



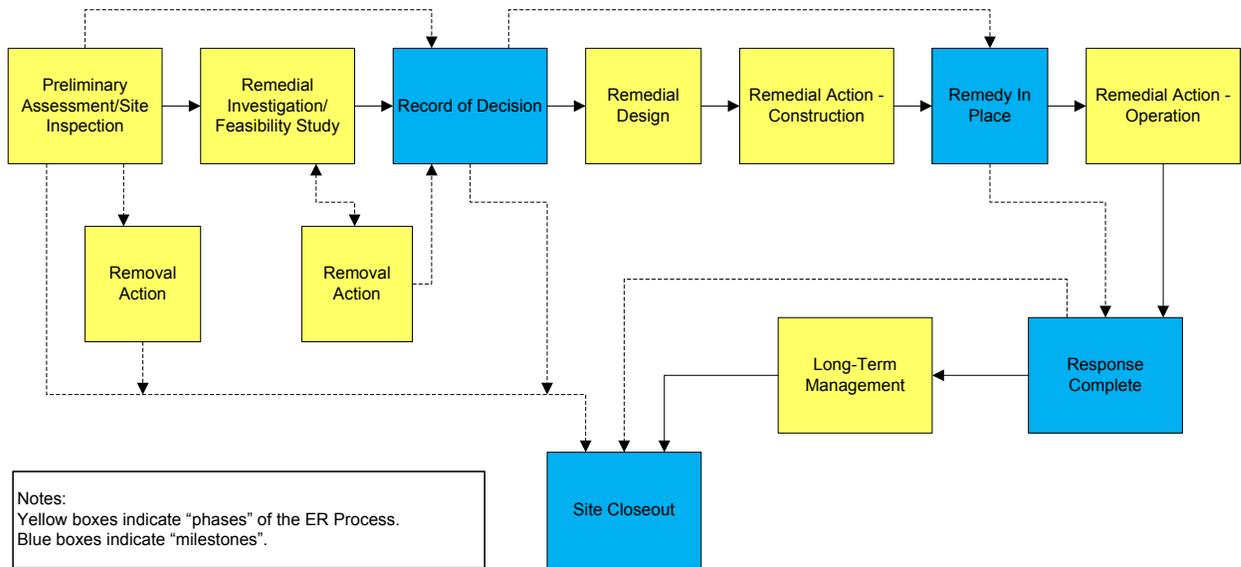
# ST. JULIENS CREEK ANNEX CHESAPEAKE, VIRGINIA ENVIRONMENTAL RESTORATION PROGRAM

## St. Juliens Creek Annex

The St. Juliens Creek Annex (SJCA) facility covers approximately 490 acres at the confluence of St. Juliens Creek and the Southern Branch of the Elizabeth River in the City of Chesapeake. Most surrounding land is developed and includes residences, schools, recreational areas, large and small industries, and a railroad corridor.

SJCA began operations as a naval ammunition facility in 1849. For a majority of its history, the SJCA facility was used for the storage and transportation of ammunition and ordnance. Past operations at SJCA included wartime transfer of ammunition to various other naval facilities throughout the United States and abroad. SJCA has also been involved in non-ordnance operations, including degreasing operations; paint, machine, vehicle and locomotive maintenance, pest control, battery, print, and electrical shop operations; boiler plant operations; wash rack operations; potable water and salt water fire-protection systems; fire-fighter training operations; and storage of oil and chemicals.

Activity at SJCA has decreased over the years and many of the aging structures have been demolished. The current primary mission of SJCA is to provide a radar-testing range and various administrative and warehousing facilities for local naval activities.



## **Environmental Restoration Program**

In 1975 the Department of Defense (DOD) initiated a program to identify contamination and remediate problems associated with the past environmental releases of hazardous substances or petroleum products. In 1980, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as "Superfund," was passed and the National Priorities List (NPL) of Superfund sites was initiated. Though CERCLA did not apply to military facilities, the DOD adopted the program as a model for environmental cleanup. In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA), which mandated that DOD follow the same cleanup regulations that apply to private entities. SARA also established the Defense Environmental Restoration Program (ERP). The Installation Restoration Program (IRP) was established to address releases of hazardous substances, pollutants, and contaminants at military installations. Furthermore, as part of the Fiscal Year 2002 Defense Authorization Act, Congress mandated that DOD develop a program to address military munitions. As a result, the Munitions Response Program (MRP) was developed. The ERP is therefore divided into the IRP, to address contamination from hazardous substances and pollutants, and the MRP, to address military munitions.

SJCA was listed as a Superfund site in July 2000. To manage the ERP and the CERCLA process, SJCA works in partnership with the Virginia Department of Environmental Quality (VDEQ) and the United States Environmental Protection Agency (EPA).

Community participation in environmental activities at SJCA includes a Restoration Advisory Board (RAB), public meetings, an information repository at a local library, fact sheets, a Community Involvement Plan to describe how SJCA interacts with the community, public notices, and a web site (<http://go.usa.gov/Dyn4>). The RAB was formed in 1999 and consists of community members and representatives of the Navy, VDEQ, and EPA. RAB meetings are generally held twice per year (normally in May and November) and are open to the public to provide opportunity for comment and input on the ERP. An update to the Community Involvement Plan is currently underway.

### **FOR MORE INFORMATION ABOUT THE RAB OR THE SJCA ERP CONTACT:**

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**757-396-8122**

**MS. KRISTA PARRA (NAVY RAB CO-CHAIR)**

**757-341-0395**

### **THE INFORMATION REPOSITORY FOR SJCA IS:**

**MAJOR HILLARD LIBRARY**

**824 OLD GEORGE WASHINGTON HWY**

**CHESAPEAKE, VA 23323**

**757-410-7078**

## Environmental Restoration Program Sites

There are currently four active ERP sites that are being addressed using the CERCLA process. There are currently no active MRP sites that are being addressed using the CERCLA process. Fifty-five ERP sites have been closed after the results of desktop audits, field investigations, and/or removal actions revealed that no further action is required.

### Installation Restoration Program Sites with Active Investigation or Remediation:

#### Site 2: Former Waste Disposal Area B

**Background:** Site 2 is a 6.2-acre site in the southern portion of SJCA. The site includes an unlined waste disposal area that operated from 1921 until some time after 1947. Initially, refuse was burned openly onsite and used to fill in portions of a tidal inlet that was located in the center of the site and was connected to St. Juliens Creek by a culvert. Mixed municipal wastes, solvents, waste ordnance, and abrasive blast media from ship overhaul and repair operations were disposed at the site. An incinerator was installed in 1942 to replace the open burning practices.



Remedial Investigation (RI) activities indicated potential risks to human health and the environment from exposure to chemicals in waste, soil, sediment, surface water, and shallow aquifer groundwater. The primary contaminants identified were chlorinated solvents (trichloroethene [TCE] and its breakdown products) in shallow groundwater and surface water and inorganics and polycyclic aromatic hydrocarbons (PAHs) in soil and sediment. The Proposed Plan identified soil cover, excavation, enhanced reductive dechlorination (ERD), monitored natural attenuation (MNA), and land use controls (LUCs) as the preferred remedial alternative for addressing the human health and ecological risks. The record of decision (ROD)



*Aerial view of historical Site 2 inlet and Site 21 industrial area*

documenting the selected remedy has been signed. The remedial action was initiated in 2012 and the construction phase of the remedial action has been completed. See “Site 2 Remedial Action” insert below for additional details on the remedial action.

**CERCLA Status:** The remedial action-operation phase is currently ongoing. The remedial action-operation phase includes groundwater monitoring and additional emulsified vegetable oil (EVO) injections, if needed. LUCs are in place to prevent unacceptable exposure to waste and COCs in soil, inlet sediment, and shallow aquifer groundwater. Additionally, a five-year review that includes review of the Site 2 remedy to determine if it remains protective of human health and the environment, is underway.

**Next Steps:** Remedial action-operation, implementation and maintenance of the LUCs, and five-year reviews will continue until the remedial action objectives are met.

## Site 2 Remedial Action

### Specific components of the remedial action include the following:

- Cover installation over waste, soil, and inlet sediment
- Excavation of St. Juliens Creek sediment
- ERD within high-concentration target area of shallow groundwater
- MNA within low-concentration, naphthalene, and heptachlor epoxide target areas of shallow groundwater
- LUCs
  - Maintain the soil cover and prevent exposure to waste and contaminants in soil and inlet sediment
  - Prevent direct exposure to and/or potable use of shallow groundwater

### The remedial action is being completed in a phased approach, as follows:

#### Phase 1 – Preparatory Activities (complete)

- Existing building foundation and surface debris demolition
- Storm water and drainage modifications
  - Re-routing drainage around Site 2
- Compensatory wetland mitigation
  - Required to offset permanent loss of Site 2 wetland

#### Phase 2 – Cover System Installation (complete)

#### Phase 3 – St. Juliens Creek Sediment Excavation (complete)

#### Phase 4 – Groundwater Treatment (in progress)

- ERD Treatment
  - EVO will be injected into permanent injection wells located in the high-concentration area
    - Emulsified vegetable oil will stimulate the degradation of chlorinated VOCs by naturally-occurring microbes
      - Following establishment of reducing conditions, bioaugmentation agent will be injected (up to 8 weeks after emulsified vegetable oil injection)
    - Additional microbial culture will be added to degrade chlorinated VOCs
  - Injection layout consists of a series of rows placed perpendicular to groundwater flow
    - Groundwater is expected to flow through these rows and be treated
- MNA
  - Will be conducted concurrently with ERD performance monitoring
  - Sampling will confirm concentrations are decreasing and aquifer conditions are conducive to further concentration reductions
  - Additional treatment may be necessary if concentrations stop decreasing



### Site 5: Former Burning Grounds

**Background:** Site 5 is an approximately 23-acre site located in the northeastern portion of SJCA. A 4.3-acre unlined waste disposal area was located at the center of the site. Much of the Site 5 area was historically used for placement of dredge spoil material that reportedly originated from Blows Creek and the Southern Branch of the Elizabeth River. Operations began at the Burning Grounds in the 1930s when waste ordnance materials were disposed of by open burning. Tetryl, trinitrotoluene (TNT), fuzes, solvents, paint sludge, pesticides, and various types of refuse were also disposed. In mid-1977, the Burning Grounds surface was used for facility-wide decontamination of ordnance equipment and material. The decontamination process included filling equipment from buildings with oil and straw and igniting them. Afterwards, the ground surface was reportedly covered with oil and straw and burned. The top 6 inches of soil was then disced, and the ground surface was covered with oil and straw and burned again. The site currently consists of an open field with a wetland in the center and a forested area and Blows Creek to the south.



*Aerial image of Site 5 prior to the removal action*



*Aerial image of Blows Creek*

RI activities indicated potential risks to human health and the environment from exposure to chemicals in waste, soil, and drainage sediment. The primary contaminants identified were inorganics and pesticides. An Engineering Evaluation/Cost Analysis was conducted to evaluate alternatives to address the waste/burnt soil area and impacted surface soil and drainage sediment areas and recommended a removal action of those areas.

Blows Creek, a tidally-influenced brackish water tributary to the Southern Branch of the Elizabeth River, runs along the southern extent of Site 5 and through the center of SJCA. Several IRP sites are located within the Blows Creek drainage basin and have been identified as potential historical contaminant sources to Blows Creek; therefore, the creek has been incorporated into

Site 5 under the IRP. A Baseline Ecological Risk Assessment was conducted to determine whether historical contributions to Blows Creek from upland Navy IRP sites, including Site 5, caused adverse environmental impacts in the creek. Results indicated that no further action for Blows Creek was necessary.

A non-time critical removal action to address potential risks to human health and the environment from exposure to Site 5 waste, soil, and drainage sediment was completed in 2012.

**CERCLA Status:** A supplemental RI is currently underway to investigate current concentrations of inorganics in the shallow aquifer groundwater.

**Next Steps:** The next steps will depend on the results of the supplemental RI.

## Site 21: Industrial Area

**Background:** Site 21 is an industrial area in the south-central portion of SJCA. Buildings at Site 21 were historically used as machine, vehicle, and locomotive maintenance shops; electrical shops; and munitions loading facilities. A fuel service station was also located in the vicinity. Outdoor areas were used for equipment and chemical storage. Several of these buildings and/or their surrounding areas were former IRP sites. Many of the older buildings at the site have been demolished. The existing buildings and the Site 21 area are currently used primarily for storage and maintenance activities. An active warehouse currently used by Fleet and Industrial Supply Center, Norfolk Integrated Logistics Support was constructed in 1992. A storm sewer system through the site and drains south to a storm water detention basin which outfalls to St. Juliens Creek.



*Aerial image of Site 21, with Building 1556 in the forefront*

RI activities identified potential risks to human health from exposure to chlorinated solvents (TCE and its breakdown products) in the shallow aquifer groundwater. Potential risk associated with vapor intrusion into onsite buildings was also identified. An Interim Proposed Plan identified in situ chemical reduction (ISCR) and ERD as the preferred remedial alternative for addressing potential risk from potable use of shallow groundwater and the Interim ROD documenting the interim response action has been signed. The Proposed Plan and ROD were “interim” because they did not address the potential risk to current and future building occupants from vapor intrusion through inhalation of indoor air, which was still being evaluated. The response action selected in the Interim ROD was selected as an interim action in order to reduce constituent of concern (COC) concentrations while the vapor intrusion pathway was investigated. An interim remedial design was developed for implementation of the interim action.

An investigation was conducted to further evaluate the potential vapor intrusion pathway. The results were documented in an RI and Feasibility Study (FS) Addendum Report, which recommended additional vapor intrusion monitoring and LUCs to maintain the current industrial building use and prevent activities that would compromise the integrity of the building envelopes throughout the Interim remedial action; and discontinuation of the monitoring and LUCs upon completion of the remedial action for groundwater.

### Site 21 Remedial Action

Specific components of the remedial action include the following:

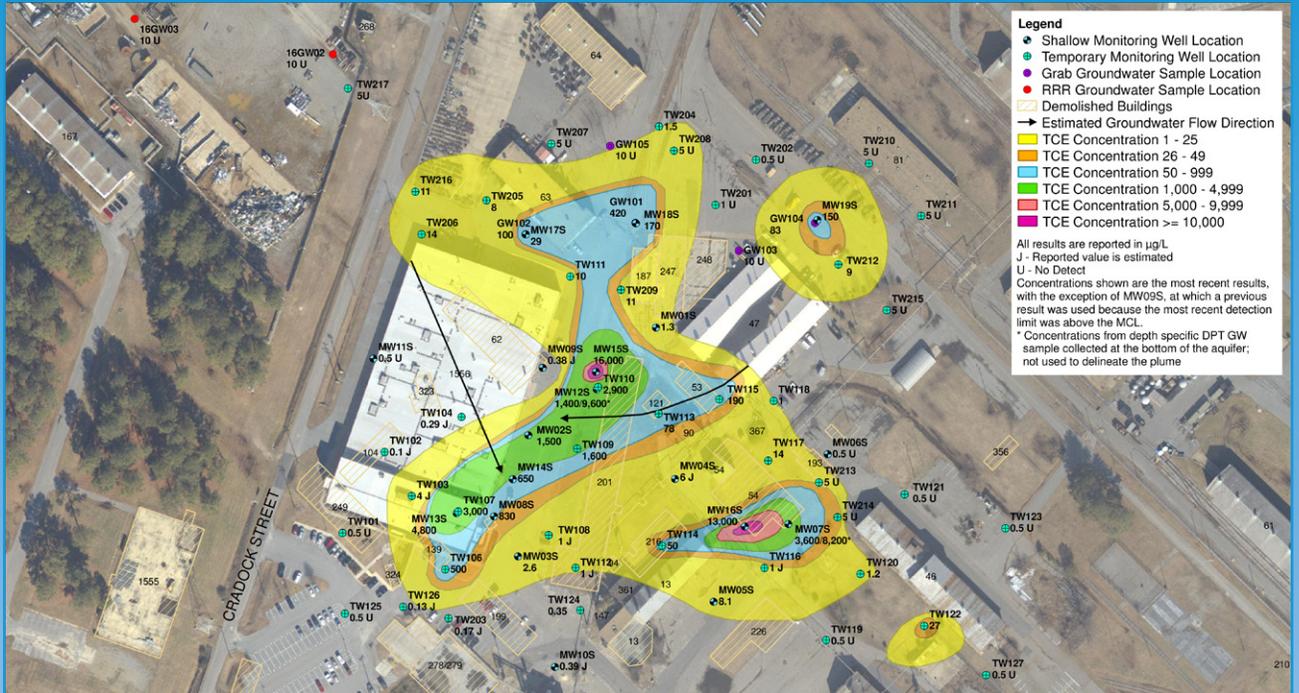
- Implementation of ISCR through direct injection of zero valent iron (ZVI) into the accessible portions of the shallow aquifer high-concentration zone
- Implementation of ERD through injection of EVO into the accessible portions of the shallow aquifer low-concentration zone
- Performance monitoring following the ZVI and ERD injections to confirm COC concentrations continue to reduce

#### What is ISCR and how is it being implemented?

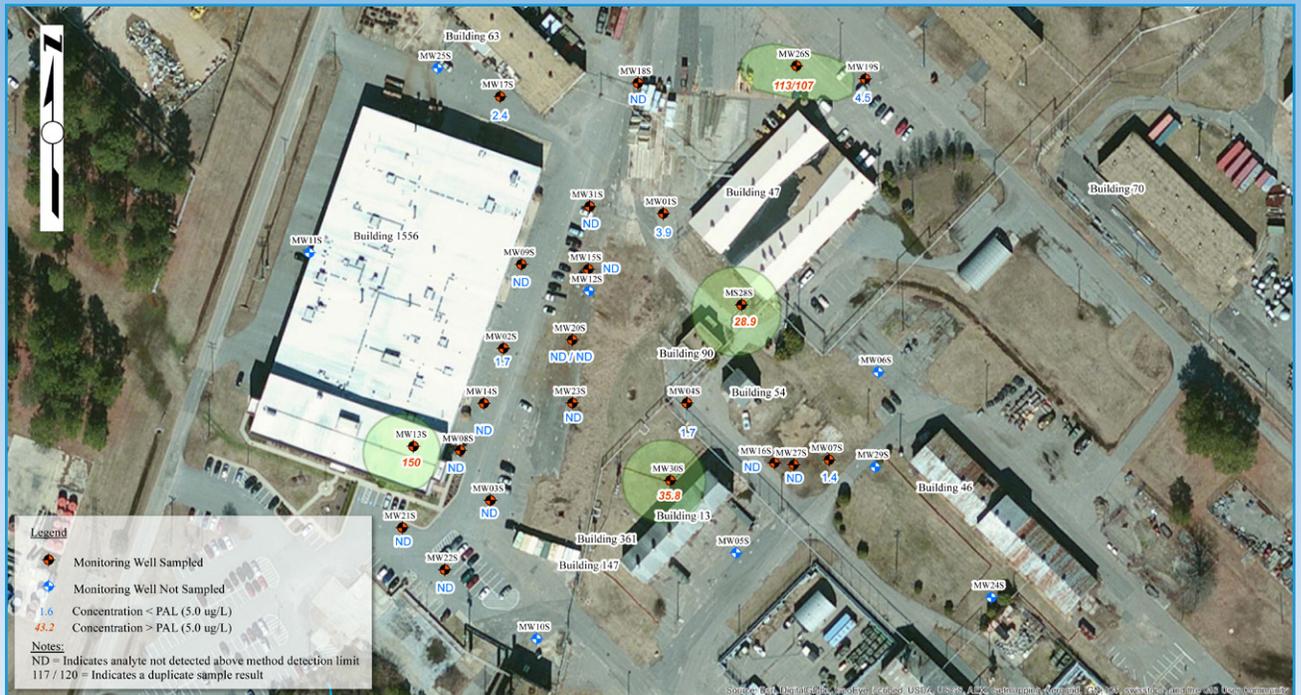
- ISCR is a process that causes a chemical reaction to break down TCE and its daughter products to innocuous products
- ZVI powder mixed with water was injected with pressure using nitrogen gas to help push it into the aquifer
- Results are relatively fast (can be seen within 3 to 4 weeks to 3 to 4 months) and can remain active for many years (up to 8 years)

#### What is ERD and how is it being implemented?

- ERD is a process where the naturally occurring biological activity in the aquifer, in which indigenous microbes are present and breaking down TCE to innocuous products, is enhanced
- Vegetable oil mixed with water and a buffer to counter the naturally low pH we injected into the aquifer in similar method as ZVI injections to create conditions favorable for microbes to flourish
- Results are not as quick (can be seen within months to years) and don't last as long (1.5 to 3 years) as ZVI



Site 21 TCE Plume - Prior to Remedy Implementation



Site 21 TCE Plume - Approximately 2.5 years after ZVI Injection

Because no risk from vapor intrusion was identified in the RI and FS Addendum, the interim remedial action will not change and will serve as the final remedial action and a final RD will not be necessary. A LUC RD has been completed. A Proposed Plan identified ISCR and ERD as the final site preferred alternative and the ROD documenting the final response action has been signed. The remedial action was initiated in 2011 and the construction phase of the remedial action has been completed.

**CERCLA Status:** The remedial action-operation phase is currently ongoing. Remedial action-operation includes groundwater monitoring to evaluate remedy effectiveness, vapor intrusion monitoring to evaluate whether the remedial action or building deterioration have resulted in potential unacceptable inhalation risks or explosive hazards, and additional emulsified vegetable oil injections, as needed. LUCs are in place to prevent unacceptable exposure to COCs in shallow aquifer groundwater. Additionally, a five-year review that includes review of the Site 21 remedy to determine if it remains protective of human health and the environment, is underway.

**Next Steps:** Remedial action-operation, implementation and maintenance of the LUCs, and five-year reviews will continue until remedial action objectives are achieved.

## Response Complete Installation Restoration Program Sites with Land Use Controls:

### Site 4: Landfill D

**Background:** Landfill D consists of 8.3 acres in the northeastern portion of SJCA at the confluence of Blows Creek and the Southern Branch of the Elizabeth River. The first indication of activity at Site 4 was trenching identified on a historical aerial photograph from 1961. From 1970 until 1981, sanitary landfill operations were conducted at Site 4 and the wastes managed were primarily trash, wet garbage, construction material, and out-dated civil defense storage material. RI activities identified potential risks to human health and the environment from exposure to chemicals in waste, soil, and drainage sediment.



*View looking out from the landfill cover at the fence installed around the perimeter of the landfill.*

A remedial action was conducted from March through October 2005 and included:

- Installation of a minimum 2-foot soil cover over the landfill
- Removal of surface debris from the wetland area adjacent to Blows Creek
- Removal of drainage sediment and re-construction of site drainages
- Implementation of LUCs to prohibit digging into or disturbing the soil cover or landfill contents and to prohibit future residential use and development of the site

A Remedial Action Completion Report was finalized in September 2006 documenting the completion of the remedial action and demonstrating that the remedial action objectives described in the FS had been met. Because the remedial action resulted in hazardous substances, pollutants, or contaminants remaining on site, a five-year review was conducted in 2010 to determine if the selected remedy remains protective of human health and the environment. The five-year review report concluded that the remedy at Site 4 is protective of human health and the environment.

**CERCLA Status:** Site 4 has achieved Response Complete. LUCs are in place to prevent unacceptable exposure to waste and COCs in soil. Additionally, a five-year review that includes review of the Site 4 remedy to determine if it remains protective of human health and the environment, is underway.

**Next Steps:** Implementation and maintenance of the LUCs, and five-year reviews will continue to be conducted.