Department of Energy
Argonne Site Office
9800 South Cass Avenue
Argonne, Illinois 60439

MAY 19 2011

Dr. Eric Isaacs
Director, Argonne National Laboratory
President, UChicago Argonne, LLC
9700 South Cass Avenue
Argonne, IL 60439

Dear Dr. Isaacs:

SUBJECT: NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) DETERMINATION FOR ARGONNE NATIONAL LABORATORY (ANL)

Argonne Site Office (ASO) has approved the following as a categorical exclusion (CX) under the category of "B 3.6 Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects".

- The Advanced Photon Source (APS) Upgrade Project (ASO-CX-286)

Therefore, no further NEPA review is required. However, if any modification or an expansion of the scope is made to the above project, additional NEPA review will be necessary.

Enclosed please find a copy of the approved Environmental Review Form (ERF) for the project. If you have any questions please contact Kaushik Joshi of my staff at (630) 252-4226.

Sincerely,

Joanna M. Livengood

Dr. Joanna M. Livengood
Manager

Enclosure:
As Stated

cc: M. Kamiya, ANL/ESQ, 201, w/encl.
D. Mancini, ANL/PSC, 401, w/encl.
G. Pile, ANL/PSC, 401, w/encl.
T. Barkalow, ANL/PSC, 401, w/encl.

Environmental Review Form for Argonne National Laboratory

Click on the blue question marks (?) for instructions, contacts, and additional information on specific line items.

(?)Project/Activity Title: APS Upgrade Project

(?)ASO NEPA Tracking No. ____________ **(?)Type of Funding**: DOE MIE
B&R Code ____________

(?)Identifying number: PSC1101 WFO proposal # ____________ CRADA proposal # ____________
Work Project # ____________ ANL accounting # (item 3a in Field Work Proposal) ____________
Other (explain) Proposed DOE MIE Project

(?)Project Director: D. C. Mancini Signature: [signature] Date: 5/13/2011

(?)Project Manager: G. Pile Signature: [signature] Date: 5/13/2011

(?)NEPA Owner: T. W. Barkalow Signature: T. W. Barkalow Date: 5/13/2011

ANL NEPA Reviewer: *M. A. Kamiya* Signature: [signature] Date: 5/13/2011

I. **(?)Description of Proposed Action:**

The Advanced Photon Source (APS) is a major national user facility providing high-brilliance x-ray beams for users from Argonne National Laboratory (ANL), other national laboratories, academic institutions, governmental bodies, and industrial firms. Synchrotron radiation emitted by circulating electron beams is used as the source of x-rays for probing the structure of matter and for studying various physical and chemical processes. The APS presently uses a stored circulating electron beam current of 102 mA at an electron energy level of 7.0 GeV (representing a stored energy level of about 2628 J) during normal operations. The highest electron energy level achievable is 7.7 GeV. The facility is authorized to operate with a safety limit for stored energy level of 9280 J (representing a maximum stored electron beam current of about 327 mA at 7.7 GeV or about 360 mA at 7.0 GeV).

The APS Upgrade project (APS-U) scope includes the design, procurement, assembly, installation, and testing of the accelerator hardware, beamline instrumentation, and enabling technical capabilities that would be required to upgrade the existing APS synchrotron light source. Specifically, the main scope elements would include:

- Upgrade technical equipment to increase the operating current to 150 mA. Note the maximum electron energy level will remain 7.7 GeV with a normal operating electron energy level of 7.0 GeV. Operating at 150 mA results in a total stored electron beam energy of about 4250 J at 7.7 GeV or about 3864 J at 7.0 GeV.
- The addition of long straight sections in the APS storage ring lattice in order to accommodate long insertion devices, a combination of a superconducting undulator and a permanent magnet undulator, or a combination of a permanent magnet undulator and a set of superconducting radio-frequency cavities.
- Superconducting insertion devices that will provide to APS users hard (energy greater than 20 keV) x-ray beams brighter than those available from any other third-generation synchrotron light source.
- New planar and helical insertion devices optimized for beamline missions.
- A Short-Pulse X-ray accelerator facility consisting of superconducting radio-frequency (RF) crab cavities with the capability to produce intense hard x-ray pulses almost two orders of

magnitude shorter than those currently available from an electron storage ring for enhanced time resolution.

- Experimental facilities to exploit the hard x-ray pulses by combining picosecond temporal resolution with atomic-scale spatial resolution, elemental specificity, and nanoprobe capabilities in a suite of new x-ray beamlines and supporting laser instrumentation.
- Upgrades to existing APS beamlines, including addition of state-of-the-art hard x-ray focusing optics and greatly improved detectors.
- New or upgraded information technology and physical infrastructure including short pulse x-ray RF buildings and a 250 meter long wide-field imaging beamline (about 160 meters of the beamline and an experiment end station would be external to the current APS buildings).

The expected increase in the daily megawatt hour usage due to normal operations following APS Upgrade Project completion is projected to be 1 MW hours usage (mainly due to increased power to enable the existing RF klystron systems to achieve 150 mA stored electron beam current in the storage ring). Electric energy usage for the entire 400 Area, including the CNM and Building 450, during normal operations had daily average megawatt hour usage of between 17.5 to 19.2 based on data collected during FY2010 from existing electric meters. The highest daily average during normal operations was 23.5 megawatt hour usage. Electric usage decreases during maintenance periods to a daily average megawatt hour usage typically in the range of between 6.2 to 6.7. This compares to the anticipated daily megawatt hour usage of 25 that is stated in the Enhanced Operations EA with the CNM being expected to add 3.5 MW hour usage (for a total of 28.5 MW hour usage for the 400 Area). It can be readily seen that the projected increase of 1 MW hour usage added to the daily average megawatts hour usage measured during FY2010 during normal operation would remain below 28.5 MW hour usage. Thus electric energy usage would not be increased beyond that provided in the Enhanced Operations EA.

Attachment A is an excerpt from the Conceptual Design Report, draft version revision 1, that provides a detailed description of the proposed physical infrastructure changes within the scope of the APS-U Project.

II. <u>(?)Description of Affected Environment:</u>

The baseline description of the affected environment is provided in the *Environmental Assessment for Enhanced Operations of the Advanced Photon Source at Argonne National Laboratory-East, Argonne, Illinois*, DOE/EA-1455, June 2003.

The APS site areas affected would be expected to be inside Building 400 and various adjoining Laboratory/Office Modules (LOMs), outdoors in the Building 400 infield and the southwest quadrant of the APS site.

Attachment A Figure 5.3-3 provides a proposed APS site plan showing possible building arrangements for the short pulse x-ray RF building and the wide-field imagining beamline. Details of the building arrangements will be finalized as design proceeds.

The infield outside of Building 400 consists of distinct areas. The area nearest the Building 400 wall would be directly impacted by the installation of the support buildings for the short pulse x-ray (SPX) RF systems. This area consists of mowed turf identical to other mowed turf areas on the Argonne site. The turf contains seeded grass rather than native plants. Other than the space taken up by the support buildings, the current use of this area would be maintained. Drainage from this area is routed into the other area of the infield further from the Building 400 wall in which native plants are being restored. Drainage collects in two depressed areas which further drain either offsite or into Wetland R. Neither the drainage nor the restored native plants will be directly impacted by the installation of the small support buildings.

The southwest quadrant of the APS site consists of an old farm field habitat which presently is not mowed and is dominated by non-native grasses and plants with infrequent occurrences of native prairie grass and plant species. The western edge of this area next to Kearney Road contains an underground pipe that empties into a drainage swale about midway to the Bluff Road intersection. The pipe is from the discharge of a pump in a collection basin that receives runoff from the CNM parking lot. The water pumped out of this basin exits the pipe and follows the drainage swale and a culvert under Bluff Road and eventually empties offsite west from Wetland R. In general the southwest quadrant drains towards the southern edge of the Argonne site that is west of Wetland R.

This quadrant also contains a small former wetland, designated as Wetland C. This location now lacks wetland hydrology, and the vegetation community is composed primarily of non-native species, including a number of upland species. See the response to III.B.19 for further details.

III. (?)**Potential Environmental Effects:** (Attach explanation for each "yes" response. **See Instructions for Completing Environmental Review Form)**

A. Complete Section A for all projects.

1. (?)Project evaluated for Pollution Prevention and Waste Minimization opportunities and details provided under items 2, 4, 6, 7, 8, 16, and 20 below, as applicable — Yes X No ___

   Note: Minor soil excavation is anticipated as there will be a need fill many areas to bring the base elevation of the SPX RF support buildings up to the grade of the nearby roadway and for construction of the wide-filed imaging beamline exterior structures. Any soil excavated would be reused as fill or for landscaping following construction completion. FMS would be contacted to see if other excavated soil that may be stored on site can be reused in the fill. An approved soil erosion plan would be used as for other construction activities on site.

2. (?)Air Pollutant Emissions — Yes X No ___

   Note: Low air emissions may result from use of vehicles and mobile lift equipment during construction. No new air emissions would result from upgrade beamline operations, but the current emission levels from Building 400 would increase.

   Emissions of airborne radionuclides could lead to exposure of the general public outside of the Argonne site. At APS radionuclides are produced as a side effect of accelerator operations (i.e., the purpose of APS is not to produce radionuclides). The source of airborne radionuclides at APS are air activation products. Three air activation products are assumed to be released as air emissions during operation of APS. N-13 and O-15 are produced by the (γ,n) reactions of bremsstrahlung photons with nitrogen and oxygen in air. C-11 is produced, to a lesser extent, by photon spallation of N-14 and O-16. All of these have short half-lives. These emissions are addressed in the existing US EPA Clean Air Act Permit Program (CAAPP) Permit ID: 043802AAA, are included in the annual NESHAPS report, and the emission quantities are calculated based on the number of operating hours, each accelerator system's beam power level, and the air exhaust from the various accelerator enclosure ventilation systems to the outside atmosphere. Three separate areas have emissions calculated: emissions from linac/PAR operations in Buildings 411 and 412, emissions from booster synchrotron operation in Building 415, and emissions from storage ring operation in Building 400.

An outcome of the APS Upgrade would be to operate the storage ring at a higher stored electron beam current which will increase the stored electron beam energy. As noted in the "Description of proposed Action," the normal operating store electron beam current of 102 mA would be increased to 150 mA. The normal operating electron energy level would remain at 7.0 GeV. The resulting change in the stored electron beam energy would be from about 2628 J to about 3864 J. The operational power levels for the linac/PAR and booster synchrotron would remain the same as they are presently. Only the quantity of air activation products released from the Building 400 storage ring enclosure will increase as a result. The quantity of air activation products is directly linear to the power level so the storage ring will produce about 1.5x greater air activation products than at present. However, the amount of air activation products produced by storage ring operation is several orders of magnitude lower than the quantities produced by operation of the linac/PAR and booster synchrotron. Increasing the quantity produced in, and emitted from, the storage ring enclosure by 50% would have a negligible impact on overall air emissions from the APS. For example, the FY2010 total air activation product emission from APS was calculated to be 31.6 curies of which 0.0304 curies were emitted from the storage ring. This means that 0.09% of the total emissions resulted from storage ring operation. Increasing this amount to 0.14% of the total emissions will make no significant difference in the total quantity released.

3. (?)Noise — Yes ____ No X

Note: Argonne requirements related to hearing protection would be followed should construction activities result in noise levels above 85 decibels. Sustaining noise above this level for appreciable lengths of time is not anticipated during normal construction activities.

4. (?)Chemical/Oil Storage/Use — Yes X No ____

Note: Various cleaning and lubricating compounds may be present during construction and chemicals will be present during beamline operation. Material Safety Data Sheets are required to be present and readily available during construction when chemicals are present.
The Enhanced Operations EA did not provide information on specific chemicals that may be present during beamline operations. Instead that document took credit for engineered ventilation means that would be used in beamline spaces to minimize chemical exposure and the use of an experiment safety review process to identify chemical hazards and to specify necessary safety measures in experiment designs and safe handling procedures to be followed during the experiments. These same means would be used following completion of APS beamline upgrades.

5. (?)Pesticide Use — Yes ____ No X

None: No use of pesticides is presently foreseen during outdoor construction activities for the upgrade project.

6. (?) Polychlorinated Biphenyls (PCBs) — Yes ____ No X

Note: No PCBs were used in APS construction, are currently present, or would be added as a result of the upgrade project.

7. (?) Biohazards Yes ____ No X

Note: No new biohazard facilities are being provided as part of the upgrade, but various biological samples would be continued to be used on upgraded beamlines. The hazards and any necessary mitigation would follow the current evaluation process provided by the experiment safety review process prior to the samples being used.

8. (?)Liquid Effluent (wastewater) Yes X No ____

Note: New floor drains to the Argonne sewer system would be installed in the support buildings added as part of the upgrade and would be added in accordance with APS standard construction practice. An existing drainage swale along Kearney Road south of the CNM is used to route to offsite drainage pumped water from the CNM parking lot sump. This drainage swale will remain and will be protected during construction of the proposed wide-field imaging beamline. A culvert for this drainage swale will be included under the driveway from Kearney Road to the wide-imaging beamline end station parking area. According to the Argonne water pollution control subject matter expert in the Environmental Safety and Health/QA Division (ESQ), the additions to the Argonne sewer system and use of the existing drainage swale will not require a modification to the current Argonne NPDES permit.

No wastewater effluent would be permitted to drain towards the Wetland 303 area northwest of the APS site. All wastewater affluent drainage would be south of the APS site.

The proposed wide field imagining beamline infrastructure to be built exterior to Building 400 most likely will exceed an acre in disturbed ground. In accordance with requirements in the Argonne site SWPPP, a project specific Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted to the Illinois EPA for review/approval prior to outdoor construction activities beginning on the wide field imaging beamline.

9. (?)Waste Management

a) Construction or Demolition Waste Yes X No ____

Note: The support buildings and wide-field imaging beamline structures would be single floor girder and panel structures on a concrete base. Typical construction related wastes may be generated, but not in any significant quantities. Metal waste will be recycled in accordance with Argonne policy. FMS would be contacted to either provide a roll-off box or to bring the material to an established collection point for recycle.

b) Hazardous Waste Yes X No ____

Note: Removal of existing beamline structures as part of beamline upgrades may result in disposal of lead contaminated waste. Any such waste would be handled in accordance with Argonne hazardous waste requirements. Use of the upgraded beamlines would result in small quantities of hazardous chemical wastes, but these are not expected to be substantially different than existing quantities.

c) Radioactive Mixed Waste Yes ____ No X

Note: Current APS operations do not produce radioactive mixed waste and none of the planned upgrades would create conditions where such waste would be generated.

d) Radioactive Waste Yes X No ____

Note: Removal of items from inside the storage ring tunnel (support girders, magnets, vacuum chamber components) may include slightly activated material. Regardless of radiological survey readings, all metallic items removed from the storage ring tunnel enclosures will be handled as low level radioactive waste unless the material can be included as part of Argonne's "Authorized Limit" process.

e) PCB or Asbestos Waste Yes ____ No X

Note: No PCBs or asbestos were used in APS construction, are currently present, or would be added as a result of the upgrade project.

f) Biological Waste Yes X No ____

Note: No new biological facilities would be added as part of the upgrade, but biological samples will continue to be used in upgraded beamline experiments. The amount of biological waste generated would not expected to be substantially different in quantity or type than for present biological experiments. The hazards of generated biological waste and its handling along with any necessary mitigation would be evaluated and provided by the experiment safety review process prior to the samples being used.

g) No Path to Disposal Waste Yes ____ No X

Note: The APS presently does not generated waste with no identified path to disposal and none would be expected to be generated from the upgrade project.

h) Nano-material Waste Yes X No ____

Note: There is a small quantity of nano-material waste presently being generated as a result of experiments conducted on nano-material samples. The amount of nano-material waste generated by experiments conducted following beamline upgrades would not be expected to be substantially different in quantity than for the present experiments. The hazards of generated nano-material waste and its handling along with any necessary mitigation would be evaluated and provided by the experiment safety review process prior to the samples being used.

10. (?)Radiation Yes X No ____

Note: Ionizing radiation could result in external exposure of personnel, users, and members of the general public. Exposure due to release of airborne radionuclides in the form of air activation products has already been addressed in responding to Item A 2 in this ERF. Prompt radiation hazards arising from the loss of beam in targets, beam stops, septum magnets, and accelerator components lead to the production of radiation fields during injector operations. These radiation fields consist mainly of bremsstrahlung (x-rays), gamma rays, and neutrons. Interaction of these radiations leads to activation of accelerator components, which could also represent potential external exposure hazards. As the stored beam circulates in the storage ring, a small fraction of the beam is lost due to collisions with gas molecules, interactions among beam particles, and orbital excursions, which also produce radiation. In addition, the primary purpose of the APS is to produce high-quality synchrotron radiation (x-rays).

The accelerator tunnel shielding for the radiation produced by normal operations of the accelerator system was designed based on operations that produce, accelerate, and store an electron beam of energy 7.7 GeV using an injected beam-power level of 308 W (2.5×10^{11} e- /s in the beam; about 44 nA) with a stored electron beam energy of 9280 J. The beamline and experiment station shielding was designed for the synchrotron radiation produced by either a bending magnet or an insertion device. For synchrotron-radiation (x-rays) calculations, storage ring energy of 7.5 GeV and storage ring current of 200 mA have been assumed in all cases. These parameters were chosen for the simulation of the synchrotron radiation because they proved to be a worse case than the 7.0-GeV, 300-mA case. In addition, to accommodate operation at the Accelerator Safety Envelope (ASE) limit for the maximum stored electron beam energy of 9280 J, the recommended shielding thicknesses include an additional layer of shielding material sufficient to reduce the radiation penetrating the shielding to a tenth of its previous value.

These design parameter values for accelerator tunnels, beamlines, and experiment stations exceed the maximum operating parameters of 7.0 GeV and 150 mA, which will result from the APS-U project. The presently installed shielding will continue to be within design parameters.

The Enhanced Operations EA provided radiation exposure information based on information from existing Safety Assessment Document (SAD)analyses (which were based on the analyses used for shielding design). The results of a new beamline bremsstrahlung analysis are being evaluated as of preparation of this ERF for potential impact on the existing SAD analyses. The results of the new analysis are presented in an APS Technical Bulletin (TB) ANL/APS/TB-54 *Dose Calculations Using MARS for Bremsstrahlung Beam-Stops and Collimators in APS Beamline Stations*. The SAD beamline analysis was based on the use of the Monte Carlo radiation transport computer code EGS4 which calculates a gamma radiation dose. The radiation dose from photoneutrons was assumed in the SAD analysis to be equivalent to the gamma dose calculated by the code. The Monte Carlo radiation transport computer code MARS used for the TB-54 analysis calculates the radiation dose from both gamma rays and photoneutrons. The results indicate the photoneutron dose contribution are higher than assumed in the existing SAD analysis. However, assuming beamline operation with a stored beam current of 150 mA, the results based on the MARS computer code remain bounded by the existing SAD analysis. The MARS computer code results for beamline operation at stored beam currents higher than 150 mA might not remain bounded by the existing SAD analysis, but operating at currents higher than 150 mA is outside the scope of the APS-U.

There are differences in the source term and beamline details modeled in the SAD analysis and the TB-54 analysis making it difficult to make an exact comparison between the two analyses. In particular it has been noted that scaling the TB-54 results to current operations should result in predicted radiation doses on area dosimeters that are higher than actual measurements. A series of experimental measurements are being planned to obtain additional data in order to better determine whether or not the SAD analysis will require revision at a future date. Regardless of the MARS computer code results, the actual radiation conditions would be determined by radiological surveys conducted as part of beamline commissioning following completion of beamline modifications within the APS-U scope and appropriate action taken. The data obtained would be used to determine if dosimeters must be worn by APS employees, resident users, and general users in order to monitor the anticipated dose received during activities performed on the Building 400 Experiment Hall floor.

11. (?)Threatened Violation of ES&H Regulations or Permit Requirements Yes ____ No X

Note: APS operation presently does not violate any ES&H Regulations or Permit Requirements and no violations are expected to result from the APS Upgrade Project.

12. (?)New or Modified Federal or State Permits Yes ____ No X

Note: Argonne presently has Illinois EPA NPDES Permit No. IL0034592 covering permitted liquid effluents and US EPA Clean Air Act Permit Program (CAAPP) Permit ID: 043802AAA. Neither of these existing permits would need to be revised as a result of the APS Upgrade Project.

As noted earlier in Section III.A.8, a project specific Stormwater Pollution Prevention Plan (SWPPP) will be prepared and submitted to the Illinois EPA for review/approval prior to outdoor construction activities beginning on the wide field imaging beamline.

13. (?)Siting, Construction, or Major Modification of Facility to Recover, Treat, Store, or Dispose of Waste Yes ____ No X

Note: The APS presently does not include any waste disposal or storage facility and none would be added as part of the APS Upgrade Project.

14. (?)Public Controversy Yes ____ No X

Note: No public controversy has resulted from APS operations and none are anticipated from the upgrade.

15. (?)Historic Structures and Objects Yes ____ No X

Note: No historic structures or objects are located in the APS and none would be involved in the upgrade.

16. (?)Disturbance of Pre-existing Contamination Yes ____ No X

Note: There is no known pre-existing contamination present around the APS structures or immediate environs.

17. (?)Energy Efficiency, Resource Conserving, and Sustainable Design Features — Yes X No ___

Note: The support buildings and wide-field imaging beamline structures would use the same light colored exterior finish, including the roof, as was used for the Center for Nanoscale Materials. This will help reduce heat input on sunny days. Electric energy usage for the entire 400 Area, including the CNM and Buidling 450, during normal operations had daily average megawatt hour usage of between 17.5 to 19.2 based on data collected during FY2010 from existing electric meters. The highest daily average during normal operations was 23.5 megawatt hour usage. Electric usage decreases during maintenance periods to a daily average megawatt hour usage typically in the range of between 6.2 to 6.7. This compares to the anticipated daily megawatt hour usage of 25 that is stated in the Enhanced Operations EA with the CNM being expected to add 3.5 MW hour usage(for a total of 28.5 MW hour usage for the 400 Area). The expected increase in the daily megawatt hour usage due to normal operations following APS Upgrade Project completion is projected to be 1 MW hours usage (mainly due to increased power to enable the existing RF klystron systems to achieve 150 mA stored electron beam current in the storage ring). It can be readily seen that this value added to the daily average megawatts hour usage measured during FY2010 during normal operation would remain below 28.5 MW hour usage. Thus electric energy usage would not be increased beyond that provided in the Enhanced Operations EA.

An Argonne Site Sustainability Plan dated December 2010 has been submitted to DOE-ASO. The new structures to be built under the APS Upgrade project would utilize the "cool/white roofs" design and other infrastructure improvement features would utilize improved energy efficiency measures described in the Site Sustainability Plan.

B. For projects that will occur outdoors, complete Section B as well as Section A.

18. (?)Threatened or Endangered Species, Critical Habitats, and/or other Protected Species — Yes ___ No X

Note: None are currently present and thus cannot be impacted by the upgrade.

19. (?)Wetlands — Yes ___ No X

Note: Prior to APS construction a permit was obtained from the Corps of Engineers (COE) accepting the loss of small wetlands during APS construction by establishing a new wetland (Wetland R) to replace them. A third small wetland, Wetland C, was to be protected during construction. When the COE conducted an inspection in 1996, the COE found that the wetlands (C & R) did not meet the COE standards after the required 5 year monitoring period. In 2000 Argonne provided consistent funding of efforts to improve the Wetland R status. The Enhanced Operations EA issued by DOE in June 2003 stated that Wetland C had been lost. However, concurrence from the COE was not obtained at that time. The COE has recently accepted Wetland R as a viable wetland replacement for the small wetlands destroyed during construction and has concluded that Wetland C is isolated and therefore non-jurisdictional so mitigation of Wetland C is no longer needed. The COE also confirmed that DuPage County does not exercise jurisdiction over wetlands at federal sites.

The location of the proposed wide-field imaging beamline includes building a portion of the beamline through part of the original Wetland C area. Since Wetland C has not been viable for nearly 15 years and is considered lost, no wetland area would be affected by the APS Upgrade project.

20. (?)Floodplain Yes ____ No X

Note: No upgrade related activities would take place in floodplain areas.

21. (?)Landscaping Yes X No ____

Note: The soil around the base slab would be graded and sloped to restore existing drainage paths, and would be planted either with the standard Argonne mowable turf in the areas next to the Building 400 infield exterior walls or existing native plant species for the other areas.

22. (?)Navigable Air Space Yes ____ No X

23. (?)Clearing or Excavation Yes X No ____

Note: Excavated soil would be reused in fill. It is anticipated that mostly fill soil would be added and that little actual excavation would be necessary. Existing drainage paths would be restored through grading of the fill following construction completion. A Sedimentation and Erosion Control (SEC) Plan will be prepared prior to any outdoor construction activities.

24. (?)Archaeological Resources Yes ____ No X

Note: None are currently present in the proposed areas affected and thus would not be impacted by the upgrade.

25. (?)Underground Injection Yes ____ No X

Note: no underground injection is being used at APS at present and none would be added by the APS Upgrade Project.

26. (?)Underground Storage Tanks Yes ____ No X

Note: No underground storage tanks are proposed in the APS Upgrade Project.

27. (?)Public Utilities or Services Yes X No ____

Note: Connections would be installed to currently existing services for telephone, sewer, and electricity. No new services or utilities would be added.

28. (?)Depletion of a Non-Renewable Resource Yes ____ No X

C. For projects occurring outside of ANL complete Section C as well as Sections A and B.

29. (?)Prime, Unique, or Locally Important Farmland Yes ____ No ____

30. (?)Special Sources of Groundwater (such as sole source aquifer) Yes ____ No ____

31. (?)Coastal Zones — Yes ____ No ____

32. (?)Areas with Special National Designations (such as National Forests, Parks, or Trails) — Yes ____ No ____

33. (?)Action of a State Agency in a State with NEPA-type Law — Yes ____ No ____

34. (?)Class I Air Quality Control Region — Yes ____ No ____

IV. Subpart D Determination: (to be completed by DOE/ASO)

Are there any extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal? — Yes ____ No X

Is the project connected to other actions with potentially significant impacts or related to other proposed action with cumulatively significant impacts? — Yes ____ No X

If yes, is a categorical exclusion determination precluded by 40 CFR 1506.1 or 10 CFR 1021.211? — Yes ____ No ____

Can the project or activity be categorically excluded from preparation of an Environment Assessment or Environmental Impact Statement under Subpart D of the DOE NEPA Regulations? — Yes X No ____

If yes, indicate the class or classes of action from Appendix A or B of Subpart D under which the project may be excluded. B3.6 "Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects".

If no, indicate the NEPA recommendation and class(es) of action from Appendix C or D to Subpart D to Part 1021 of 10 CFR.

ASO NEPA Coordinator Review: Kaushik N. Joshi / Angela C. Harvey for

Signature: Angela C. Harvey Date: 5/16/11

ASO NCO Approval of CX Determination:

The preceding pages are a record of documentation that an action may be categorically excluded from further NEPA review under DOE NEPA Regulation 10 CFR Part 1021.400. I have determined that the proposed action meets the requirements for the Categorical Exclusion identified above.

Signature: [signature] Date: 5/16/11

Peter R. Siebach
Acting Argonne Site Office NCO

ASO NCO EA or EIS Recommendation:

Class of Action: ____________________

Signature: ______________________________________ Date: ________________________

Peter R. Siebach
Acting Argonne Site Office NCO

<u>Concurrence with EA or EIS Recommendation:</u>

CH GLD: ___________________

Signature: ______________________________ Date: ________________

<u>ASO Manager Approval of EA or EIS Recommendation:</u>

An ____ EA ____ EIS shall be prepared for the proposed ____________________ and

__________________ shall serve as the document manager.

Signature: ______________________________ Date: ________________

Dr. Joanna M .Livengood
Manager

[5.2-6] J. Collins. Technical report, (2010).

[5.2-7] D. D. Hall and I. Mudawar, International J. of Heat and Mass Trans., 43(14), 2605 (2000).

[5.2-8] D. D. Hall and I. Mudawar, International J. of Heat and Mass Trans., 43(14), 2573 (2000).

[5.2-9] B. Brajuskovic. Technical report, Advanced Photon Source, (2010).

[5.2-10] T. Kuzay. Technical Report TB-5, Advanced Photon Source, (1993).

[5.2-11] Y. Jaski, T. Warwick et al., editors, Proc. of SRI 2004, AIP Conf. Proc. **705**, 356 (2004.

[5.2-12] C. Benson et al., Proc. of SRI 2004, AIP Conf. Proc. **705**, 466 (2004).

[5.2-13] P. Den Hartog et al., Proc. of PAC'03, Portland, OR., (2003); http://www.JACoW.org.

5.3 Physical Infrastructure

5.3.1 Introduction

Conventional facilities provide control over the critical environmental envelope necessary for optimum operation of the APS accelerator, storage ring, and beamlines. These include the building structural systems, primary electrical power and distribution systems, and mechanical systems and associated temperature controls. These conventional facility systems are a dedicated and integral part of the overall accelerator and beamline equipment and operation.

5.3.2 Storage Ring Tunnel - Building 400 [CAS]

One of the activities for the APS-U project is to improve beam stability, as discussed in section 3.6. In order to enhance beam stability to meet the criteria for the upgrade of the APS storage ring, the temperature controls systems for both the space air temperature and the vacuum chamber deionized water cooling systems will be upgraded. This upgrade will result in an increase in the precision and stability of each system's operating temperature and greater temperature stability of the storage ring vacuum chamber. Table 5.3-1 is a comparison of the current vs future needs for temperature stability requirements for the storage ring air temperature and the vacuum chamber deionized cooling water.

Table 5.3-1. System Temperature Stability Requirements

Storage Ring Space Air Temperature Tolerance (° F)		Vacuum Chamber DI Cooling Water Temperature Tolerance (° F)	
Current	Upgrade	Current	Upgrade
±0.5 ° F	±0.25 ° F	±0.20 ° F	±0.1 ° F

The existing storage ring tunnel temperature control system consists of 20 individual air handling units dedicated to tunnel temperature control. These units are located in the experiment hall mechanical mezzanine and each unit controls the space temperature in two individual sectors. The air temperature control systems will be modified to include a reheat stage capable of providing extremely fine control of the temperature or the air stream supplied to the tunnel. The existing temperature control coils and devices will be reconfigured to supply a constant-supply air temperature upstream of this new reheat coil, providing a first stage of control (course adjustment) with the new coil providing the final temperature control (fine) adjustment. The new reheat coil will be an electric resistance device utilizing silicon-controlled rectifiers to provide rapid cycling (on the order of 0.1 s or less) to infinitely adjust power output to the new coil. Figure 5.3-1 is a schematic representation of the planned modification to the storage ring air temperature control system.

The deionized cooling water to the storage ring vacuum chambers provides direct cooling to maintain temperature stability of the chambers to inhibit dimensional changes resulting from thermal expansion and contraction. Water is supplied to a pair of sectors from individual cooling water skids located in the experiment hall mechanical mezzanine. To increase the stability of the cooling water temperature, each skid will be modified to include an additional stage of temperature control to be provided by electric heating coils controlled by SCR controllers and integrated into the existing Allen-Bradley temperature control system. As described above for the air temperature control, these devices will be capable of rapid cycling to make infinitely small adjustments to the temperature of the water supplied to the vacuum chambers. Figure 5.3-2 is a schematic of the modification to the deionzied water cooling circuit for the storage ring vacuum chamber.

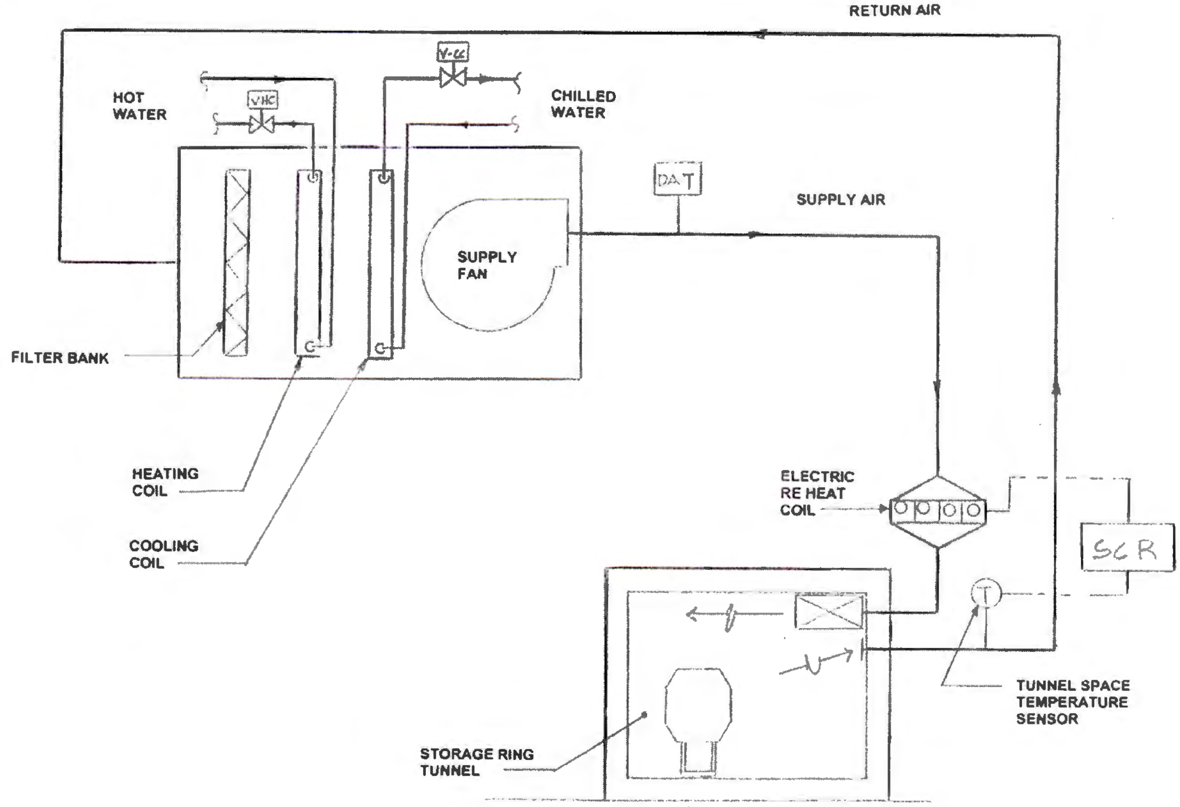

Figure 5.3-1. Diagram of modifications to the storage ring tunnel air temperature control system.

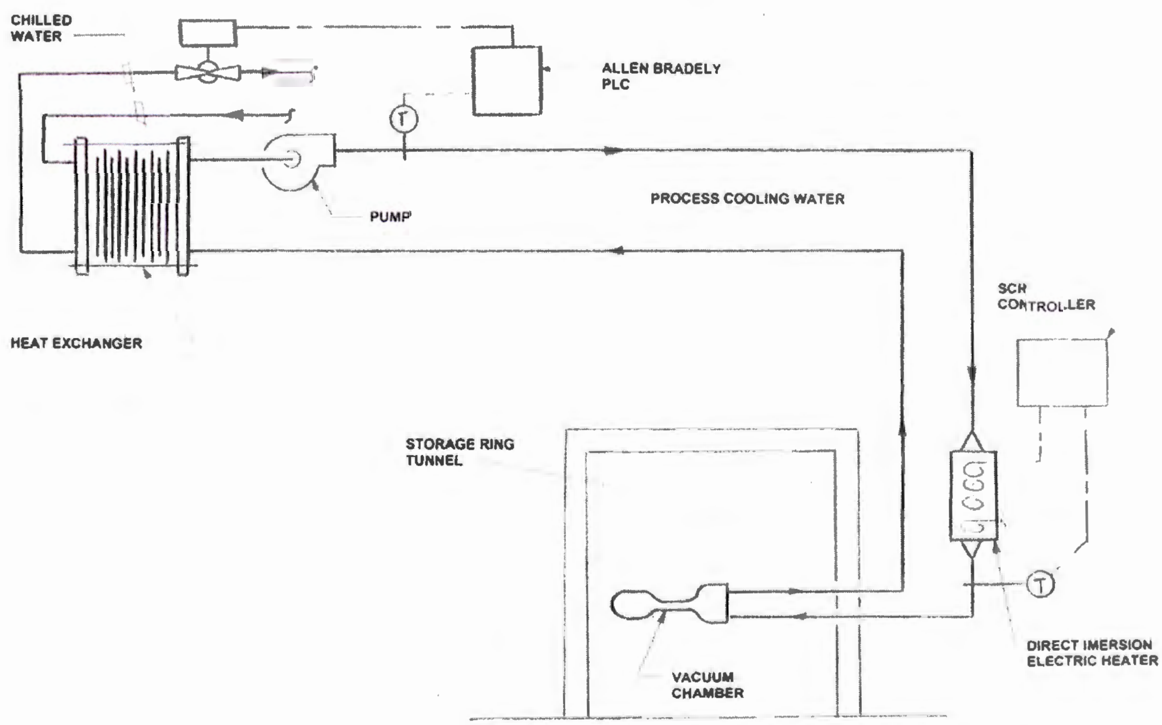

Figure 5.3-2. Diagram of modifications to storage ring tunnel vacuum chamber temperature control system.

5.3.3 Conventional Facilities for the Wide-Field Imaging Beamline [U1.05.03.01]

The wide-field imaging beamline, as discussed in section 4.3.2, has an end station at about 250 m from the insertion device source. The beamline will further extend about 160 m outside of the existing experiment hall. The end stations will be housed in a building about 130 m away from the experiment hall. The end-station building will be connected to the experiment hall through a beam transport utility corridor. The new building enclosures (e.g., end-station building, corridor) will be designed and constructed in a manner similar to that of the APS facility and will provide the appropriate vibration protection, temperature and dimensional stability, and life-safety systems. Figure 5.3-3 is a site plan with the wide-field imaging beamline located at Sector 19 (in red).

End-Station Building: The end station building will be a high- bay-style building to house the experiment stations and a small control area for the stations. The approximate dimensions are 12 m wide × 35 m long × 7 m high. The building will also have a mechanical room and a large door lock access. The building will be air conditioned similar to the experiment floor.

Beam Transport Utility Corridor: A beam transport corridor will connect the experiment hall to the end station building. The corridor will be about 3 m wide × 130 m long × 4 m high and will house the beam transport. In addition, all service lines (power lines; Tel/Data lines; DI, chilled, and hot water; cable trays, etc.) to the end station building will be inside the corridor. There will be room for a pedestrian walkway along the beam transport connecting the 400 building with the end station building.

Infrastructure and Modifications to Existing Facility: The long beamline will disrupt the layout of the experiment hall. The sighting of the long beamline is to minimize the disruption to the experiment hall and the lab/office module laboratories and the office space. The location of Sector 19 for the long beamline will be least disruptive of all possible scenarios. The long beamline will penetrate through a corner of one of the building 435 end laboratories. The truck lock and the liquid nitrogen storage area will also be disrupted and will require relocation.

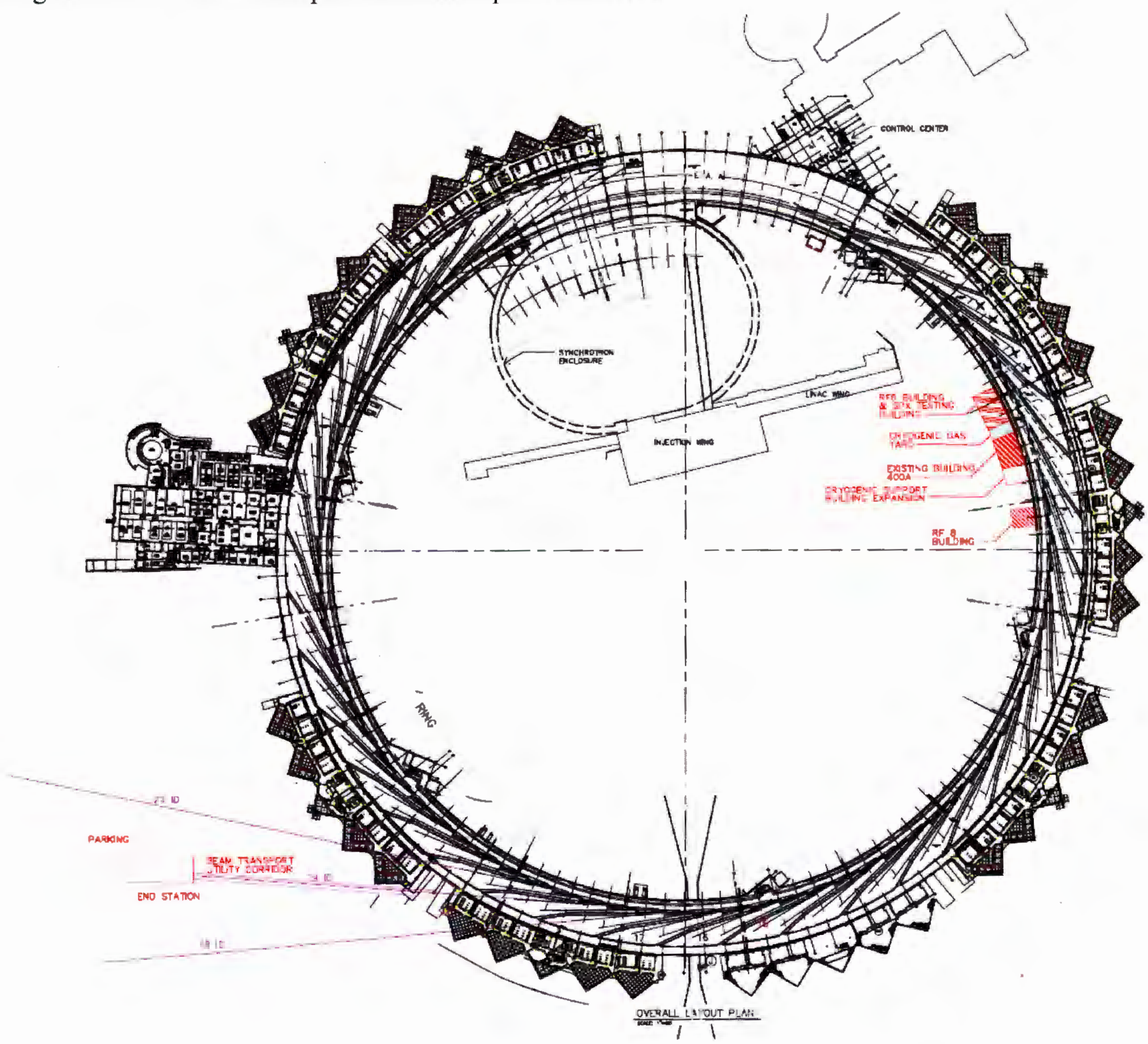

Figure 5.3-3. Proposed APS site plan with the SPX radio frequency building (blue) and the wide-field imaging beamline (red).

Alternate Beamline Analysis: In addition to Sector 19, two more beamlines were also considered, at Sectors 18 and 20. A comparison of the merits and cost of each of the three options was performed. The two alternate locations will significantly impact the adjacent building 435(for Sector 18) or 436 (for Sector 20). The proposed beam lines will go through the office suite, electronics and chemistry laboratories, causing significant disruption and requiring that adequate new substitute spaces be constructed. The cost estimate for Sector 19 was also lower than the other two alternates. Thus, from conventional facilities prospective, Sector 19 is the option recommended for adoption by the APS-U project.

5.3.4 Conventional Facilities for the XIS Beamline [CAS]

The x-ray interfacial science (XIS) beamline is to be located at Sector 28. The beamline, as discussed in section 4.6.2, will have two branches, which will extend past the experiment hall into Building 437, where there will be three end stations. A planned Class-10000 clean room will coexist with the three end stations.

The existence of two beamlines extending past the experiment hall corridor will impose some restrictions to foot traffic and material movement in the experiment floor. To overcome this problem a pedestrian path will be established that meets the Americans with Disabilities Act requirements. To allow for scheduled occasional vehicular access, the beamlines will be installed with removable segments.
The scope of conventional facilities is limited to providing the basic infrastructure and utilities (e.g., power, HVAC mains, process water, means for handicapped access, etc.) needed to support the later installation of end stations and clean room inside Building 437.

5.4 Information Technology Infrastructure [CAS]

5.4.1 Introduction

Computing infrastructure is the electronic backbone on which both the beamlines and the accelerator are completely dependent. Enhancement of this infrastructure is required in order to support the huge demands placed on the APS computing and network infrastructure by the combination of additional beamlines and increased amount of data generated by faster and larger detectors resulting from the APS-U project. These factors, coupled with the ever-advancing speed of computing hardware, require investment by the APS to provide sufficient future capacity for data collection, analysis, storage, and transfer.

An effective IT strategy, closely aligned with the APS-U project strategies and objectives, is fundamental and will assure that the required IT enabling infrastructure, skills, and systems are in place and operational.

The results of new computing research will be rapidly incorporated into the APS operational network. This approach is particularly important because the network services envisaged in APS-U project scientific research plans are so advanced that the technological path for providing them has yet to be defined. Many of the fields represented at the APS will need grid computing. These range from now-emerging computational grids required by computationally intensive fields (e.g., molecular orbital calculations and many modeling and simulation tasks) to the proposed virtual data grids needed by data-intensive fields. Meeting these requirements will take a challenging interplay among the operation of the production network, computing, and testing and deployment of new capabilities on a rapid schedule. Close contact with the research and technical communities is essential.
Continuation of the indispensable benefits of APS computing and networking to the APS programs depend on efforts in the following areas and require sufficient funding to meet the program goals.

The APS networking will expand performance levels to meet the escalating program requirements. Network rate capability is expected to need exponential growth of a factor of two per year, on the basis of past experience and programmatic predictions. The APS must also expand and enhance the services that allow programmatic users to use the network for collaboration.