# Collider-Accelerator Facility Infrastructure and Building Consolidation and Renovation Plan

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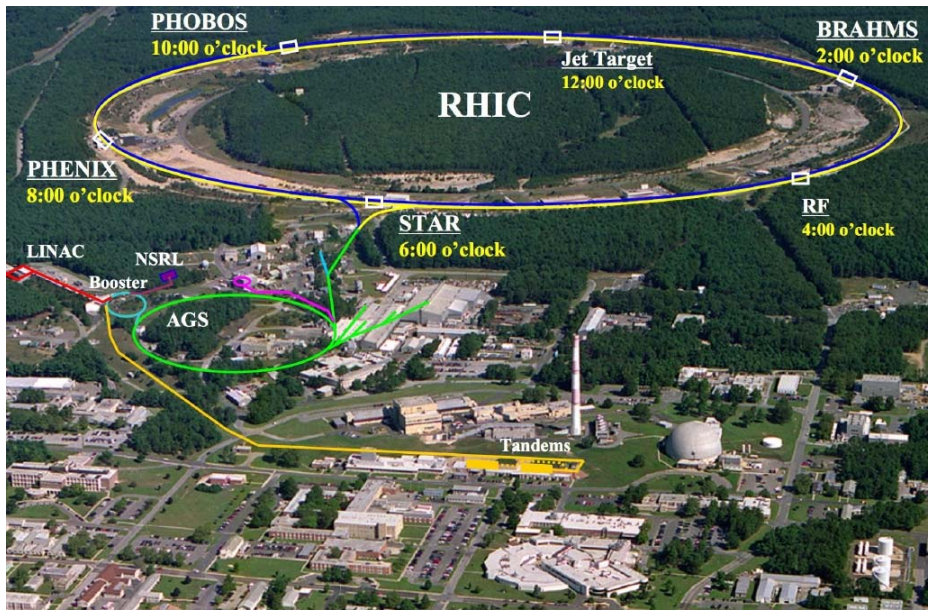


# Outline

Background History Of Facilities

Major Issues – Facility Maintenance

Staffing Support

C-AD Building Consolidation Program

**Basics:**

- Over 1 Million $Ft^2$ Of Equipment, Office, And Workshop Space
- 124 Buildings, 1000 Acres Of Land
- 7 Accelerators, 6.2 Miles Of Vacuum Beam Pipe
- 24 Miles Of Cable Tray
- 60 Electrical Substations, 6000 High Power Switches @ 480 Volts
- 12 Cooling Towers In Service, 40+ Cooling Systems In Service
- 1000s Of Electro-magnets / Power Supplies, 1740 Superconducting Magnets in RHIC
- 26 Compressors For Cryogenics System
- Power Consumption: 25 MW includes 5 MW for the cryogenic refrigerator.

# RHIC Facilities Commission Dates

AGS (1960)

80” Bubble Chamber – **Building 919** (1966)

Slow Extracted Beam – **Buildng 912** (1968 -1978)

200 MeV Linac (1970)

Booster (1990)

AGS to RHIC Transfer Line (1968 – 1999)

RHIC Facilities (1980 – 2000)

These machines are daily commuters
not “trailer queens”.

# LINAC and Booster

LINAC

- Regular maintenance and replacement of high power RF tubes.
- New Laser Profile Monitor for BLIP
- Support for BLIP Target Development
- Source and LEBT/MEBT upgrade programs

Booster

- Modifications and Installation for EBIS
- Main Power Supply Transformer Repair
- Injection foil studies
- New BTA stripping foil chamber and foil studies (2008)
- New Booster Vacuum Pump Power Supplies

# AGS

- Major upgrades to vacuum system and RF occurred 1988 to 1992.
- Siemens (1970) and Westinghouse (1960) PS require constant maintenance – new bearing cap for Siemens this year and new stator installation for Westinghouse next year.
- New Siemens transformers installed this year. ($1,000K)
- New sextupole coils next year. ($275K)
- New ion pumps and turbomolecular pumps needed (1989, 1982).
- Replace L10 (bunch merging) RF Cavity this year.
- Upgrade AGS IPM's (1985)

# RHIC

The RHIC Cryogenic Refrigerator was commissioned in 1983.

- Cooldown & Operations upgrades 2004 to 2009 – 9 MW to 5 MW.
- The compressors and oil bearing turbines require yearly maintenance and repair.
- Work space access upgrades are required for safety.
- Yearly inspections and 5 year re-cert required for relief valves.

The CERN LHC Failure drove reassessment of RHIC Cryo Risks

- The tunnel and service buildings raised to ODH-1 from ODH-0
- Valve box relief valves to be vented outside (2009).
- Valve box lead feedthroughs being upgraded (2009).
- Tunnel failure detection and refrigerator response being upgraded. (2009-2010)
- Review and approval to be presented to BNL PCSS in August.

- Triplet vibration remediation program.
- RHIC Warm RF Cavity Maintenance and upgrades – common cavity separation, RF windows, bakeout, cooling, 9 MHz, . . .
- RHIC Beam instrumentation – polarimeters, IPM's, BPM's, . . .

# C-AD Power Distribution

Much of this system is between 30 and 50 years old.

- $500K to $1000K required over next 6 years for upgrades
- One additional Electric Power Engineer required.
- Electrical Arc Flash identification and remediation another significant effort – Equipment parameters recalculated, PPE maintained and tested, documentation controlled and maintained.

(ARC Flash injures 2000 workers/year in the US)

- $900K and 5 manyears of effort to date has significantly improved worker safety (arc flash) in C-AD.
- Thermal video surveillance has been added to Tier 1's.

# RHIC AC

The RHIC Service Building AC Upgrade nearly complete.

- AC added to 1002A, 1004B, 1006B, 1008B – duct work in process.

AC System Repairs for RHIC Experiments.

- A new 50 ton chiller and 10 ton air handler will be added to STAR.
- PHENIX will have one new unit.

AC Maintenance for all C-AD PS service buildings require significant maintenance and repair.

ERL PS area and the new MCR require AC support.

- Full time engineering support is required
- Additional technician support is required

# Other Power Distribution Initiatives

- Substation A adding a 2000A main breaker dropping the arc flash level from DANGEROUS to 2.
- PTR line ATS 3-5 and associated deteriorated panel boards.
- Over-duty panel boards at PHENIX high bay area to be replaced.
- 1010A and 1012A N/E main panel boards are over-duty.
- 1004B high bay area – distributed fluorescent lighting will be added.
- Replace MDS1 and 2 panel boards in building 922
- Replacing 928 basement SIEMENS main 480V distribution panel-board adding a main breaker.
- Add 1200A main breaker to 925 substation
- Add 1200A main breaker for STAR CWS MCC
- Add 800 main breaker for PHENIX CWS MCC
- Add main breaker for Siemens exciter
- Add load banks on 8 units for RHIC diesel generators
- Replace batter chargers on RHIC diesel generators.  Remotely monitor.
- Add lighting to 929 pump room

# C-AD Engineering and Technical Support

The average age of staff is >50 years old.

- NSLS II hiring and retirements driving turnover.
- 11 new hires to replace departed E&TS staff in 2008 (1 staff addition).
- 20 new hires to replace departed E&TS staff in 2009 (3 staff additions)
- 19 additional E&TS requisitions in process, 4 are staff additions.

Staff Additions:

- Significant maintenance, upgrade, and safety efforts for C-AD accelerator systems requires additional E&TS staff.
- 4 staff additions driven by stimulus project funding.
- Experienced staff members with years of experience and knowledge are not easily replaced by a single outside hire.

# C-AD Building Consolidation Program

C-AD has been on a long term building consolidation program.

Goals:

- Return underutilized buildings to Laboratory for other use.
- Consolidate staff in and around building 911
- Abandon and Demolish of high maintenance and energy inefficient buildings and trailers.
- Scrap obsolete equipment and spare components and old production fixtures.
- Secure valuable materials and equipment.

# ADS Program Proposals – Laboratory Support

| ADS # | TITLE | S | ORG | CHAMPION | TEC | STATUS |
|---|---|---|---|---|---|---|
| AA8D0029 | **REHAB CONCRETE RETAINING WALL at H-10 HOUSE** | 186 | AD | PENDZICK, A. | 100 | To be estimated FY2009 |
| AA3D0035 | **MAIN BUILDING 912 ROOF REHABILITATION** | | AD | PENDZICK, A. | | To be completed FY2009 |
| AA7D0007 | **MOTOR CONTROL EQUIPMENT CONSOLIDATION AND UPGRADE** | 244 | AD | SANBERG, J. | 1,500 | Started FY2009, TBC FY2011 |
| AA8D0030 | **RENOVATE B/924 to INCREASE OPPS EFFICIENCY** | 312 | AD | TUOZZOLO, J. | 800 | Started FY2009, TBC FY2010 |
| AA8D0003 | EXIT ENCLOSURE FOR BUILDING 930 | | AD | TUOZZOLO, J. | | **ESH Item** |
| AA8D0031 | **RENOVATE B/911** | 212 | AD | TUOZZOLO, J. | | Estimated FY2009 |
| NEW | COMPLIANCE WITH FIRE PROTECTION REQUIREMENTS AT C-AD'S ACCELERATORS AND MAIN CONTROL AREAS (BUILDINGS 909, 911, 913, 914, 927, 930 AND NSRL COMPLEX) | | AD | LESSARD, E. | | **ESH Item** |
| NEW | COMPLIANCE WITH FIRE PROTECTION REQUIREMENTS AT C-AD'S COLLIDER AND CRYO CONTROL AREAS (BUILDINGS 1012, 1010, 1005H, 1005R, 1008, 1004, 1005E, 1007W, 1002 AND 1006) | | AD | LESSARD, E. | | **ESH Item** |
| NEW | COMPLIANCE WITH FIRE PROTECTION REQUIREMENTS AT C-AD'S OPERATIONS BUILDINGS (928, 929, 942, 901A AND 912) | | AD | LESSARD, E. | | **ESH Item** |
| AA8D0032 | **RENOVATE B/918 TO INCREASE OPERATIONAL EFFICIENCY** | 222 | AD | TUOZZOLO J. | | |
| AA1D0087 | EXTENSION OF B/1101 FIRE SPRINKLER SYSTEM | - | AD | LESSARD, | | |
| AA2D0047 | RESTORE REQUIRED AGS FIRE PROTECTION FLOW CAPACITY | | AD | LESSARD, | | |
| N98d0107 | 13.8 KV DISTRIBUTION SYSTEM REINFORCEMENT - PHASE 1 | | AD | SANBERG, | | |
| AA6D0037 | REPLACE OUTDOOR POWER DISTRIBUTION PANELS, C-A | | AD | SANBERG, | | |
| P98D0010, 26, 27 and 28 | UPGRADE POWER DISTRIBUTION SYSTEM FOR AGS FAN HOUSES A, B, C, D and E AND NORTH TARGET BUILDING 912 | | AD | | | |
| AA6D0060 | SEPARATION OF CHILLED WATER LINE BETWEEN NON-ACTIVATION AREAS AND ACTIVATION AREAS | | AD | LESSARD, | | |
| N98D0086 | NEW TRANSFORMER #9 | | AD | SANBERG, | | |
| AA6D0034 | RHIC REPAVING B/1006E, 1007W, 1008B AREAS | | AD | PENDZICK, A. | | |

# ADS - MCC and Generator Replacements

20, 30, 40 yeqr old units to be replaced – obsolete – no parts available.

911 Pump Rm


930 LINAC

912 Floor

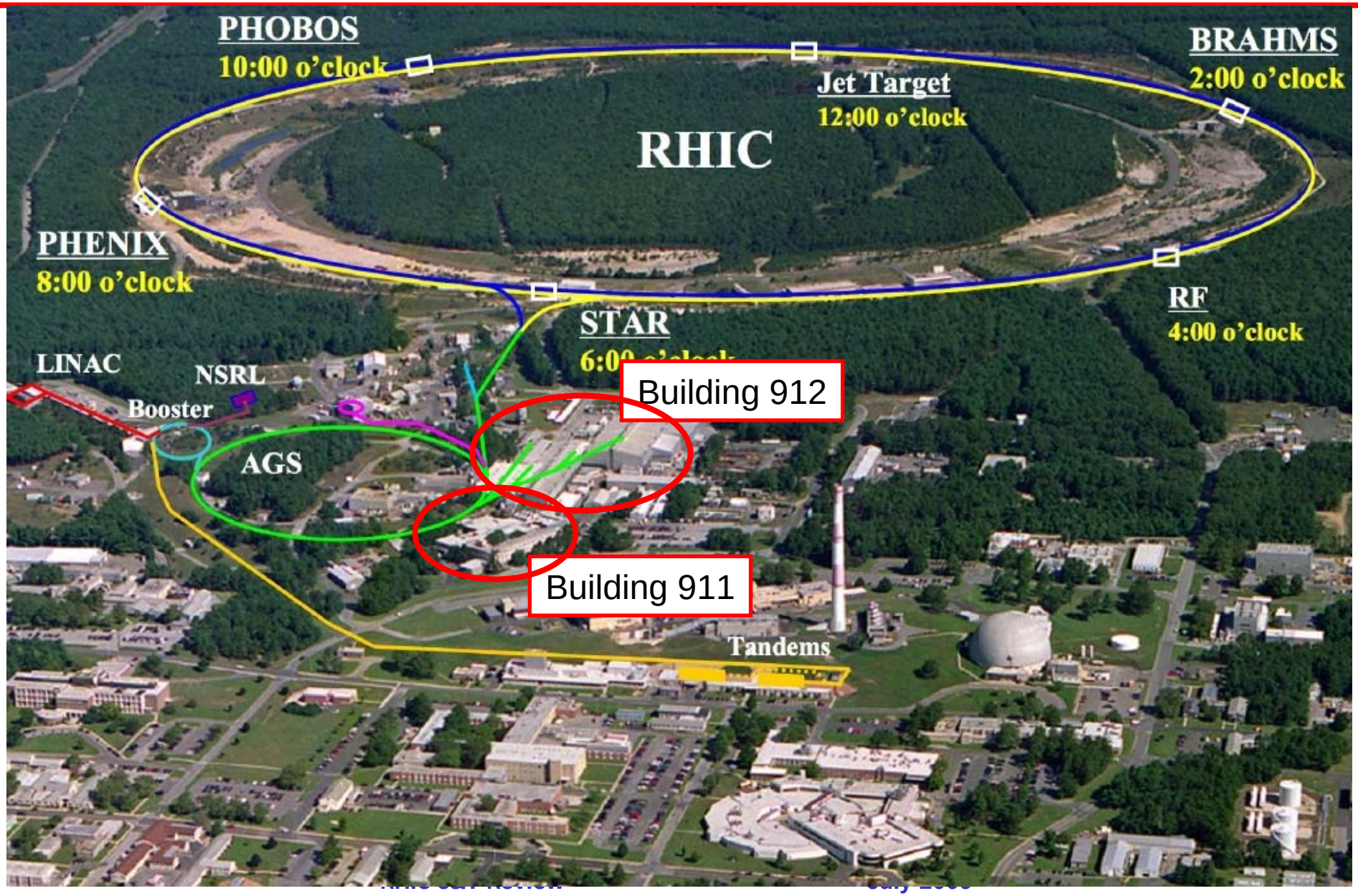
3 New emergency 400 KW generators :

# C-AD Building Consolidation Program

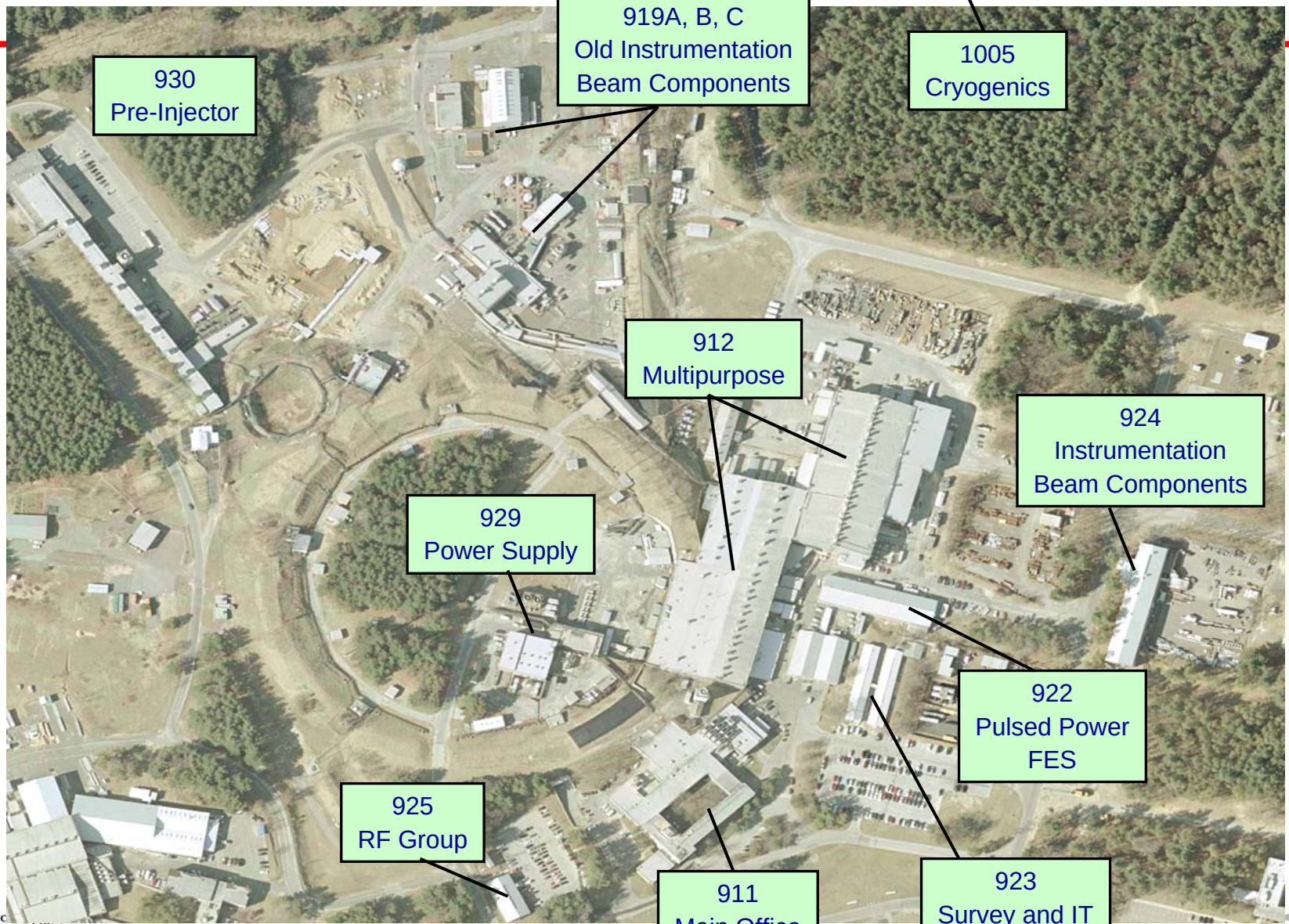
Plan in Process to Abandon Older Buildings and Consolidate Staff.

- Update building 912 for Technician Space and Equipment Storage
  - Infrastructure in place: power, water, air, and cranes
  - Infrastructure in place: Interior walkway with 911
  - Infrastructure needs: roof repair underway ($1,500K), interior work areas
- Convert building 918 to technician support shop area. ($900K)
- Update building 924 for mechanical and electronic technician shop. ($700K)
- Abandon old tech shops & trailers in 919A, 919B, 919C and 975 (924)
- Abandon old tech shops and offices in 923.
- Abandon 905 area (924, 918, 912).

# BNL & RHIC complex & Building 911



# 911 Complex


930
Pre-Injector
919A, B, C
Old Instrumentation
Beam Components
1005
Cryogenics
912
Multipurpose
924
Instrumentation
Beam Components
929
Power Supply
922
Pulsed Power
FES
925
RF Group
911
Main Office
923
Survey and IT

# Building 911

316 (+/- 10) Personnel Housed in 911

- 244 Scientific, Engineering, and Information Technology Staff
- 22 Administrative Staff
- 33 Technical Support Staff
- 17 Design Room Staff
- +/- Contract Staff and Visitors

RHIC 2012 Staffing (33 additional staff members)

- Stochastic Cooling (+ 3 Scientific, Engineering, and Information Technology)
- e-RHIC (+ 10 Scientific, Engineering, and Information Technology)
- Super Conducting RF (+ 5 Scientific, Engineering, and Information Technology
- Linac, Booster, AGS, and Controls upgrade program. (+ 5 Scientific, Engineering, and Information Technology)
- Staff turn over (+ 10 Scientific, Engineering, and Information Technology)

# Common Issues in 911

Typical 1954 Issues

- Fire Safety, Obsolete HVAC Equipment
- Old Windows and Blinds, Antique furniture
- Old steam heat (where's the thermostat?)
- Little wall insulation, Asbestos
- Water leaks

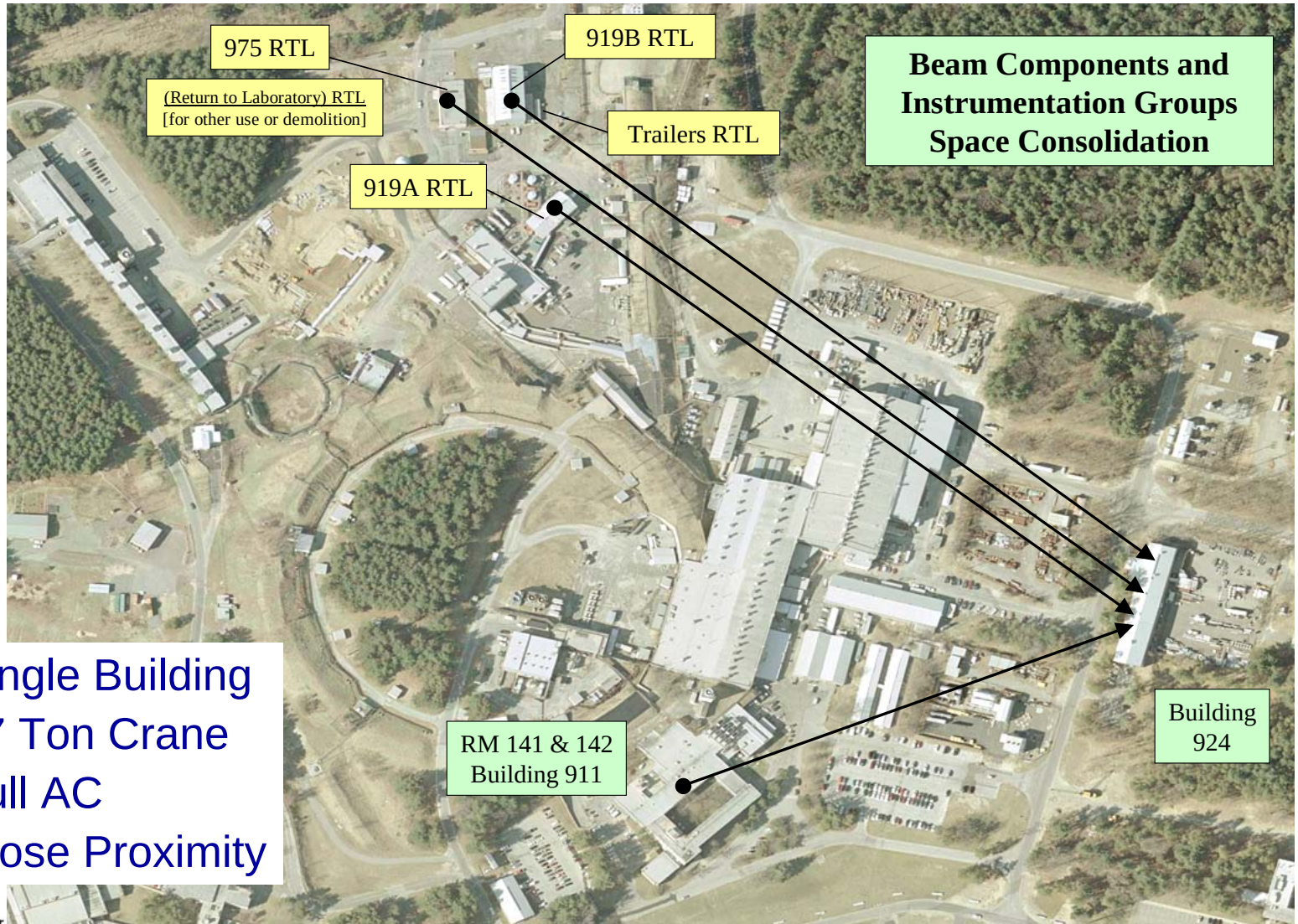









# Building 924 Consolidation



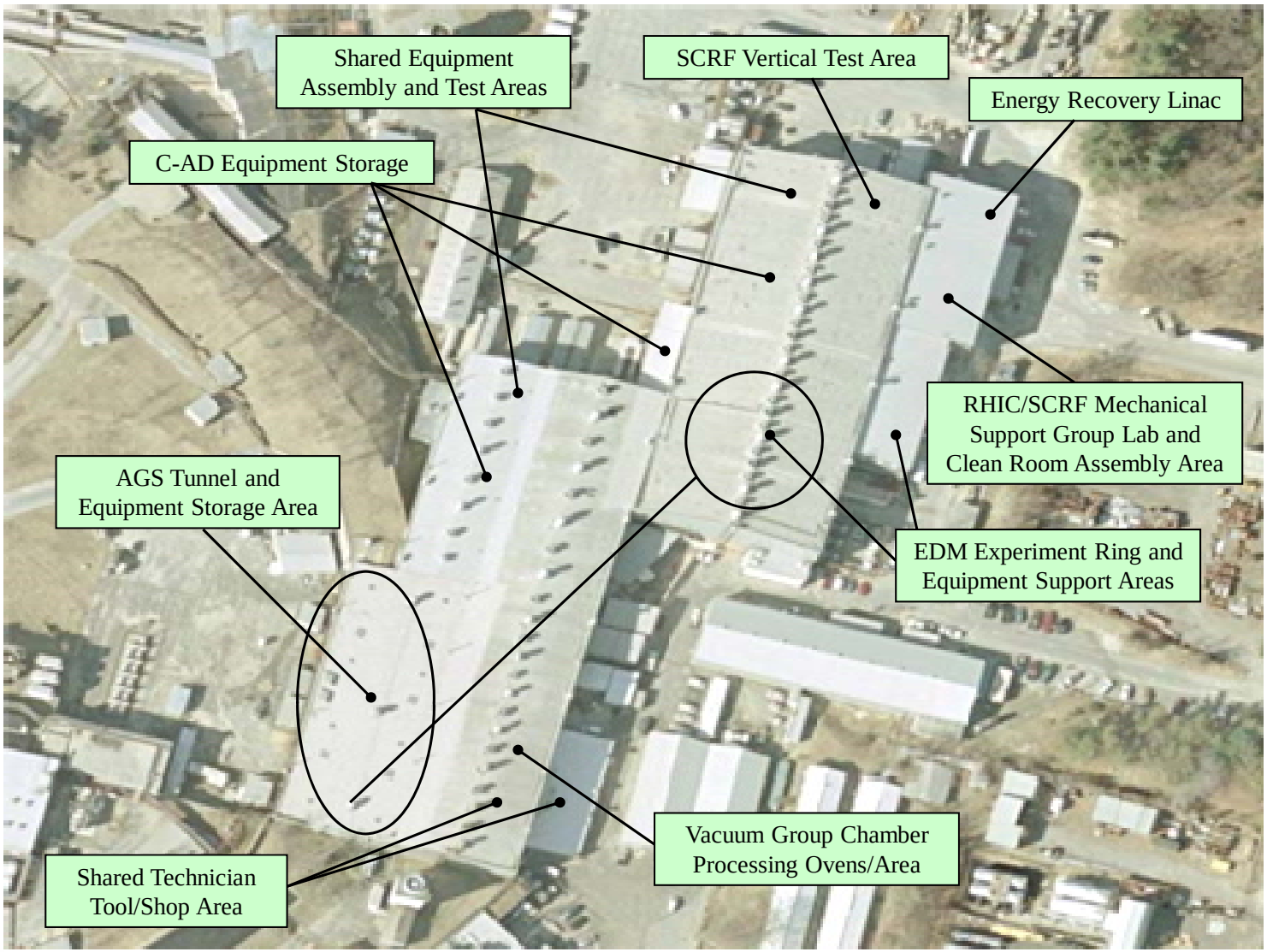

Single Building
17 Ton Crane
Full AC
Close Proximity

# Building 912 Consolidation

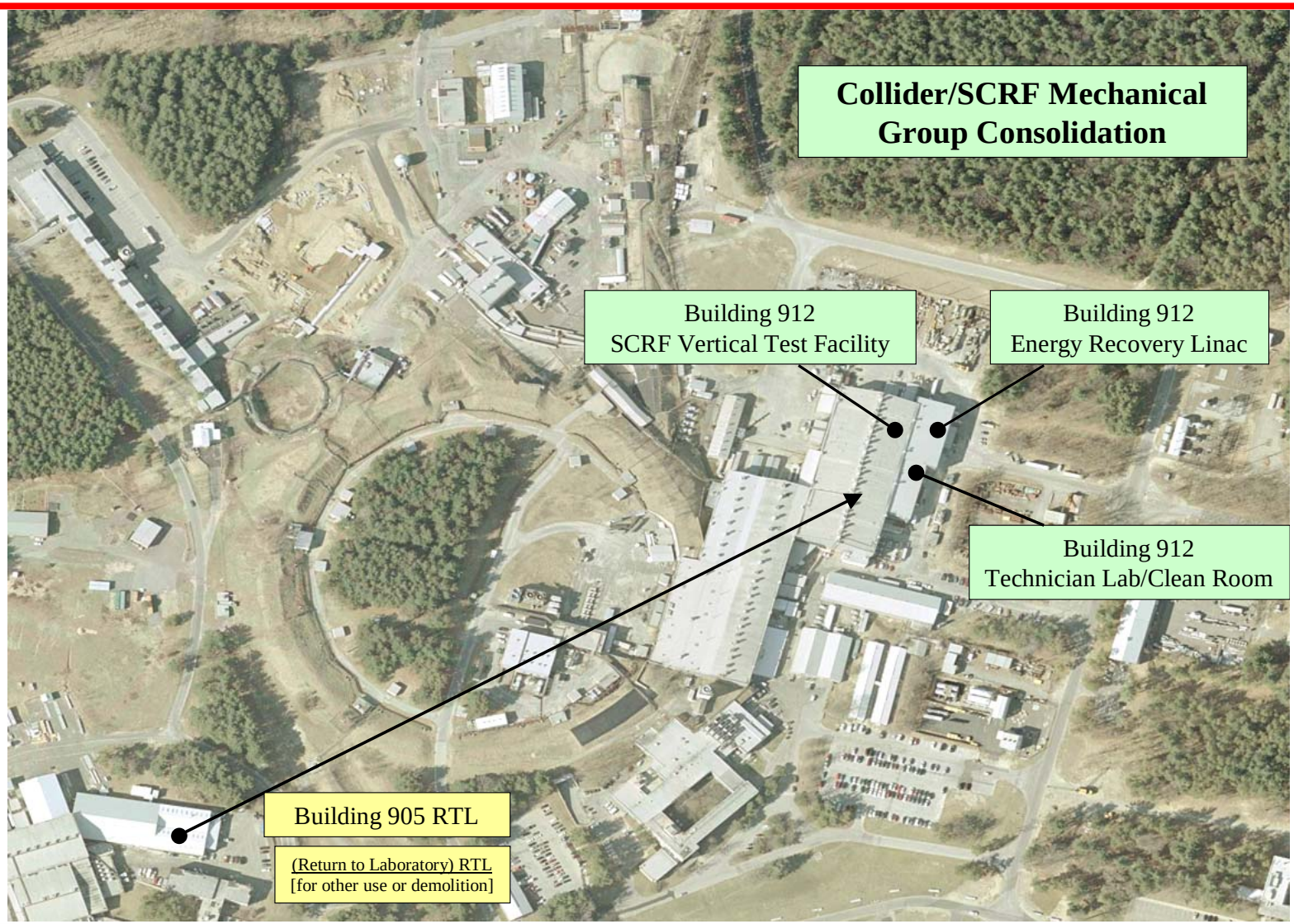
Use 912's infrastructure for multipurpose area.

- Heated space, w/experimental water and power (ERL & SCRF Test Area).
- Crane Access and Large Doors (Equipment Storage)
- Upgrade space for tech shop (Building in a Building)
- Roof Repair/Replacement nearly complete (10 years) – Cap roof vents.
- Electrical upgrades still needed
- Need additional technical support areas

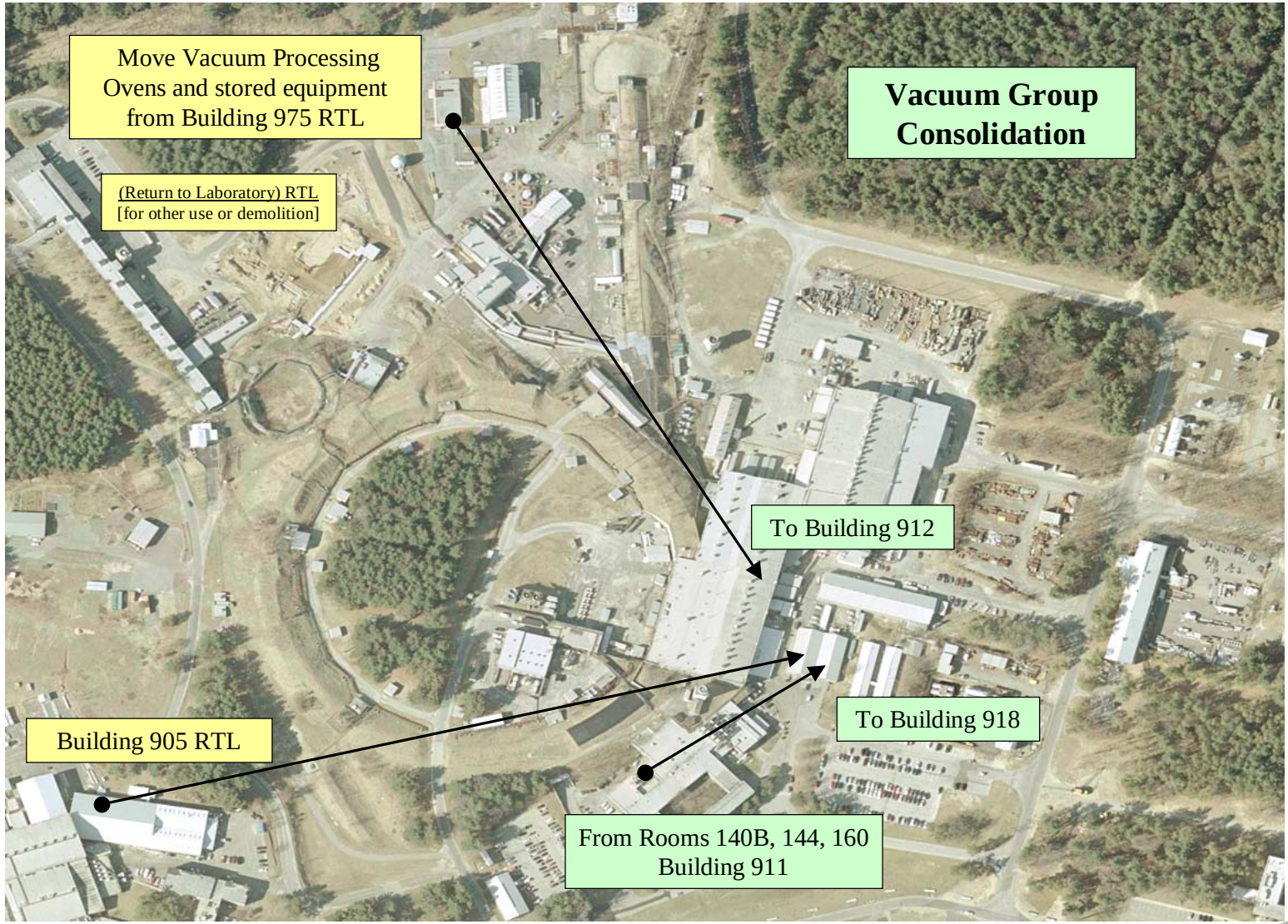
# Building 912 Consolidation



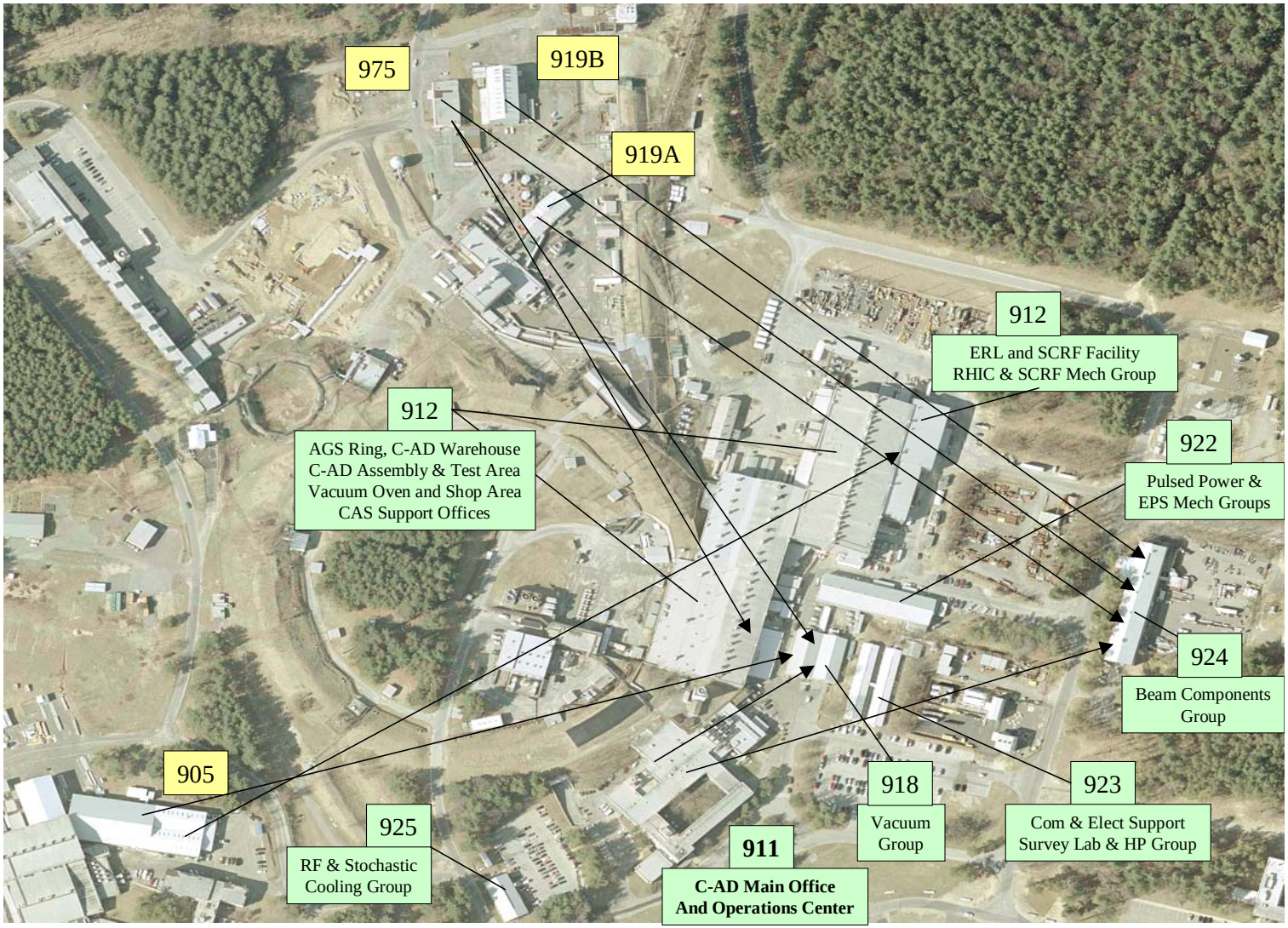
# SCRF Development in Building 912



# Building 918 Consolidation



# Consolidation Summary



# Building Consolidation Summary

Building 911 is the Central Office and the Operations Center for RHIC

Interior areas need to be modified and improved to meet present Departmental staffing needs.

To improve operations, reduce building maintenance, save energy, and eliminate under utilized space, a program to consolidate technician shops near Building 911 is underway.

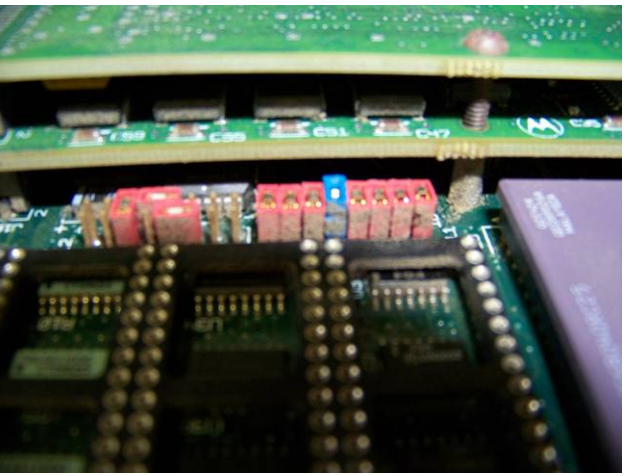
Central to this program is upgrading the major areas that are adjacent to building 911– Buildings 912, 918, and 924.

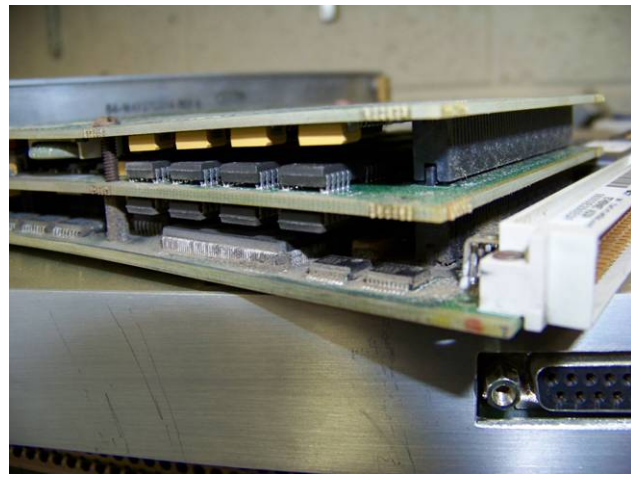
The complex is 30 to 40 years old but has solid infrastructure in place. It needs maintenance in critical areas such of roofs, power, fire safety, and HVAC to meet future RHIC needs.

Work areas are dated and need to be painted, patched, and updated.

# Power Supply PCB (appendix)

Prior to AC installation outside air was used for direct cooling of power supplies.





# C-AD Building Consolidation Program (appendix)

Work done to date:

- Returned underutilized buildings for Laboratory Use:
  Buildings 817, 820, 830, 835, 933, 934, 1005 2nd, 3rd, and 4th floors
- Recycled 912 EEBA area and adjacent buildings for ERL.
- Conversion of 911 High Bay to new MCR and Office Space underway.
- Demolition of more than 30 trailers, building 913T, 966, and cooling tower 4.
- Recycled and consolidated old equipment and spares in buildings T- 209, 913T, 926, 933, 934, 835, and 933 yard.
- Renovated 922 for Pulsed Power Group High Voltage Laboratory (Provided space in 911 for new MCR).
- Decommisioned superconducting magnet production facility from 924. Move fabrication equipment to 902.

C-AD Building Space

| | | |
|---|---|---|
| October | 2006 | 650,000 sq ft |
| October | 2007 | 620,000 sq ft |
| October | 2008 | 594,000 sq ft |
| October | 2009 | 580,000 sq ft |

# Old Main Control Room Conversion (appendix)

Old Main Control Room (113) to be converted to conference room:

- Remove old consoles and wiring.
- Repair water leaks
- Install stand alone HVAC
- Add white boards, audiovisual presentation, and phone conference equipment.