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DSWA
Delaware Solid Waste Authority

Los Angeles County Sanitation Districts
Converting Waste Into Resources

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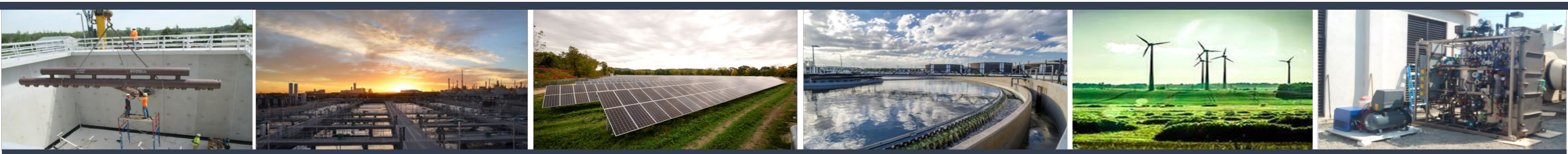
LA DWP
Los Angeles Department of Water & Power

We will begin our presentation in a few minutes…



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South Pole Station Master Plan

American Academy of Environmental Engineers & Scientists®

May 7, 2025

Randy Duzan, AICP, PLA

Principal Planner, Master Planner, Stanley Consultants

Presentation

- History – Present and Future
- Master Planning Process
- Plan and Projects
- Renderings

NSF, undated

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Fun Fact:

- Austral winter is Mar to Oct. 24 hours of darkness. Aurora australis is visible.
- Austral summer is Oct to Mar. 24 hours of sunlight.

Planning at the edge of the world

Young, 2021

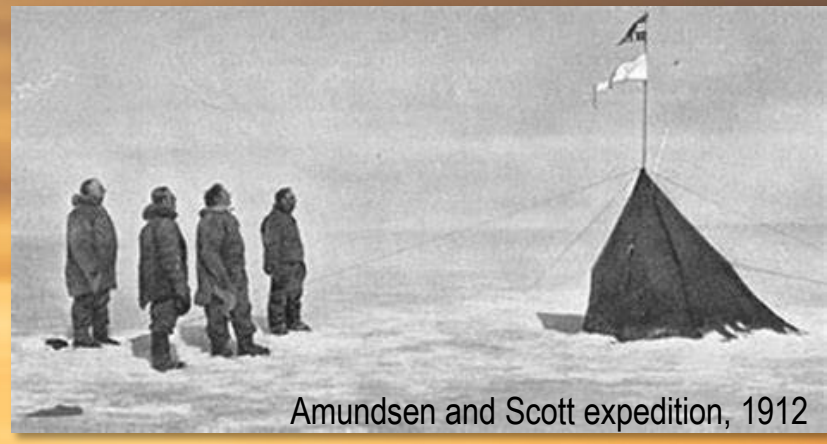
New Zealand Standard Time
18 hours ahead of MST
4 am tomorrow

M. Lucibella, 2019

Welcome to the South Pole

South Pole Station - History

- 1912: Amundsen and Scott expedition. First structure at the South Pole.
- 1957: U.S. Navy builds Amundsen-Scott South Pole Station, now known as “Old Pole”
- 1958: International Geophysical Year
- 1959: The Antarctic Treaty reserves Antarctica for peace & science (12 signatory)
- 1975: U.S. Navy builds the SPS Geodesic Dome to replace the “Old Pole”
- 1982: Presidential Memo 6646 appoints the National Science Foundation (NSF) as steward of U.S. Antarctic Program (USAP)
- 1991: ASMA No. 5: South Pole establishes zones & “sectors” (Antarctic Specially Managed Area)



Amundsen and Scott expedition, 1912

Dome Station, NOAA, Undated

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Present & Future

- The Antarctic Support Contract (ASC) supports NSF
- 2008: Construction of the Amundsen-Scott South Pole Station ("Elevated Station") completed
- 2008+: Freestanding, external structures and adhoc storage spaces were created as needed
- 2023: Stanley Consultants was contracted by ASC to develop the first ever master plan for the SPS, working closely with the NSF and ASC.
    - The Master Plan provides a vision for the next 30 to 50 years to modernize infrastructure and operations to continue scientific support. The master plan proposes specific projects and studies to improve efficiencies and replace life support facilities.

Elevated Station (65K SF)

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Master Planning Process

NSF, 2016

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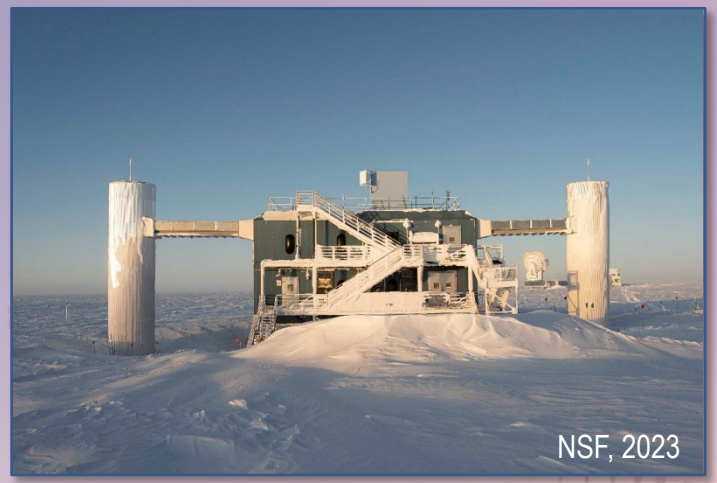
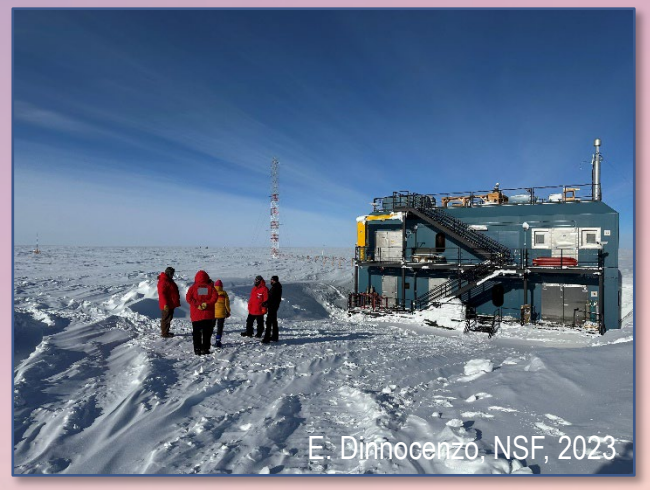
Science Research

- Atmospheric Sciences
- Astrophysics and Cosmology Sciences
- Geospace Science
- Glaciology
- Seismology
- Medical Research



Ice Cube



ARO

MAPO

DSL

Skiway

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Challenges

Fun Fact:

- Mean avg. - 56° F
- Min. – 8 ° F, Max. - 117 ° F

- Arctic Conditions
- Current Building Challenges
- Seasonal Limitations
- Travel Logistics
- Structures


J. Corbin, 2002


J. Corbin, 1990s


NSF, 2001

30-day journey from McM to SP


Butcher, undated


NSF, 2023

Existing Conditions

- Blue Buildings
- Elevated Station
- Arches
- Retrograde
- Logistics

Fun Fact:

- Ice sheet is 8,850' thick sitting on bedrock. It is a glacier.
- Ice sheet moves 10m a year in a northeasterly direction. It is basically a glacier.

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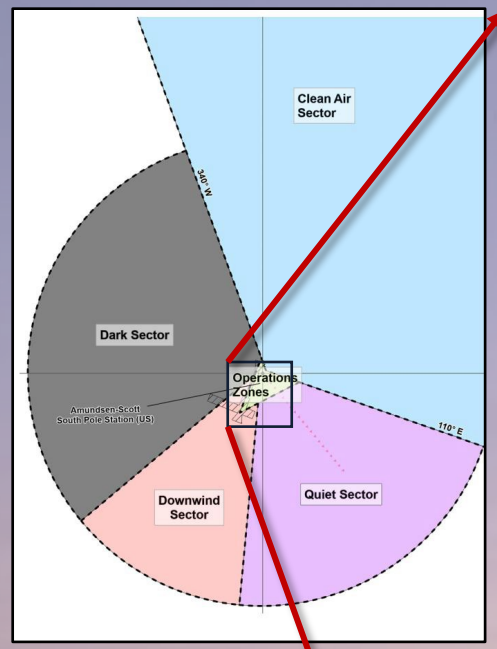
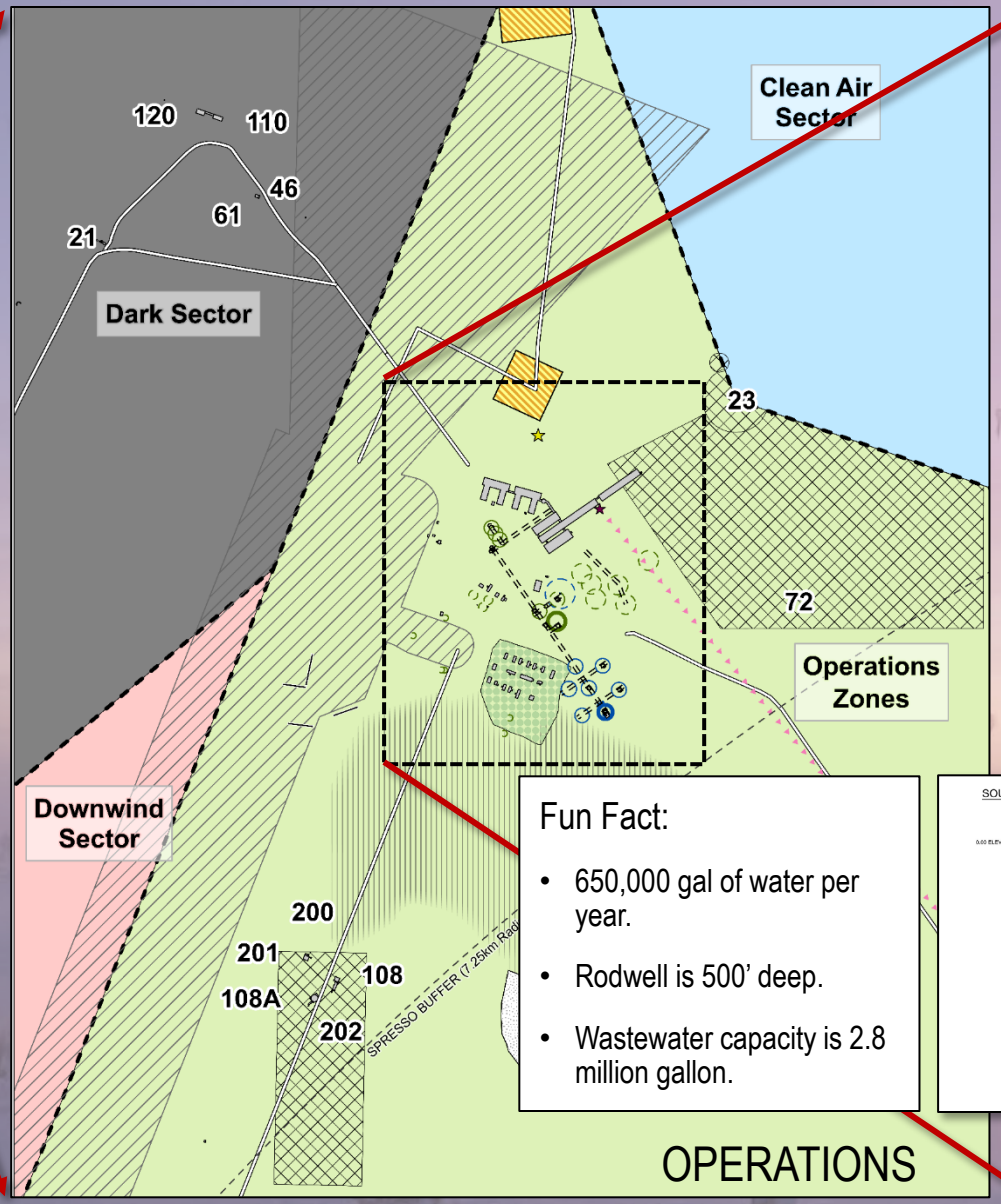
Site



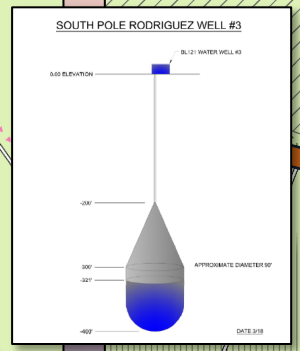
ASMA No. 5



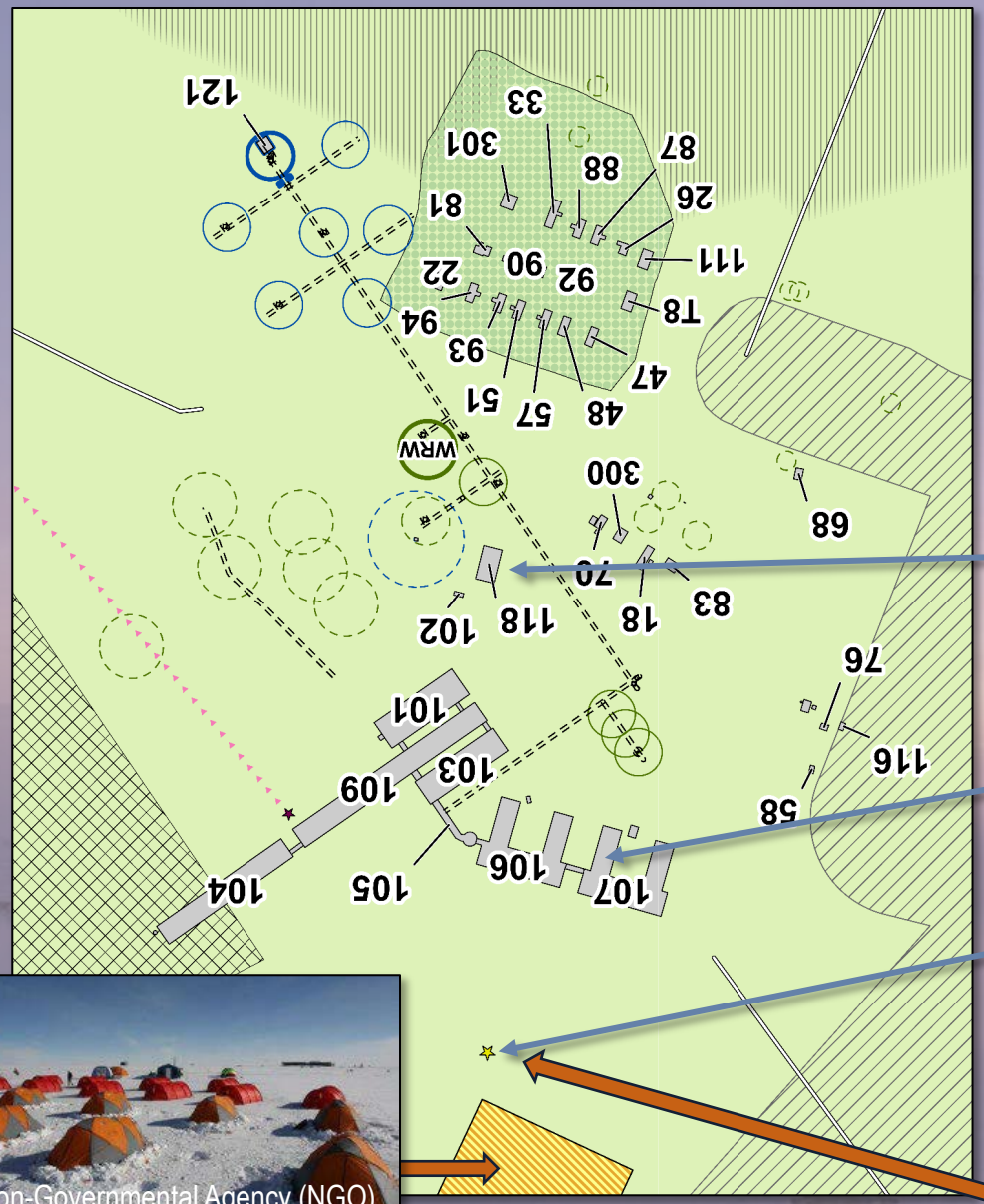
Fun Fact:

- 650,000 gal of water per year.
- Rodwell is 500' deep.
- Wastewater capacity is 2.8 million gallon.

OPERATIONS



CORE OPERATIONS ENLARGMENT



CORE OPERATIONS

Planning Charrette

- Engagement (Virtual)
  - Scientific Community Involvement
  - Concerns and Recommendations
  - MIRO

Fun Fact:

- Four charrette days (6 hrs. ea.)
- 100+ attendees each day.

Scientific Community Involvement (22)

- University of Chicago
- University of Wisconsin
- MIT
- Argonne National Laboratory
- NJ Institute of Technology
- NOAA
- National Science Foundation
- CRREL
- University of Minnesota
- Department of Interior
- USAP
- South Dakota State University
- Harvard University
- Incorporated Research Institution for Seismology
- University of Washington
- University of Alaska
- NIWC
- University of California – Irvine
- University of Florida
- NASA
- Pennsylvania State University
- United States Army

Day 1: Overview

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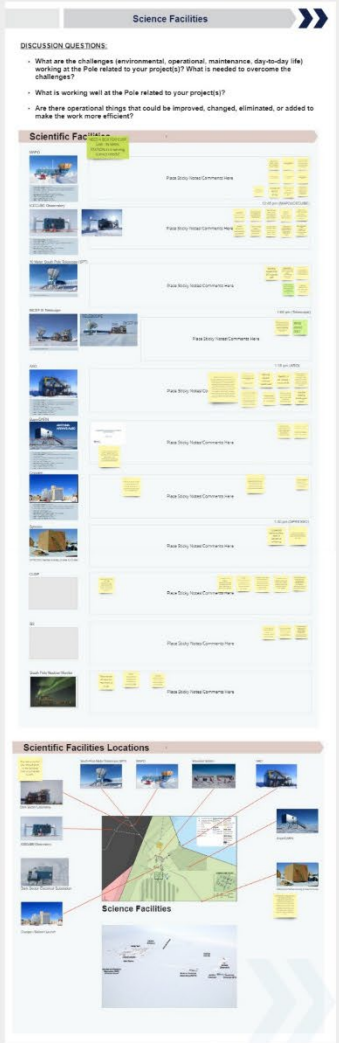

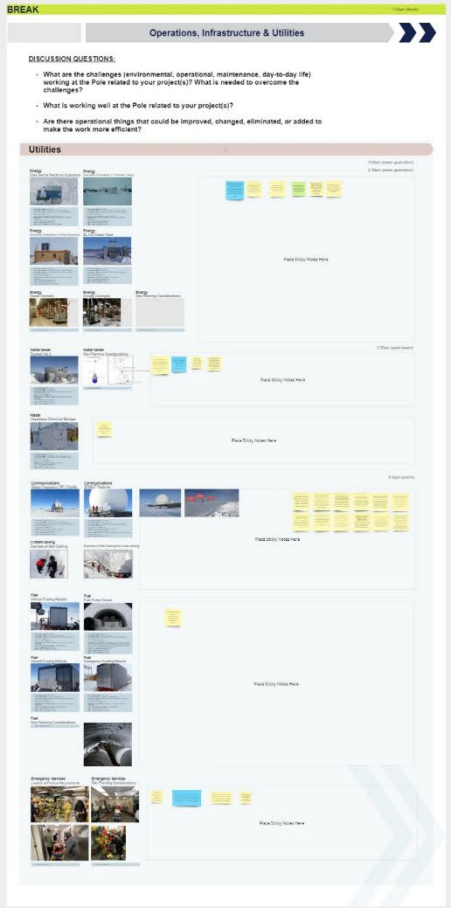

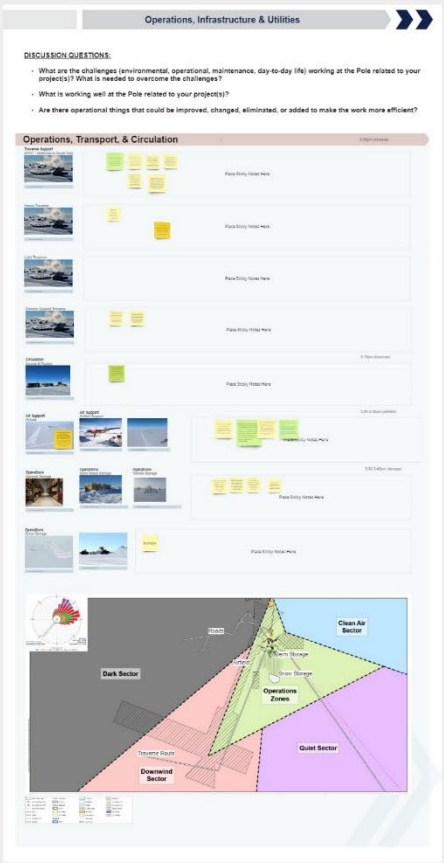

TIME (MT)	Day One Overview	Day Two Science	Day Three Science	Day Four Master Planning
1000	Intro, Purpose, Objectives, MIRO	Intro, Objectives for the day	Intro, Objectives for the day	Intro, Objectives
1030	Mission / Vision	Astrophysics	Seismology	NSF
1100	SPS Overview	Dark Sector	Quiet Sector	Sectors
1130	Opp/Constraints	MAPO, DSL, ICL		Overlays
1200	Structures	Geospace	Glaciology	Easements
1230		Dark Sector	South Pole Station	Site Planning
1300	Break	Break	Break	Break
1330	Operations	Atmospheric	Medical Research	Site Planning
1400	Infrastructure	Clean Air Sector	Field Science	
1430	Utilities	ARO		Projects
1500	Airfield	Science Vision	Science Vision	Priorities
1530				Closing comments
1600	Summary / Homework	Summary / Homework	Summary / Homework	Next Steps

MIRO

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MIRO

Day 3: Science

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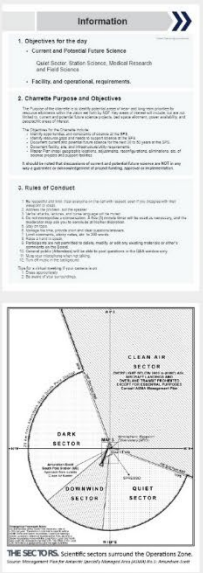
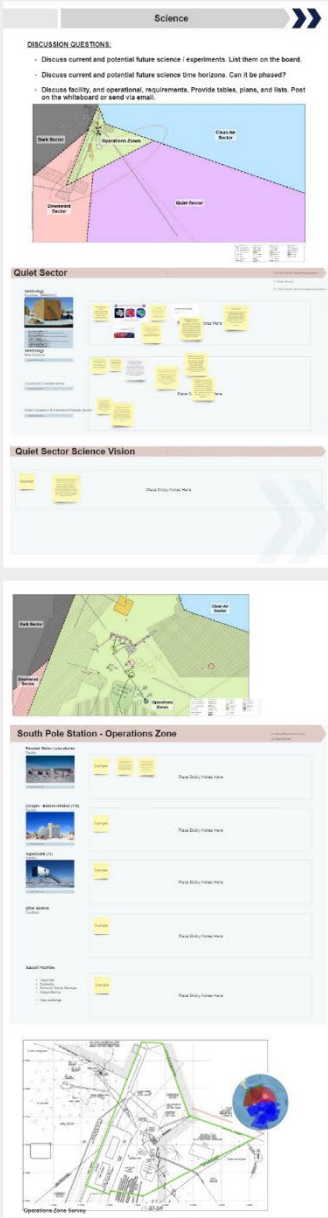
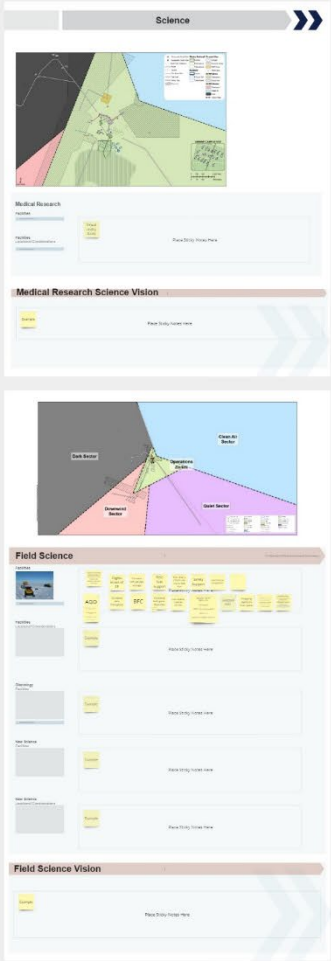
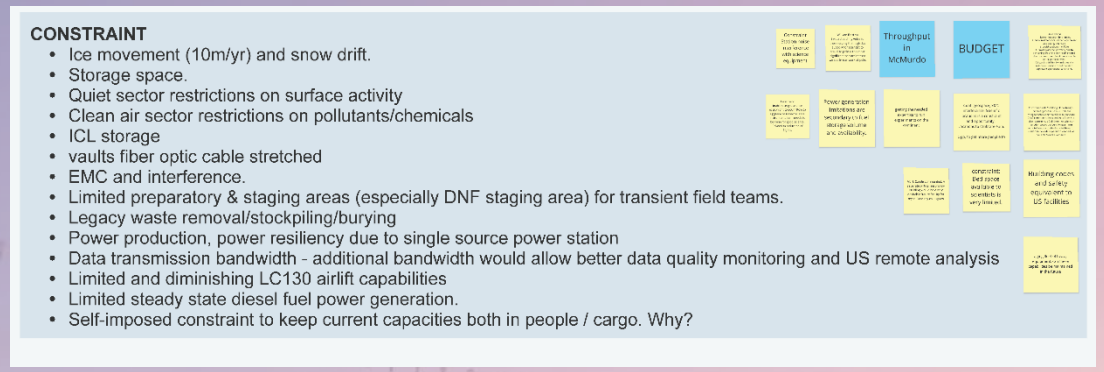






MIRO

- Documentation
  - Voting on potential projects
  - Sticking Note Comments
  - Recorded Sessions



Sticky note comments

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WEBVTT

00:00:10.000 --> 00:00:32.000
And wanna welcome everybody. Who has joined us. We have several
participants from the Science community and also attendees that
are general, public, and others.

00:00:32.000 --> 00:01:02.000
And so the format today is kinda 2 fold. Everybody has called in
on a Zoom Webinar site and you're viewing a application called
Miro, which is a whiteboard technology that allows interaction by
all participants who are part of the panelists and miro allows
information to be posted photographs as you can see text and it
allows the panelists to
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Conversation transcripts

Data Collection

- Technical Information
  - Technical drawings
  - Stakeholder/SMEs
  - NSF and ASC review comments

On site inventories

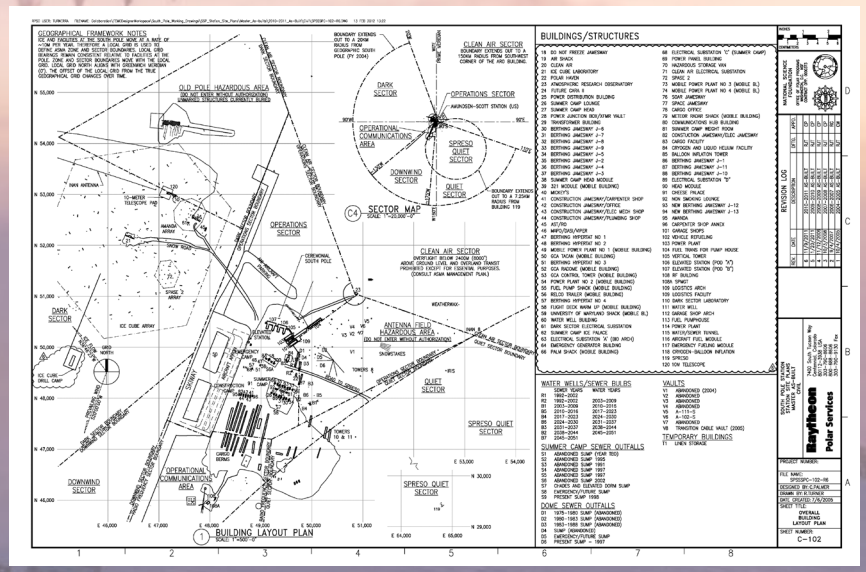
Storage Use Type	Improvised square footages					
	Berms	Out Bldgs	Arches	ES - A	ES - B	Totals
Construction	12,160	0	0	0	0	12,160
Emergency Management	160	0	180	100	0	440
Fleet	6,400	0	3,760	0	0	10,160
Food/Dry Goods	0	560	0	91	0	651
Fuels	160	320	0	0	0	480
Greenhouse	0	0	0	68	0	68
IT/Communications	160	0	0	124	237	521
Janitorial	4,000	0	0	102	99	4,201
Lodging Supplies	0	563	0	48	55	666
Maintenance	22,960	2922	56	8	118	26,064
Medical	0	0	0	0	66	66
Miscellaneous	0	0	0	38	0	38
Postal Service	0	0	0	12	0	12
Recreation	0	0	0	0	100	100
Science	640	1126	0	0	0	1,766
Store Stock	160	0	0	0	0	160
Utilities	4800	0	624	0	0	5,424
Waste	1,160	0	0	0	0	1,160
Totals	52,760	5,491	4,620	591	675	64,137

Operational input

SME review comments

SPSMP Federal Register Review Comments					
ID	Location	Comment	Commentor	Complete (Y/N)	Responses
1	Pg 10	Missing support for deep field activities to support remote autonomous instruments that are important to Atmospheric, Geospace, Seismology and Glaciology sciences...	B. Clauer	y	Deep field activities will be addressed as part of a future Field Activity Master Plan.
3	General	The Scripps CO2 program has been measuring CO2 in flasks collected at SPS since 1957. The Scripps O2 program has been measuring O2/N2, CO2, and Ar/N2 in flasks collected at SPS since 1991. Changes to sampling criteria, sample location, or the addition of local influences has the possibility to impact our time series, so we have read the Master Plan with interest. As proposed we do not have any specific concerns with any of the proposed changes to the Clean Air Sector (which, from the Plan, seems to only be the creation of stricter controls on access to the CAS via an official easement, which we welcome). Thus, our only comment is that if the recommendation CAS 1 is followed (a new NOAA science building is built within the CAS), that the construction of it be carefully coordinated with atmospheric sampling activities (i.e., construction activities are not ongoing within a certain period before and during sampling, agreed upon in advance by relevant stakeholders).	E Morgan	y	Thank you for your comment. Agreed coordination will be required.
4	General	Renew Antarctic Treaty to include all nations under the alliance of the United Nations	T Hurd	y	Thank you for your comment. Beyond the scope of the MP.
5	General	Convert South Pole Station to alternative clean energy.	T Hurd	y	Thank you for your comment. - The use of renewable energy is an on going area of study for the South Pole Station.

Site surveys



South Pole Station – Plan and Projects

- Master Plan
- Projects
  - Cost
  - Phasing
- Renderings

NSF, undated

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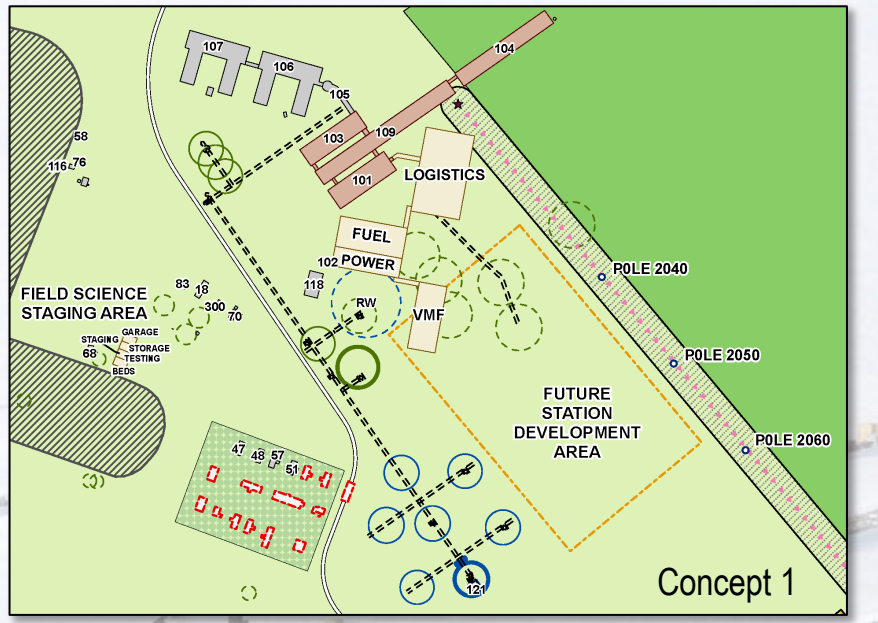
Plan and Projects

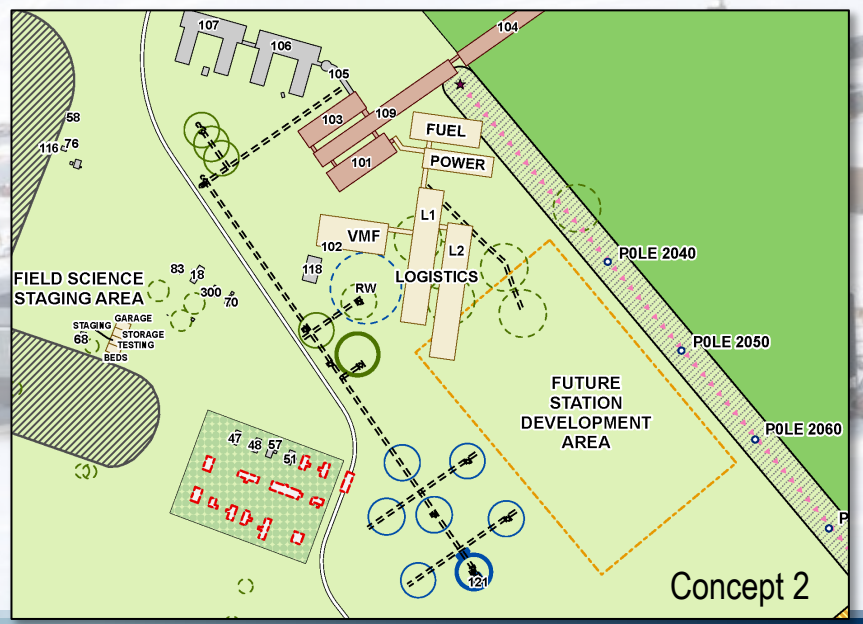
- Structures
  - Three types of structures were considered: elevated, surface, and dome
- Electrical
  - Five generators will be replaced. Transferring power to the new generators will be a challenge.
- Mechanical
  - The cabling network buried in the ice needs to be replaced. New technology will be looked at to address the movement of the ice.
- Communications
  - Communications is critical for transferring data back to CONUS. New system like Starlink are being looked at.
- Airfield
  - One recommendation was to shift the skiway southwest to deconflict departure routes.

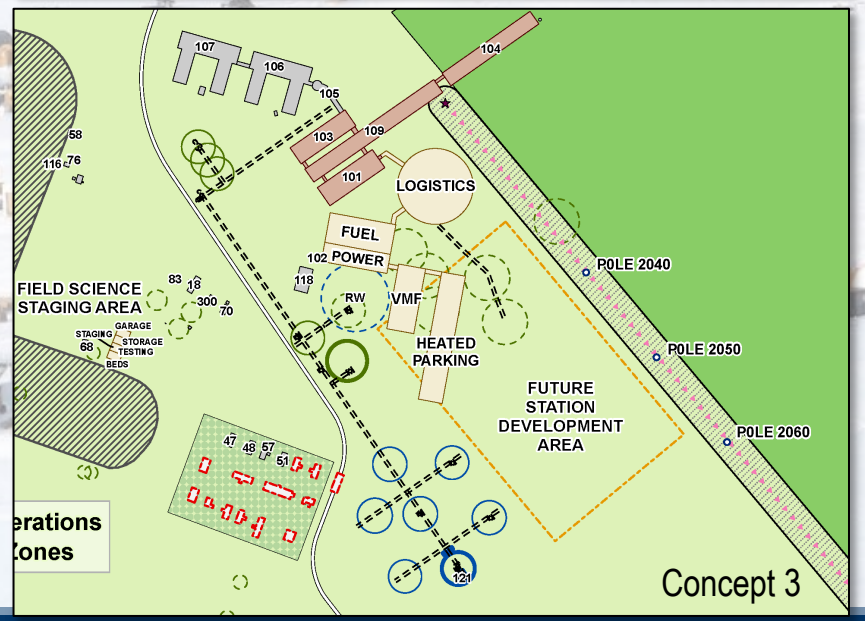
NSF, undated

Master Plan Concepts

- Developing the Master Plan
  - Concepts







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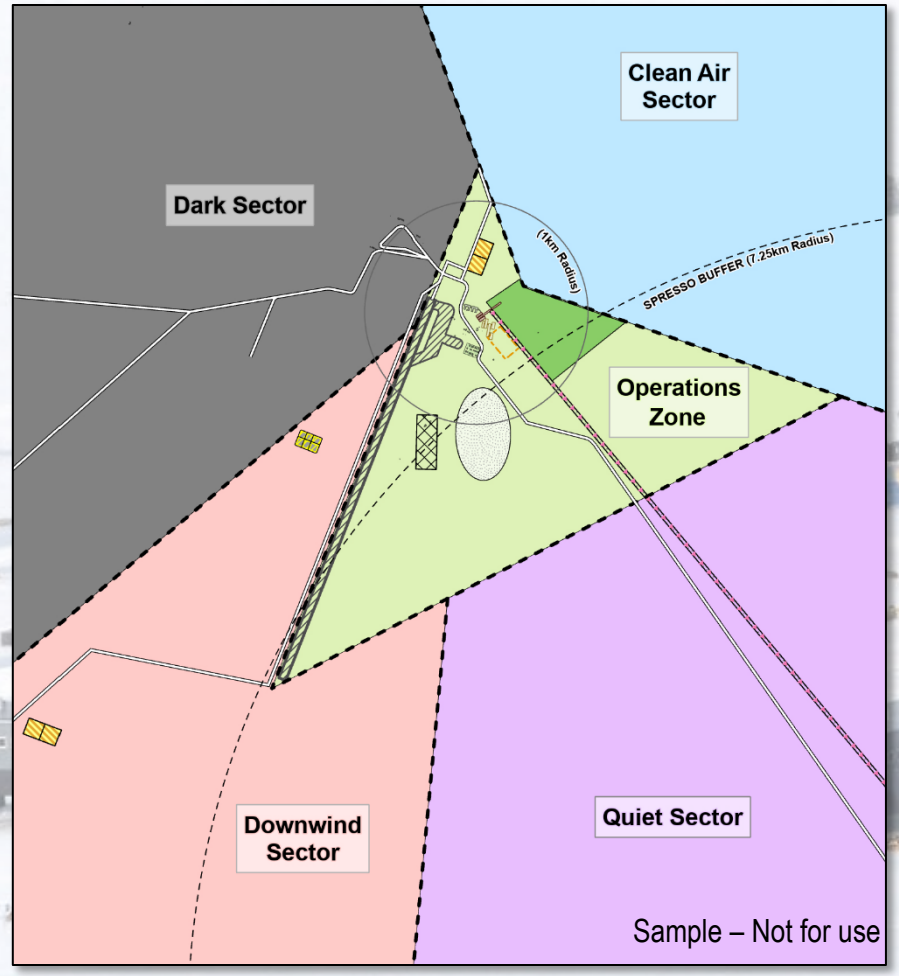
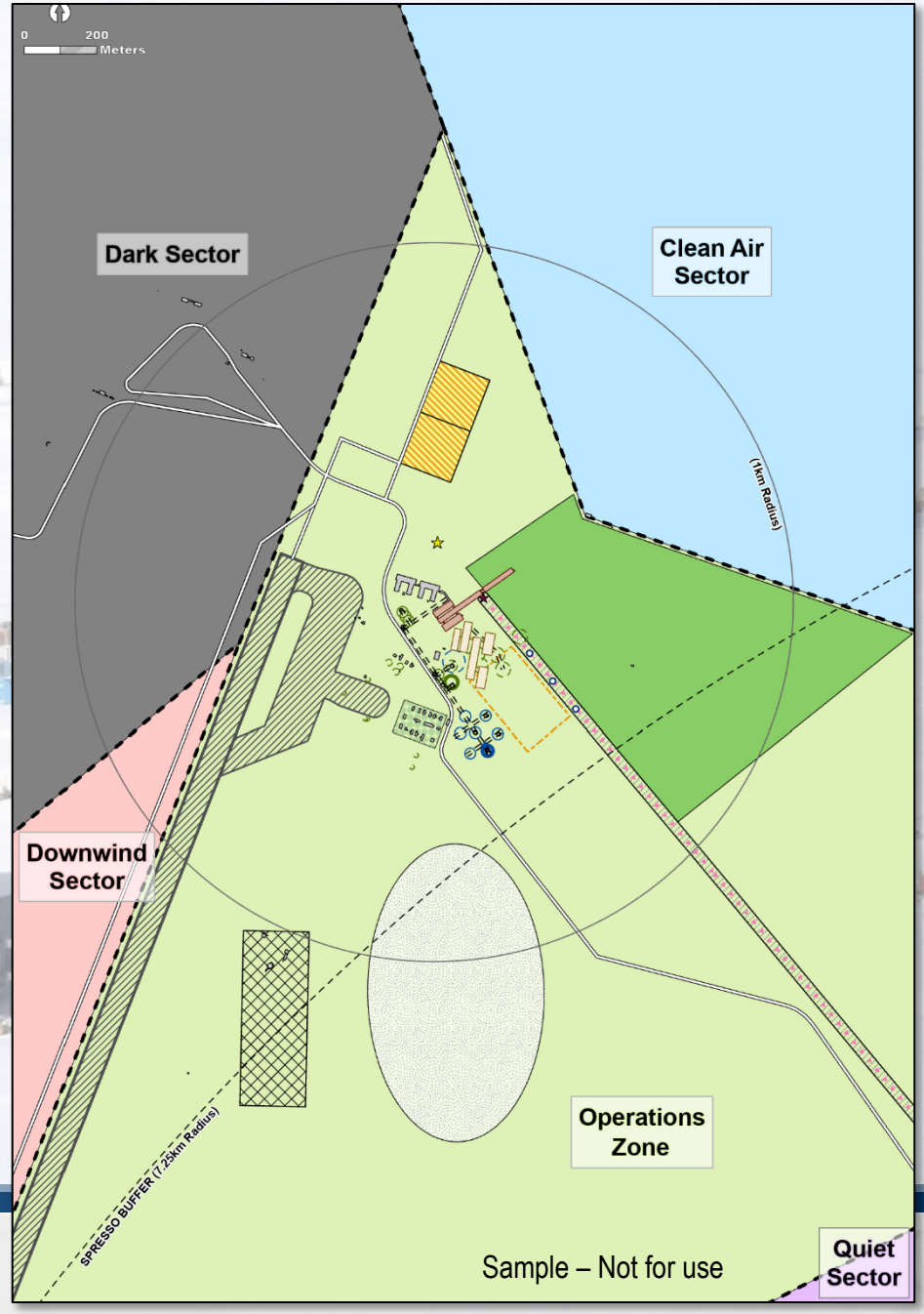
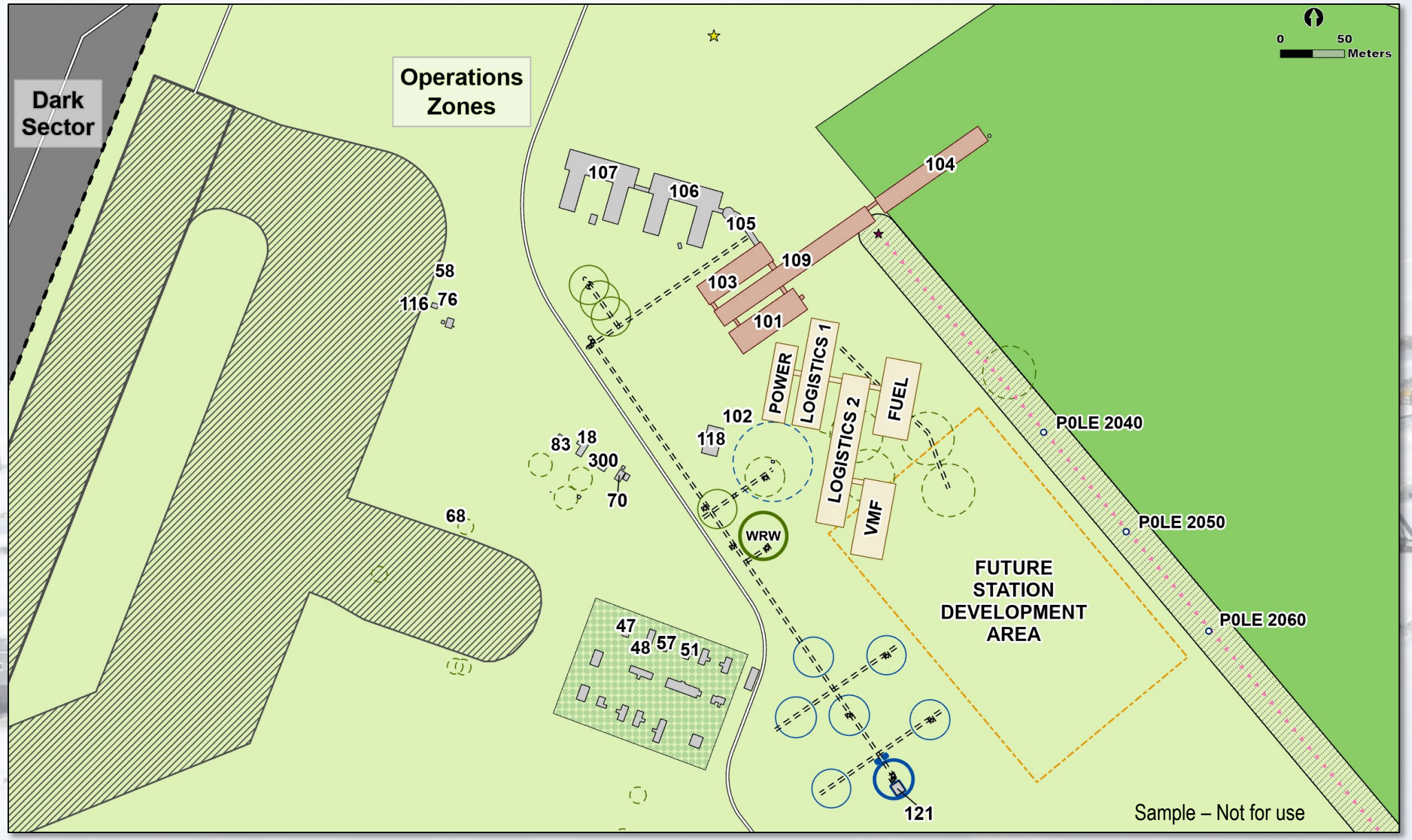
The Final Plan





Core Area



Projects

Capital Infrastructure Plan – Phasing (30 – 50 years)

PHASE 1: Mobilization/Construction

This phase prepares SPS and the SPS logistics chain for major construction activities, while also raising smaller utility structures and the deepest buried science structures.

PHASE 2: Primary Infrastructure

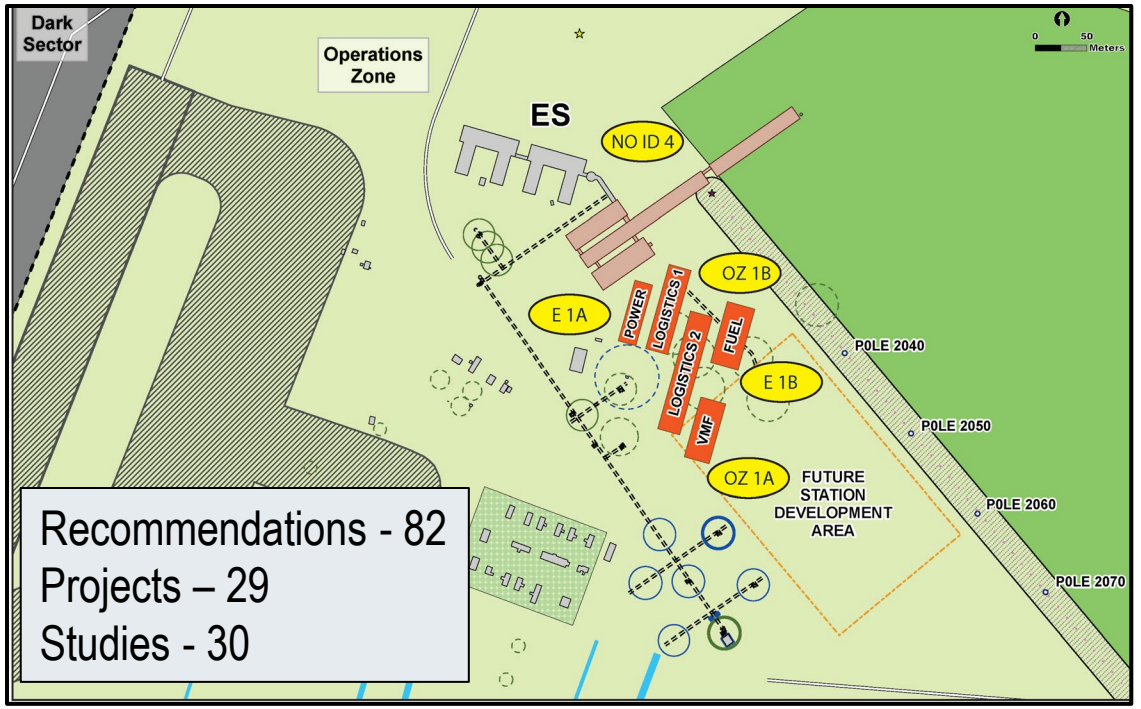
This phase focuses on arch replacements, while also raising additional science structures.

PHASE 3: Support Facilities

This phase focuses on completing the remaining arch replacement and the Elevated Station raise, while also raising the remaining science structures.

PHASE 4: Maintenance Cycles

This phase establishes maintenance rhythm for future raises and replacements to prevent future backlogs.



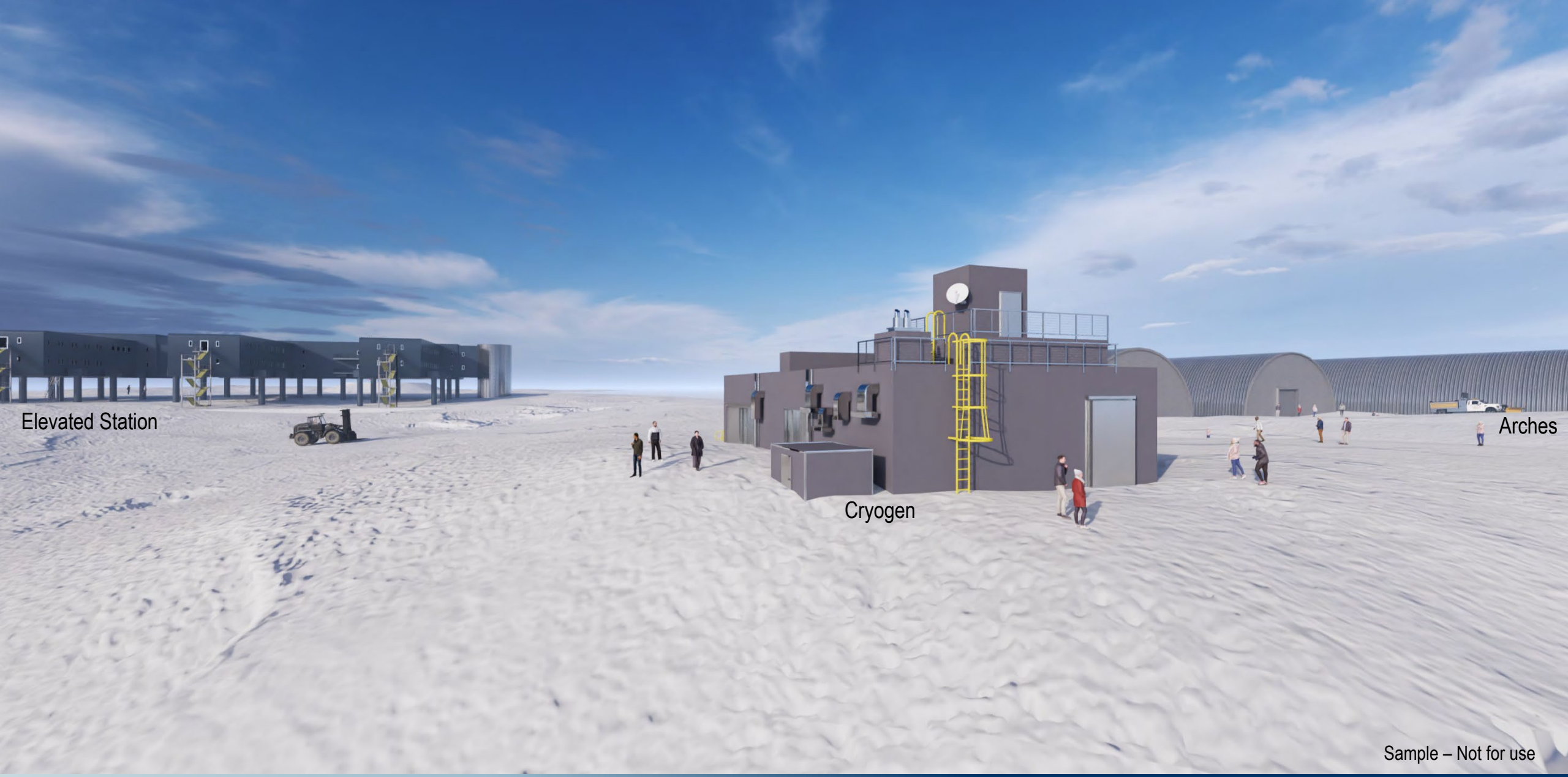
Sample – Not for use

2025 Master Plan Vision: Modernize infrastructure and operations to continue scientific support at SPS

Renderings

Elevated Station

Sample – Not for use



Sample – Not for use

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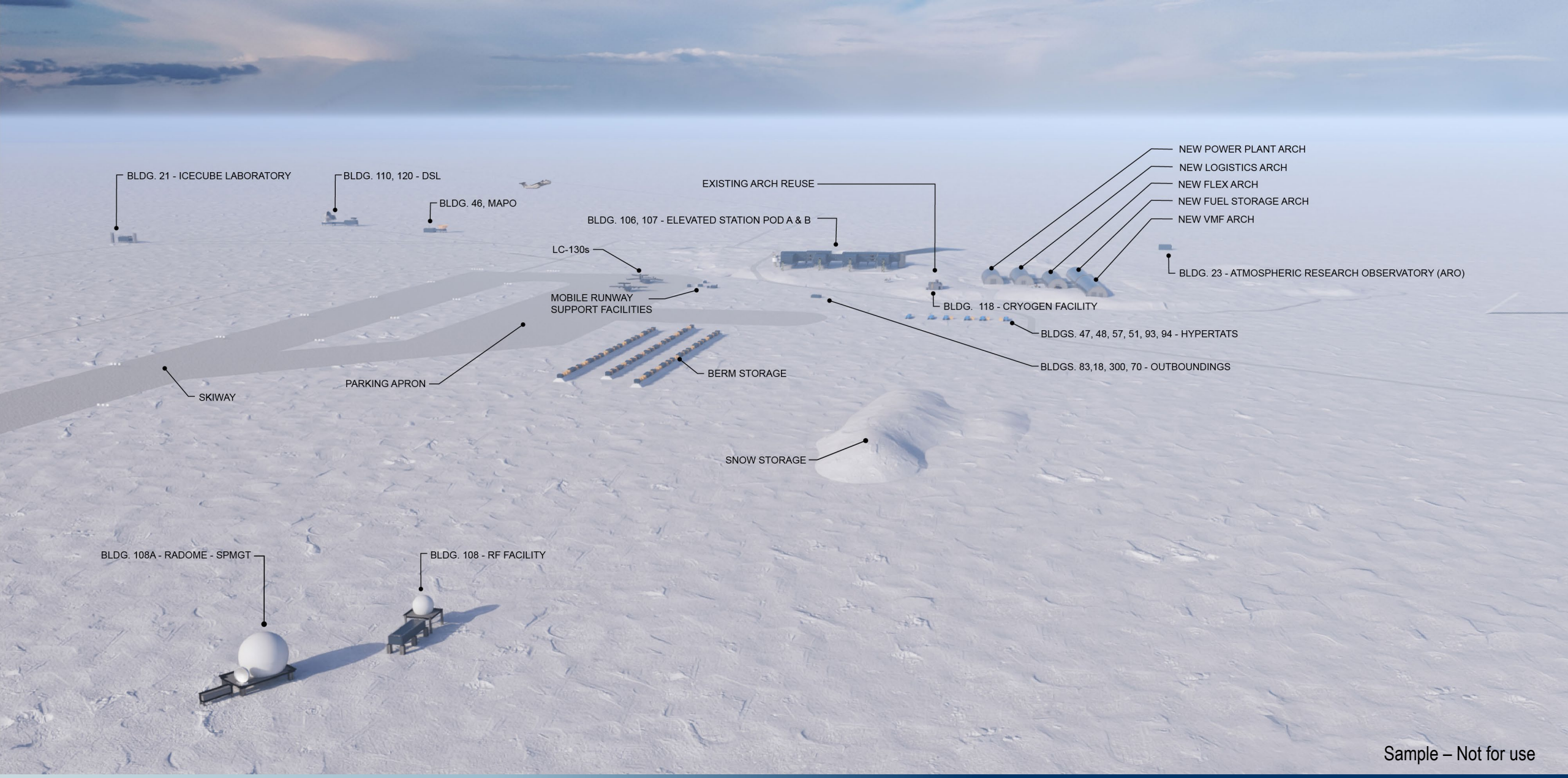

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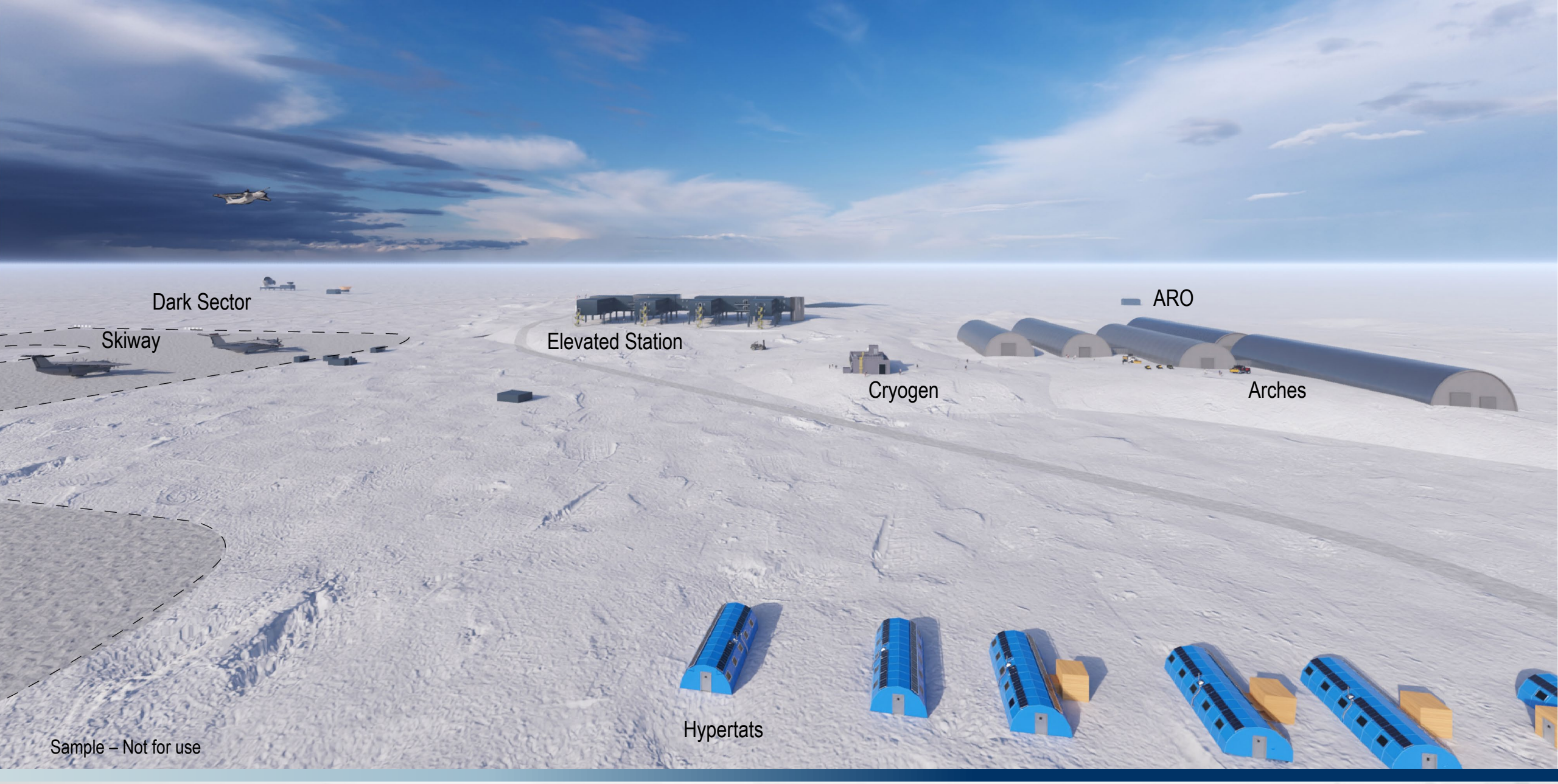

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Questions

Randy Duzan, AICP, PLA
DuzanRandy@stanleygroup.com

NSF, undated

Stanley Consultants

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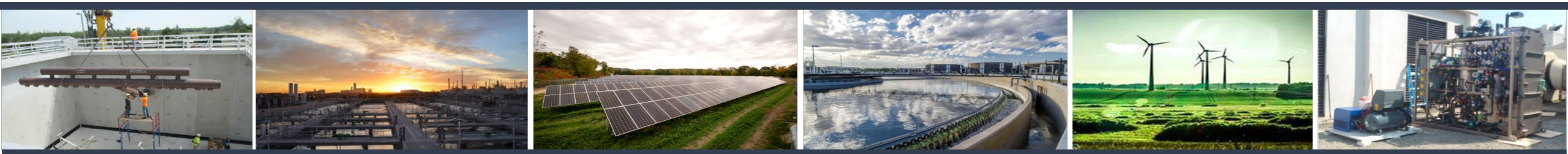
Would you like to watch this event again?
A recording of today's event will be available on our website in a few weeks.

Need a PDH Certificate?
Board Certified Individuals will be emailed a PDH Certificate for attending this event within the next week.

Questions?
Email Marisa Waterman at mwaterman@aaees.org with any questions you may have.



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