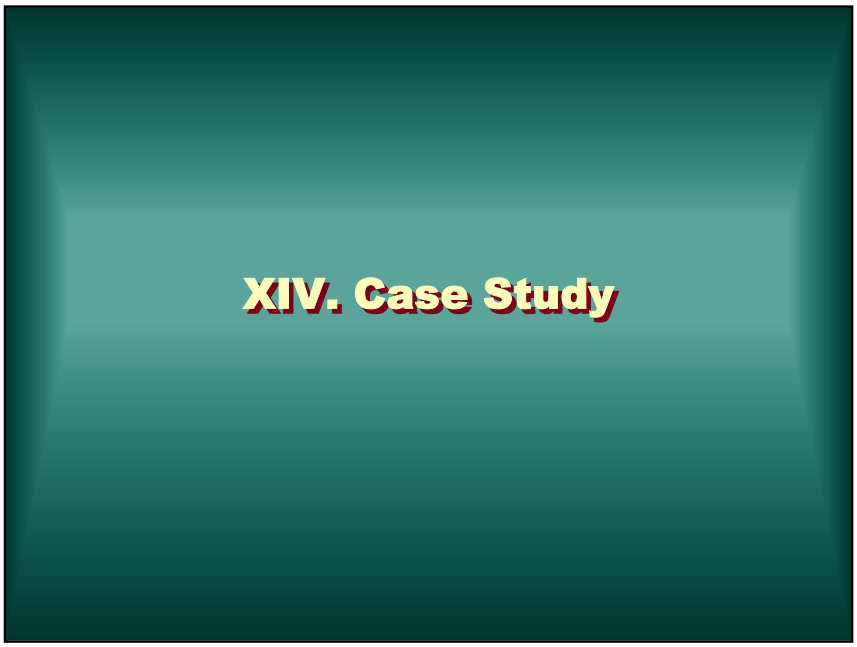
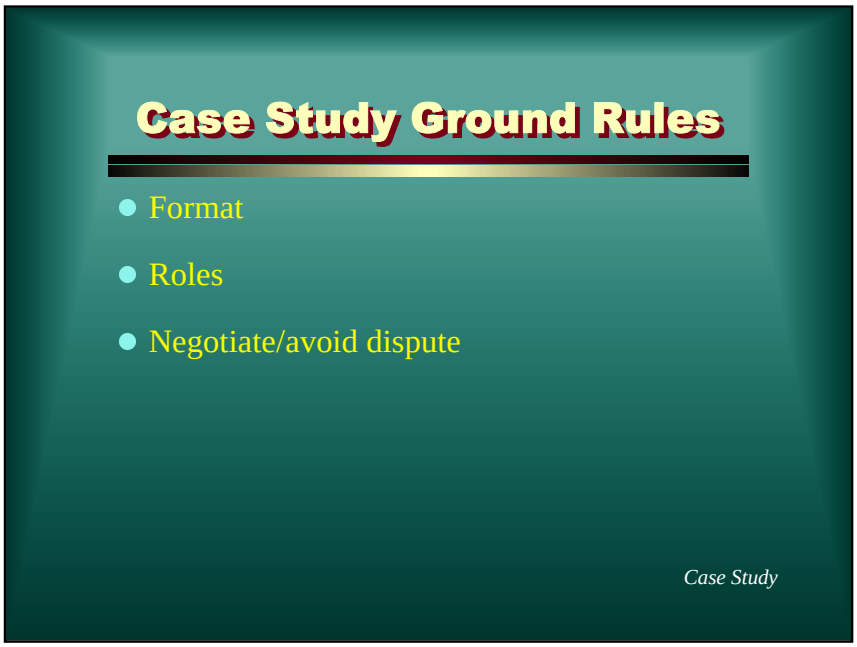


Notes:


Case Study Ground Rules
Format
Roles
Negotiate/avoid dispute
Case Study

Notes:

Notes:

CERCLA remedial action addressed four surface impoundments: 3524, 3513, 3539 and 3540. The impoundments were used as part of Oak Ridge National Laboratory's waste management system.

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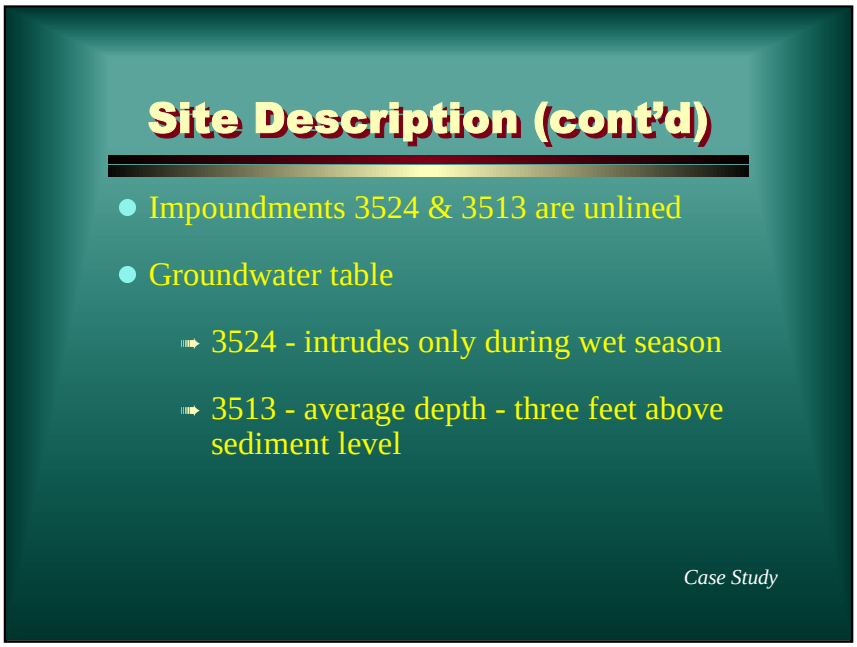
Most recently the impoundments were used as backup overflow capacity for the process waste storage tanks during storms. In June 1996, the Surge Tank Project was completed which eliminated the need for the impoundments.

Notes:

Bedrock is approximately 8-12 feet from the subsurface soils. Although the bedrock is fractured, no major karst development has been identified.

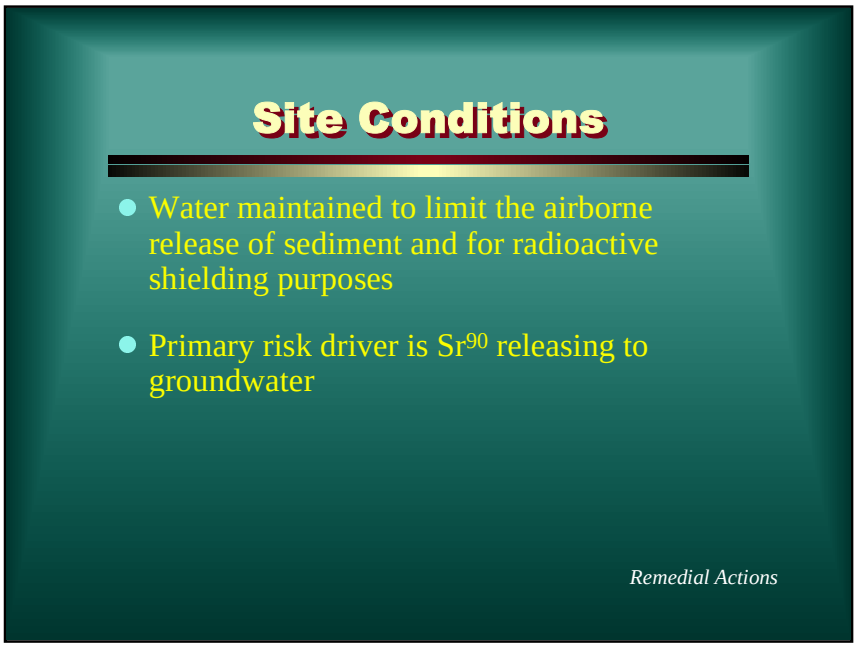
No seismic considerations are present at the site (e.g., faults).

Bentonite clay was added to the southern berm in February 1994 and January 1995 to plug seeps which had developed in the berm. The seeps were draining into WOC and triggered a CWA NOV by the state. The state chose to address this under the CWA, but could have addressed it as a CERCLA removal or interim remedial action.



Notes:

Impoundments 3539 and 3540 are lined impoundments (5-ft compacted clay) with groundwater levels below the impoundments.



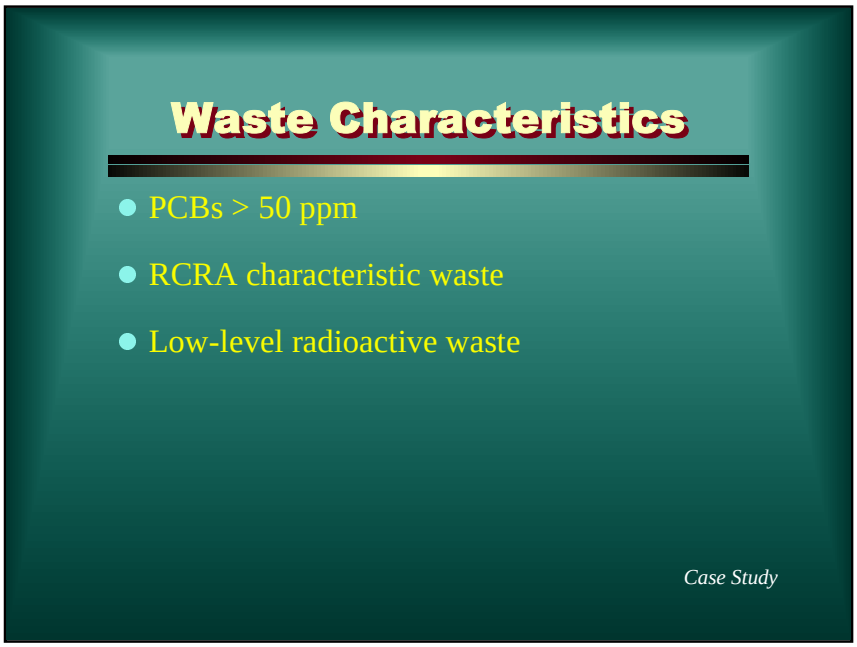
Notes:

After release to groundwater the contaminants migrate via WOC off-site over WOC dam.

WOC dam is located approximately 3000 yards from the impoundments operable unit.

These impoundments contribute 15-20 pCi/L to WOC.

Water shielding is not required for the two smaller impoundments (3539 and 3540).



Notes:

Principle chemicals of concern:

n-Nitroso-di-n-propylamine

Mercury

Zinc

PCBs.

PCBs >50ppm

RCRA characteristic waste (cadmium, chromium, lead, mercury, selenium, silver and 2,4-dinitrotoluene) based on operator knowledge (concentrations exceed 20 times the TCLP limit).

Principle radionuclides of concern:

Cs^{137} (133 curies)

Sr^{90} (36 curies)

Pu^{239} (6.6 curies)

Pu^{238} (0.3 curies)

Co^{60} (1.3 curies)

Am^{241} (3.1 curies)

also small amounts of Uranium

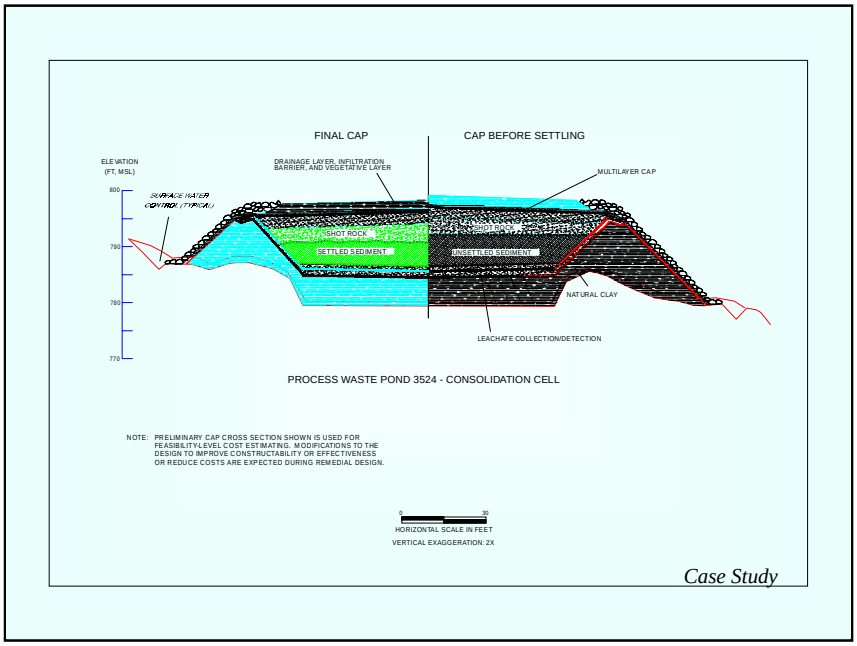
Notes:

Alternative 1 assumes maintenance of existing controls (i.e., maintenance of the water cover over the impoundments for 30-100 years). After 100 years the site is assumed to be abandoned.

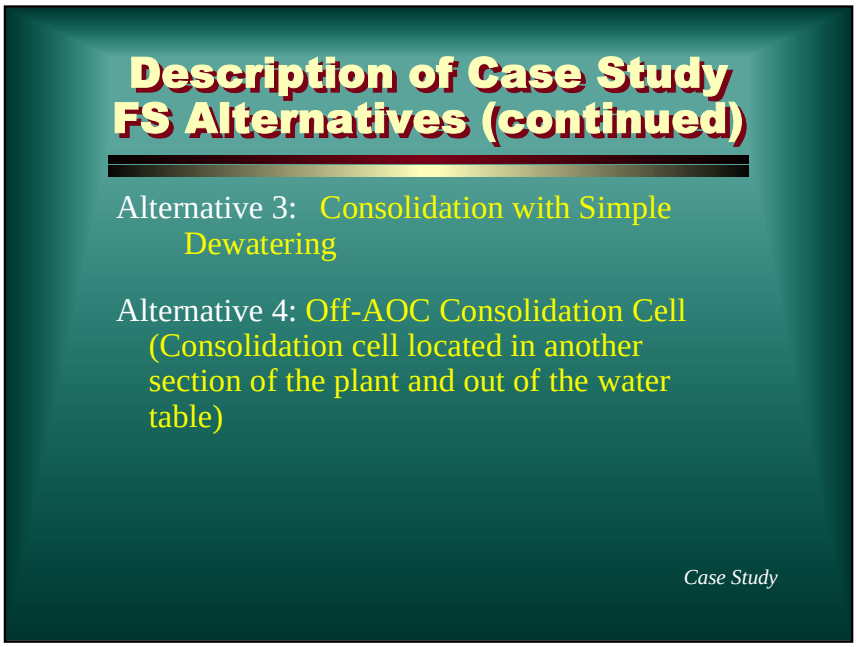
Usually, in a true no action scenario, there are no ARARs. [U.S. Environmental Protection Agency's Office of Solid Waste and Emergency Response (OSWER) Directive 9234.2-01/FS-4 (*ARARs Q's and A's*, June 1994)]

Alternative 2 Actions:

1. General site preparation activities.
2. Install multilayer cap (removing water as impoundments are backfilled).
3. Long-term monitoring/institutional controls.


FINAL CAP
CAP BEFORE SETTLING
ELEVATION
(FT. MSL)
DRAINAGE LAYER, INFILTRATION
BARRIER, AND VEGETATIVE LAYER
MULTILAYER CAP
SURFACE WATER
CONTROL (TYPICAL)
SHOT ROCK
SETTLED SEDIMENT
UNSETTLED SEDIMENT
NATURAL CLAY
LEACHATE COLLECTION/DETECTION
800
750
700
770
PROCESS WASTE POND 3524 - CONSOLIDATION CELL
NOTE: PRELIMINARY CAP CROSS SECTION SHOWN IS USED FOR
FEASIBILITY-LEVEL COST ESTIMATING. MODIFICATIONS TO THE
DESIGN TO IMPROVE CONSTRUCTABILITY OR EFFECTIVENESS
OR REDUCE COSTS ARE EXPECTED DURING REMEDIAL DESIGN.
0
30
HORIZONTAL SCALE IN FEET
VERTICAL EXAGGERATION: 2X
Case Study

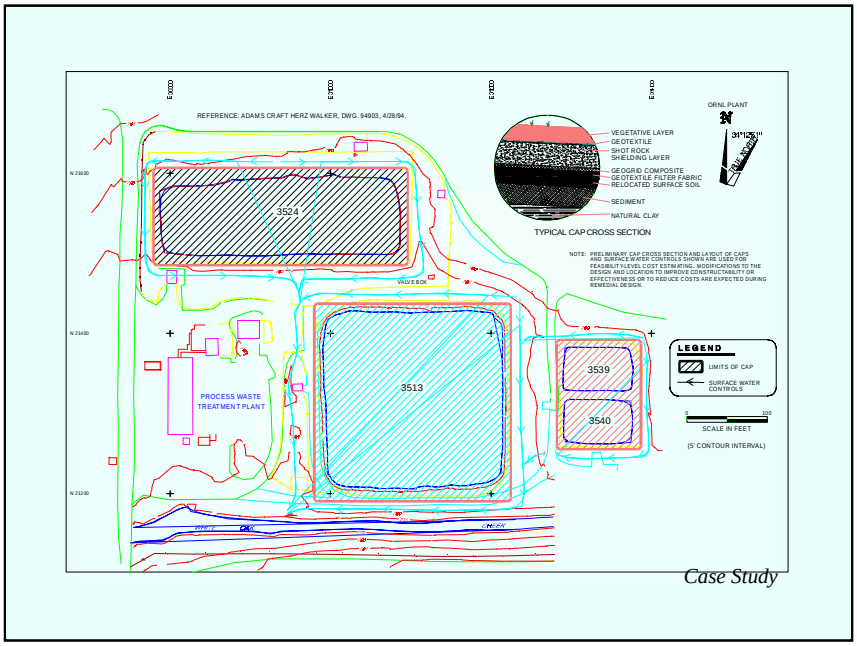
Notes:



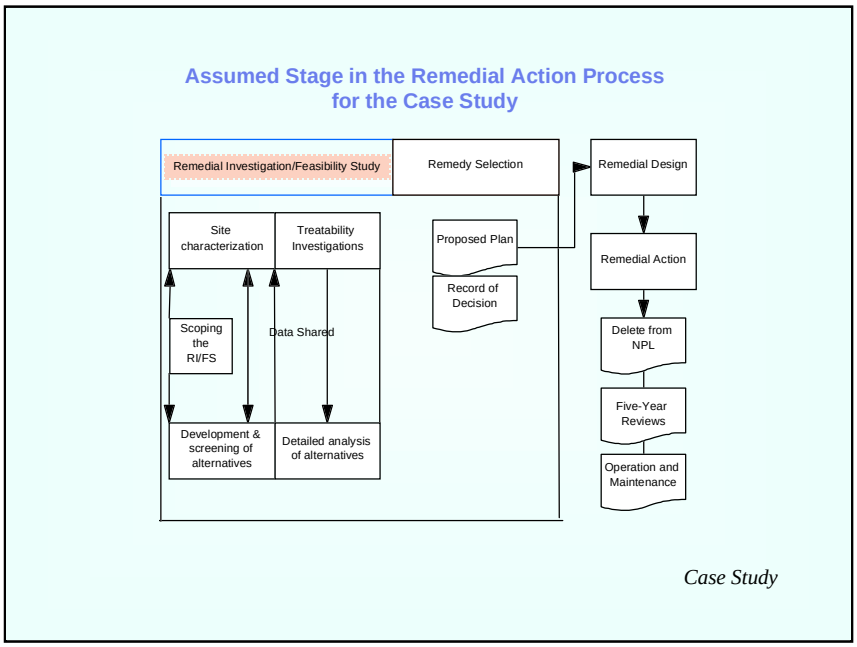
Notes:

Alternative 3 Actions:

1. Site preparation activities.
2. Relocate sediment/soils from 3524 to 3513 by dredging.
3. Relocate wastewater to 3513, 3539, 3540, or to the process waste treatment system.
4. Backfill with clay to raise the cell bottom above the groundwater and install liner and leachate collection system.
5. Consolidate sediment/soils from all impoundments to 3524 with leachate collection sytem turned off to allow water to accumulate for shielding.
6. Install geocomposite liner over sediments.
7. Remove water via leachate collection system while adding backfill/rock.
8. Install multilayer cap (redress cap with additional topsoil and vegetation after 2 years).
9. Long-term monitoring and leachate collection.


REFERENCE: ADAMS CRAFT HERZ WALKER, DWG. 94903, 4/28/94.
VEGETATIVE LAYER
GEOTEXTILE
SHOT ROCK SHIELDING LAYER
GEOGRID COMPOSITE GEOTEXTILE FILTER FABRIC
RELOCATED SURFACE SOIL
SEDIMENT
NATURAL CLAY
TYPICAL CAP CROSS SECTION
ORNL PLANT
3524
3513
3539
3540
VALVE BOX
PROCESS WASTE TREATMENT PLANT
LEGEND
LIMITS OF CAP
SURFACE WATER CONTROLS
SCALE IN FEET
(5' CONTOUR INTERVAL)
Case Study

Notes:


Assumed Stage in the Remedial Action Process for the Case Study
Remedial Investigation/Feasibility Study
Remedy Selection
Remedial Design
Site characterization
Treatability Investigations
Proposed Plan
Record of Decision
Remedial Action
Scoping the RI/FS
Data Shared
Delete from NPL
Five-Year Reviews
Development & screening of alternatives
Detailed analysis of alternatives
Operation and Maintenance
Case Study

Notes:

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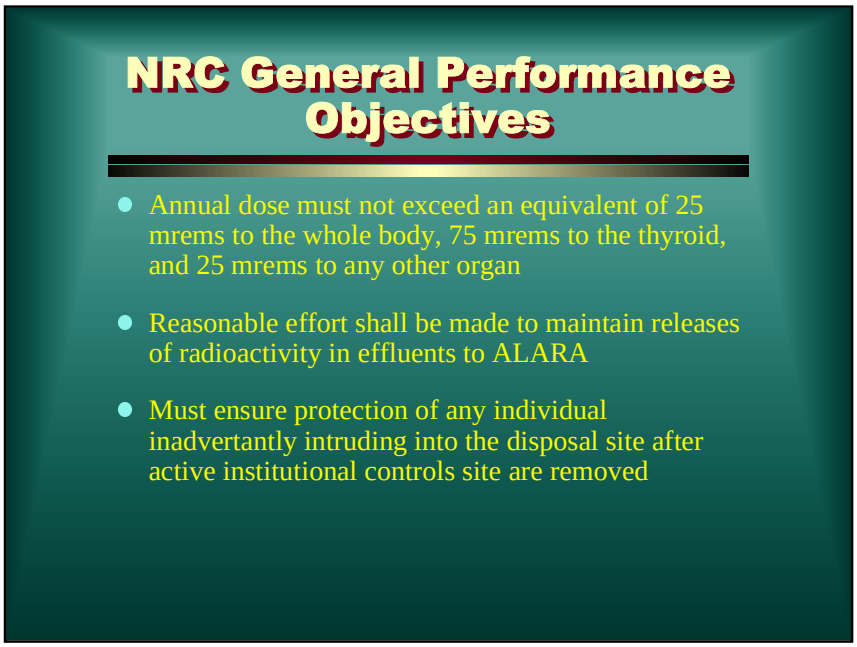

NRC General Performance Objectives
Annual dose must not exceed an equivalent of 25 mrems to the whole body, 75 mrems to the thyroid, and 25 mrems to any other organ
Reasonable effort shall be made to maintain releases of radioactivity in effluents to ALARA
Must ensure protection of any individual inadvertantly intruding into the disposal site after active institutional controls site are removed

Notes:


NRC Siting Requirements
Capable of being characterized, modeled, analyzed and monitored
Well drained and free of areas of flooding and frequent ponding
Prohibits location in 100-year flood plain or wetland

Notes:


NRC Siting Requirements (continued)
Projected regional population growth and future developments are not likely to affect the ability of the disposal facility to meet the performance objectives
Provide sufficient depth to the water table that groundwater intrusion, perennial or otherwise, into the waste will not occur
Prohibits location where nearby activities or facilities could impact the site's ability to meet performance objectives or mask environmental monitoring

Notes:


NRC Site Design Requirements
Directed toward long-term isolation and avoidance of the need for continuing active maintenance
Covers designed to minimize to the extent practicable water infiltration, to direct percolating or surface water away from the disposed waste
Minimize to the extent practicable the contact standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal

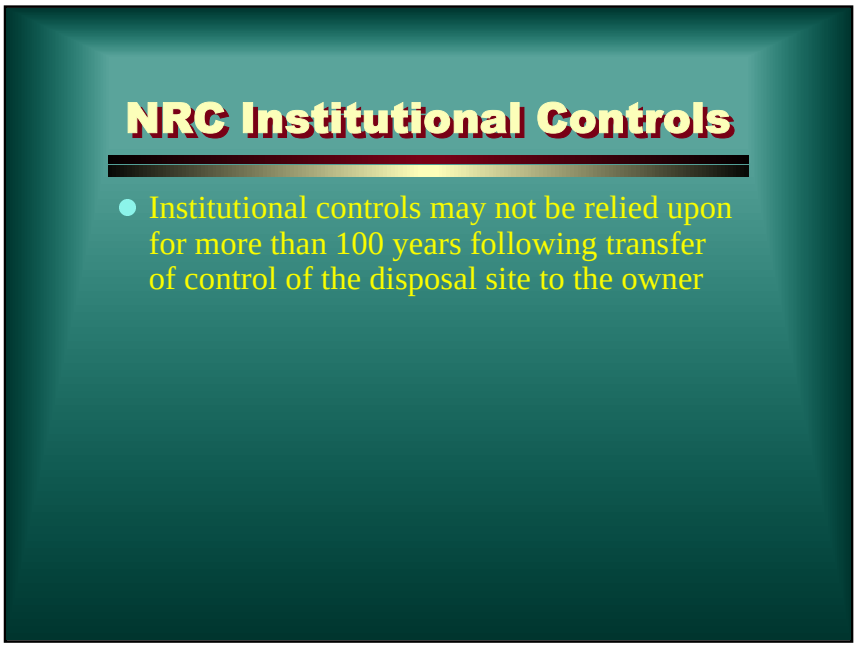
Notes:


NRC Monitoring Requirements
Maintain post-operational surveillance
Capable of providing early warning of releases of radionuclides from the disposal unit before they leave the site boundary

Notes:


NRC Site Operation and Closure Requirements
Maintains the package integrity during emplacement
Minimizes the void spaces between packages
Void spaces between waste packages must be filled to reduce future subsidence
Locations of disposal unit must mapped by survey
Only wastes contaminated with radioactive materials shall be disposed

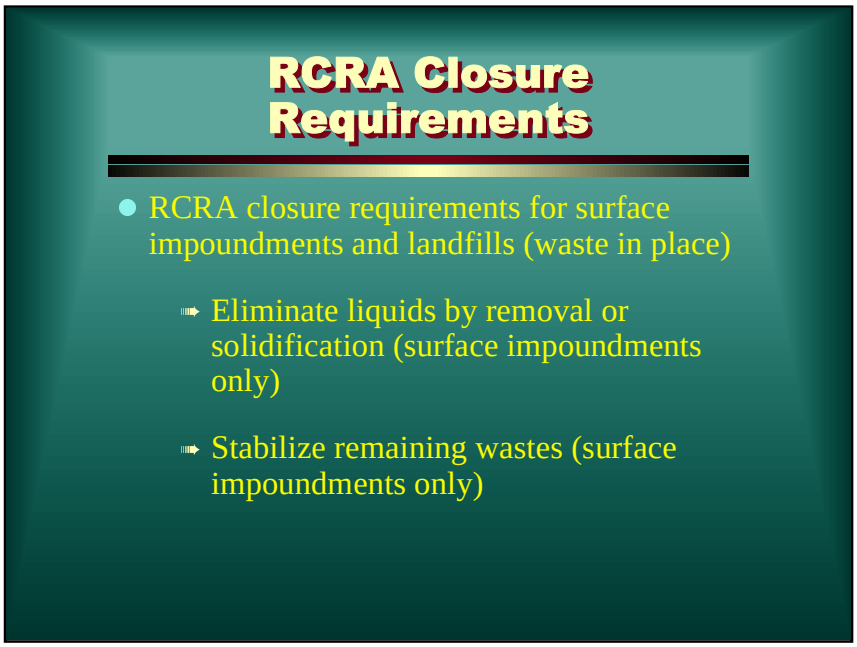
Notes:


NRC Institutional Controls
Institutional controls may not be relied upon for more than 100 years following transfer of control of the disposal site to the owner

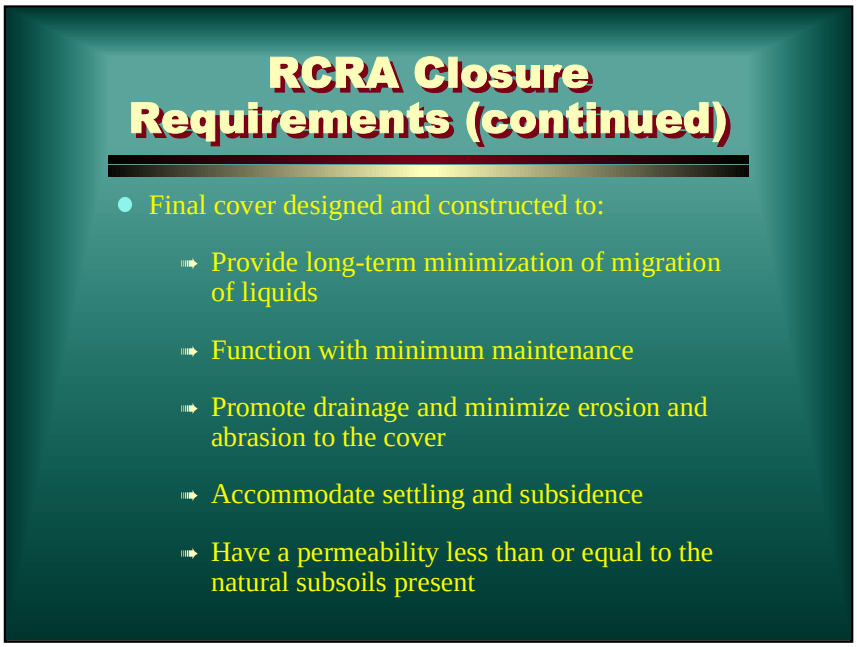
Notes:


RCRA Design and Operating Requirements
RCRA design and operating requirements for surface impoundments and landfills
Minimum technological requirements
Must have a two-liner system
Leachate collection/detection and removal system
Groundwater monitoring

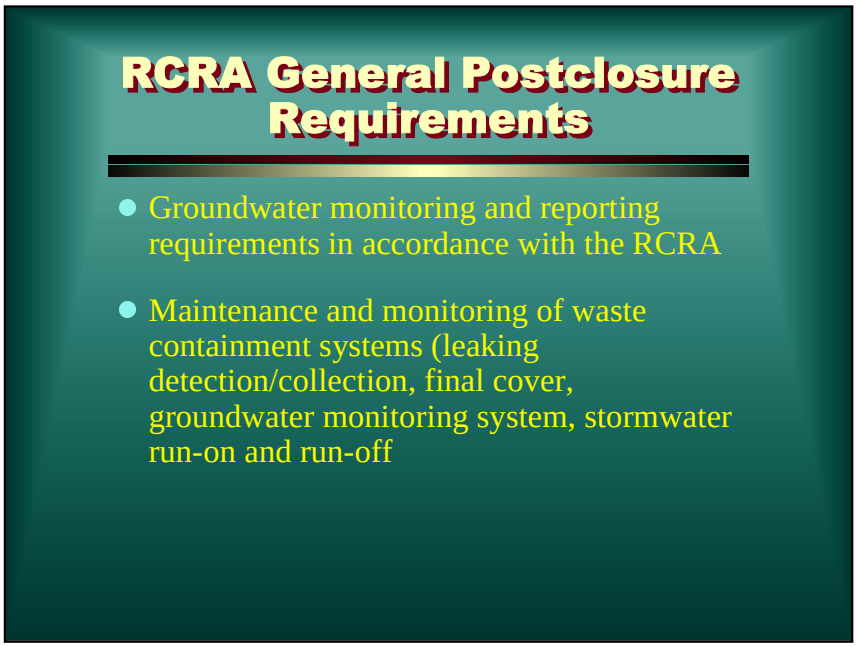
Notes:


RCRA Closure Requirements
RCRA closure requirements for surface impoundments and landfills (waste in place)
Eliminate liquids by removal or solidification (surface impoundments only)
Stabilize remaining wastes (surface impoundments only)

Notes:


RCRA Closure Requirements (continued)
Final cover designed and constructed to:
Provide long-term minimization of migration of liquids
Function with minimum maintenance
Promote drainage and minimize erosion and abrasion to the cover
Accommodate settling and subsidence
Have a permeability less than or equal to the natural subsoils present

Notes:


RCRA General Postclosure Requirements
Groundwater monitoring and reporting requirements in accordance with the RCRA
Maintenance and monitoring of waste containment systems (leaking detection/collection, final cover, groundwater monitoring system, stormwater run-on and run-off

Notes:

Notes:

Location of the landfill above the historical high groundwater table. The bottom of the liner must be at least 50-ft above the historical high water table.

Must be located in thick, relatively impermeable formations (clay pans) **or** soil should have a high clay and silt content within specified parameters and a 30 mils synthetic liner.

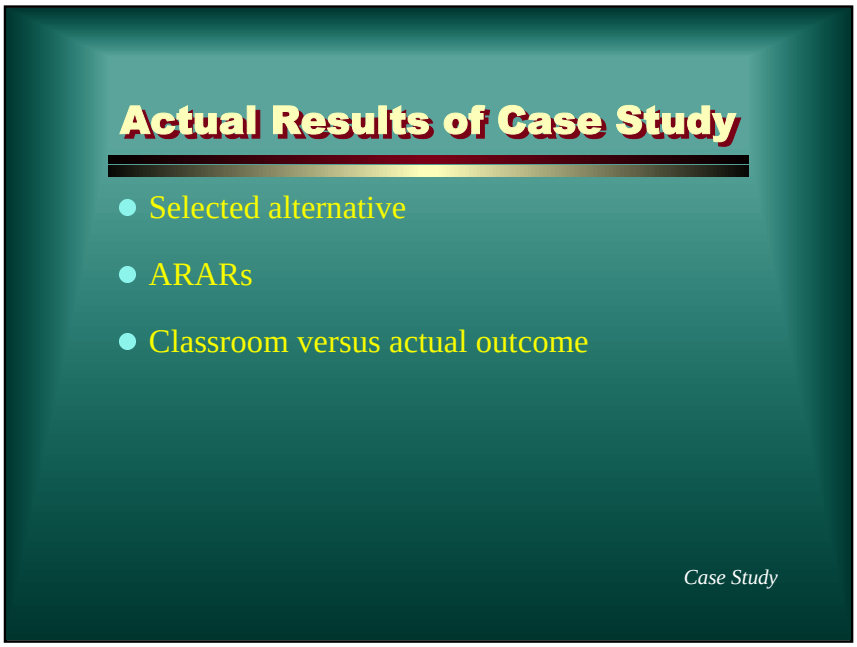
Must contain a leachate collection system.

A 6-ft woven mesh fence, wall or similar device must be placed around the site to prevent unauthorized access.

Located in an area of low to moderate relief (minimize erosion/slumping/landslides).

Sampled of designated watercourses.

Groundwater monitoring at a minimum of three points.


Actual Results of Case Study
Selected alternative
ARARs
Classroom versus actual outcome
Case Study

Notes: