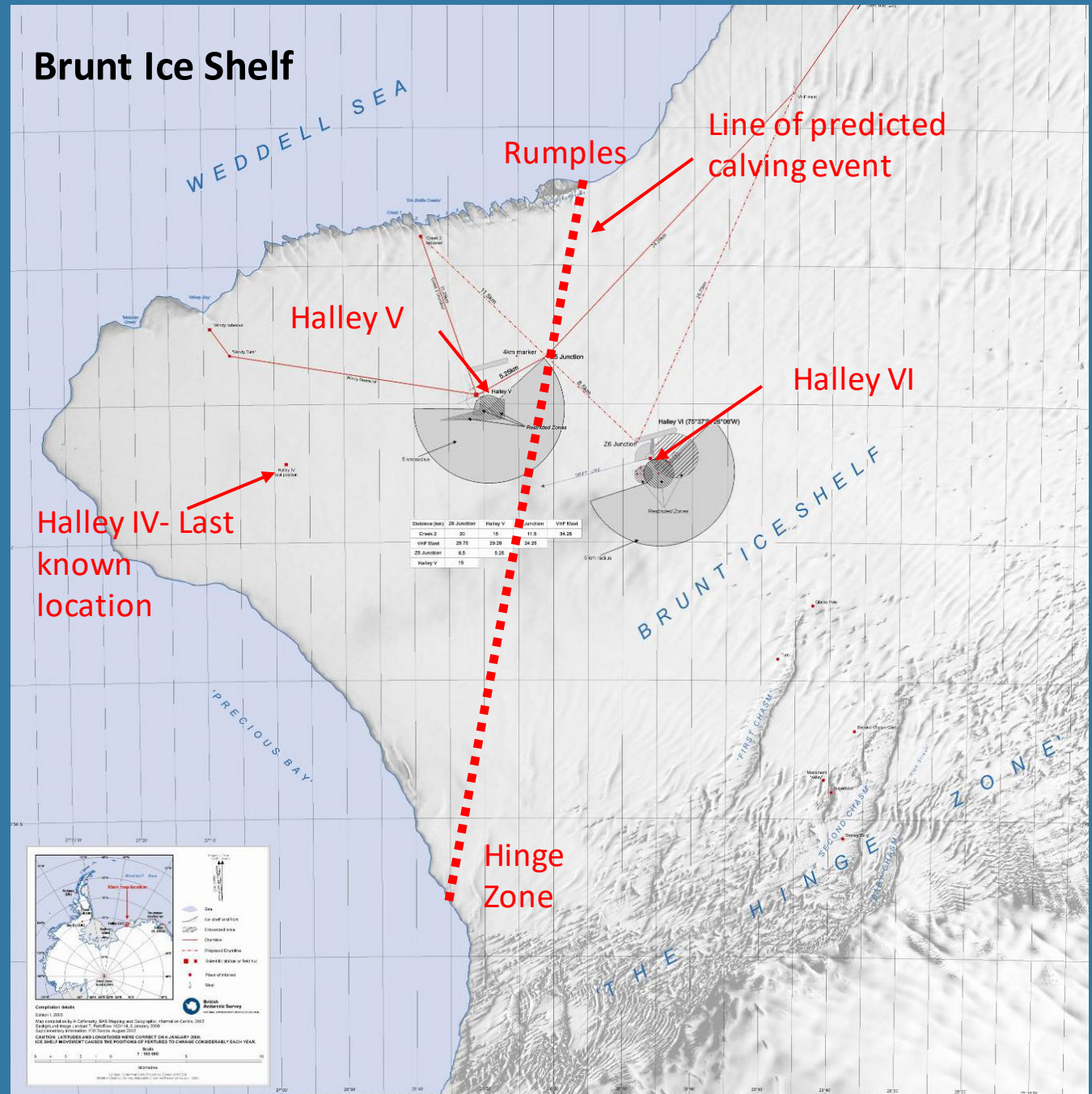
Assimilated GOME total ozone
11-10-96 0h

KNMI/ESA



Status in 2005

- Ice Shelf Moving 1200 feet per year towards Sea
- Ice shelf grounded at The Rumples and at the Hinge Zone
- Major calving event predicted in 5 to 10 years



Concordia (France-Italy)



Scott Amundsen (USA)



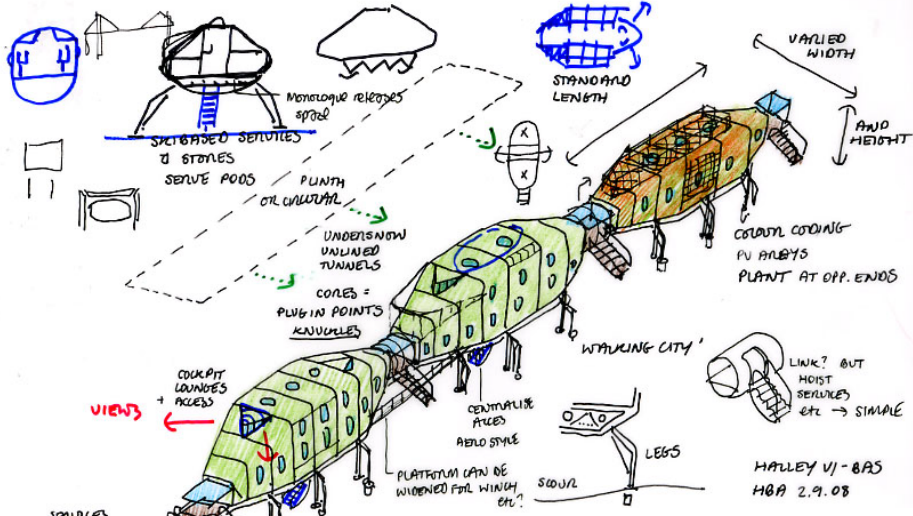
Neumayer III (Germany)



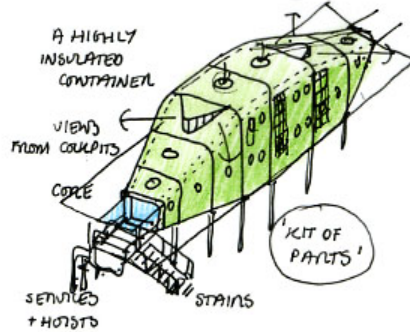
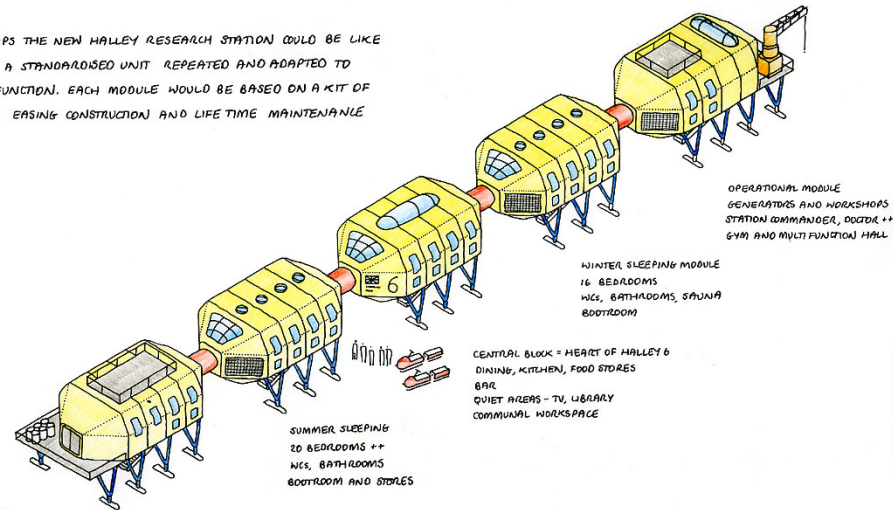
Princess Elisabeth (Belgium)



HALLEY 6
ARCHITECTURAL DESIGN CONCEPTS

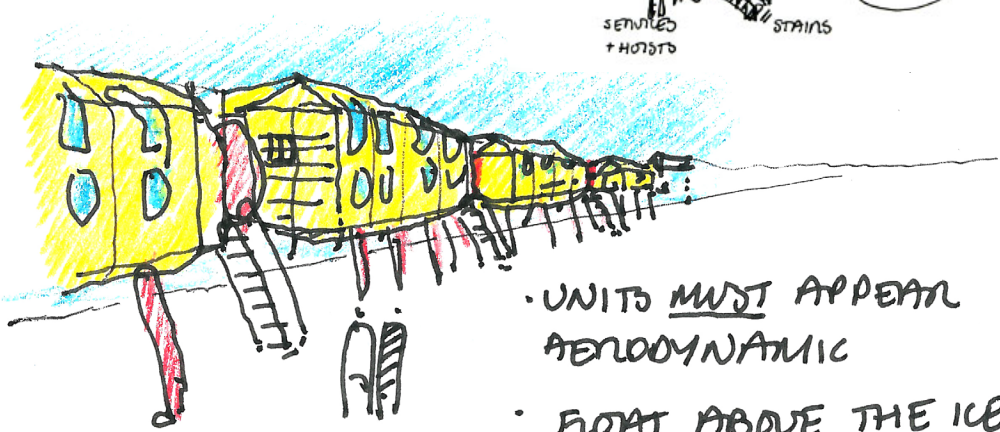


PERHAPS THE NEW HALLEY RESEARCH STATION COULD BE LIKE THIS - A STANDARDISED UNIT REPEATED AND ADAPTED TO ITS FUNCTION. EACH MODULE WOULD BE BASED ON A KIT OF PARTS EASING CONSTRUCTION AND LIFE TIME MAINTENANCE

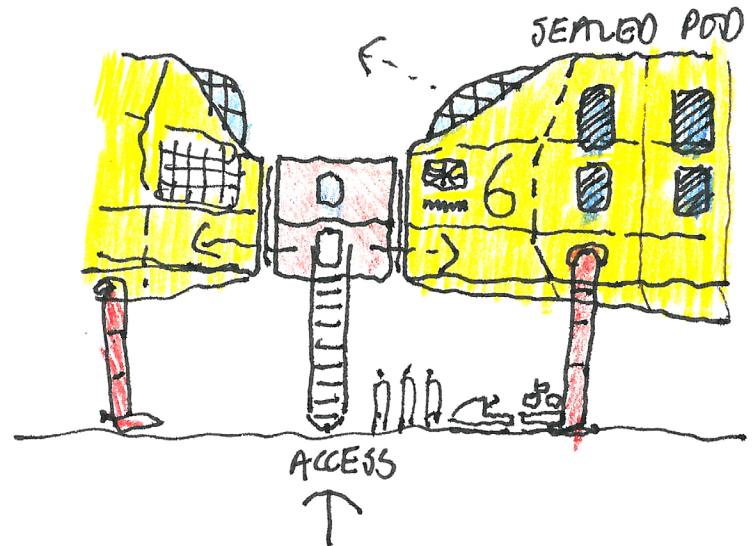


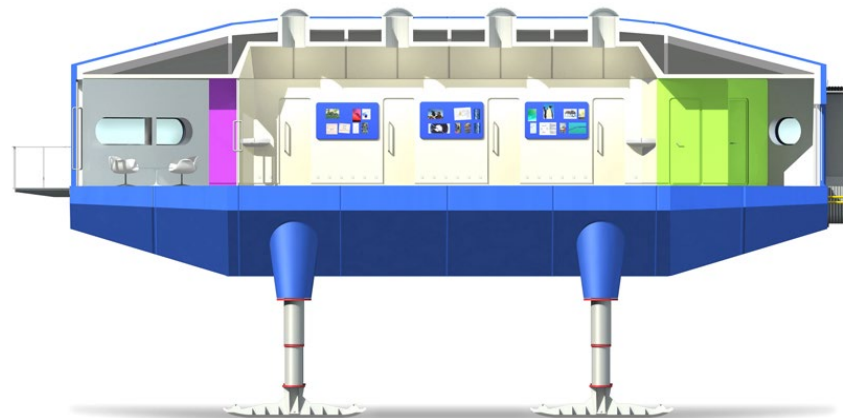
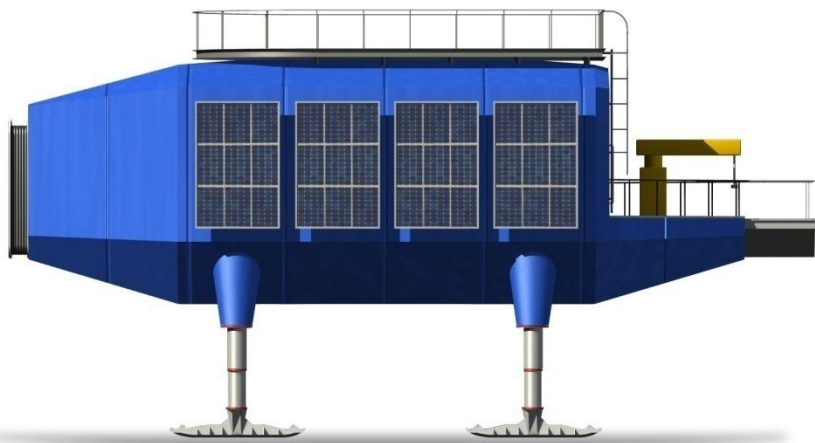
SUMMER PLANTROOM
 SUMMER KITCHEN AND DINING
 WINTER EMERGENCY BACK-UP
 VISITORS' SLEEPING - 16 BERTH?

BUT DOES IT RELATE TO THE ANTARCTIC STATION PROCESS?
 IS IT THE NEW BAS ICON - A SYMBOL OF WORLD SCIENCE?



- UNITS MUST APPEAR AERODYNAMIC
- FLOAT ABOVE THE ICE





The Central Module = the HEART of Halley VI



- A Science
- B Plant installations
- C Operations
- D Living
- E Sleeping

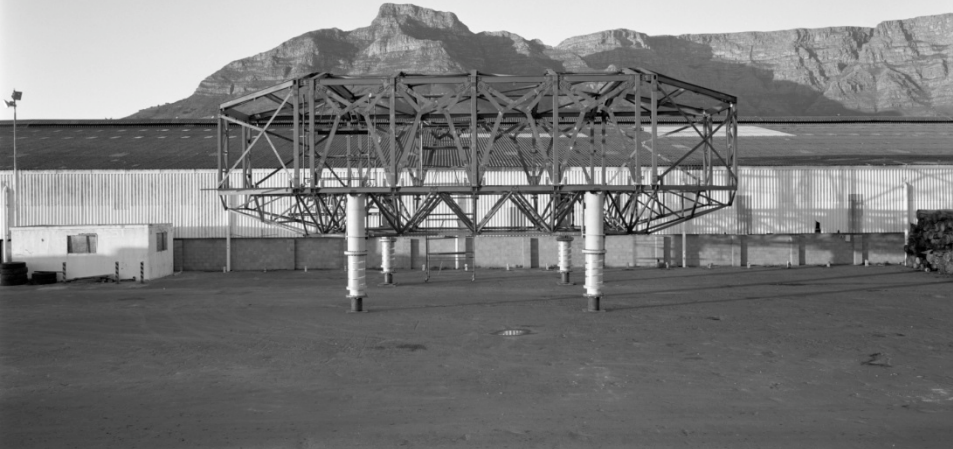
A A B B C D C E E

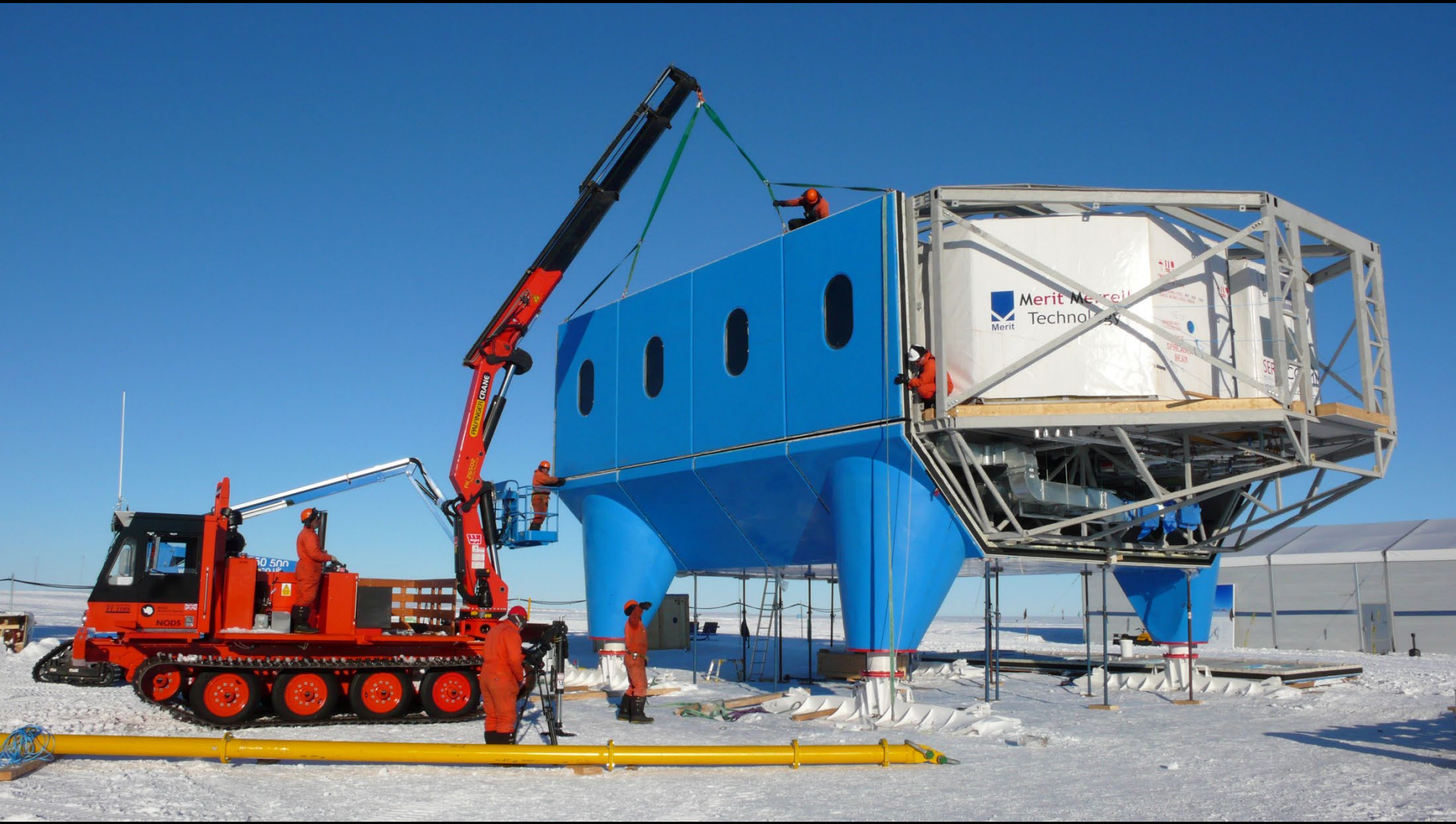


South

North

Test modules in South Africa





Moving modules from Halley V to Halley VI (10 miles)





MT02 1 MT01











Juan Carlos 1 Spanish Antarctic Base

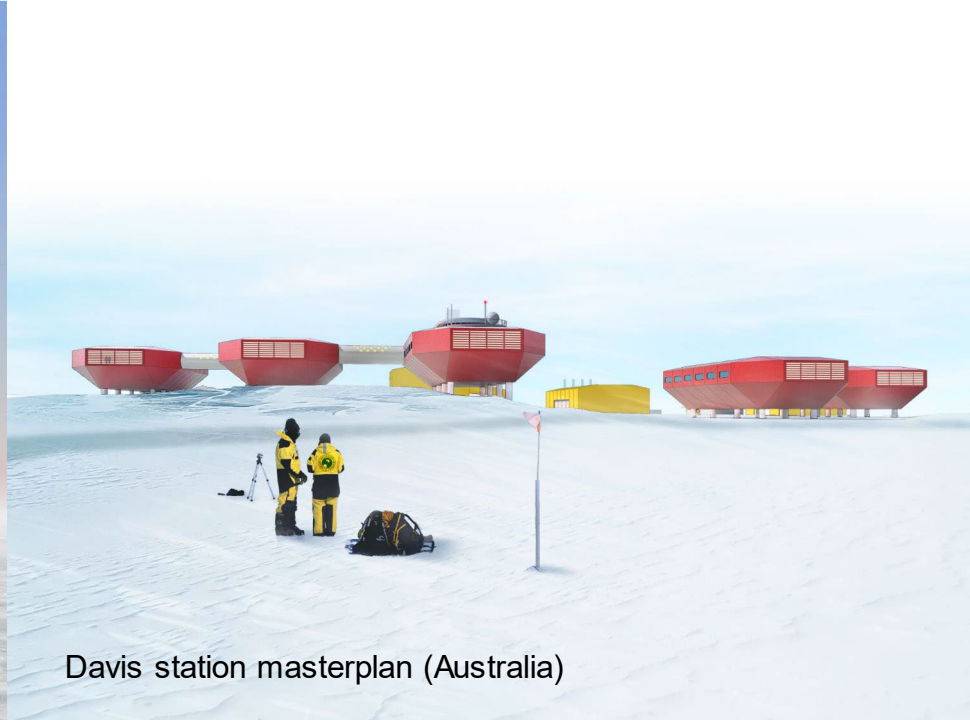


Discovery Building, Rothera Research Station (UK)

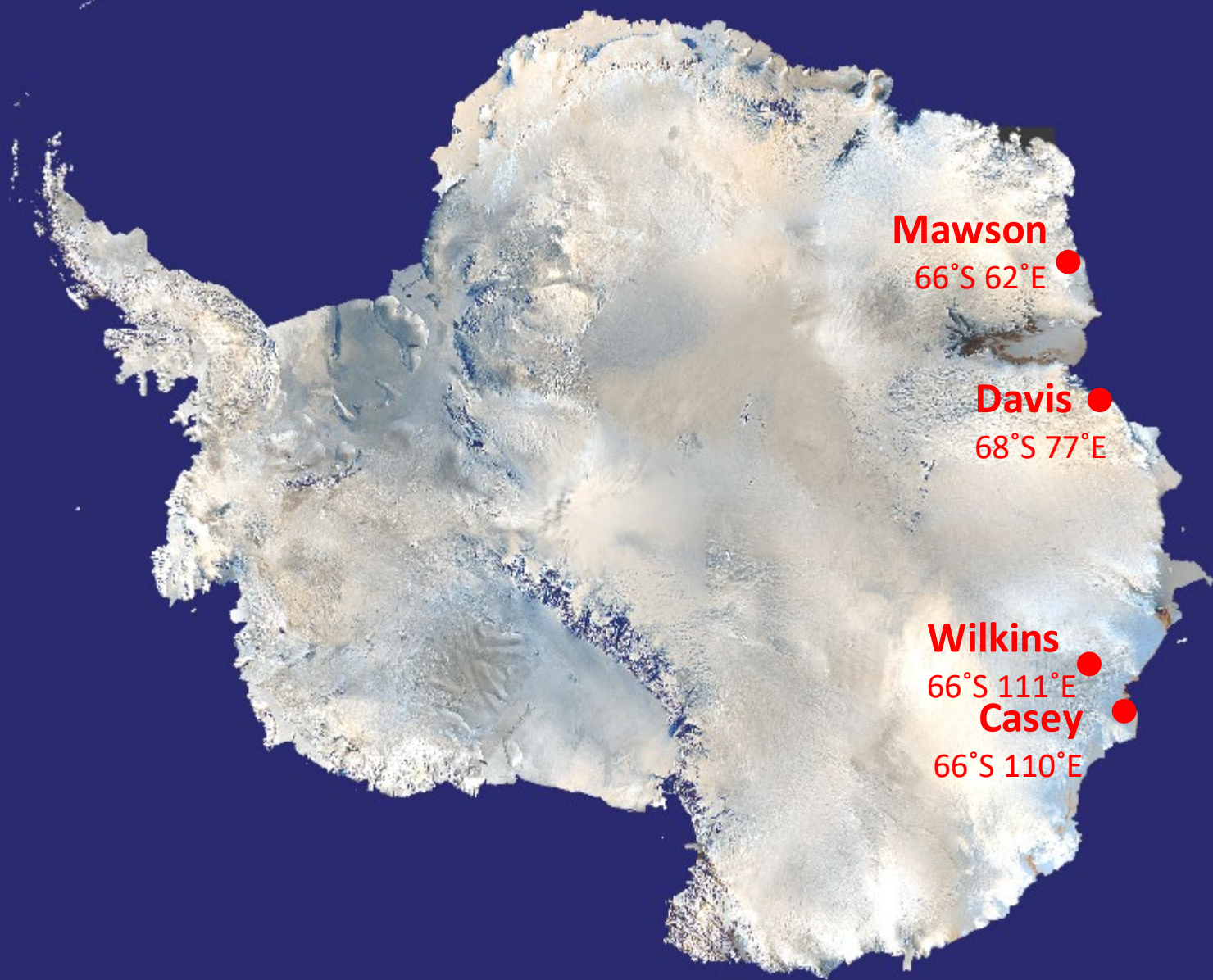
as part of the Antarctic Infrastructure Modernisation Programme partnership



Atmospheric Observatory, Summit Station, Greenland (USA)



Davis station masterplan (Australia)



Renewal Program for Australian Antarctic Division

Davis Station Phase Masterplan







Wilkins Aerodrome



Davis Plateau Ski Landing Area



Scott Base, Ross Island, Antarctica



Existing base

Multiple issues need addressing



11 different levels reduce efficiency



Services are difficult to maintain



Key equipment is old



Fire safety is compromised



Snow drifts require management



.. Including roof clearance

Climate

Minimum temperature -72 degF

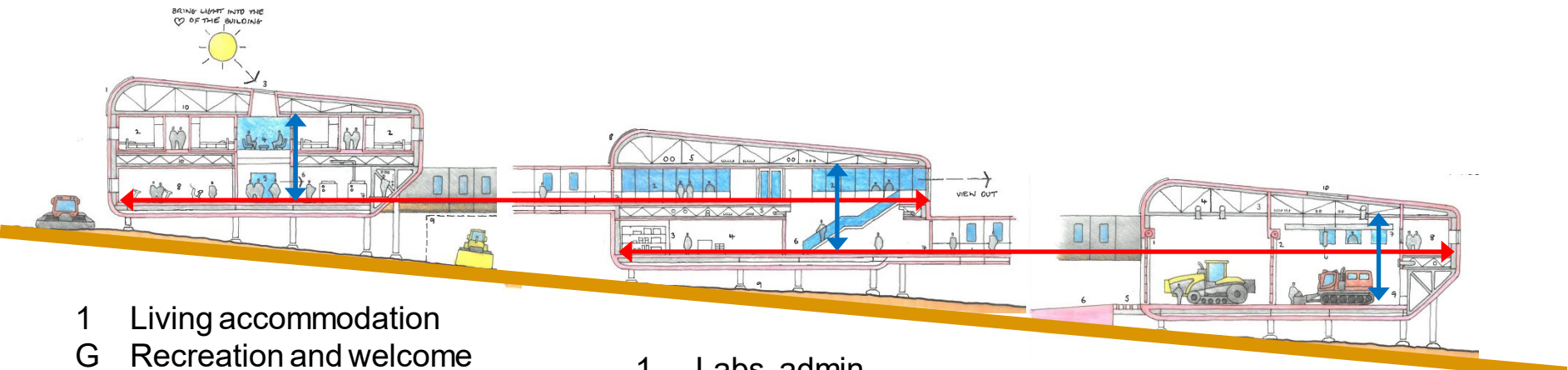
Maximum wind speed 115 miles/hr



Base concept

Interconnected buildings

Floors in adjacent buildings are at the same level
Each building has two stairs and one lift (hoist)



- 1 Living accommodation
- G Recreation and welcome

- 1 Labs, admin
- G Event staging

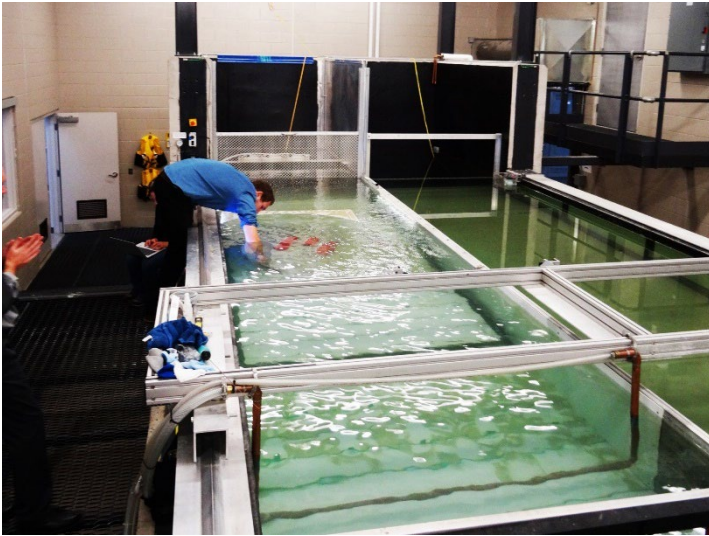
- 1 Field stores
Workshops
- G Stores
Workshops
Cargo

↔ Horizontal link

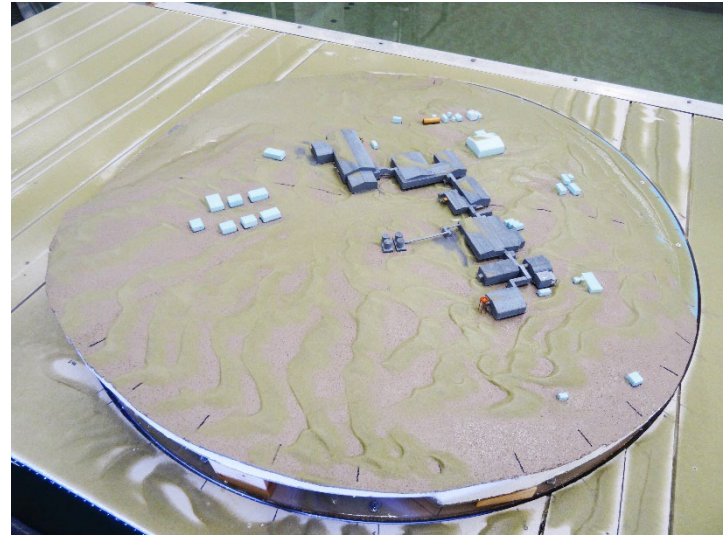
↕ Vertical link

Snow modelling

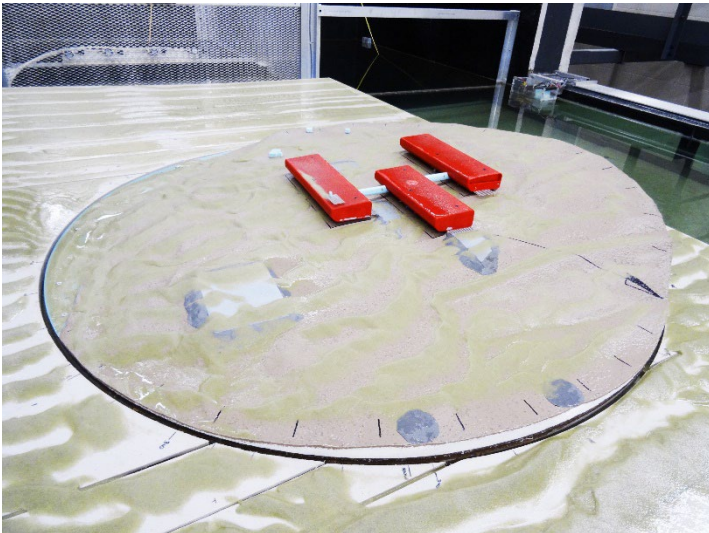
RWDI Laboratories, Canada



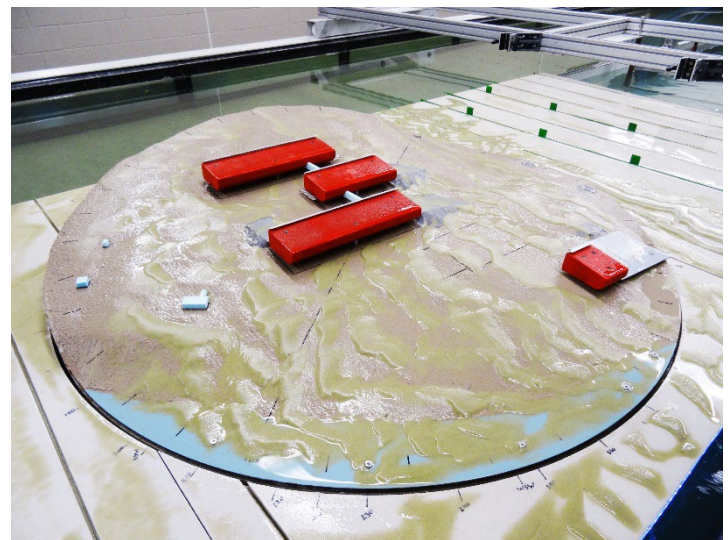
Water flume at RWDI laboratories



Calibration of flume using existing base model



Option 1 model with constant grade topography



Option 2 model

- A Accommodation
- B Science, admin, management
- C Workshops and stores
- D Helipads
- E Historic TAE Hut



Living spaces to remind the residents of home



Flexible working spaces to support collaboration



Non Ferrous Geomagnetic Huts Scott Base Redevelopment



Ongoing Activities

Testing in Europe, NZ and on site



Roof weather testing in Ireland



Wall and window testing – ongoing in Ireland



Ceiling shake-table test in NZ



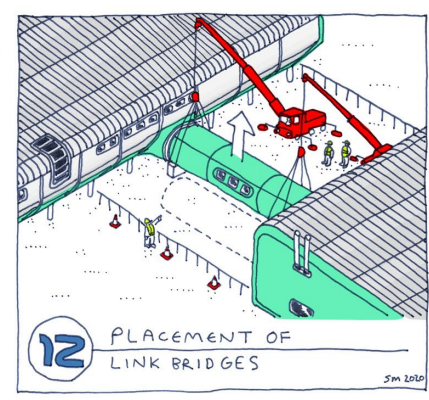
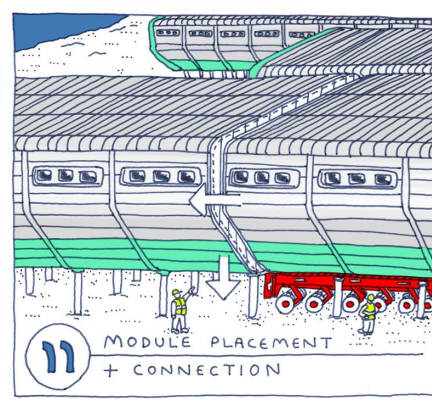
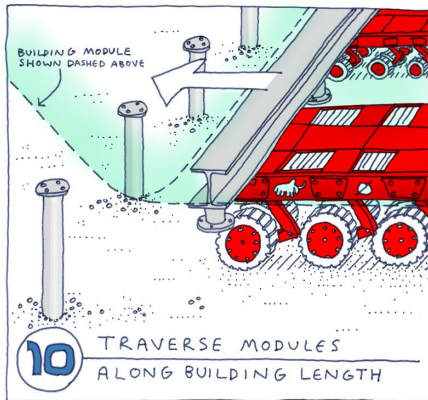
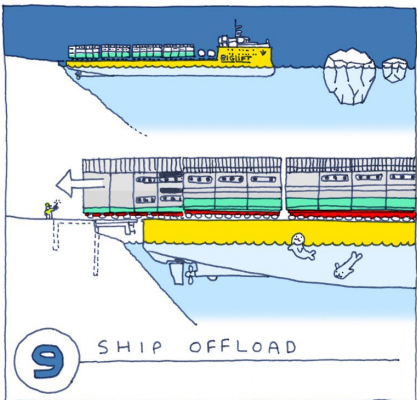
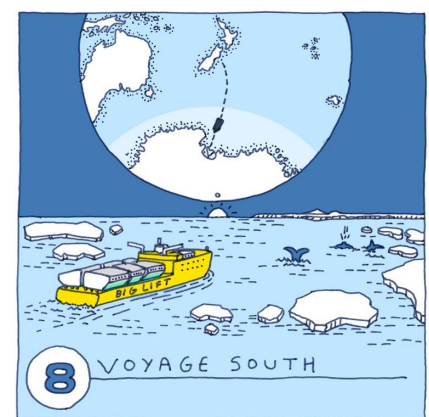
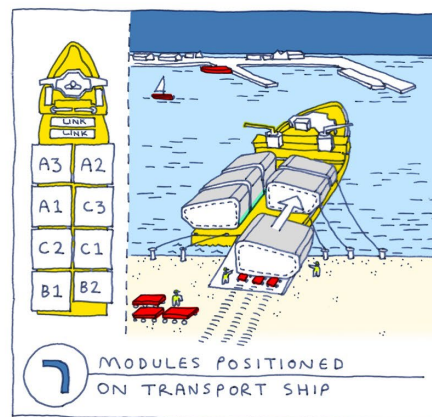
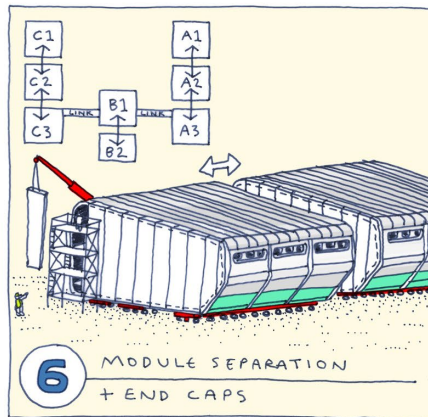
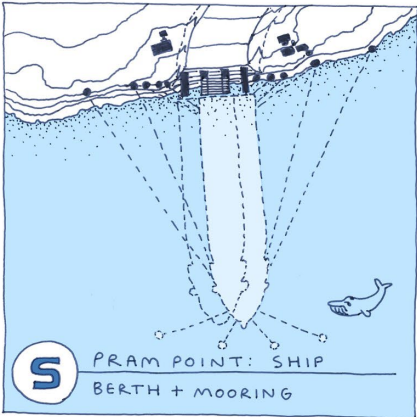
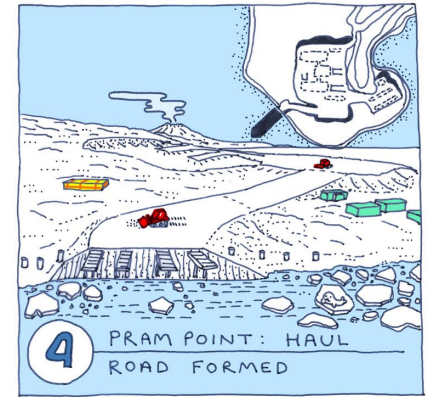
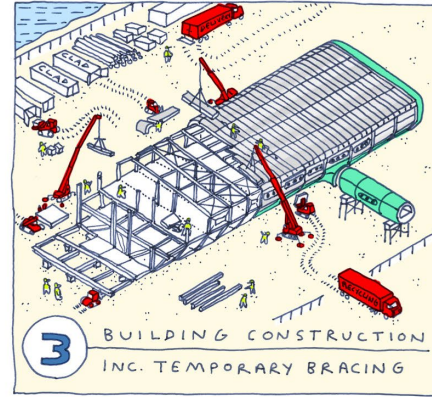
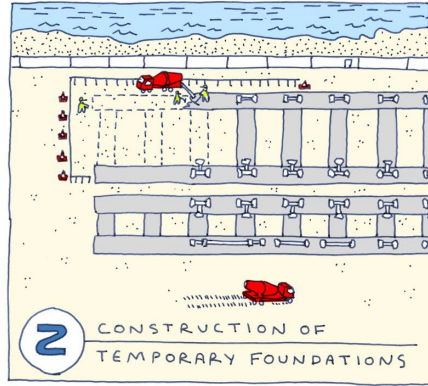
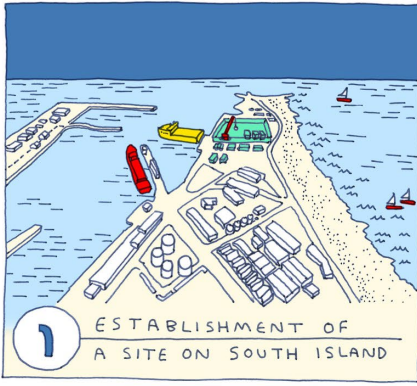
SPMT and temporary fill trial in Netherlands



Surface miner trial on site



Pile trial on site

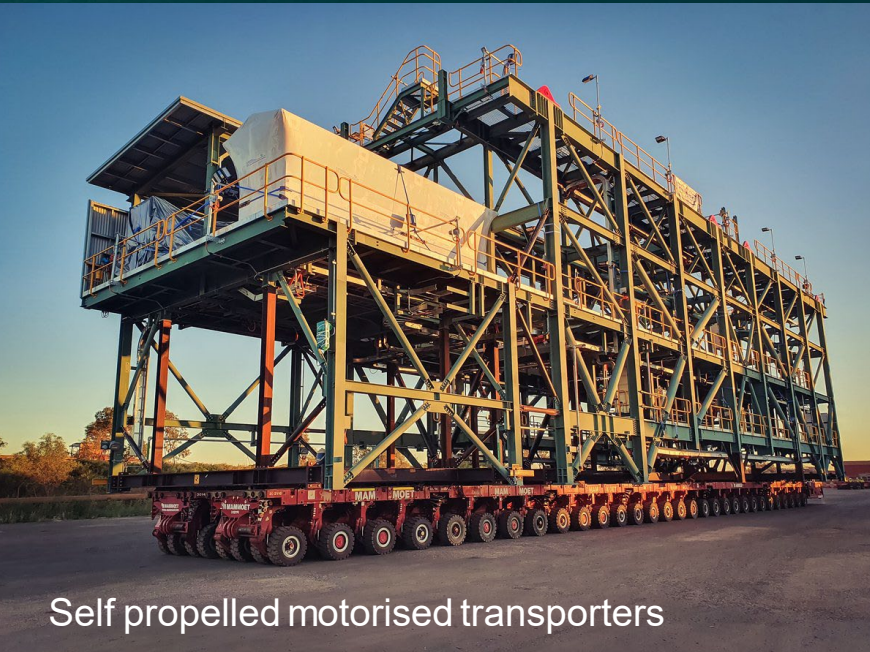


Construction and Logistics

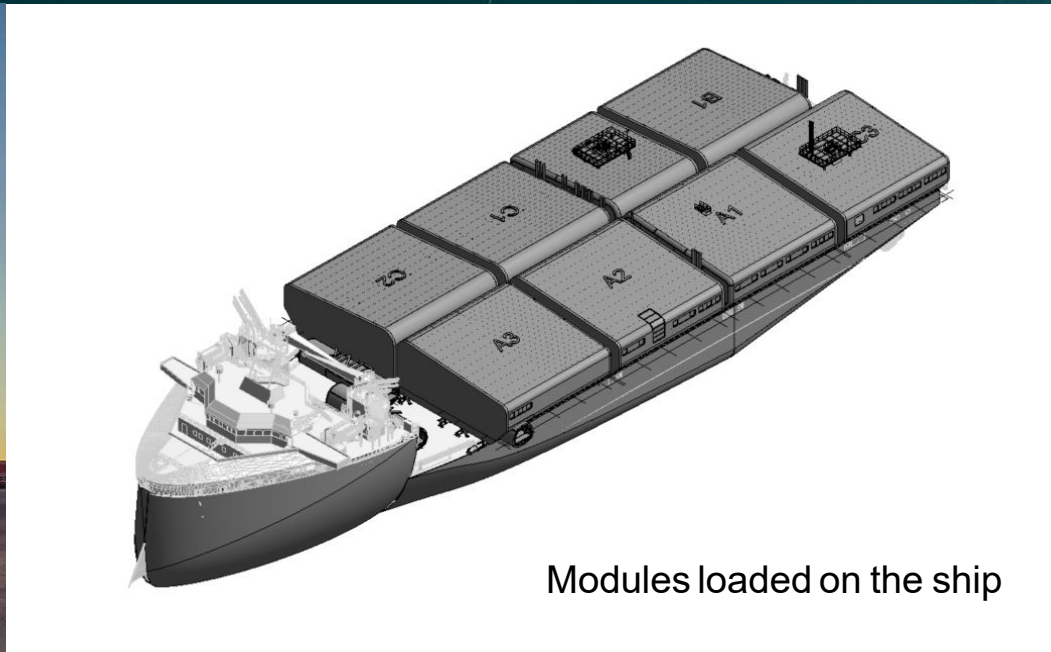


Plan is to build the base in New Zealand & ship in large modular sections on a RORO ice strengthened vessel

2023 Commence site preparation
2028 Complete construction in Antarctica



Self propelled motorised transporters



Modules loaded on the ship

Renewable energy

Ross Island Wind Energy Network



- Currently 1 MW with three turbines
- Equivalent to 500,000 litres of fuel pa
- 11% of fuel consumption of McMurdo and Scott Base
- Increasing to 2MW with Scott Base Redevelopment
- Will provide 70% of the energy demand for Scott Base



HUGHBROUGHTONARCHITECTS