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*Building Enterprise Value on Sustainable Foundations*

# NATURAL CAPITAL ASSET MANAGEMENT (NCAM)™

## PHASE II INVENTORY DEVELOPMENT REPORT
## ASSET REVITALIZATION INITIATIVE
## SAVANNAH RIVER SITE PILOT PROGRAM

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*Prepared for*

SAVANNAH RIVER NUCLEAR SOLUTIONS

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# Executive Summary

## Background

In conjunction with Asset Revitalization goals to develop systems that catalogue and value built infrastructure and related assets, Savannah River Nuclear Solutions (SRNS) engaged Koetz and Duncan LLC to provide technical support and develop tools that can integrate similar information, analytic and management concepts for Natural Capital Assets (NCA) at SRS.

Within DOE, the Savannah River Site (SRS) is an industrial complex dedicated to the safe stabilization, treatment, and disposition of nuclear materials, spent nuclear fuel, and radioactive waste. With an overarching goal of providing Nuclear Knowledge for the Nation, SRS has at present four primary missions: Environmental Management (or EM, responsible for cleaning up the Cold War legacy and preparing for Long Term Stewardship); National Nuclear Security Administration (NNSA)-Defense Program (DP); NNSA Nuclear Non-Proliferation Program; and the Savannah River National Laboratory (SRNL). The SRS is situated on 197,925 acres (310 square miles) and has a workforce of 12,000 people with an annual budget of approximately $2 billion. There are over 7 million square feet of buildings containing millions, if not billions of dollars worth of equipment.

The Asset Revitalization Initiative (ARI) is a Department of Energy (DOE) Complex-wide program to advance the beneficial reuse of the agency's unique and diverse mix of assets, including land, facilities, infrastructure, equipment, technologies, natural resources, and a highly skilled workforce. Operating in conjunction with the Office of Legacy Management (LM), the ARI goals are to promote an efficient business environment to encourage collaboration between public and private resources, and to integrate DOE missions with community interests.

The ARI incorporates a paradigm shift in how the department views its capital from a liability orientation to one that recognizes the asset value DOE land, world-class facilities, highly skilled workforce, supportive host communities, and irreplaceable natural, cultural, and historical resources. Current mission and asset planning in a new fiscal environment is driving LM/ARI reuse activities to improve ongoing efforts using new, innovative and more streamlined approaches to achieve more efficient results, and to become more aggressive in its approach regarding goals for clean energy and energy security, stakeholder engagement, and streamlined property and technology transfer processes.

Communication is a key piece of revitalization programming. Reuse of DOE property depends on community and economic entities knowing the assets are available; bringing compatible use opportunities to the table; and workable transfers executed to enable redevelopment using the property assets. Field Office Managers (FOM) are annually required under regulations in 10 CFR Part 770 to make available to Community Reuse Organizations and other persons and entities a list of real property at defense nuclear facilities that DOE has identified as appropriate for transfer for economic development using any effective means. The Preliminary Site Screening questionnaire included as an appendix to this report confirms the role of natural capital capacity in reuse, and the value of data that communicates it. In that survey, the "Site Must Haves" includes various land, air, and water asset components with defined capacity requirements such as contiguous acres and millions of gallons of water available daily.

## SRS NCAM™ Project History

In Phase I of the SRS NCAM™ project, completed in 2012, a preliminary Architecture and Design Report was prepared after review of SRS asset management systems for facilities, environment, geospatial information, and other relevant data, law, and policy. The Preliminary Design Report identified the natural capital categories and subcategories, and postulated an inventory design that correlated to nuclear security, energy production, and environmental management missions.

For Phase II of this Project, ARI is supporting a Pilot Study NCAM™ Inventory at SRS to provide capacity and capability data and information regarding air, land, and water assets that play a key role in mission requirements and potential community-based development. The SRS NCAM™ project is also serving as a case study for DOE HQ development of advance planning to support the sustainable modernization of DOE natural capital assets and facilities through reuse and transfer under Asset Revitalization. NCAM™ inventory and management tools are also being reviewed for input into corporate approaches for infrastructure planning that allows the DOE to fulfill mission requirements with a more efficient, higher quality, and condensed footprint envisioned under numerous laws, regulations, and Executive Orders.

Tasks for the Phase II Project included identifying Natural Capital capacity and capability data for communication to stakeholders, community partners, and potential reuse parties. As part of this task, the Project examined data collection procedures used by potential re-user entities and authorities to site economic development project with a view to correlating DOE information sharing requirements under law and policy with typical redevelopment requirements and processes.

Phase II tasks also included data collection, GIS query, and inventory compilation processes, as well as creation of the prototype inventory for the air, land, and water assets at SRS that are currently used, banked, and in restoration as Natural Capital. As will be described in this report, the challenges in calculating and compiling foundation natural capital data required a revision of the preliminary inventory design to a site-wide compilation that can be correlated to mission categories as needed. The Phase II Project report will also make recommendations regarding a process to use the capacity data to document higher operational performance factors from natural capital investment and operational efficiencies.

## SRS NCAM™ Pilot Study Results

The standard NCAM™ System addresses two main categories of natural capital: Natural Infrastructure and Ecosystem/Regenerative Assets. Within the natural infrastructure category, there are assets that are generally owned or held as in conjunction with real property, and assets that result from permitted uses overseen by a regulatory process. The SRS NCAM™ Pilot Inventory accounts for the former as Operational Assets (OPS), and the latter as Residual Material Management (RMM) Assets. A fuller description of each as applied in the project format is as follows:

- **Operational Assets (OPS)**: Air, Land, and Water elements owned or controlled by the Department of Energy or its assigns and currently allocated to a mission-related activity for use in meeting operational performance factors. Examples include land under and around buildings, surface and groundwater, controlled airspace, land/airspace comprising rights-of-way, drinking water, silviculture production areas.
- **Residual Material Management (RMM)**: Air, Land, and Water elements currently allocated by permit or license to the Department of Energy or its assigns for use within regulatory parameters as receptor ca-

pacity for residues or discarded materiel generated while meeting operational performance factors. Examples include a Title V Air Permit, NPDES Permits, RCRA Permits, landfill/trench capacity.
- **Rejuvenative/Ecosystem Assets (ECO)**: Air, Land, Water, Plant, and Biotic Communities providing rejuvenation or ecosystem services such as groundwater recharge, habitat, carbon sequestration, filtration/purification. Examples include Crackerneck WMA, Carolina Bays, Pine Plantation acreage, Upper Three Runs Creek.

The Preliminary NCAM™ Inventory prepared under this SRS Pilot Program has produced the first compiled "asset" inventory for air, land, and water assets needed for economic development or reuse activity. By creating an inventory system for natural assets that correlates to those currently used for physical infrastructure, NCAM™ generates and compiles information specifically sought by development authorities and needed by ongoing mission activities, bringing these key data outside the compliance stovepipe for broader use in revitalization and mission programs.

The NCAM™ Inventory Display starting on Page 18 shows the volume data organized in a spreadsheet format by asset type within each natural capital element. The Available Capacity determinations are the differential factors between the Site total and the asset capacity in use, and provide a preliminary indication of assets potentially available for mission and revitalization programming subject to applicable regulations.

**Inventory Data Collection and Evaluation**

Using results of the Architecture and Design Study, spreadsheet-based input tables were set up for each of the three categories of natural capital assets at SRS noted above. Within the categories were the possible uses to which air, land, and water elements could be put and entry sections for the quantified volumes held and in use. These forms were submitted to experts in program offices overseeing the assets, and the data entries received were aggregated into the Inventory compilation.

For the most part, quantitative designations have not heretofore been applied to many of the natural capital categories and items recorded in this Inventory. Therefore, the compilation and recording process followed for this project used a combination of assumptions and derivative calculations to generate several entries for which values are not currently maintained at SRS and therefore input data was not directly received. Where data gaps prevented performing calculation procedures, the inventory was marked for future revision when values can be ascertained.

Data pertaining to Residual Material Management capacity did not require additional calculations beyond the net capacity availability recorded on the input sheets. A second sample of Residual Material Management data was collected by SRNS personnel for the Paducah Gaseous Diffusion Plant or PDGP, and was included in the study to demonstrate how the data could be collected site wide.

The pool of Ecosystem/Rejuvenative Assets are extensive at the SRS and some detailed data regarding higher-profile subsets of assets, such as Carolina Bays or Red Cockaded Woodpecker habitat were generally available. However, most volumes of air, land, or water performing certain services or providing particular capacity required derivative calculations after descriptive geographic locations were identified by SREL experts. These first-cut calculations should be reviewed by site personnel, either separately or as part of comprehensive planning procedures, and refined as necessary.

## Comprehensive Planning Interface

As outlined in the 2011 Report to Congress, the ARI Program groups reuse activities in four use categories: Energy Production; Industrial; Research and Development; and Wildlife and Recreation, also noting projects as Regional Initiatives or those supported by a Community Reuse Organization. At the SRS, its *Land Use and Facilities Planning Process* does not currently maintain formal or specified use designations for real and infrastructure properties, but retains applicable data in GIS and other tools that identify natural and physical infrastructure to meet various needs. Other complex sites, such as Hanford, have established more specified use designations in anticipation of community reuse of large portions of the Site, but this type of system is not necessarily appropriate for SRS where the Site is primarily intended for continued Federal use.

Land and natural resource categories in the *Land Use and Facilities Planning Process* capture a portion of the natural capital portfolio at SRS, particularly land. As part of the ARI initiative at SRS, ARI use categories and applicable NCAM™ data could be further incorporated into comprehensive planning. From a current planning perspective, the NCAM™ Inventory Assets compiled in this Pilot Program can be categorized as "Used" or "Banked" although more formal designations or recordation may occur later as the planning process continues. The inventoried assets may also be designated as "reusable" or "co-useable" for future enterprise activities. Current examples of co-use include land for hunting or leases to other Agencies. For the most part, all the natural capital assets have the potential for more than one use designation or could be changed depending on mission needs. Use designations will be of particular relevance to Environmental Management assets reentering the portfolio for active purposes while subject to various use restrictions.

## Wider DOE Application

The SRS pilot study is intended as a possible template for data collection at other sites in the DOE Complex. This Study will also be considered in DOE HQ development of advance planning to support the sustainable modernization of DOE natural capital assets and facilities through reuse and transfer under Asset Revitalization. NCAM™ inventory and management tools are also being reviewed for input into corporate approaches for infrastructure planning that allows the DOE to fulfill mission requirements with a more efficient, higher quality, and condensed footprint envisioned under numerous laws, regulations, and Executive Orders.

In light of the potential for additional application of an NCAM™ Inventory applications at other DOE sites, as an additive element for this project, SRNS personnel were also able to collect comparable data in the Residual Material Management Asset category from Paducah Gaseous Diffusion Plant (PGDP). Although the PDGP Inventory is limited to the Residual Materials Management category of natural infrastructure, its development for this Project is extremely useful and supports key findings for broader implications of NCAM™ and ARI procedures:

- Use of the Data Input Sheets as currently formulated are flexible enough to record data at diverse Complex Sites while providing consistency and replicable collection methods that support NCAM™ as a DOE-wide system.
- The RMM Asset capacity depicted again aligns with several categories and features of a "Must Have" list used to scout locations for business and economic development.
- The current PGDP capacity levels for RMM have both similar and differentiated levels to those of SRS; comparison illustrates how DOE mission or revitalization choices could be based on asset availability in one or more categories.

The full value of the NCAM™ Inventory data and information will further emerge as it is applied in strategic planning and communication processes within the SRS and with local communities and potential reuse entities. Review and comment by both Savannah River Site and DOE Headquarters personnel will provide valuable in-depth responses and recommendations for further use and refinement of the NCAM™ Inventory.

**Next Steps**

The NCAM™ System as a tool, and the data, information, and knowledge it generates are usable for both internal and external DOE processes. The former includes uses for site- and complex-level planning, legacy programming and investment, and operational performance factors. External to DOE, NCAM™ data can be the basis for positive communication to reuse entities, Community Reuse Organizations, host communities, and state and local government entities to enable revitalization or garner support for mission activities. Effective use of this tool and the information it contains has many possible applications at both the headquarters and site level.

DOE experts should fully evaluate the results and make recommendations regarding inventory design, data inclusion, and data communication protocols to enable more widespread and consistent use of NCAM™ in relevant DOE management processes. This QA/QC process both improve the execution of a NCAM™ process for DOE, and establish consistent and replicable protocols for all DOE Sites.

# I. Natural Capital Asset Management: Purpose of Phase II Project

The Asset Revitalization Initiative (ARI) is a Department of Energy (DOE) Complex-wide program to advance the beneficial reuse of the agency's unique and diverse mix of assets, including land, facilities, infrastructure, equipment, technologies, natural resources, and a highly skilled workforce. The goals are to promote an efficient business environment to encourage collaboration between public and private resources, and integrate DOE missions with community interests. The ARI incorporates a paradigm shift in how the department views its assets, recognizing in a 2011 Report to Congress that "[i]n addition to land, DOE's assets include distinctive world-class facilities; a highly skilled workforce; supportive host communities; and irreplaceable natural, cultural, and historical resources."[1]

Concurrently, strategic planning at the Savannah River Site includes transforming past environmental liabilities into revitalized and repurposed assets for future use in national security, clean energy development, and environmental management programs and missions under an enterprise vision linked to the DOE comprehensive Asset Revitalization Strategy.[2]

In conjunction with Asset Revitalization goals to develop systems that catalogue and value built infrastructure and related assets, Savannah River Nuclear Solutions (SRNS) engaged Koetz and Duncan LLC to provide technical support and develop tools that can integrate similar analytic and management concepts for Natural Capital Assets (NCA) using the Savannah River Site as a pilot project (SRS or Site). Natural Capital Asset Management (NCAM)™ will identify the natural asset capacity and related capability available to current SRS missions and future program planning.

The Phase II Project will deliver a Natural Capital Inventory compiled in table format from various existing data sources to demonstrate a portfolio view of the SRS from a broader perspective. Classically, depictions of site assets were limited to the built structures, utility or other infrastructure, and the capability provided by technical and logistical support to new or enhanced mission profiles. The addition of the natural assets to the recorded and visible portfolio more clearly represents the total capacity, capability and value of the SRS and other DOE sites. Information and knowledge from these quantified data elements adds needed depth to the communication and execution processes for both mission and revitalization goals.

As this project will generate a prototype, further integration of these inventories and concepts in ongoing comprehensive planning requires continued interface with many stakeholders both within the SRS and the community. The concept of assigning value to the natural assets is a fundamental shift in the existing process used to accept or decline new missions or partners. The compiled NCAM™ information provides added knowledge to the trustees of the decisions pertaining to the highest and best use of the Site by requiring natural capital alignment in decisions, understanding of infrastructure capacity, and determinations of value to mission needs. The NCAM™ Pilot can support the risk and value considerations envisioned in the Comprehensive Planning Process to ensure a sustainable and enduring SRS role in Environmental Risk Reduction, Nuclear Material Management, and National Security.

In Phase I of the project, completed in 2012, a preliminary Architecture and Design Report was prepared after review of SRS asset management systems for facilities, environment, geospatial information, and sustainability along with documents prepared under NEPA, other law and regulation, Executive Order, planning programs and DOE policy. The Preliminary Design Report identified the categories and likely ele-

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[1] U.S. Department of Energy, *Asset Revitalization Initiative, Report to Congress,* August 2011, p. iii.

[2] Savannah River Site Strategic Plan, September 2011. http://sro.srs.gov/docs/srsstrategicplan2011-2015.pdf

ments of the Natural Capital categories, and postulated an inventory design that correlated to nuclear security, energy production, and environmental management missions.

Tasks for the Phase II Project included identifying Natural Capital capacity and capability data for communication to stakeholders, community partners, and potential reuse parties. As part of this task, the Project examined data collection procedures used by reuse entities and authorities to site economic development projects, with a view to correlating DOE information sharing requirements under law and policy with typical redevelopment requirements and processes.

Phase II tasks also included data collection, GIS query, and inventory compilation processes, as well as creation of the prototype inventory for the air, land, and water assets at SRS that are currently used, banked, and in restoration as Natural Capital. As will be described in this report, the challenges in calculating and compiling foundation natural capital data required a revision of the preliminary inventory design to a site-wide compilation that can be correlated to mission categories as needed. The Phase II Project report will also make recommendations regarding a process to use the capacity data to document higher operational performance factors from investment and operational efficiencies.

# II. Background: Natural Capital Asset Data in Asset Revitalization

The Department of Energy is the fourth largest landholder in the Federal government, operating at 50 major sites on 2.4 million acres nationwide. Throughout its history, the weapons Complex has largely been sited and maintained because of its natural capital capacity.[3] Vast volumes of land for safety and security, water for industrial processes, and air for outfall were assets critical to nuclear security operations. But rectifying past historical practices and re-tooling to comply with fifty years of environmental law and regulation altered the primary focus of air, land, and water management across the DOE Complex to one of *liability*, and the *asset* value of natural capital was overshadowed.

The combination of success and challenges in more recent decades are turning the needle back to the asset side. Fifty years of ecosystem management have preserved and conserved some of the most valuable and irreplaceable sanctuaries for flora and fauna in the nation. Restoration successes are bringing physical and natural assets back into the usable portfolio for activities compatible with ongoing or long-term cleanup program management. And as new fiscal and mission efficiencies shrink footprints, both physical and natural infrastructure assets are becoming excess to mission needs and available for repurposing and reuse.

As described by the Office of Legacy Management (LM), three drivers are significantly affecting the use of DOE assets over the next decade, all with a view toward expected lower use rates by the Department itself: [4]

- Reductions in DOE's footprint as the Office of Environmental Management (EM) program completes significant portions of cleanup;
- Changes to DOE's nuclear security infrastructure as the National Nuclear Security Administration (NNSA) modernizes the nuclear security enterprise; and
- Improvements in environmental, energy, and economic performance through implementation of efficiencies in clean energy and water use to meet sustainability and energy security goals.

So as DOE transitions to sustainability-based programs and management that reduces the used portions of its infrastructure portfolio, the Department now finds itself in a position to apply its considerable asset stockpile to its evolving mission, to continued provision of ecosystem services, and to reuse-based economic development in the regional communities where it operates.

## A. Asset Revitalization Initiative

Federal law and Executive Orders require executive agencies hold only that land necessary to economically and efficiently support agency missions,[5] and DOE initiated a comprehensive review of all the Department's assets and possible disposition paths in examining how best to utilize its vast and varied assets.[6] As part of this effort, DOE recognized that its asset portfolio includes "distinctive world-class facilities, a

[3] President Truman's 1950 order to expand nuclear security activities required a new production facility in addition to those already at Hanford, Washington. The primary and non-negotiable siting criterion for this new location: 600 cubic feet per second of water from a reliable and dedicated source.

[4] U.S. Department of Energy, *Asset Revitalization Initiative, Report to Congress,* August 2011, p. iii.

[5] Specifically, Executive Order 12512, Federal Real Property Management, requires executive agencies to ensure the effective use of real property in support of mission-related activities. Also, to stimulate the identification and reporting of excess real property and to achieve maximum utilization, the Federal Property and Administrative Services Act of 1949, as amended, requires all executive agencies to periodically review their real property holdings. These reviews identify property which is "not needed," "underutilized," or "not being put to optimum use."

[6] *The Asset Revitalization Initiative, Report to Congress August 2011*, U.S. Department of Energy, p. iii.

highly skilled workforce, supportive host communities, and irreplaceable natural, cultural, and historical resources,"[7] although to a great degree the latter assets are subsumed within the traditional catch-all category of "land."

Ongoing departmental efforts to consolidate mission areas, sites and facilities--and reduce the overall operational footprint of the DOE complex across the country--have already identified the potential for 15,000 acres that could be made available in the next 10-12 years for beneficial reuse.[8] Since the 1950s, DOE and its predecessor agencies have completed 95 transfers of approximately 25,500 acres of land, facilities and other assets for beneficial reuse, including excess fire stations, water treatment plants, water production facilities and other land, assets and facilities that local communities are using to support their civic, economic and social needs. Of the assets undergoing Environmental Remediation, DOE has already supported the cleanup and closure of approximately 90 sites that were involved in US nuclear weapons development, and many of these sites are also in beneficial reuse.

Current mission and asset planning in a new fiscal environment is focusing LM reuse activities under the Asset Revitalization Initiative (ARI) to improve ongoing efforts using new, innovative and more streamlined approaches to achieve more efficient results, and to become more aggressive in its approach.[9] Going forward, the ARI is basing its program efforts on the following key elements in that Approach: [10]

- Paradigm shift in how the department views its assets
- Accelerate the current shift to multiple site uses and users
- Transform the workforce to meet future needs
- Partner with non-DOE entities
- Promote DOE national goals for clean energy and energy security
- Streamline property and technology transfer processes to meet timetables to take advantage of private-sector opportunities
- Engage stakeholders significantly: generate the best ideas and advance to positive outcomes

The Asset Revitalization Initiative (ARI) is also focused on communicating past efforts and lessons learned from DOE's long history of property management to enhance current and future efforts to improve the efficiency and effectiveness of future land, asset and facility transfer and beneficial reuse.[11]

Key elements of the ARI include an efficient business environment to encourage collaboration between public and private resources, and integration with DOE missions with community interests. Its vision of asset management includes *DOE Operations* that are conducted in a sustainable manner with facilities and transit powered by clean energy; modern, adaptable, and efficient *Site Infrastructure*; thriving *Public-Private*

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[7] Ibid, p. iii.

[8] U.S. Department of Energy, Asset Revitalization Initiative. http://energy.gov/ari/overview

[9] U.S. Department of Energy, *Asset Revitalization Initiative*. http://energy.gov/ari/overview

[10] Asset Revitalization Initiative Brochure, p. 4.
http://energy.gov/sites/prod/files/2013/08/f2/ARI%20Brochure%20Update%20062813%20FINAL.pdf

[11] DOE's overview of the ARI effort describes how the program benefits local communities through economic development efforts, re-industrialization, technology transfers, and other public and private sector partnerships. Examples include environmental researchers who have access to protected and recovering natural habitats, development and deployment of technical and manufacturing technologies, and energy technology development and deployment that will promote energy security, energy sector employment and energy independence. Reuse successes inform continuing opportunities including clean energy development, manufacturing, nature preserves, educational centers, recreation, and other mixed commercial or industrial reuse opportunities.

*Partnerships* that create new jobs while helping meet future workforce needs; and *Local Communities* connected to DOE sites whose activities are a driving force behind regional development.[12]

## B. NCAM™ Design Framework

NCAM™ is an empirical data-to-information-to-knowledge system that quantifies and catalogues the air, land, and water capital assets owned or accessed by client enterprise activities. Complimentary to impact analysis or compliance assurance, NCAM™ inventories natural assets for their capacity, capability, and value in sustaining operations and ecosystem services under two primary use categories:

- Natural Infrastructure, made up of air, land, and water assets sanctioned for use by deed, lease, permit, license, or other formally recognized designation; and
- Banked or Ecosystem Assets comprised of air, land, water elements maintained in a conserved state to generate ecosystem services, research opportunities, provide credits, or be re-designated for enterprise use in future where appropriate.

Developing an NCAM™ System is a phased process that begins with a Preliminary Design and Architecture Study. This includes initial data gathering and familiarization though site visits, facility tours, SME/ Stakeholder meetings and interviews. First steps also include research and review of internal and external enterprise activities and goals, strategic plans, community outreach, relevant data and data systems, reports, natural asset holdings (including deeds, leases, permits, banking programs), comprehensive planning documents, and other historical records.

Next, a client-specific prototype framework is designed around standard parameters for air, land, and water use. The NCAM™ Framework Template is structured and mapped to key categories or features of the client's enterprise. The inventory includes developing customized input sheets to elicit natural capital data from iterative process steps following the Framework Template design that are then customized to particular client assets, operational requirements, or preferences during the follow-on phases. The data elements are then compiled in a Natural Capital Asset Inventory that records the data and information related to the enterprise natural capital capacity.

NCAM™ provides unique knowledge to an array of management needs, but is primarily useful in the following areas:

- Enterprise Planning Functions – opportunities for optimized use, conservation, and growth of enterprise activities using informed capital inventories
- Asset Disposition/Revitalization – high capacity/high value natural capital asset elements of a property can enable and enhance sale, lease or other transfer for follow-on uses in economic development
- Built Infrastructure Recapitalization – infrastructure improvements or replacements can be fully valued when natural infrastructure savings or use reductions are included
- Environmental Management Transition – the capacity and capability of assets restored through restoration and cleanup activities can be more fully integrated into reuse or conservation, mitigating damage claims and lost opportunity costs.
- Market Share Expansion - documenting efficient Natural Capital use rates supports affirmative procurement opportunities under Federal Acquisition Regulations and other green purchasing programs.

[12] U.S, Department of Energy, *Asset Revitalization Initiative.* http://energy.gov/ari/mission-and-vision

## C. NCAM™ in Revitalization Processes and Transfer Mechanisms

Reuse of DOE property depends on community and economic entities knowing it is available; having a compatible use opportunity brought the table; and a workable transfer executed that enables redevelopment using the property assets. To accomplish this, new procedures were added to property transfer and disposal mechanisms already available under Federal law. [13] The Defense Authorization Act of 1998 directed DOE to prescribe regulations for the sale or lease of real property for economic development purposes. The resulting regulations in 10 CFR Part 770 include requirements that Field Office Managers (FOM) annually make available to Community Reuse Organizations and other persons and entities a list of real property at defense nuclear facilities that DOE has identified as appropriate for transfer for economic development.[14] FOMs may use any effective means of publicity to notify potentially-interested persons or entities of the availability of the list; upon request, FOMs must provide to interested persons and entities relevant information about listed real property, including information about a property's physical condition, environmental, safety and health matters, and any restrictions or terms of transfer.[15]

Including Natural Capital Asset capacity data with management and information processes under 10 CFR 770 and other DOE legacy and revitalization/reuse programs supports many aspects of the ARI approach:

- Developing data on the asset value inherent in properties shifts the management paradigm from liability to asset
- Operational capability inherent in natural capital capacity attracts a broader range of interested parties and accelerates the current shift to multiple site uses and users
- Potentially expands the pool of non-DOE entities parties interested in partnering
- Supports programs that can meet DOE national goals for clean energy and energy security because natural capital is the sine qua non of energy production
- Adds data upfront to streamline property and technology transfer processes to meet timetables to take advantage of private-sector opportunities
- Serves as a "Best Idea" to significantly engage stakeholders on a positive platform
- Supports an efficient business environment to encourage collaboration between public and private resources

In addition, NCAM™ data can align the ARI approach with established industrial and commercial real estate practices for locating or screening property. Appendix A contains an example of such a screening document used in South Carolina that typifies the various categories of "Must Have" asset features for evaluating further transfer interest. Entitled "Site Must Questionnaire," this preliminary site screening tool requests information on land acreage and built infrastructure capacity such as rail, road, electric, and natural gas that is typically identified in real property management processes. But it also categorizes other natural infrastructure components as "must haves" including water supply, wastewater carrying capacity, airshed car-

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[13] Various laws, regulations and orders govern real property and facility disposition. Process requirements will depend on the original authority used to acquire the realty Section 161g of the Atomic Energy (42 USC Section 2201) or the Atomic Energy Communities Act (42 USC Section 2301, et seq.), specific Congressional direction in law (e.g., P.L. 107-107 for Rocky Flats), and non-exempt property subject to the Federal Property & Administrative Services Act of 1949 (40 U.S. Code Section.101, et seq. and 41 CFR 102) which can include disposal by demolition (Federal Management Regulation 102-75.990 et seq.).

[14] 10 CFR Section 770 et seq. Improvements at defense nuclear facilities on land withdrawn from the public domain that are excess, temporarily underutilized, or underutilized, for the purpose of permitting economic development may only be transferred by lease. 10 CFR Section 770.2 (a) and (b).

[15] 10 CFR Section 770.7 (a) and (b).

rying capacity (as evidenced by attainment designation), and hazardous material disposal capacity. This type of data will be more readily available and communicable using NCAM™ procedures.

## D. NCAM™ Interface with SRS Comprehensive Planning and ARI Use Categories

Within DOE, the Savannah River Site (SRS) is an industrial complex dedicated to the safe stabilization, treatment, and disposition of nuclear materials, spent nuclear fuel, and radioactive waste. With an overarching goal of providing Nuclear Knowledge for the Nation, SRS has at present four primary missions: Environmental Management (or EM, responsible for cleaning up the Cold War legacy and preparing for Long Term Stewardship); National Nuclear Security Administration (NNSA)-Defense Program (DP); NNSA Nuclear Non-Proliferation Program; and the Savannah River National Laboratory (SRNL). The SRS is situated on 197,925 acres (310 square miles) and has a workforce of 12,000 people with an annual budget of approximately $2 billion. There are over 7 million square feet of buildings containing millions, if not billions of dollars worth of equipment.

As outlined in the 2011 Report to Congress, the ARI Program groups reuse activities in four use categories: Energy Production; Industrial; Research and Development; and Wildlife and Recreation.[16] ARI Transfers and Projects are also noted when they are Regional Initiatives and when carried out by a Community Reuse Organization.[17] At the SRS, its *Land Use and Facilities Planning Process* is described as the "process for planning for the future use and physical development of SRS in terms of: Land, Infrastructure, Facilities, Natural Resources and Environment.[18] The cited presentation notes the missions, tenants, and a partial inventory of land and infrastructure assets, but does not indicate how the infrastructure inventory and mission activities would be correlated for approved use, possibly using dsignations such as the ARI categories noted above. For example, Defense Program assets are not designated as industrial, and while natural resources are generally noted as wildlife or forest, uses such as recreation, research, or ecosystem services are not specifically noted. The following factors regarding SRS use planning and asset management were noted in the course of executing the project tasks and may be applicable to other DOE sites:

- Currently, SRS does not maintain formal or specified use designations for real and infrastructure properties, instead maintaining a programmatic information system using GIS and other tools that identify natural and physical infrastructure to meet various needs. Other complex sites, such as Hanford, have established more specified use designations in anticipation of community reuse of large portions of the Site, but this type of system is not necessarily appropriate for SRS where the Site is primarily intended for continued Federal use.
- "Positive impacts" identified through NEPA Analysis (such as the Environmental Assessment for the biomass-fueled co-generation plant) or asset restoration in the EM program that are potentially usable as asset capacity do not appear to be recorded in EMS, FIMS, or other data system as a capacity addition, plant value increase, or asset disposition in forms or processes that would communicate future use capability.
- The Savannah River Ecology Laboratory (SREL), a research unit of the University of Georgia (UGA), maintains detailed databases regarding the Site's ecology compiled through 60 years of fundamental and applied ecological research. Services and uses of the ecosystem assets were qualitatively identified

[16] T*he Asset Revitalization Initiative, Report to Congress August 2011*, U.S. Department of Energy, p. 5.

[17] T*he Asset Revitalization Initiative, Report to Congress August 2011*, U.S. Department of Energy, p. 6.

[18] *Land Use and Facilities Planning Process*, Presentation to the Citizens Advisory Board September 25, 2012, Savannah River Nuclear Solutions Co., LLC, p. 3.

in responsive detail by the Laboratory leadership but the particular areas or volumes of assets had no formal designations or volumes assigned.

The *Land Use and Facilities Planning Process* for SRS is intended to support current missions and transformation initiatives by: a) Continued Refinement of the Land Use and Facilities Planning Process Enhancement; and b) Enhancement and Development of Planning Tools and Data Capabilities.[19] As part of the ARI initiative at SRS, ARI use categories and applicable NCAM™ data may be of use in comprehensive planning as mission requirements and enterprise transformation efforts progress given the role this information plays in reuse as supported by Appendix A.

From a functional planning perspective, the NCAM™ Inventory Assets compiled in this Pilot Program can be categorized as "Used" or "Banked" although more formal designations or recordation may occur later as the Planning Process continues. The inventoried assets may also be designated as "reusable" or "co-useable" for future enterprise activities. Current examples of co-use include land for hunting or leases to other Agencies. For the most part, all the natural capital assets have the potential for more than one use designation or could be changed depending on mission needs. Use designations will be of particular relevance to Environmental Management assets reentering the portfolio for active purposes while subject to various use restrictions.

## E. NCAM™ Categories at SRS

As noted above, the standard NCAM™ System has two main categories of natural capital: Natural Infrastructure and Ecosystem/Regenerative Assets. Within the natural infrastructure category, there are assets that are generally owned or held as in conjunction with real property, and assets that result from permitted uses that generally involved a regulatory process. The SRS NCAM™ Pilot Inventory accounts for the former as Operational Assets (OPS), and the latter as Residual Material Management (RMM) Assets. A fuller description of each as applied in the project format is as follows:

- **Operational Assets (OPS)**: Air, Land, and Water elements owned or controlled by the Department of Energy or its assigns and currently allocated to a mission-related activity for use in meeting operational performance factors. Examples include land under and around buildings, surface and groundwater, controlled airspace, land/airspace comprising rights-of-way, drinking water, silviculture production areas.
- **Residual Material Management (RMM)**: Air, Land, and Water elements currently allocated by permit or license to the Department of Energy or its assigns for use within regulatory parameters as receptor capacity for residues or discarded materiel generated while meeting operational performance factors. Examples include a Title V Air Permit, NPDES Permits, RCRA Permits, landfill/trench capacity.
- **Rejuvenative/Ecosystem Assets (ECO)**: Air, Land, Water, Plant, and Biotic Communities providing rejuvenation or ecosystem services such as groundwater recharge, habitat, carbon sequestration, filtration/purification. Examples include Crackerneck WMA, Carolina Bays, Pine Plantation acreage, Upper Three Runs Creek.

The inventory design categories are intended to provide data, information, and knowledge that will inform both continuing operations, and legacy and revitalization efforts to "modernization-through-reuse" in cooperation with regional and community partners. As demonstrated by the "Must Have" questionnaire referenced in this report (and discussed further below), NCAM™ Inventory content correlates to asset capacity sought in economic development and reuse activities, and results will generate communicable information regarding available capacity at DOE Complex sites.

[19] Ibid, p. 9.

# III. ARI Pilot NCAM™ Project at the Savannah River Site

As tasked, a Pilot Study NCAM™ Inventory was developed at SRS to provide capacity and capability data and information regarding air, land, and water assets in relation to mission requirements and potential community-based development. The SRS NCAM™ process is also serving as a case study for DOE HQ development of advance planning to support the sustainable modernization of DOE natural capital assets and facilities through reuse and transfer under Asset Revitalization. NCAM™ inventory and management tools are also being reviewed for input into corporate approaches for infrastructure planning that allows the DOE to fulfill mission requirements with a more efficient, higher quality, and condensed footprint envisioned under numerous laws, regulations, and Executive Orders.

## A. ARI Pilot Tasks and Activities

In Phase I of the SRS NCAM™ Project, completed in 2012, a preliminary Architecture and Design Report was prepared after review of SRS asset management systems for facilities, environment, geospatial information, and sustainability, including review of documents prepared under NEPA, other law and regulation, Executive Order, planning programs and DOE policy. The Preliminary Design Report identified the categories and likely elements of the Natural Capital categories, and postulated an inventory design that correlated to nuclear security, energy production, and environmental management missions.

The first Phase II Project Task is to identify Natural Capital capacity and capability data for communication to stakeholders, community partners, and potential reuse parties. As part of this task, the Project examined data collection procedures used by potential reuse entities and economic development authorities with a view to correlating DOE information sharing requirements under law and policy with community redevelopment needs. This task includes developing processes and mechanisms for data collection from key data managers and the GIS system. The second Phase II Task requires development of a format for correlating and displaying the data. A Prototype Inventory has been developed that catalogues the capacity of air, land, and water assets at SRS that are currently used or banked as Natural Capital. Specific data as to the volumes of air, land, and water undergoing restoration in the Environmental Management or other programs was not specified, but the inventory design was structured to allow inclusion in a later development phase. The Phase II Project report will also make recommendations regarding processes to capture capacity and asset opportunities from investment and efficiencies achieved in meeting operational performance factors.

- **Process Notes**

Although compliance has played the key role in rectifying environmental damage of the past, transition to a sustainability focus can benefit from new paradigms to better align remaining and restored air, land, and water assets to the 21st century Department of Energy. NCAM™ is such a paradigm, and represents a different strategic and tactical approach to managing Federal enterprise as it relates to infrastructure. Recognizing the factors inherent in change and new things, executing these tasks encountered understandable limitations and unforeseen requirements to which the process adjusted as effectively as possible:

- Data requested through the input sheets was, in some instances, limited as to certain categories; for other quantifications such an ecosystem entries, significant additional calculations were needed to arrive at preliminary numbers. Numeric data from research sources was used to supplement values not available from GIS or current records. These limited instances of gaps or derived calculations are

noted wherever possible, and the authors encourage users to view the overall product more for its knowledge and communication potential than the data content in this initial effort.

- Calculating and compiling foundation natural capital data required a revision of the preliminary inventory design to a site-wide compilation that can be correlated to mission and operational activities as part of the next steps in implementing an NCAM™ System.
- Advance quality assurance and quality control procedures for determining and entering data will be a priority for later stages of the process.
- A Key Chart follows that describes placeholder data entries pending further information:

**Chart 1: Inventory Notation Key**

| Inventory Notation | | Application |
|---|---|---|
| | | |
| TBD | To Be Determined | Natural Capital Assets are likely to be in the SRS Portfolio, but numeric levels or volumes require further review before being included in the overall inventory |
| N/S | Not Specified | Either 'capacity' or 'current use' volumes in a category were not specified in the input submissions, and could not otherwise be determined within the scope of this project |
| N/C | Not Calculated | In instances where only one data element was provided regarding overall 'capacity' or 'current use,' or data remained to be determined, 'available' capacity was not calculated |
| N/A | Not Applicable | The Site does not, nor is not likely to, maintain natural capital assets for this use |
| Calculation Notations: | | Several Categories of natural capital assets are not currently tracked in DOE processes for volume capacity; where possible values have been generated by Project calculations and included (E.g., SRS airspace) |

- **Input and Calculation Factors**

As can be expected for any process that is first-of-a-kind in many respects, steps to identify and compile natural capital data at SRS necessitated several adaptive measures for inventory processes, as well as revision and improvements that will inform future inventory activities. The following notes outline factors influencing the data used or derived, and clarify sourcing used to supplement SRS data availability:

**1) Operations Data (OPS)**

- Aerodrome volume calculation based on sectional chart notices requesting no flight below 2000' msl and total site acreage
- Only data for land assets currently in use was specified, therefore total land capacity potentially available is not calculated at this time
- Timbering acreage cited from Forest Service reports
- Site Services-supplied data used for process water entries
- Drinking water inputs calculated using prior-year use levels as capacity baseline

**2) Residual Materials Management Data (RMM)**

- Use of aerodrome for smoke absorption in prescribed burns based on 1 km average height of smoke plume
- A baseline greenhouse gas capacity was not specified
- Greenhouse gas sequestration was calculated using the U.S. EPA Conversion Factor of 1.22 metric ton carbon sequestered annually by 1 acre of average U.S. forest

- Storm water permit levels were not specified
- Use of available airshed and water discharge elimination capacity subject to specified and limited regulatory increments[20]

**3) Ecosystem/Regenerative Asset Data (ECO)**

- ECO Data is primarily calculated based on GIS queries aligned with SREL definitions and descriptions of asset boundaries or volumes (e.g., habitat defined as all non-operational, not wetland acreage)
- The SREL input response was both comprehensive and extensive; for purposes of this pilot effort, several categories of Ecosystem Assets delineated by SREL were consolidated into broader roll-up categories. The valuable levels of detail and granularity provided will be retained for possible future use as SRS considers its comprehensive site planning and enterprise programming, and can easily be revised as needed
- The Key Chart below provides the primary numeric values used to calculate the recorded inventory volumes ascribed to the listed Ecosystem Assets:

**Chart 2: Acreage Calculation Key**

| Calculation Key | (figures provided by SRS inout submissions and GIS unless otherwise noted) | |
|---|---|---|
| | | |
| Site Acreage | | 197925 |
| | | |
| PPond | 2157 | |
| LLake | 1034 | |
| Other | 4209 | |
| Total Surface Water (NRDA Report 1995 P. 13) | | 7400 |
| Industrial | 15742 | |
| TR Landfill | 1380 | |
| Haz/LL Landfill | UNK | |
| | | 17122 |
| Wetland | 2446 | |
| CBays | 2450 | |
| | | 4896 |
| Subtotal (Industrial, wetland, surface water) | | 29418 |
| Site w/o Industrial | | 180803 |
| Site w/o industrial, wetland, surface water | | 168507 |

## B. Prototype Natural Capital Asset Inventory

The following NCAM™ Inventory Display shows the volume data organized by asset type within each natural capital element in a spreadsheet format. The Available Capacity determinations are the differential factors between the Site total and the asset capacity in use, and provide a preliminary indication of assets potentially available for mission and revitalization programming subject to applicable regulations.

[20] In the case of permitted air emissions, the Inventory values reflect maximum total potential emissions (MTPE) under current/expired permit and 2012 actual emissions. A permit renewal application is pending which will reflect lower MPEs based on current operations. All new emission sources will need to be below the Prevention of Significant Deterioration (PSD) limits. Some possible SRS "netting" may be available. Additional emission sources will require permit modifications and modeling considerations. For water discharges, values are based on average annual flow and average annual and permit limit concentrations for applicable outfalls. Additional discharges will require permit modifications and outfall considerations. All new discharges should be below the current applicable outfall maximum concentrations (mg/l). Additional new discharges will require permit modifications in conjunction with operational risk management.

## Chart 3: SRS Prototype Natural Capital Asset Inventory Display

| Air Assets | | Total Capacity | In Use | In Restoration | Available Capacity |
|---|---|---|---|---|---|
| | | | | | |
| | OPERATIONS | | | | |
| | | | | | |
| **Navigation/Transport** | Aerodrome to 2000' msl ($Nmi^3$) | 76.85 | 0 | | 76.85 |
| **Security/Buffer** | Aerodrome to 2000' msl ($Nmi^3$) | 76.85 | 76.85 | | 0 |
| **Communication/Bandwidth** | N/S | | | | 0 |
| **Process/Supply (Industrial)** | N/A | | | | 0 |
| **Other** | | | | | 0 |
| | | | | | |
| | RESIDUAL MATERIAL MANAGEMENT | | | | |
| | | | | | |
| **Part 70 Air Quality Permit TV-0080-0041** | Discharge of air contaminants into ambient air (Tons/year) | | | | |
| | Particulate Matter | 1240 | 18 | | 1222 |
| | Carbon monoxide | 453 | 52 | | 401 |
| | Nitrogen oxides | 3370 | 621 | | 2749 |
| | Sulfur dioxide | 9690 | 953 | | 8737 |
| | Lead | 4.69 | 0.00064 | | 4.69 |
| | VOCs/Ozone | 188 | 40 | | 148 |
| | Mercury | | | | 0 |
| | Hydrogen Chloride | | | | 0 |
| | Asbestos | | | | 0 |
| | Radioactivity | | | | 0 |
| | Alpha radionuclides | | | | 0 |
| | Halon/ODC | | | | 0 |
| **Greenhouse Gases (Tons CO2Eq)** | Biogenic Carbon Dioxide | TBD | 368358 | | N/C |
| | Carbon Dioxide | TBD | 96052.4 | | N/C |
| | Methane | TBD | 2877.21 | | N/C |
| | Nitrous Oxide | TBD | 5629.6 | | N/C |
| **Smoke/Contaminants** | Prescribed Burn Acreage (20000 acres) ($NMi^3$) | 1.89 | 1.89 | | 0 |
| | | | | | |
| | ECOSYSTEM SUSTAINMENT | | | | |
| | | | | | |
| **Habitat/Refugia/Transit** | SRS Airspace volume to 500' msl for food, flyways ($NMi^3$) | 19.19 | 19.19 | | 0 |
| **Cultural (Archeological/Spiritual))** | N/S | | | | 0 |
| **Cultural (Recreation/Scenic)** | Airspace volume over undeveloped acreage ($NMi^3$) | 17.38 | 17.38 | | 0 |
| **Societal (Research/Scientific)** | Airspace volume over undeveloped acreage ($NMi^3$) | 17.38 | 17.38 | | 0 |
| **Provisioning/Cultivation** | SRS Airspace Volume to 500' msl for Photosynthesis Support/GHG Uptake/Biotransporation ($Nmi^3$) | 19.19 | 19.19 | | 0 |
| **Rejuvenation (Drainage/Recharge/Retention)** | SRS Airspace Volume to 500' msl for Photosynthesis Support/GHG Uptake/Biotransporation ($Nmi^3$) | 19.19 | 19.19 | | 0 |
| **Component Retention/Recycling** | Airspace volume to 500' for monitored Contaminant Dilution/Retention/Attenuation including Prescribed Burning ($NMi^3$) | 19.19 | 19.19 | | 0 |

| Land Assets (in Acres unless otherwise noted) | | Total Capacity | In Use | In Restoration | Available Capacity |
|---|---|---|---|---|---|
| | | | | | |
| **OPERATIONS** | | | | | |
| | | | | | |
| **Buildings (Industrial)** | | N/S | 59 | | N/C |
| **Buildings (Administrative)** | | N/S | 44 | | N/C |
| **Buildings (Other)** | | N/S | 177 | | N/C |
| **Storage Area** | | N/S | 127 | | N/C |
| **Parking Lots** | | N/S | 234 | | N/C |
| **Roads** | Paved | N/S | 1023 | | N/C |
| | Not Paved | N/S | 2566 | | N/C |
| **Rail** | | N/S | 64 | | N/C |
| **Utility ROW (electrical)** | | N/S | 800 | | N/C |
| **Setback/Safety/Buffer** | | N/S | 217 | | N/C |
| **Extraction/Cultivation** | Biomass Fuel; Timbering (797 MBdft sawn; 2690 Mcord pulpwood) | 174000 | | | 174000 |
| **EM/Tanks/Storage** | | N/S | 2053 | | N/C |
| **Military Training** | ATTA Range | N/S | 8378 | | N/C |
| | | | | | |
| **RESIDUAL MATERIAL MANAGEMENT** | | | | | |
| | | | | | |
| **Radioactive Waste Landfill ($m^3$)** | SRS Remaining Low-level radioactive disposal | 225,640 | | | 225640 |
| **Landfill (Construction/Demolition) 065800-1901 (TPY)** | (permitted annual tonnage limit = 120,000 Tons per Year (TPY)) | 120,000 | 45,000 | | 75000 |
| | Remaining permitted disposal space/airspace (Cubic yards with ~40 Year capacity) | | | | 1,518,330 |
| **RCRA Landfill Hazardous Mixed Waste SC1890008989 SRS hazardous waste storage permit. In-use values are currently estimates. (Gallons)** | 1) Hazardous and Mixed Waste Container Storage permitted for a variety of liquids, solids and sludges | 358,000 | 355,000 | | 3000 |
| | 2) Transuranic Contaminated Waste | 1,234,000 | 1,134,000 | | 100000 |
| | 3) Liquid Mixed Storage Tanks | 120,000 | 90,000 | | 30000 |
| **Three Rivers Solid Waste Authority Landfill 024202-1101** | Municipal solid waste disposal with ~70 years capacity measured in cubic yards. However, permitted annual tonnage limit allotted as 250,000 Tons per Year (TPY) | 250,000 | | | 250000 |
| | Acreage | 1380 | 1380 | | 0 |
| **Settling Basins** | Par Pond (n.b. Cited as 2640 in other literature) | 2,157 | 2,157 | | 0 |
| | L-Lake | 1,034 | 1,034 | | 0 |
| **Wetlands Mitigation Bank SAC-27-2001-0523-G** | SRS wetlands mitigation bank supports wetland/Carolina Bay restoration in conjunction with USACE. (Credits) | 120 | 32 | | 88 |
| **Sanitary Wastewater Capacity (MGD)** | Current Peak and Future Clean Water Redirect Flow | 1.05 | 0.60 | | 0.45 |
| **Greenhouse Gas Sequestration** | SRS Pine Plantation (Metric Tons $CO_2$) | TBD | 156954 | | N/C |
| | | | | | |
| **ECOSYSTEM SUSTAINMENT** | | | | | |
| | | | | | |
| **Habitat/Refugia/Transit** | Forest and grassland ecosystems for uncommon and high-exemplar plant communities; nesting and breeding for wildlife, insect, game, mammal, and avian habitat; interconnects and transit corridors | 168507 | 168507 | | 0 |
| | RCW - Pine Plantation (64% total acreage) | 128651 | 128651 | | 0 |
| **Wetlands/Forested Wetlands** | N.B: Identified as 15,000 acres by 1995 NRDA Report | 2446.69 | 2446.69 | | 0 |
| **Wetlands/Carolina Bays** | | 2450.4 | 2450.4 | | 0 |
| **Cultural (Archeological/Spiritual))** | N/S | | | | 0 |
| **Cultural (Recreation/Scenic)** | | | | | 0 |
| **- Birding** | Crackerneck Set Aside | 10470 | 10470 | | 0 |
| **- Hunting** | | 168507 | 168507 | | |
| **- Bike trails (Mi)** | | 60 | 60 | | 0 |
| **- Walking Trails (Mi)** | | 14 | 14 | | 0 |
| **Societal (Research/Scientific)** | | 168507 | 168507 | | 0 |
| **Provisioning/Cultivation** | | 0 | 0 | | 0 |
| **Rejuvenation (Drainage/Recharge/Retention)** *(Site minus infra. and wetlands )* | Groundwater recharge, | 168507 | 168507 | | 0 |
| | | | | | |
| **Component Recycling/Formation** | N/S | | | | 0 |
| **Attenuation** | EM Program Natural Capital Assets | TBD | | | N/C |
| **Sequestration** | Carbon/Pine Plantations | 128651 | 128651 | | 0 |
| | Tritium | TBD | | | N/C |
| | Soil | TBD | | | N/C |

| Water Assets | | Total Capacity | In Use | In Restoration | Available Capacity |
|---|---|---|---|---|---|
| | | | | | |
| | **OPERATIONS** | | | | |
| | | | | | |
| **Docks** | N/S | | | | N/C |
| **Navigation/Transport** | N/S | | | | N/C |
| **Utility Corridor/ROW (Pipeline, Wells)** | N/S | | | | N/C |
| **Extraction (e.g. mining)** | N/A | | | | N/C |
| **Cultivation** | EM: Tritiated Water for irrigation (Mgal) | 8.7 | 8.7 | | 0 |
| **Safety/Buffer** | N/S | | | | N/C |
| **Surface Water Withdrawal (permit pending)** | Savannah River Water Rights (MGM) | 25185 | 329 | | 24856 |
| **Process/Supply** | Drinking/SRS Groundwater Aquifers (MGD) | 10 | 3 | | 7 |
| | Process/Service Water (GPM) | 3000 | 1125 | | 1875 |
| | Savannah River Withdrawal Pumphouse Capacity | 250000 | 6500 | | 243500 |
| | Fire Protection Pump Capacity (GPM) | 18250 | N/S | | N/C |
| | Fire Protection Tank Capacity (Gal)) | 3338000 | N/S | | N/C |
| | Steam Production (Units of Water) | TBD | | | N/C |
| **Environmental Management/Impoundment** | L Lake (Par Pond N/S) (MG) | 7000 | 7000 | | 0 |
| | | | | | |
| | **RESIDUAL MATERIAL MANAGEMENT** | | | | |
| | | | | | |
| **Sanitary Waste Water Permit #17679** | Treatment and discharge of sanitary waste water (MGD) | 1.05 | 0.25 | | 0.8 |
| **Stormwater/Industrial** | N/S | | | | 0 |
| **National Pollutant Discharge Elimination #SC 0000175** | Discharge treated wastewater to State waters (Pounds per year (Lbs/yr)) | | | | 0 |
| | Copper | 89 | 30 | | 58.5 |
| | Mercury | 175 | 6 | | 168.9 |
| | Zinc | 525 | 72 | | 452.7 |
| | Nitrogen | 23028 | 256 | | 22771.8 |
| | Total Suspended Solids (TSS) | 1360000 | 23400 | | 1336600 |
| | Biological Oxygen Demand (BOD) | 86955 | 3636 | | 83319 |
| **Radioactivity** | N/S | | | | 0 |
| **Construction** | N/S | | | | 0 |
| | | | | | |
| | **ECOSYSTEM SUSTAINMENT** | | | | |
| | | | | | |
| **Habitat/Spawning** | Fish, Invertebrates/Upper Three Runs Creek | 70967 | 70967 | | 0 |
| | Birds, Raptors/ Foraging and Nesting/Wetlands | 4896 | 4896 | | 0 |
| | Amphibians, reptiles, fish, Waterfowl/Surface Water | 7400 | 7400 | | 0 |
| **Habitat/Transit** | Savannah River Swamp Acreage | TBD | | | N/C |
| **Cultural/Artifact** | Carolina Bays | 2450 | 2450 | | 0 |
| **Societal (Research/Scientific)** | Aquatic permit Areas | TBD | | | N/C |
| **Provisioning/Cultivation** | Biofuel (Algae ) | 7400 | 0 | | 7400 |
| **Rejuvenation (Drainage/Recharge/Retention)** | Carolina Bay Enhanced Recharge | 2450 | 2450 | | 0 |
| **Component Recycling/Formation** | Terrestrial organic cycling for aquatic species | TBD | | | N/C |
| | | | | | |
| **Attenuation** | EM Remediation Zone Waters (other than Par Pond, L Lake) | TBD | | | N/C |
| **Sequestration** | (See EM above) | | | | |
| | | | | | |

## C. Preliminary Data Evaluation and Review

The full value of the NCAM™ Inventory data and information will emerge as it is applied in strategic planning and communication processes within the Site and with local communities and potential reuse entities. Review and comment by both Savannah River Site and DOE Headquarters personnel will provide valuable in-depth responses and recommendations for further use and refinement of the NCAM™ Inventory. For purposes of this report, initial review of the compiled data highlights several attributes of DOE site operations and future capacity that can inform mission and revitalization decisions in the three asset categories:

- **Operations**
  - SRS Aerodrome usable as both safety buffer and operational area
  - Combined bandwidth ranges and transmission infrastructure have operational use that can also support economic and community needs, but more capacity data needed
  - Significant surface and groundwater may be available for operational processes
  - Likely land availability for possible biomass or other Clean Energy applications will benefit from more detail regarding Environmental Management assets restored to the operational inventory

- **Residual Material Management**
  - SRS operating at a high degree of eco-efficiency given the relatively low levels of available capacity used in mission performance, with only the RCRA hazardous waste capacities operating at near-permitted levels
  - Notable Greenhouse Gas (GHG) tonnage of a kind comparable to credits registered in informal GHG trading markets sequestered in forested areas; data on soil sequestration could yield similarly significant levels
  - RMM Assets frequently provide concurrent value in ecosystem services (e.g., Par Pond, Controlled Burn Emissions)

- **Ecosystem/Rejuvenative Assets**
  - In the aggregate, SRS is nationally recognized as a major ecological sanctuary, but NCAM™ Inventory process generated disaggregated data that revealed individual ecosystem service components of particular significance; more granular data can further reveal expanded value platforms embedded in subset categories of ecosystem service
  - Air and airspace is a potentially under-recognized SRS natural asset for habitat and transit
  - Significance and value of EM assets returned to ecosystem processes should be further developed as part of data refinement

- **Data Issues and Follow-on Quality Assurance Improvements**

For the most part, quantitative designations have not heretofore been applied to many of the natural capital categories and items recorded in this Inventory. Therefore, the compilation and recording process followed for this project used a combination of assumptions and derivative calculations to generate as many preliminary entries as possible. And as noted previously, where data gaps prevented performing calculation procedures, the inventory was marked for future revision when values can be ascertained.

As might be expected, data pertaining to Residual Material Management capacity was the most readily attained as quantitative values are the definitional element of the permits by which they are designated, and thereby allowed for a second sample compilation at another DOE Site (Paducah Gaseous Diffusion Plant or PDGP) to be included in the study. The next section gives further details of the additional data inclusion.

As the Ecosystem/Rejuvenative Assets are so extensive at the SRS, detailed data regarding higher-profile subsets of assets, such as Carolina Bays or Red Cockaded Woodpecker habitat were generally available, but for the most part, the volumes of air, land, or water performing certain services or providing particular capacity required derivative calculations after descriptive locations were identified by SREL experts. These first-cut calculations should be reviewed by site personnel, either separately or as part of comprehensive planning procedures, and refined as necessary.

- **Additional Sample Data Inclusion**

In light of the potential for additional application of an NCAM™ Inventory evaluation at other DOE sites, as an additive element for this project, SRNS personnel were also able to collect comparable data in the Residual Material Management Asset category from Paducah Gaseous Diffusion Plant. Although the PDGP Inventory included below is limited to the Residual Materials Management category of natural infrastructure, its development for this Project is extremely useful and supports the following observations:

- Use of the Data Input Sheets as currently formulated are flexible enough to record consistent data across more than one Complex Site while still replicating collection methods and categories that underscore the viability of NCAM™ as a DOE-wide system.
- The RMM Asset capacity depicted again aligns with several categories and features of a "Must Have" list used to scout locations for business and economic development.
- The current PGDP capacity levels for RMM have both similar and differentiated levels to those of SRS; comparison illustrates how DOE mission or revitalization choices could be based on asset availability in one or more categories. For example, although hazardous material storage is at near-full capacity at SRS, PGDP may have capacity available depending on more detailed regulatory and operational factors if a potential reuse involved handling hazardous material.

### Chart 4: Compiled RMM Asset Capacity Display for PGDP

| Residual Material Management Assets/Paducah Gaseous Diffusion Plant (PGDP) | | | | | |
|---|---|---|---|---|---|
| **Air Assets** | | **Total Capacity** | **In Use** | **In Restoration** | **Available Capacity** |
| **Part 70 Air Quality Permit TV-0080-0041** | Discharge of air contaminants into ambient air (Tons/year) | | | | |
| | Particulate Matter | 1240 | 18 | | 1222 |
| | Carbon monoxide | 453 | 52 | | 401 |
| | Nitrogen oxides | 3370 | 621 | | 2749 |
| | Sulfur dioxide | 9690 | 953 | | 8737 |
| | Lead | 4.69 | 0.00064 | | 4.69 |
| | VOCs/Ozone | 188 | 40 | | 148 |
| | Notes: (1) Values reflect maximum total potential emissions (MTPE) under current/expired permit and 2012 actual emissions. A permit renewal application is pending which will reflect lower MPEs based on current operations. (2) All new emission sources will need to be below the Prevention of Significant Deterioration (PSD) limits. Some possible SRS-wide "netting" may be available. Additional emission sources will require permit modifications and modeling considerations. | | | | |
| **Land Assets (in Acres unless otherwise noted)** | | **Total Capacity** | **In Use** | **In Restoration** | **Available Capacity** |
| **Solid Waste Landfill SW07300015, SW07300014, SW07300045** | Construction and Demolition debris disposal (permitted annual tonnage limit = None Tons per Year (TPY)) | N/S | 55,000 | | N/C |
| | Note: Remaining permitted disposal space/ airspace (Cubic yards with ~40 Year capacity)) | | | | 0 |
| **RCRA Landfill KY8-890-008-982** | PGDP hazardous waste treatment/storage permit. In-use values are currently estimates. (Gallons) | | | | 0 |

| Residual Material Management Assets/Paducah Gaseous Diffusion Plant (PGDP) | | | | | |
|---|---|---|---|---|---|
| | C-752-A (neutralization, precipitation, oxidation, reduction, stabilization, absorption, decanting, compaction, macro-encapsulation) | 496,000 | 55,000 | | 441000 |
| | C-746-Q (neutralization, precipitation, oxidation, reduction, stabilization, absorption, decanting, compaction, lamp crushing) | 306,240 | 9,200 | | 297040 |
| | C-733 (absorption, decanting, compaction) | 38,500 | 500 | | 38000 |
| **Water Assets** | | **Total Capacity** | **In Use** | **In Restoration** | **Available Capacity** |
| **Surface Water Withdrawal Permit USEC - Permit No. 0900** | USEC water rights (Million Gallons per Day (MGD)) | 30 | 11 | | 19 |
| | | | | | |
| **Sanitary Waste Water Permit USEC - KY0102083 Outfall 004** | Treatment and discharge of sanitary waste water (Million Gallons per Day (MGD)) | | | | 0.00 |
| | Carbonaceous Biochemical Oxygen Demand, 5-day | 128 | 24 | | 103.70 |
| | Fecal Coliform Bacteria | | | | 0.00 |
| **Kentucky Pollutant Discharge Elimination System Permit USEC - KY0102083** | Discharge treated wastewater to State waters (Pounds per year (Lbs/yr)) | | | | |
| | Total Suspended Solids (TSS) | 330 | 117 | | 213 |
| | Oil & Grease | 633 | 65 | | |
| | Phosphorus | 39 | 10 | | 29 |
| | Note: values are based on average annual flow and average annual and permit limit concentrations for applicable outfalls. Additional discharges will require permit modifications and outfall considerations. | | | | |
| **Kentucky Pollutant Discharge Elimination System Permit DOE - KY0004049** | Discharge treated wastewater to State waters (Pounds per year (Lbs/yr)) | | | | 0 |
| | Total Suspended Solids (TSS) | 1467 | 437 | | 1030 |
| | Oil & Grease | 696 | 163 | | 533 |
| | Total Residual Chlorine | 0 | 0 | | 0 |
| | Total Recoverable Zinc | 5 | 3 | | 2 |
| | Phosphorus | 19 | 4 | | 15 |
| | Note: values are based on average annual flow and average annual and permit limit concentrations for applicable outfalls. Additional discharges will require permit modifications and outfall considerations. | | | | |

## D. Data Applications and Use

As described in Section II, NCAM™ provides unique knowledge to an array of management needs.[21] In three of the five primary NCAM™ information/knowledge applications previously noted, the NCAM™ SRS Pilot natural capital capacity data will be of particular value, specifically:

- Enterprise Planning Functions – opportunities for optimized use, conservation, and growth of enterprise activities using informed capital inventories
- Asset Disposition/Revitalization – high capacity/high value natural capital assets can enable and enhance sale, lease or other transfer for follow-on uses in economic development
- Environmental Management Transition – the capacity and capability of assets restored through restoration and cleanup activities can be more fully integrated into reuse or conservation, mitigating damage claims and lost opportunity costs.

Follow-on NCAM™ steps for aligning natural capital capacity with operational decision-making and performance outcomes are described in the next section.

[21] *See* ARI/SRS Pilot NCAM™ Inventory Report, Section II(B), page 7-8.

# IV. ARI Pilot NCAM™ Project at the Savannah River Site: Asset Capability (AC) Assessment Followup

The original taskings for this phase of the NCAM™ Project included recommending a process to perform the capacity and capability evaluations of the DOE Sites' natural infrastructure for mission support and expansion (as needed) based on units of natural infrastructure available. Consistent with using the SRS as an NCAM™ Pilot site, the recommended process in intended as a mechanism to perform capacity and capability evaluations, again within a "common but differentiated" rubric that allows for Complex wide application while recognizing site specific capabilities and needs.

This NCAM™ process element uses a framework estimating tool to correlate units of mission capability (or units of output or performance) to required or consumed units of natural capital. A display version developed for the U.S. Air Force illustrates an example of how capability data can be compiled and depicted. Additional task elements to scope performance, output, expansion, or mission goals and actions at SRS by natural capital use levels, and test alignment indexes that relate natural capital units to mission output were supplanted by additional scope and steps required to complete the preliminary NCAM™ Inventory, but can be developed for inclusion in project updates.

## A. NCAM™ Asset Capability (AC) Assessment

The *NCAM™ Asset Capability (AC) Assessment* is a tool derived from early evaluation processes used by the U.S. Air Force to understand and respond to major operational issue referred to as Encroachment. After decades of mission realignment and base closings, air, land, and water assets of sufficient capacity and capability were frequently no longer available to warfighters and mission operators.

The AC Assessment was applied at both installations and ranges as a means of identifying the operational baseline for air, land, and water capacity used or needed for mission operations, and comparing it to available Natural Capital Asset capacity, whether Natural Infrastructure or Ecosystem Assets. These components include but are not limited to: airspace; emissions/air shed availability; water supply; water discharge availability; onsite surface/subsurface land; offsite surface land; seaspace used for vessel movement, ranges, and other water operations; and frequency spectrum.

- **Standardized Methodology for** *NCAM™ AC Assessment*

The AC Assessment executes a gap analysis, providing parallel information and knowledge streams that depict both risk and opportunity in mission programming. Operational natural capital requirements are compiled as baseline data and compared against existing natural capital capacity (or supply). The resulting calculations provide knowledge as to both Asset Opportunities and Asset Deficiencies as they apply to ongoing operations. Additionally, the AC Assessment pushes vital data regarding unused capacity that affords opportunities for co-use, reuse, banking, or disposition within regional economic areas or local communities envisioned by the Asset Revitalization Initiative.

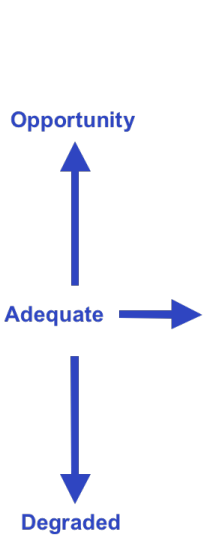
The process begins by determining and articulating "Operational Capability" requirements associated with an installation or complex site; this requires a clear understanding of mission activities, including national security, environmental management, and energy development. For example, a mission requirement may be producing a certain amount of tritium or developing a particular energy technology. All the steps and ac-

tivities in producing tritium are identified as needed capability. Involvement of the mission enterprise community in this step is essential.

Once operational requirements are defined, the next step is to quantify the corresponding Natural Capital Asset "Capacity" already used or potentially needed to meet the mission capability requirements of the site or activity under review. Generally this will require review of the Natural Capital Inventory of a site, and allocation of the asset capacity used to the operational capability defined.

For analysis purposes, the minimum natural capital used to reach mission goals is baselined as 100%. Natural capital supplies in excess of baseline use levels represent mission opportunity, and levels below represent mission deficiency. Chart 5 below is an example of a Capacity Baseline Chart developed for use by U.S. Air Force combat operation installations. Establishing the "Capacity/Capability" operations linkage between mission performance goals and natural infrastructure asset requirements is critical and requires input from the operational community. Without it, it is difficult to articulate a basis for the air, land, water, and spectrum assets needs.

**Chart 5: Prototype Baseline Capacity Alignment Chart**




| | DESCRIPTIVE RATING | RATING CODE |
|---|---|---|
| >140% | | RO3 |
| >120-140% | | RO2 |
| >110-120% | | RO1 |
| 110-90% | | RR |
| <90-80% | | RD1 |
| <80-60% | | RD2 |
| <60% | | RD3 |

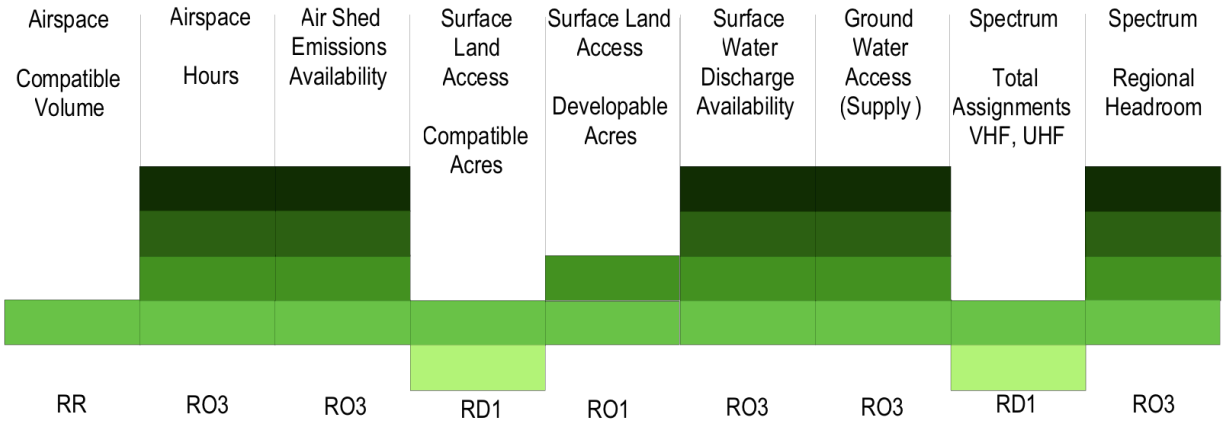
* Percentages results from comparison of resource availability to resource requirements, using 100% as the baseline for breakpoints

**RO = Resource Opportunity**
**RD = Resource Deficiency**
**RR = Resource Ready**

The next step structures the natural assets ratings of the activity or site by Inventory data categories into comparable levels against the baseline; this readily depicts whether certain asset categories have deficiencies or opportunities. Again, an Opportunity and Deficiency chart developed for use at military installations is included here to demonstrate capability use in decision-making.

To the extent transfer and reuse are target goals in a DOE evaluation of Asset Opportunities, the readiness rankings could be replaced by a usability ranking that corresponded to assets in various levels of restricted use due to ongoing restoration activity.

**Chart 6: Prototype Site Natural Capital Capability Alignment**




- Installation has significant resource opportunity
- Approximately 9.9% airspace encroachment in the aerodrome using Metric 1
- Approximately 11-15% off-base surface land encroachment using Metric 1
- Resource Deficiency for Spectrum Metric 1 is due to NTIA denial of four requests for frequency assignments, not encroachment

The *NCAM™ AC Assessment* incorporates risk management actions that ensure compliance while at the same time, identifying asset deficiencies and opportunities for revitalization and enterprise operations. The capability differential also provides needed information for identifying, prioritizing, and funding actions as early as possible to both avoid mission cost and risk, as well as generate expansion opportunities. Once an inventory baseline is identified at a site, the system correlations also inform management actions that optimize, sustain, restore and modernize the natural infrastructure in support of all enterprise goals.

## B. Asset Valuation (AV) Assessment

Functional capacity of natural capital assets has the potential to be of market value in addition to mission value. And of particular interest for DOE natural capital assets, valuation of air, land, and water elements restored through the EM Program can provide vital information in mitigating damage claims and lost opportunity costs.

Valuation processes include approaches and techniques that address both economic (i.e., monetized) and ecological benefit values. Collectively, AC and AV results provide a natural infrastructure resource information baseline that includes the quantities, capacities, conditions and values of the natural resource portfolio.

The following table lists various types of economic valuation techniques. The top seven techniques are used in empirical studies to place values on goods and services that are not traded in markets. The bottom three techniques are market appraisal techniques used to estimate values of goods and services that can be bought and sold in markets.

## Chart 7: List of Potential Valuation Techniques

| TECHNIQUES FOR NON-MARKET VALUATION, USED IN EMPIRICAL STUDIES | |
|---|---|
| **Travel Cost** | Uses costs incurred to visit a site (e.g., gas, lodging, meals, etc.) to infer a value for the service provided at the site. |
| **Hedonic Pricing** | Compares market value of properties that differ only in presence/quality of an environmental asset (e.g. shoreline or non-shoreline property) to infer a value. |
| **Contingent Valuation** | Uses direct questioning of individuals about their willingness to pay for a good or service (e.g., how much would you be willing to pay on a sewer bill to preserve water quality in this bay?) |
| **Substitute Cost, aka Replacement Cost** | Estimates value of environmental goods from market-priced goods that are substitutes (e.g., determines the value of wetland water quality services by estimating the cost of replacing those services with a wastewater treatment plant or stormwater best management practices). |
| **Avoided Cost, aka Damage Cost** | Estimates value by calculating the costs that would be incurred if an environmental good or service did not exist (e.g., flood damages that barrier islands prevent). |
| **Restoration Cost** | Uses the actual cost of restoring an environmental good or service in a similar situation as an estimate of value. |
| **Net Factor Income, aka Production Function** | Estimates value based on the contribution of an environmental good or service to income gained from dependent activities (e.g., natural fish nurseries of coastal wetlands support commercial fisheries). |
| **TECHNIQUES FOR MARKET APPRAISAL** | |
| **Comparable Sales** | Determines value based upon the sale price of properties of similar type, age, location, size and other tangible criteria. Also applicable to wetland mitigation credits, air emissions credits, etc. |
| **Income Stream** | Values an asset based upon the income it does or potentially could generate. |
| **Replacement Cost** | Values an asset by totaling the labor and material costs necessary to rebuild it. |

To maintain compatibility between Asset Capability and Asset Valuation assessments under NCAM™, the latter retains the distinction between assets whose value stems from intrinsic ecosystem services and natural infrastructure assets whose value stems from artificial scarcity established under law and regulation. Natural infrastructure assets can be valued using the market appraisal approach with one or more of the techniques of comparable sales, income streams, or replacement costs.[22]

The concept of natural capital value and its importance to sustainable development has been the subject of growing awareness in the last decade. Lead by United Nations sponsored efforts, accounting firms and multinational corporations have made a collective call for natural capital valuation and accounting, encouraging institutions to account for and value the risks and opportunities related to Natural Capital in finance and supply chain activities.[23]

Accounting practitioners are also responding to the combined effect of ecological degradation and population growth by identifying a new array of risks to business ranging from increasingly severe competition for

[22] To value these assets, information must be collected on the parameters of the entitlement. In the case of airshed emissions and wastewater discharges, which type and quantity of pollutants can be emitted or discharged and when and where the discharges can occur are all important to a valuation. Regulatory documents describing the permit terms will often provide these parameters. Historical data on actual emissions and discharges is also required; collection of this data is often, but not always, a requirement of the permit. In the case of water supply, the location, timing and use of a water right would be important. These parameters may be described in a codified water right. In the case of pollutant credits, it is necessary to determine if reductions in these pollutants can be "banked" and sold or traded in formal or informal markets.

[23] http://www.naturalcapitaldeclaration.org/the-declaration

resources, tightening regulation, and greater hurdles to financing. In response, accounting practices are changing to provide better understanding of the implications of the loss of natural capital for governments and for business.[24] Although NCAM™ System activities predated these efforts by nearly a decade, the design elements are right in line with pubic and private processes being advocated today.

[24] See, Is Natural Capital a Material Issue? A report from ACCA, Fauna and Flora international, and KPMG, September 2012. http://www.kpmg.com/UK/en/IssuesAndInsights/ArticlesPublications/Documents/PDF/Tax/natural-capital.pdf

# V. Summary and Recommendations

The Asset Revitalization Initiative (ARI) focuses on communicating past efforts and lessons learned from DOE's long history of asset revitalization while improving the efficiency and effectiveness of future land, asset and facility transfer for beneficial reuse. Through facilitating discussions among DOE, communities around DOE sites, nonprofit organizations including Community Reuse Organizations, the private sector, and other stakeholders, the Asset Revitalization Task Force identified potential reuse assets and approaches to take advantage of land, assets and facilities that were becoming available as environmental cleanup efforts reached completion and National Nuclear Security Administration (NNSA) programs modernized, consolidated and reduced the size of its infrastructure.

Initially responding to Congressional direction, the Task Force developed recommendations for a continued formalized asset revitalization program that would apply the capacity and capability of these land, assets and facilities to the development and deployment of energy technologies and related advanced manufacturing technologies to promote energy security, energy sector employment and energy independence while fostering a business environment that encouraged collaboration and interaction between the public and private sectors.

Natural Capital Asset Management (NCAM)™ System is a tool that provides both data and evaluation criteria for reuse options that provides information to break down stovepipes and bridge gaps. The Preliminary NCAM™ Inventory prepared under this SRS Pilot Program has produced the first compiled "asset" inventory for air, land, and water assets that are a principle element of any economic development or reuse activity. The singular role of natural capital capacity in reuse is underscored by reviewing site questionnaire categories that are viewed as "must have"--almost half are natural capital capacity in air, land, and water categories. By creating an inventory system for natural assets that correlates to those currently used for physical infrastructure, NCAM™ generates and compiles information specifically sought by development authorities and needed by ongoing mission activities, bringing these key data outside the compliance stovepipe.

Although often recognized informally, these assets can now be optimized used to their full capacity to sustainably achieve enterprise and ARI goals. Continuing under the existing contract, the prototype Framework Template of the SRS NCAM™ System can be further developed by additional tasks described in the following recommendations:

- Continue working with DOE HQ and SRS experts to review the categories, sub-elements, collection and input procedures, and quantitative formulas used to calculate inventory entries. This QA/QC process will establish NCAM™ protocols available to other DOE Sites.

- Devise steps needed to include NCAM™ Inventory data in ARI project development

- With relevant SRS personnel, identify how best to incorporate the NCAM™ inventory or component data into site comprehensive planning activities

- Bridge to EM Program managers to identify and process data related to EM natural capital assets whether completed (with/without use restrictions) or still undergoing restoration for more detailed and robust inclusion in NCAM™ Inventories

- To the extent possible, clarify best practices for use designation or identification opportunities that can be included in 770 data publication so as to attract development entities who may not be aware of SRS or other DOE site asset availability.

- Establish a more in-depth profile of general and site specific redevelopment market entities likely to be users, consumers, and beneficiaries of NCAM™ Inventory data to assure integration of appropriate activities and data to meet user requirements

- Continue evaluating a possible wraparound data system to integrate/correlate FIMS, EMS, NCAM™, CompPlan, and GIS

- Develop a plan for applying valuation protocols for sample asset categories such as wetlands or air emission credits

The NCAM™ System as a tool, and the data, information, and knowledge it generates are usable for both internal and external DOE processes. The former includes uses for site- and complex-level planning, legacy programming and investment, and operational performance factors. External to DOE, NCAM™ data can be the basis for positive communication to reuse entities, Community Reuse Organizations, host communities, and state and local government entities to enable revitalization or garner support for mission activities. Effective use of this tool and the information it contains has many possible applications at both the headquarters and site level.

# VI. References


*The Savannah River Site Strategic Plan: Shaping the Business of SRS for Success,* Office of Integration and Planning/ DOE-Savannah River, Briefing to the Citizens Advisory Board, September 27, 2011

Natural Resource Damage Assessment Implementation Project: Savannah river Site, U.S Department of Energy, October 1995 http://homer.ornl.gov/sesa/environment/guidance/cercla/srs-tap.pdf

European Environment Agency - Glossary, based on: IPCC Third Assessment Report, 2001 http://glossary.eea.europa.eu

*Ecology and Management of a Forested Landscape*, Fifty Years on the Savannah River Site, edited by John C. Kilgo and John I. Blake (2005)

*Savannah River Site Environmental Report for 2011* (SRNS-STI-2012-00200) (undated)

*Savannah River Site FY 2012 Site Sustainability Plan*, December 2011 (Rev. A)

*Savannah River Site Facility Information Management System*, Building 703-H Report

*Savannah River Site - Site Services Infrastructure Mission Alignment Plan*, SRNS-RP-2008-01310 Revision 2, October 2012

**SRS Cleanup Activities at Specific Areas/OUs**, U.S. Environmental Protection Agency, http://www.epa.gov/region4/superfund/sites/fedfacs/savrivscareas.html

*Savannah River Site Policy Manual*, SRSPM 250.1.1A, September 15, 2011

## APPENDIX A: SITE "MUST HAVES" QUESTIONNAIRE



# Preliminary Site Screening

## PROJECT ARROWHEAD

** PLEASE REFER TO PROJECT ARROWHEAD PRELIMINARY PROJECT DESCRIPTION FOR PROJECT CHARACTERISTICS AND SPECIFIC DETAILS **

**Primary Contact Information:**

| | |
|---|---|
| *NAME:* | |
| *TITLE / DIVISION:* | |
| *COMPANY / ORGANIZATION:* | |
| *STREET ADDRESS:* | |
| *CITY:* | |
| *STATE / PROVINCE:* | |
| *POSTAL CODE* | |
| *COUNTY / PARISH:* | |
| *COUNTRY:* | |
| *OFFICE PHONE:* | |
| *CELL PHONE:* | |
| *FAX:* | |
| *E-MAIL:* | |

FLUOR

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Global Location Strategies

## I. SITE INFORMATION

Site name:

Site street address:

City:

County:

State / Province:

Zip code:

Directions to site from major highway / interstate:

Latitude & Longitude coordinates:

Site website (if applicable)

## II. PROJECT MUST REQUIREMENTS

A. Is the site a minimum of 75 contiguous, developable acres? Yes ☐ No ☐

- Number of total contiguous & developable acres of proposed site:
- Describe the topography of the site?
- Describe the general soil conditions and if pile foundations are typically required for industrial development.
- Describe foliage covering the site.
- Describe any buildings on the site that must be demolished site or may be reused for this project.

B. Is the site rail served? Yes ☐ No ☐

- Rail provider(s)
- If shortline rail road, specify to which Class I railroads there are connections to and where the connections are.
- Distance to rail siding

- Is this a mainline or a spur?
- Time required to bring rail to the site
- Approximate cost of bringing rail to the site
- Have the right-of-ways necessary to bring rail to the site been secured? Yes ☐ No ☐
- Explain if no.

C. Does the site have adequate access to highway infrastructure? Yes ☐ No ☐
- Number of access roads to the site.
- Distance to closest Interstate.
- Name of Interstate
- Generally describe the route to the Interstate (number of lanes, number of controlled intersections (traffic lights), congestion, time to travel, etc.).

D. Can the site accommodate electric demand of 12 MW initially? Yes ☐ No ☐
- Electricity provider
- Distance to closest substation
- Excess capacity at substation
- Time required to build infrastructure to accommodate 12 MW electric demand
- Approximate cost of bringing 12 MW electric supply to the site
- Have the right-of-ways necessary to bring 12 MW of electric power to the site been secured? Yes ☐ No ☐
- Explain if no.
- Describe general configuration of electric service to the site (main supply, feasibility of dual feed, reliability of supply, etc.)

E. Can the site accommodate up to electric demand of 64 MW at full build out? Yes ☐ No ☐
- Time required to build infrastructure to accommodate 64 MW electric demand
- Approximate cost of bringing 64 MW electric supply to the site

- Have the right-of-ways necessary to bring 64 MW of electric power to the site been secured? Yes ☐ No ☐
- Explain if no.

F. Can the site be supplied with a minimum of 4 million gallons of water per day? Yes ☐ No ☐

| Type of water | Source | Distance to Line | Size of Line | Pressure of Line | Excess capacity (gallons per day) |
|---|---|---|---|---|---|
| Potable | | | | | |
| Raw | | | | | |
| Gray | | | | | |
| Other | | | | | |

- Time required to extend gas to the site to meet requirement
- Approximate cost of bringing gas to the site to meet requirement
- Have the right-of-ways necessary to bring gas to the site been secured? Yes ☐ No ☐

G. Can the site be supplied with a minimum of 2.5 million cubic feet per day of natural gas? Yes ☐ No ☐

- Gas provider(s): Transmission Distribution
- Distance to nearest gas line
- Size of line inches
- Pressure of line
- Time required to extend gas to the site to meet requirement
- Approximate cost of bringing gas to the site to meet requirement
- Have the right-of-ways necessary to bring gas to the site been secured? Yes ☐ No ☐
- Explain if no.

H. Can the site be supplied with the ability to treat 2 million gallons per day of wastewater effluent? Yes ☐ No ☐

- Wastewater treatment provider

- Total capacity of wastewater treatment plant gallons per day
- Total excess capacity of wastewater treatment plant gallons per day
- Distance to nearest wastewater treatment line
- Size of line
- Time required to extend wastewater line to the site to meet requirement
- Approximate cost of bringing wastewater line to the site to meet requirement
- Describe any special infrastructure that would be required (lift station, capacity expansion, etc.)
- Does the WWTP have the ability to treat industrial waste with BOD of 50 PPM and COD of 90 PPM? Yes ☐ No ☐ Provide details/additional information.
- Does the WWTP have the ability to treat 150,000 – 300,000 gallons per day with acrylonitrile content of 50 PPM? Yes ☐ No ☐ Provide details/ additional information.

I. Is the site/ can the site be permitted to store flammable and volatile materials in low to moderate quantities? Yes ☐ No ☐ Provide details/ additional information.

J. Would the company have the ability to purchase steam, nitrogen, other industrial gases from existing providers? Yes ☐ No ☐

- Describe existing industry adjacent/ near site with ability to serve this operation.

K. Is the site adequately zoned for chemical manufacturing/ heavy industrial use? Yes ☐ No ☐

- Specify zoning classification.
- If site requires rezoning, provide letter of commitment to change the zoning from the ruling authority along with a description of the process and the time required for change.

L. Is the site must be free of wetlands, endangered species or other environmentally unacceptable conditions that would impact or delay development of the site. Yes ☐ No ☐

- Indicate previous land use.
- Has a Phase I/ Phase II environmental study been conducted of the site? Yes ☐ No ☐

- If yes, provide a copy of the study.
- Were any issues identified in the Phase I/ Phase II? Yes ☐ No ☐ If yes, explain what steps have been taken to remediate those issues and if any subsequent investigations have been performed.

M. Is the site must be capable of being under full control within 30 days of a final location decision? Yes ☐ No ☐

- Who currently owns the site?

| Name | Address | City, State/Province | Postal Code | Country | Phone Number |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

- Is the site currently listed for sale? Yes ☐ No ☐
- Is the site under option? Yes ☐ No ☐
- Price per acre
- Total property price
- Can the site be subdivided if greater than 75 acres? Yes ☐ No ☐ Not applicable ☐

N. Is the site outside the 100-year flood plain as defined on FEMA flood plain maps? Yes ☐ No ☐

- If no, how many acres are inside the 100-year flood plain? (Note: a minimum of 75 acres must be outside of the flood plain).
- Provide FEMA flood plain map.

O. Can the company dispose of hazardous and non-hazardous materials of a few drums a week? Yes ☐ No ☐

- Name to closest non-hazardous solid waste disposal facility.
- Distance to closest non-hazardous solid waste disposal facility.
- Name to closest hazardous solid waste disposal facility.
- Distance to closest hazardous solid waste disposal facility.

P. Is the site in an area of air quality attainment? Yes ☐ No ☐

- If no, indicate for which pollutants the area does not meet air quality standards.

| Pollutant | Nonattainment Classification | Year Designated as Nonattainment | Plans for redesignation as attainment? Provide details. |
|---|---|---|---|
| Ozone | ppm | | |
| PM 2.5 | N/A | | |
| PM 10 | N/A | | |
| Carbon Monoxide | ppm | | |
| Sulfur Dioxide | N/A | | |
| Nitrogen Oxide | N/A | | |
| Lead | N/A | | |

Q. Are there any noise restrictions for the site? Yes ☐ No ☐ If yes, provide details.

R. Are lighted towers (approx. 120' tall) permissible at this site? Yes ☐ No ☐ If yes, provide details.

S. Are visible steam plumes from cooling towers permissible at this site? Yes ☐ No ☐ If yes, provide details.

## III. VISUAL SITE EVALUATION REQUIREMENTS

For the proposed site, please furnish the following:

A. Highway Map

Indicate a 30-mile, 60-mile & 90-mile radius circle from the site.

B. Tax Map

Identify existing property owners

Identify surrounding / adjacent property owners

C. Large Scale Plat of Property Map

Identify site boundaries, easements and right-of-ways

Utility Infrastructure Map

Identify all current locations and sizes of each utility, including routes from the site to the source/destination

Identify all proposed locations and sizes of each utility, including routes from the site to the source/destination

D. Transportation Infrastructure Map

Site:

Identify existing ingress & egress routes for both truck & passenger vehicle traffic into site

Identify proposed ingress & egress routes for both truck & passenger vehicle traffic into site (include improvements, upgrades or proposals for elimination of bottlenecks, etc).

Interstate:

Identify existing ingress & egress routes for interstate access from the site

Identify proposed ingress & egress routes for interstate access from the site (including any improvements, upgrades and proposals for elimination of bottlenecks, etc)

Rail:

Identify existing rail lines serviceable to site

Identify proposed rail line routes for servicing of site, if required

E. USGS Topographic Map

Prefer 7.5 Minute Quadrangle Map with a Scale of 1:24,000 or 1" = 24,000 ft

F. FEMA Flood Plain Map

Identify proposed site boundary

Indicate percent of land located within the 100-year flood plain

G. Satellite Photograph or Google Earth file (.kmz)

Identify proposed site boundary

Identification of various roads, surrounding land usage/businesses, etc., on photo is very helpful

# VII. About Koetz and Duncan

Koetz and Duncan LLC, provides strategic advice and consultation on sustainability risk and value management for public and private enterprise reliant on natural capital assets and access. Innovative and first-mover capabilities in risk analytics, infrastructure asset management, green procurement, and advanced accounting generate reduced operating costs, market share, price validation and social license assurance. Natural Capital Asset Management (NCAM)™ is an exclusive strategic planning tool developed by K&D for public and private enterprise systems with extensive natural and built infrastructure holdings and requirements.

Prior to forming K&D, **Maureen T. Koetz**, Principal Partner served as a Presidential appointee as both Acting Assistant Secretary, and Principal Deputy Assistant Secretary for Installations, Environment, and Logistics of the United States Air Force, managing a 10-million acre/$200 billion asset portfolio in support of sustainable operations for the largest energy consumer in the federal government. She has also held positions as Environmental Counsel for the Senate Energy and Natural Resources Committee, and Counsel to U.S. Senator Pete Domenici. As Environmental Policy Director for the Nuclear Energy Institute, she developed the first analytic models for "Emissions Avoidance," the results of which have remained a key management and policy element supporting nuclear as the Clean Air Energy. She has represented the nuclear industry at the Kyoto Climate Change Conference and the United Nations Council on Sustainable Development.

Ms. Koetz is an Adjunct Professor of Environmental Finance at NYU-Poly and a veteran of active duty service with the U.S. Navy, as well as a published author in several areas related to sustainability. She has a Juris Doctor from the Washington College of Law at American University, a Bachelor of Arts degree from the American University, and is a member of the Bar of the State of New York.

*Building Enterprise Value on Sustainable Foundations*