Status of Corrective Actions Along Fourmile Branch, Savannah River Site

Philip Prater
Project Manager
US Department of Energy

Gerald Blount
Bechtel Savannah River Company

January 2008

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Acronyms

1pCi/L	one picocurie per liter
1pCi/mL	one picocurie per milliliter
40Km	40 kilometers
I-129	Iodine, atomic number 129
mrem/yr.	millirem per year
pH	negative logarithm of effective hydrogen-ion concentration
Sr-90	Strontium-90
MWMF	Mixed Waste Management Facility
RCRA	Resource Conservation and Recovery Act
SRS	Savannah River Site
VOCs	Volatile Organic Compounds

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Groundwater and Surface Water Quality Goals

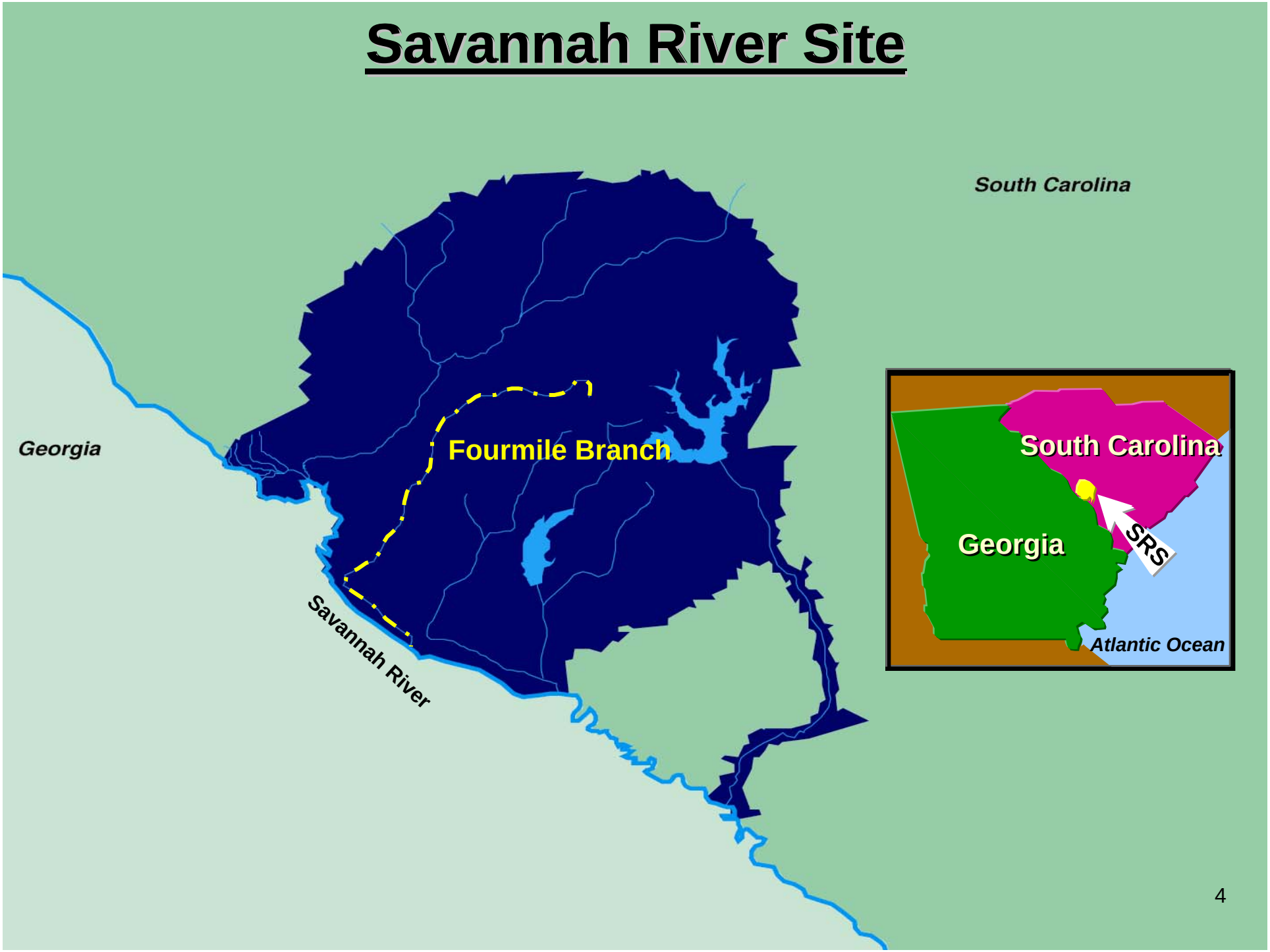
- **Protect the water quality of the Savannah River**
  - **Water quality in the river is good**
  - **No downstream drinking water or ecological issues**

- **Currently performing three Corrective Actions on Groundwater (Plumes) adjacent to Fourmile Branch**
  - **RCRA Permit Goals include:**
    - **70% reduction in tritium flux to Fourmile Branch**
    - **Reduce all other constituents to below standards in Fourmile Branch and seeplines along the Branch**

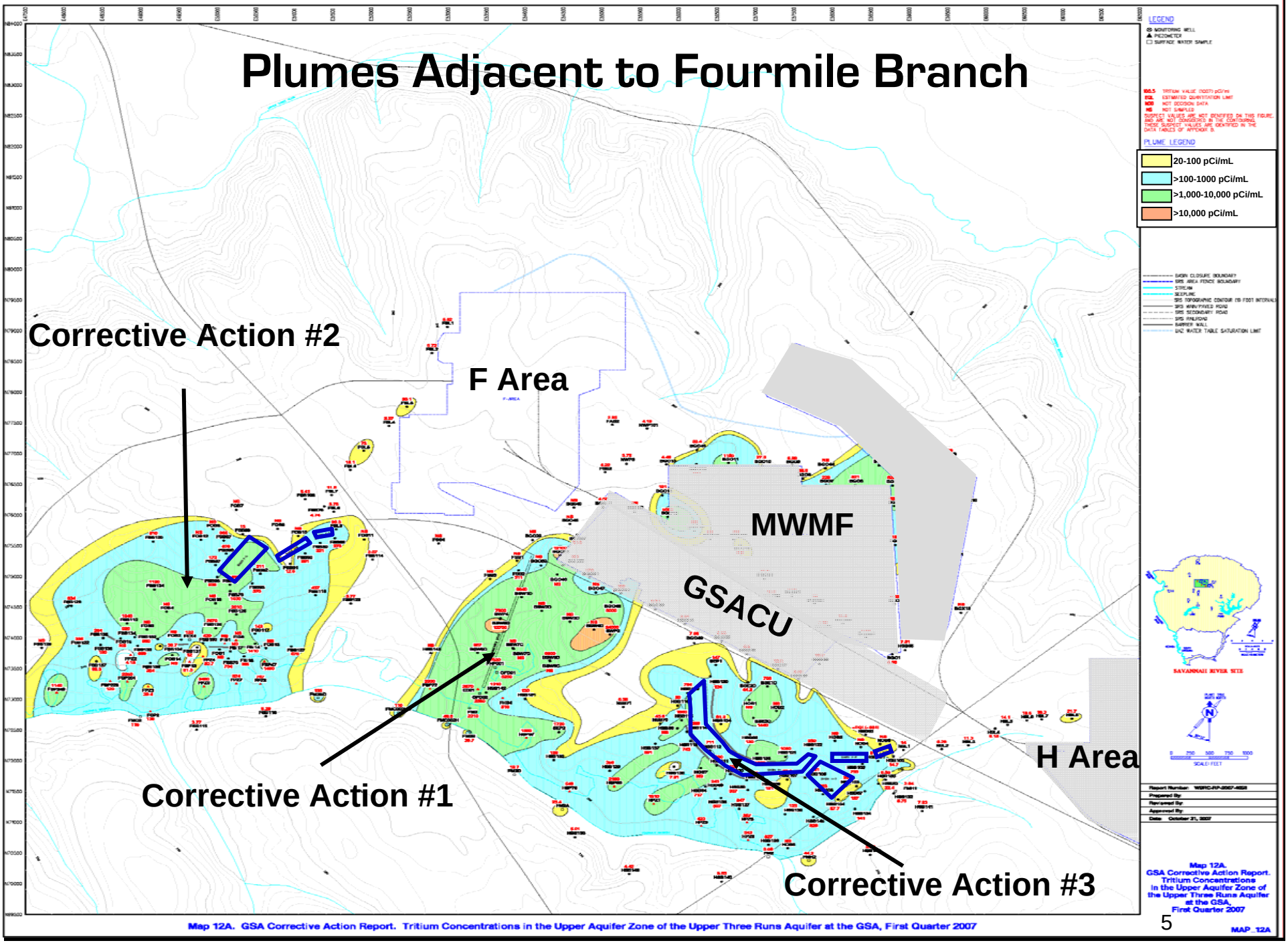
EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Savannah River Site



Plumes Adjacent to Fourmile Branch

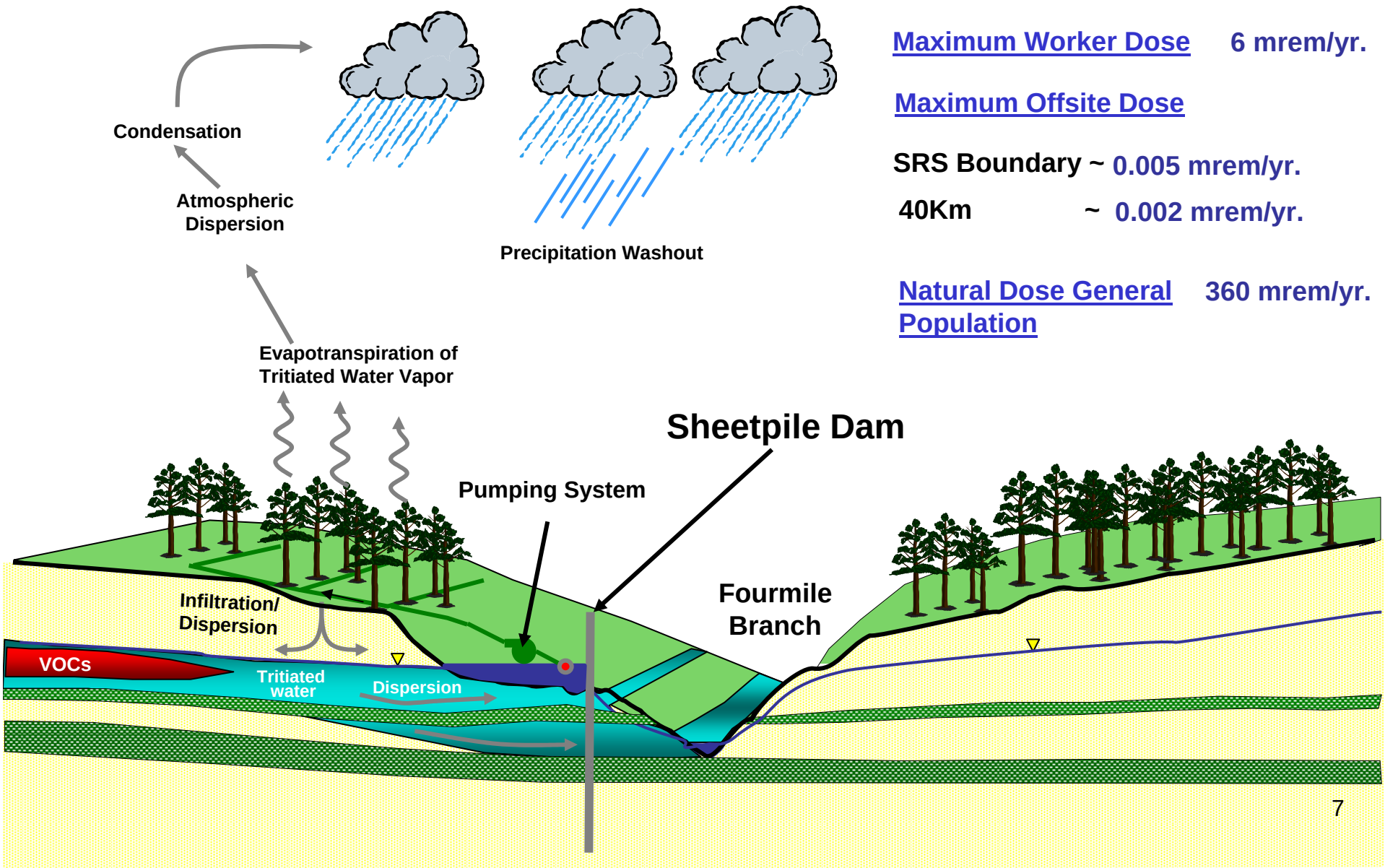


Map 12A. GSA Corrective Action Report. Tritium Concentrations in the Upper Aquifer Zone of the Upper Three Runs Aquifer at the GSA, First Quarter 2007

Corrective Action #1

- **Tritium at the Mixed Waste Management Facility Southwest Plume**
  - **Plume is sourced from the Old Radioactive Waste Burial Ground consists principally of tritiated water and VOCs**
  - **Groundwater containing contaminants discharged into a spring area that was eventually released to Fourmile Branch and the Savannah River (over 1000 curies per year)**
  - **No treatment for tritium other than decay**

MWMF Southwest Plume Seepline Management and VOC Treatment Strategy



Maximum Worker Dose 6 mrem/yr.

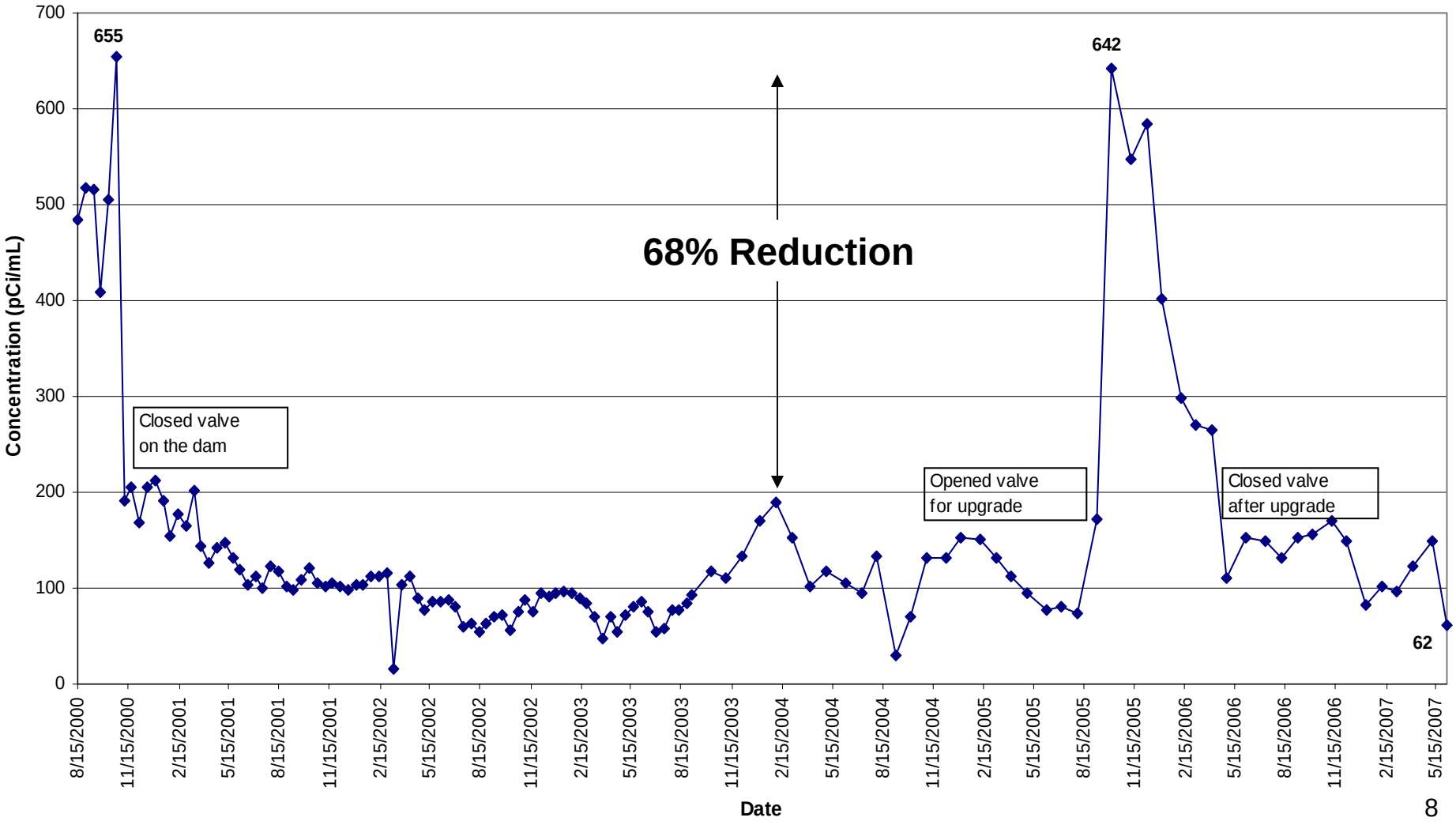
Maximum Offsite Dose

SRS Boundary ~ 0.005 mrem/yr.

40Km ~ 0.002 mrem/yr.

Natural Dose General Population 360 mrem/yr.

Effectiveness of Phytoremediation on Tritium Concentration in Fourmile Branch



Phytoremediation Effectiveness

- **System operated since 2000**
- **Concentration of tritium in Fourmile Branch has been reduced by just under 70%**
- **We have identified no issues with the system**

Corrective Actions #2 and #3 F&H Area Seepage Basins

Background

- **The F and H Area Seepage Basins received acidic and radioactive liquids (including Tritium) from the F and H Separations Facilities**
- **Release created a low pH plume containing radionuclides (metallic and non-metallic)**
- **The acid stripped the formation of metals (including natural radionuclides) and minimized the retardation of contaminants**
- **The plumes discharge into Fourmile Branch**

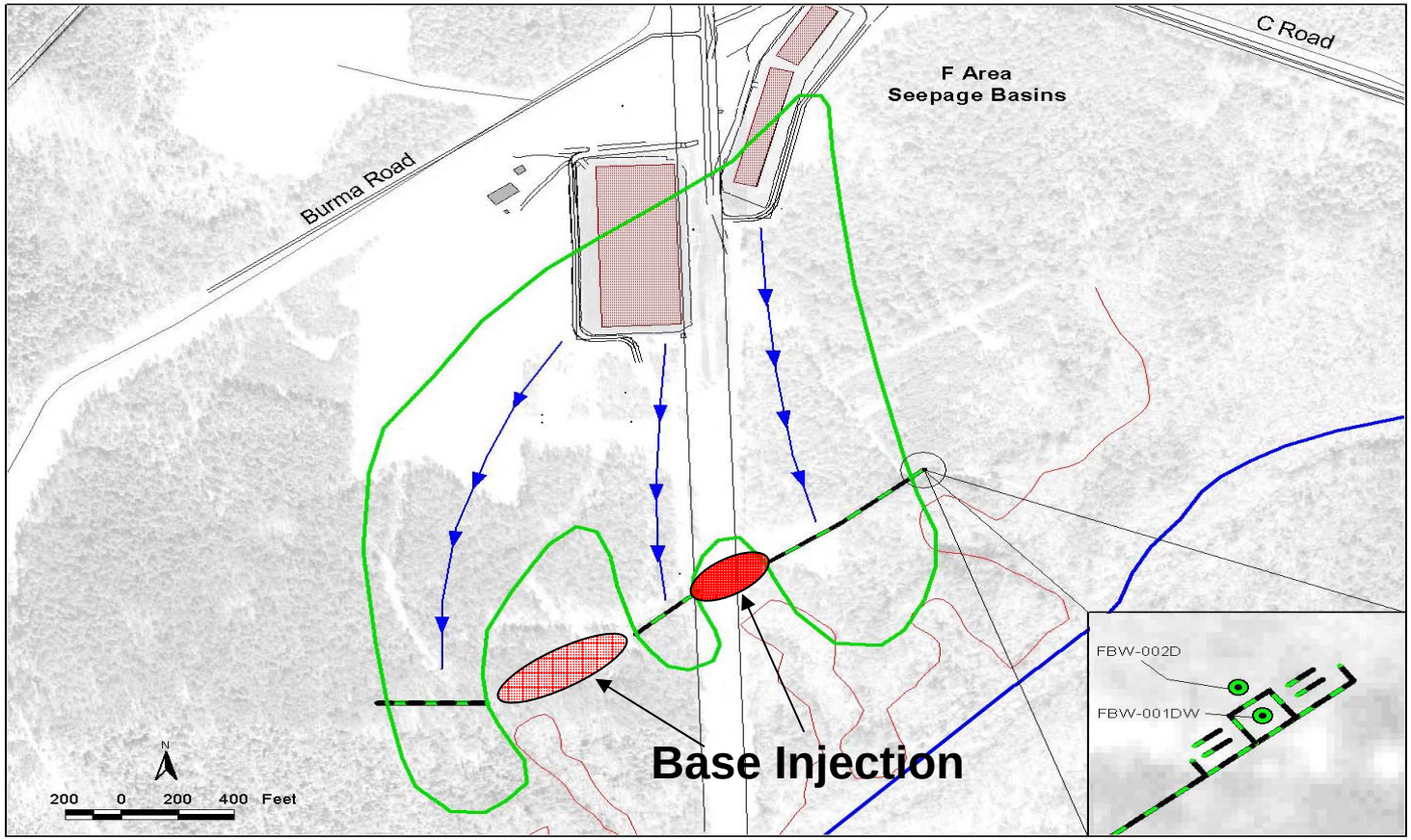
EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Initial Remedial Strategies

- **Releases to the basins were stopped in the mid 1980s**
- **The basins were capped in the early 1990s**
- **Two pump and treat / reinject systems were started in 1997 and terminated in 10/2003**
  - **Did not have a significant impact on releases to Fourmile Branch**
  - **Cost over $1million a month to operate**
  - **Generated large volumes of waste**

F Area Solution:
Barrier Walls / Base Injection



EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

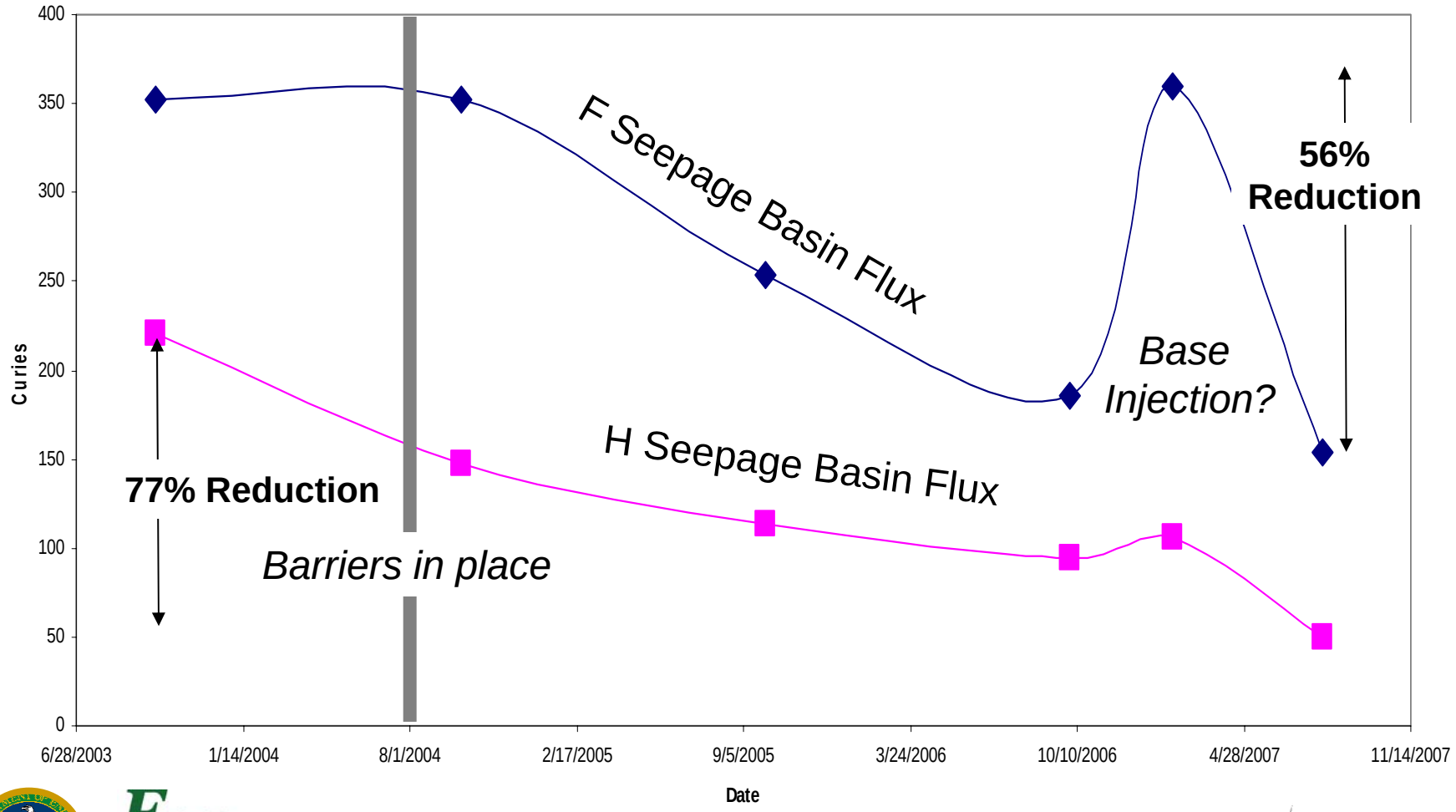
SRS

H Area Solution: Barrier Walls

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

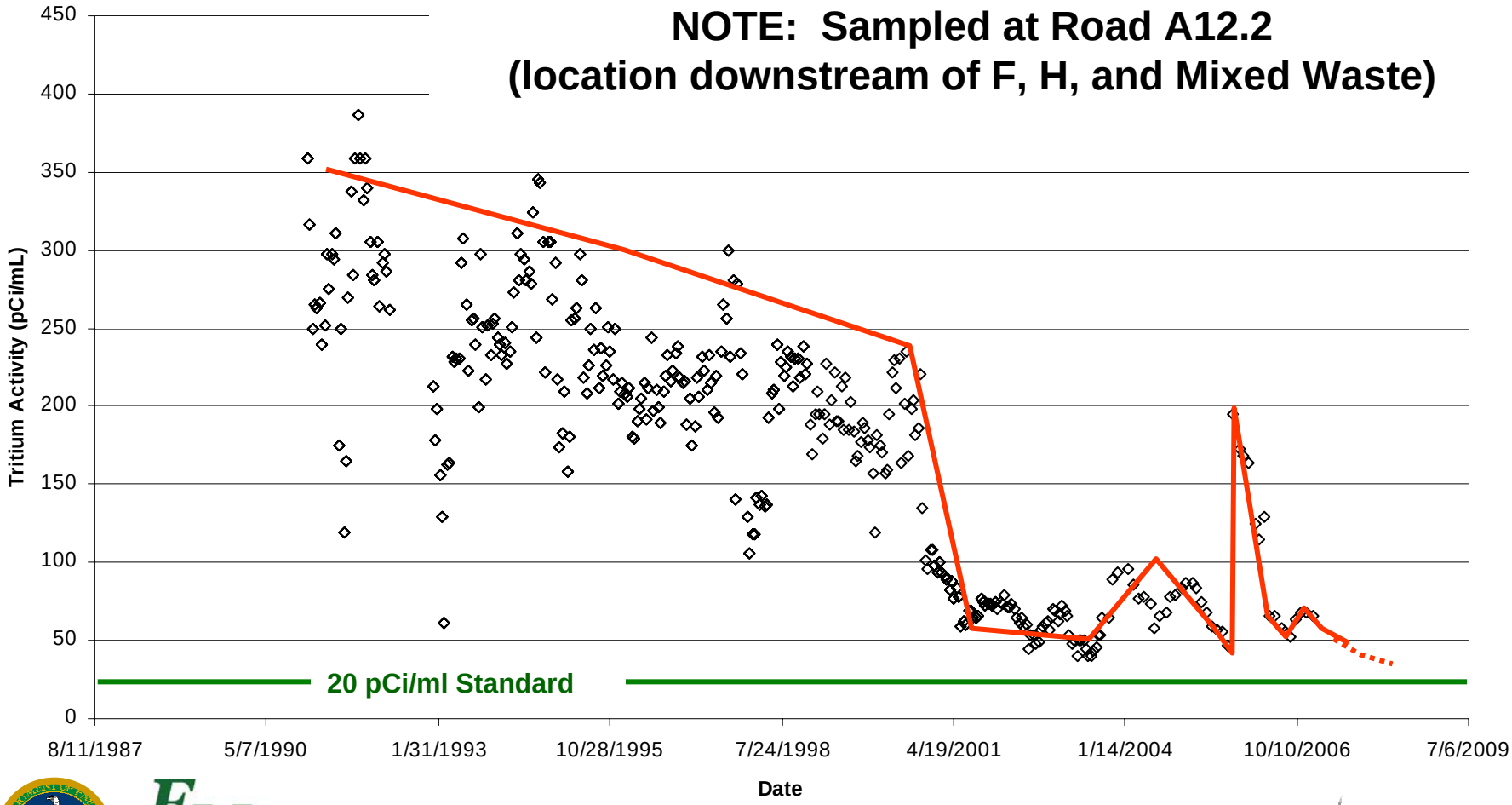
Effectiveness of Barrier Walls in Reducing Tritium Flux



EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Combined Effectiveness of Corrective Actions in Tritium Reduction at Fourmile Branch



EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS

Remaining Challenges

- **Sr-90 and I-129 concentrations occasionally exceed the standard in Fourmile Branch near the plumes (much progress has been made)**
  - **Perform another base injection campaign at both F&H Areas that will fully treat the Sr-90 between the creek and the barriers**
  - **Developing a technology to treat I-129 in-situ**
- **This will take several years to complete**
- **It will take several years to see the effects**

Conclusions

- **No water quality issues associated with the Savannah River**
- **Significant progress has been made in reducing tritium activity at Fourmile Branch**
  - **Near the permit goals for tritium (70%)**
- **Need to perform additional remedial actions to meet permit goals**
  - **Base treatments in F/H Areas for Sr-90**
  - **Develop technology for I-129 and implement**
  - **Will take several years to implement and several years to understand the effects**

EM Environmental Management
safety ❖ performance ❖ cleanup ❖ closure

SRS