United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R03-86/030
September 1986

Superfund Record of Decision:

Chisman Creek, VA

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

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15. SUPPLEMENTARY NOTES

16. ABSTRACT

The Chisman Creek site, located in Southeastern York County, VA, is in a 520-acre sub-watershed of the Chisman Creek coastal Basin on the Virginia Peninsula. As a tidal estuary, Chisman Creek flows easterly into Chesapeake Bay. Approximately 500 to 1,000 people live within one mile of the site in this primarily residential area. Chisman Creek supports private and commercial marinas and numerous private docks, and is also a popular fishing area. In 1957 and 1958, two units of the Virginia Power Yorktown Power Generating Station began burning coal mixed with coke from a nearby petroleum refinery. Fly ash was produced by these units until 1974. A private contractor, employed between 1957 and 1974 to haul the fly ash from the generating station, disposed of large quantities of this incinerated coal by-product in four abandoned sand and gravel pits in the Chisman Creek watershed, approximately two miles south of the generating station. No dust control measures were employed during the hauling, and uncontrolled erosin caused fly ash to wash from the pits into Chisman Creek and its tributaries during heavy rains. The remedial investigation conducted at the site found contaminants in the fly ash, the sediments of Chisman Creek and its tributaries, the ground water within and adjacent to the pits, and in surface water. The primary contaminants of concern include: trace metals (nickel and vanadium), and inorganics.

(See attached sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Superfund Record of Decision Chisman Creek, VA Contaminated Media: gw, sw, soil sediments, wetlands Key contaminants: trace metals (nickel and vanadium), inorganics		

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16. ABSTRACT (continued)

The selected remedial action includes: capping Areas A and B with a soil layer overlaid with topsoil and vegetative growth; capping Area C with a low-permeability compacted soil layer overlaid with topsoil and vegetative growth; installation of a subsurface drain on the west, south, and east sides of Area C to lower the water table below the bottom of the fly ash; transportation of ground water drainage from Area C to an onsite treatment plant; extension of the Newport News and the Allen Mill Road waterlines to affected homes; implementation of deed restrictions or other controls to prohibit excavation of soil and restrict onsite building and ground water use. The estimated capital cost for this remedy is $14,119,000 with O&M costs for year one of $506,000 and $64,000 for years 2-30.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Chisman Creek Site, Grafton, York County, Virginia

Documents Reviewed:

I am basing my decision principally on the following documents describing the analysis of cost effectiveness and feasibility of remedial alternatives for the Chisman Creek Site. Also, meetings to discuss these remedial alternatives have been conducted with the State and the general public. I have been briefed by my staff on the documents and the meetings and they form the principal basis for my decision.

- Remedial Investigation Report, Volumes I and II, Chisman Creek Superfund Site, York County, Virginia, November 22, 1985, prepared by CH2M Hill
- Public Health and Environmental Evaluation, Chisman Creek Superfund Site, York County, Virginia, August 1986, prepared by CH2M Hill
- Feasibility Study Report, Chisman Creek Superfund Site, York County, Virginia, August 1986, prepared by CH2M Hill
- Staff Summaries and Recommendations
- Public Comments and Responsiveness Summary

Description of the Selected Remedy:

1. Areas A and B - These fly ash pits will be capped with a soil layer overlaid with topsoil and vegetative growth to prevent direct contact with the fly ash and to minimize erosion of the fly ash.

2. Area C - This fly ash pit will be capped with a low-permeability cover overlaid with topsoil and vegetative growth. A subsurface drain will be installed on the west, south, and east sides of the fly ash pit in order to lower the water table below the bottom of the fly ash. Contaminated ground water collected from the fly ash during the initial drawdown period will be conveyed to an onsite treatment plant. Once the ground water being collected through the drain is shown to meet National Pollutant Discharge Elimination System (NPDES) limits, the treatment will cease.

3. Alternate Water Supply - The homes along Wolf Trap Road will be connected to the existing Newport News waterline and the homes along Allens Mill Road will be served by extending the existing waterline to Allens Mill Road. During the design of the remedial alternatives, a survey of the

existing water supplies will be conducted. The survey will determine the the number of homeowners currently using the Tabb or Yorktown Formations for drinking water and the corresponding number of connections to the alternate water supply lines.

4. Land Use Controls - EPA will attempt to obtain deed restrictions or other controls on the use of the fly ash pits and immediately adjacent areas. These restrictions should prohibit excavation of soil and restrict building onsite. These controls should also include restrictions on ground water use in the pits and down gradient of the fly ash pits.

5. Monitoring - Post-closure monitoring program for the ground water and surface water will be designed and implemented.

Operation and Maintenance

The State of Virginia will perform post closure operation and maintenance of the site.

Continuing Action

The U.S. Fish and Wildlife Service is preparing a study for EPA on the environmental impacts of the site on the streams and ponds adjacent to the flyash pits. Once the U.S. Fish and Wildlife Service concludes its study, EPA will determine the need for additional remedial measures for any ponds or streams affected by the site as a separate operable unit under Section 300.68(c) of the National Oil and Hazardous Substances Contingency Plan (NCP), 40 CFR §300.68(c).

Declarations

Consistent with the Comprehensive Environmental Response and Compensation and Liability Act of 1980 (CERCLA) 42 U.S.C. §9601-9657 and the NCP, I have determined that the remedial action described above, together with proper operation and maintenance, constitute a cost-effective remedy which mitigates and minimized damage to public health, welfare, and the environment. The remedial action minimizes or eliminates the the threat of further contamination to the groundwater and the environment. The State of Virginia has been consulted and agrees with the approved remedy. These activities will be considered the approved action and eligible for Trust Fund monies.

I have determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites.

9/30/86
Date

James M. Seif
Regional Administrator

SUMMARY OF REMEDIAL ALTERNATIVES SELECTION
CHISMAN CREEK SUPERFUND SITE

Site Location

The Chisman Creek Superfund site is located in Southeastern York County, Virginia, in a 520-acre sub-watershed of the Chisman Creek Coastal Basin on the Virginia Peninsula (Figure 1). Chisman Creek is a tributary to Chesapeake Bay. The site consists of four abandoned sand and gravel pits that were filled with fly ash from the Virginia Power, (formerly Virginia Electric and Power Company), Yorktown Power Generating Station (Figure 2).

The four fly ash disposal pits are located adjacent to Wolftrap Road (State Route 630), approximately 0.7 miles northeast of the intersection of Route 630 and U.S. Route 17 (Figure 1). The southernmost pit, Area A, is approximately 13.5 acres in area and is bordered on the west by the former York County municipal landfill and on the east by Route 630. Area B, approximately 4.5 acres, is 700 feet north of Area A and is bordered on the east and west by intermittent streams. Area C, approximately 12.9 acres, is 500 feet northeast of Area B, and is bordered by Route 630 to the west and by Chisman Creek to the northeast. Area D, approximately 5 acres, is 150 feet northwest of Area C. Parts of Areas A and C are elevated between 5 and 20 feet above the surrounding land. The relief of Areas B and D is similar to that of the surrounding land.

Surface Hydrology

The predominant surface hydrologic feature of the area is Chisman Creek, which is located directly east of the fly ash pits. Chisman Creek is a tidal estuary 3.75 miles long which flows easterly into Chesapeake Bay. The Creek is approximately 0.5 miles wide at its mouth, where the average depth is 12 feet. The mean range of the tide in the creek is approximately 2.5 feet.

Surface drainage of the area around the fly ash pits occurs through a wetlands and a number of small, unnamed tributaries to Chisman Creek. Natural drainage throughout the area has been altered by man-made ponds which resulted from the excavation of sand and gravel from the Tabb Formation. A number of these ponds also drain into the tributaries of the creek (Figure 2).

Hydrogeology

The four fly ash disposal pits are situated on the Hornsbyville Flat, a 1/2 mile wide plateau characteristically 25 to 30 feet above mean sea level.

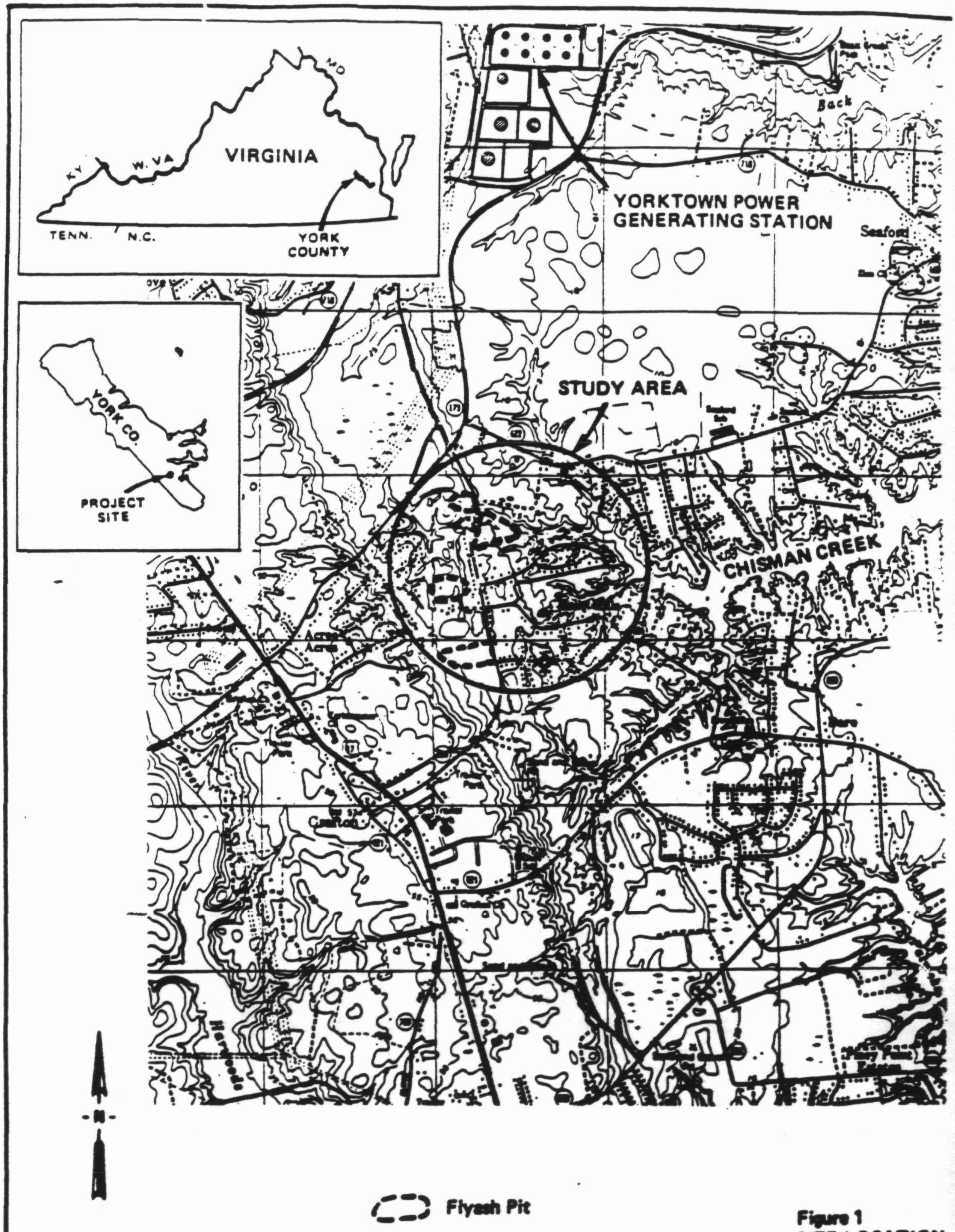


Figure 1
SITE LOCATION
CHISMAN CREEK FS

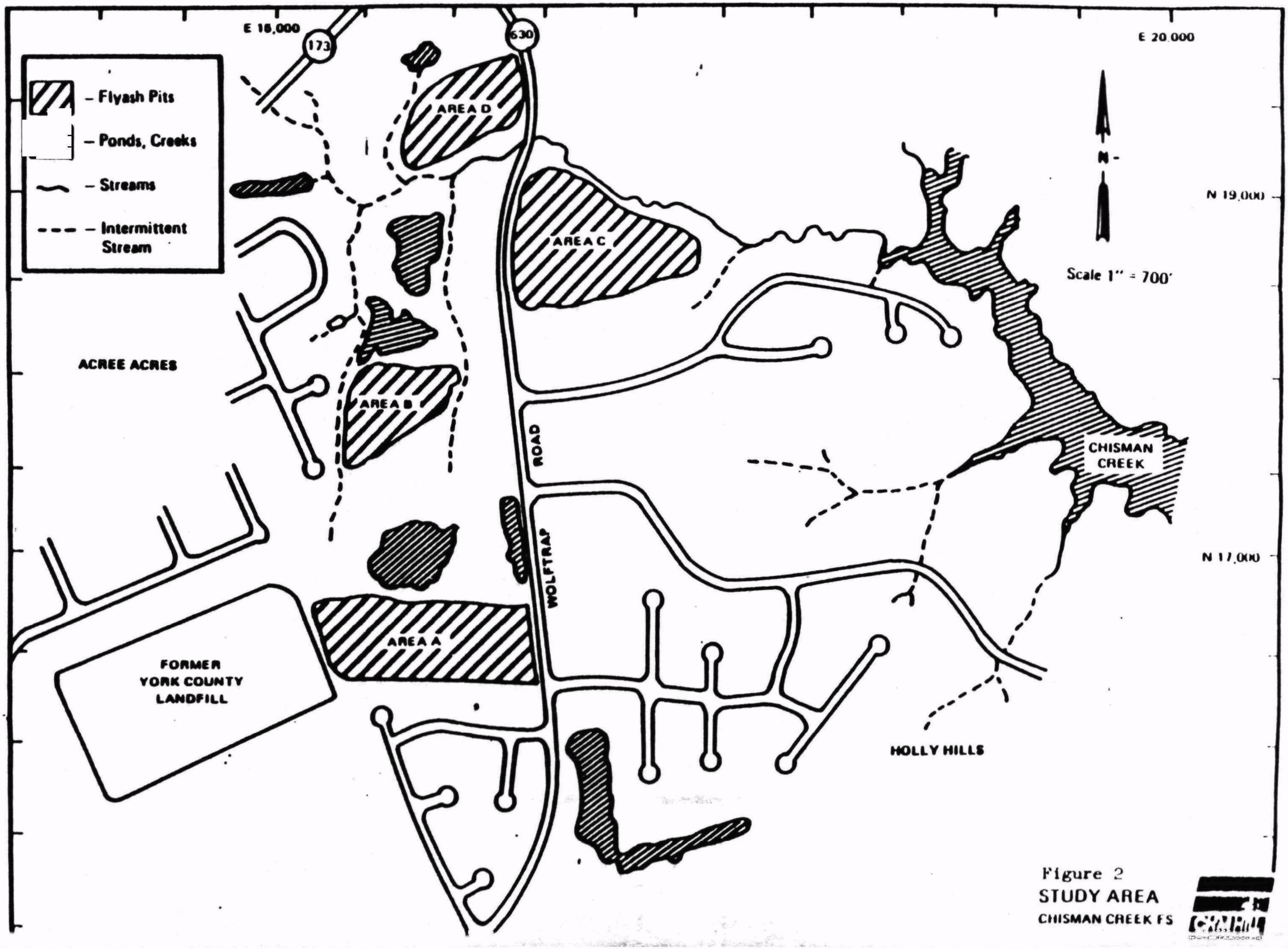


Figure 2
STUDY AREA
CHISMAN CREEK FS

The Chisman Creek site and surrounding area are underlaid by two geologic formations, the shallow Tabb and deeper Yorktown Formations (Figure 3). The late Pleistocene Tabb Formation is composed primarily of medium sand with some gravel or fine silty clayey sand, and is of moderate to high permeability. Locally, the thickness of the Tabb is as much as 20 feet. In some areas the Tabb has been completely excavated or removed by natural erosion.

The late Miocene/early Pleistocene Yorktown Formation underlies the Tabb Formation at the site. The Yorktown consists primarily of greenish-gray, silty sand with whole and broken calcareous fossils (shells) interspersed or heavily bedded throughout; it is of relatively low permeability. The thickness of the Yorktown at the site is unknown, but it is estimated to be 100 to 150 feet.

The regional pattern of ground water flow is from major recharge zones in the highlands west of the study area, eastward to discharge zones in and along Chisman Creek. In detail, however, ground water flow patterns in the study area are much more complex, shaped by details of surface topography, by local recharge within the study area, by the difference in conductivity between the Tabb and Yorktown Formations, and by the topography of the surface of the Yorktown.

In general, local flow directions in the Tabb are toward the ponds and stream channels tributary to Chisman Creek. The direction and estimated velocity of ground water are shown on Figure 4.

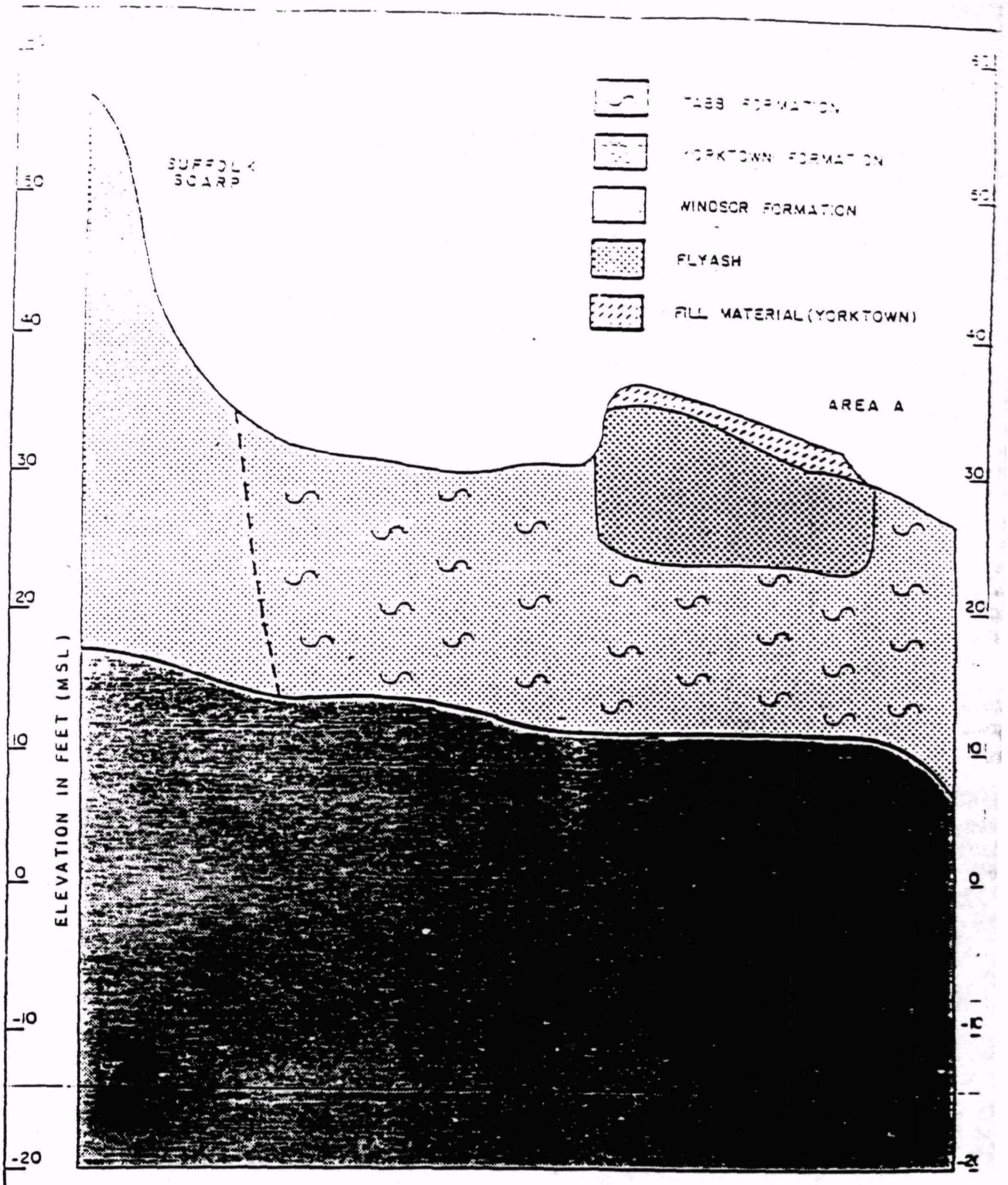
Vertical movement of ground water generally is downward from the Tabb into the Yorktown, but at a very low velocity (less than 10^{-7} feet per second or less than 3 feet per year) over most of the site. However, relatively strong upward flows occur along Chisman Creek and around the other surface water bodies. The Yorktown Formation presents a significant geochemical boundary by virtue of its high shell (calcium carbonate) content, which causes pore waters to have very high pHs.

Area Land Use

Approximately 500 to 1,000 people live within 1 mile of the Chisman Creek site. Land use in the immediate vicinity of the site is mainly for single family residences. Extensive residential construction was underway to the south of Area A at the time of the Remedial Investigation (RI).

Chisman Creek supports private and commercial marinas and numerous private docks, and is a popular fishing area for both private and commercial fishermen. Ponds in the area are reportedly used for recreation as well.

Municipal water service has been extended to most of the residences adjacent to the flyash pits. However, 46 residential wells in the vicinity



SCALE

HORIZONTAL : 1" = 300'
VERTICAL: 1" = 10'

SOURCE: CH2M HILL, DRAFT REMEDIAL INVESTIGATION REPORT (NOV., 1985)

Figure 3

TYPICAL
GEOLOGIC CROSS SECTION

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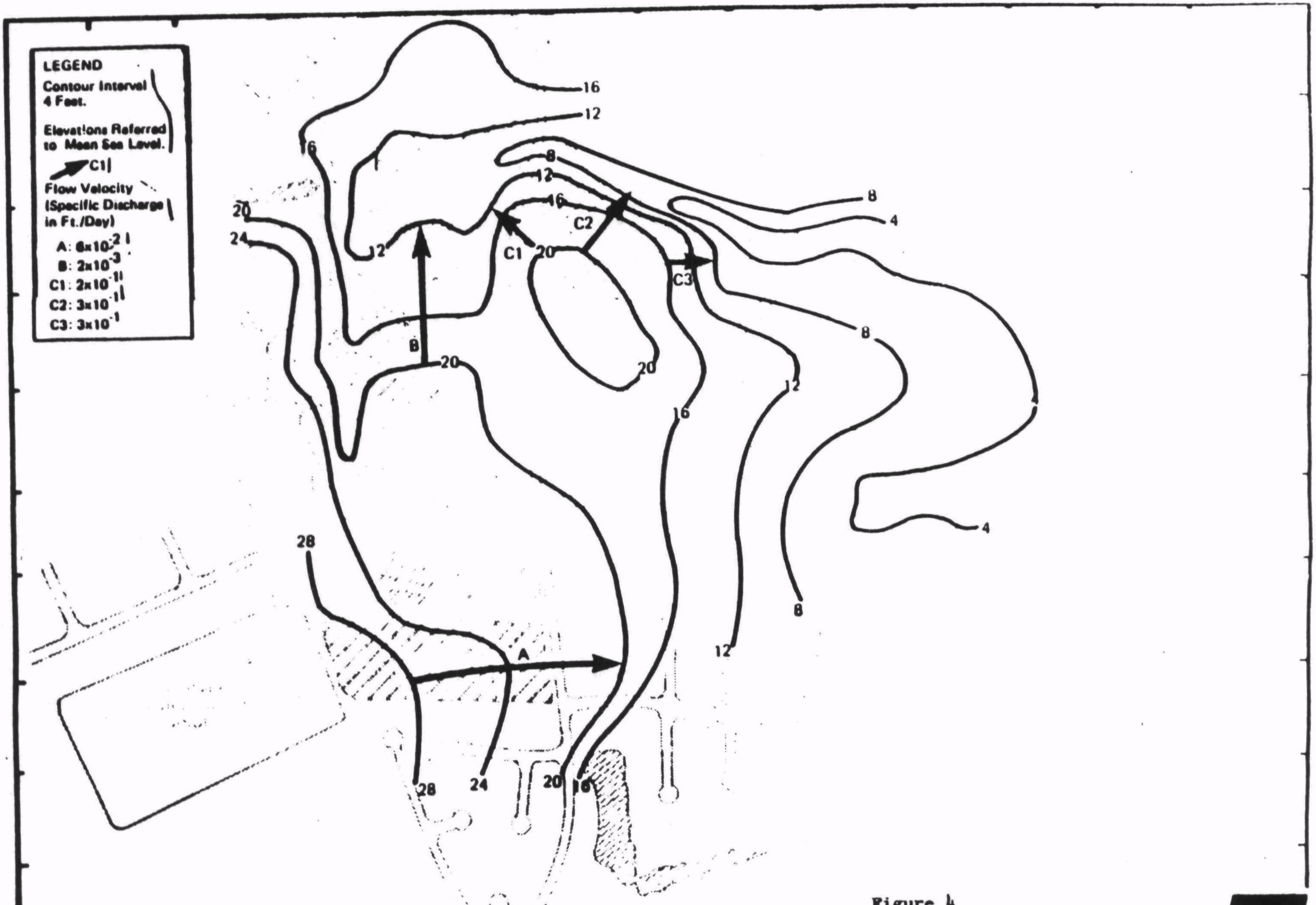


NOTE: Co[illegible] prepared from water levels measured in monitoring wa[illegible]n observations of surface water bodies, and from inte[illegible]ation of topographic and geo[illegible]ogic features of the area.

Figure 4
INTERPRETIVE CONTOUR MAP OF WATER TABLE ELEVATION, 28 29 JAN 198[illegible]

of the site were being used for potable water supply at the time of the RI. Most of these wells are believed to be completed in or below the Yorktown Formation, but at least two are completed in the Tabb (depths less than 30 feet). Approximately 20 other wells in the area are used solely for purposes other than human consumption (e.g., watering gardens and lawns.)

Site History

In 1957 and 1958, two units of the Virginia Power Yorktown Power Generating Station began burning coal mixed with coke from a nearby petroleum refinery. Fly ash was produced from these units until 1974, when Virginia Power converted them to burn fuel oil.

Between 1957 and 1974, Virginia Power employed a private contractor to haul away the fly ash from the generating station. The contractor disposed large quantities of the fly ash in four abandoned sand and gravel pits in the Chisman Creek watershed, approximately two miles south of the generating station.

Homeowners in the vicinity of the site reported that the fly ash was transported to the pits in open trucks. No dust control measures were used, and fly ash apparently blew from the trucks and the pits. Little, if any, attempt was made to control erosion, and during heavy rains fly ash apparently washed from the pits into Chisman Creek and its tributaries.

Area D appears to have been partially filled with fly ash within approximately the same time period as the other three pits. However, the owner of Area D reported that all of the fly ash was excavated from Area D and deposited in Area C sometime between 1971 and 1973. Area D was reportedly then refilled with construction rubble from public utility construction occurring along Wolftrap Road at that time. The RI confirmed the removal of flyash as the drilling samples showed only traces of flyash.

As encountered in borings at the site, the fly ash is typically a dark gray silt or fine sand, with occasional gravel or pebble-sized fragments. Fly ash in Areas A and C appears to be covered with a patchy deposit of sandy fill up to two feet thick.

In 1980, a domestic well west of Area C was reported to have discolored water. In 1980 and 1981, the State Board of Health (SBH) and the State Water Control Board (SWCB) sampled ground water from residential wells in the vicinity of the fly ash pits to determine if contaminants were present in elevated concentrations. Subsequent studies to determine the nature and extent of contamination included investigations by the SWCB and Virginia Institute of Marine Science (VIMS). Both of these studies found ground water and surface water contamination in and near the fly ash areas. As a result of data gathered and conclusions drawn by these studies, the site was included on the National Priorities List (NPL) in 1983.

Remedial Investigation Findings

The RI was conducted from 1984 to 1985 and a report was issued on November 22, 1985. The RI found that contaminants are found in the fly ash itself, in the sediments of Chisman Creek and its tributaries, in ground waters within and adjacent to the pits, and in pond and stream waters tributary to Chisman Creek. Nickel and vanadium are the most ubiquitous and abundant of the trace metal contaminants; arsenic, beryllium, chromium, copper, molybdenum, and selenium are also present at elevated concentrations in some parts of the study area. Sulfate and total dissolved solids (TDS), which occur naturally at relatively high concentrations in the Chisman Creek estuary, are also elevated in ground waters and tributary waters contaminated by the fly ash. No organic contaminants attributable to the fly ash were found during the RI. Samples of fly ash taken directly from the pits did not contain hazardous concentrations of trace metals, as determined by the EP Toxicity test. The RI concluded that this localized contamination is caused by the fly ash pits.

For soils and sediments, highest levels of contamination are found in samples from the fly ash disposal pits, which have concentrations of vanadium, nickel, arsenic, beryllium, copper, and selenium between about 10 and 100 times background. Concentrations of vanadium and nickel are comparably high (up to more than 100 times the background levels of 10 to 15 ppm) in sediments from two ponds directly north of Areas A and B. Sediments from some parts of the tributary stream channels show concentrations of vanadium and nickel up to about 50 times background. Sediments from the adjacent part of the Chisman Creek estuary are contaminated with vanadium at concentrations above approximately 100 ppm; sediments from much of the rest of the estuary have relatively low levels of vanadium contamination.

For shallow ground waters, highest levels of contamination are again found within and immediately beneath the fly ash pits, where concentrations of TDS and sulfate are approximately 10 and 100 times background levels, respectively. Trace metals showing highest concentrations above background are vanadium and nickel (up to about 1000 times background); arsenic, beryllium, chromium, copper, molybdenum, and selenium show concentrations up to more than ten times background.

Filtered samples of contaminated shallow ground waters in the Tabb Formation downgradient of the fly ash pits also have high levels of TDS and sulfate, in excess of the Secondary Maximum Contaminant Levels (SMCL) of 500 and 250 ppm, respectively. (SMCLs are Federal aesthetic standards and have no regulatory weight.) Elevated molybdenum and vanadium are found in ground waters downgradient of all pits but not at levels that indicate human health problems. Elevated nickel is found in ground waters downgradient of Area C.

The ground water samples downgradient from Area A and B do not have elevated levels of nickel. None of the samples taken from residential wells in the area was found to have constituents in excess of primary and secondary MCLs. (Primary MCLs are Federal guidelines that establish human health standards.)

For surface waters, highest levels of contamination are found in two ponds north of Areas A and B, where concentrations of TDS and sulfate are approximately five and twenty times background levels, respectively. Tributary channels downstream of these pits also show elevated TDS and sulfate. Concentrations of sulfate and TDS in these tributary waters exceed the SMCLs.

Concentrations of vanadium are high (up to more than 10 times background) in the pond north of Area A and in the stream channel adjacent to Area C; vanadium is slightly elevated in the pond north or Area B. Nickel is present at slightly elevated levels (approximately two times detection limit) in the stream channel adjacent to Area C, and molybdenum is found at similar levels in the two ponds. Surface waters in the study area are otherwise free of detectable contamination.

Monitoring wells in the upper part of the Yorktown have shown no contaminants that exceed EPA Drinking Water Standards or Ambient Water Quality Criteria. Three deeper monitoring wells were recently installed to assess that part of the Yorktown that is thought to be pumped for residential supplies. The ground water samples from these wells also did not exceed EPA Drinking Water Standards or Ambient Water Quality Criteria.

Contaminant migration pathways at the site include erosion, surface water transport and ground water transport, with erosion judged to be the most significant historically. Contaminated sediments are widespread throughout the study area in depositional environments. Surface water transports small quantities of dissolved contaminants through the ponds and tributary channels into the Chisman Creek estuary.

Public Health and Environmental Assessment Findings

Potential public health risks from media assessed during the RI were found to be as follows:

- Human consumption of ground water at contaminant concentrations found in the monitoring wells within the flyash pits would exceed guidance levels for specific noncarcinogens found at the site (See Tables 5-8 and 5-9 of the PHEE and EPA sample results from April 1986). A cancer risk (10^{-2} to 10^{-3}) is also associated with human consumption if arsenic is considered a carcinogen. Properly filtered ground water samples outside the flyash pits revealed no contaminants at levels exceeding EPA guidelines with the exception of Nickel, which was found in monitoring wells downgradient of Area C. The proximity of residential wells to the pits and the on-going and potential future migration of contaminants from the pits presents a public risk from contaminated groundwater.

- Based on field observations of children and adults frequenting the site, exposure to fly ash through ingestion presents a health concern.

As discussed in the PHEE, persons ingesting flyash at quantities (0.1 g/day) over a lifetime would approach maximum recommended intakes, and at higher quantities (1.0 g/day) actually exceed recommended intakes of noncarcinogens. A cancer risk is associated with the recreational setting for both children and adults.

The impacts of the site on off-site surface waters are being further investigated by the U.S. Fish and Wildlife Service and will be evaluated in another Record of Decision as a separate operable unit.

Remedial Action Objectives

As specified in the National Oil and Hazardous Substances Contingency Plan (NCP), "the appropriate extent of remedy shall be determined by the lead agency's selection of a cost-effective remedial alternative that effectively mitigates and minimizes threats to and provides adequate protection of public health and welfare and the environment." NCP §300.68(i). Generally, "this will require selection of a remedy that attains or exceeds applicable or relevant and appropriate Federal public health and environmental requirements that have been identified for the specific site." Id. The remedial alternative for the Chisman Creek site must be consistent with the NCP.

The remedial alternatives discussed in this document address the identified, existing public health and environmental hazards associated with actual or threatened releases of hazardous substances from the site.

Remedial action objectives are presented below.

1. Direct Contact: Prevent human contact with or consumption of fly ash or fly ash-contaminated soils.

2. Ingestion of Contaminated Water: Prevent human consumption of water contaminated by fly ash in excess of relevant human health standards and criteria.

3. Wetlands Protection: Minimize disruption or destruction of existing wetlands that might result from the implementation of remedial actions at the site.

4. Water Protection: Prevent further degradation of ground water quality to levels that could jeopardize human health or the environment.

5. Water Restoration: Restore the quality of ground water in the Tabb Formation. Surface waters may incidentally be benefitted by measures taken in this Record of Decision.

Identification and Evaluation of Alternatives

Alternatives to meet the remedial action objectives are classified as source control or management of migration remedies (See 40 CFR §300.68(c)). Source control alternatives are directed at controlling the source of contamination. These alternatives will address the problems associated with the fly ash pits. Other areas besides the fly ash pits could be considered sources of contamination if enough contaminated material has migrated to these areas, however, this does not appear to be the case at the Chisman Creek site. The source control measures will seek to completely remove, stabilize and/or contain the hazardous substances. The impacts of the site on off-site surface waters are being further investigated by the U.S. Fish and Wildlife Service and will be evaluated in another Record of Decision as a separate operable unit.

An initial screening of the potential remedial technologies for the flyash areas identified in the Feasibility Study (FS) was conducted pursuant to §300.68(g) of the NCP to narrow the list of potential remedial actions for detailed evaluation. The remedial technologies eliminated during initial screening are shown on Table 1.

Alternatives remaining after the initial screening were analyzed on the basis of the requirements of §300.68(h) of the NCP. A comparision of these alternatives, as presented in the FS, is on Table 2 and 3, and the costs are on Table 4.

1. No action with monitoring.

2. Access restrictions (land use controls), alternative water supplies, monitoring programs, soil cap topped with a vegetative layer.

3. Access restrictions (land use controls), alternative water supplies, monitoring programs, low-permeability caps, slurry walls, interior drains for ground water control, and onsite treatment of water withdrawn from the drains for Areas A, B, and C.

4. Access restrictons (land use controls), alternative water supplies, monitoring programs, low-permeability cap, perimeter drains to dewater the flyash, and onsite treatment (during dewatering only) of water withdrawn from the drains for Area C. This alternative applies only to Area C. This alternative, considered as a whole, was infeasible at Areas A and B and, therefore, another of the retained alternatives would be chosen for these areas in conjunction with this alternative for Area C for the site remedial alternative.

5. Alternative water supplies and excavation and offsite disposal of flyash.

6. Access restrictions (land use controls), alternative water supplies, monitoring programs and in-place stabilization/solidification of the flyash.

Table 1
INAPPLICABLE TECHNOLOGIES

General Response Action	Technology/Technology Option	Comments
Containment	Capping with Asphalt, Concrete	Susceptible to cracking from settlement, shrinkage, frost heave (not self-healing)
	Vertical Barriers: Grout Curtain	Not appropriate for site conditions; difficult to assure integrity
	Sheet Piling	Interlocks difficult to seal; not water-tight
	Vibrating Beam	Difficult to assure integrity
	Horizontal Barriers: Block Displacement	Difficult to assure continuity; not compatible with site conditions
	Gradient Control: Extraction Wells	Not as efficient or cost-effective as drains
Water Treatment	Biological Processes	Not applicable for the removal of inorganic constituents
	Physical Processes: Activated Carbon	High doses/cost required compared to chemical precipitation
	Ion Exchange	Inefficient in comparison to optimum technologies
	Reverse Osmosis	Not applicable for many waste - stream constituents, costly
	Thermal Processes	Not applicable to inorganic constituents
Water Discharge	Onsite: Aquifer Reinjection	No advantage in comparison to direct surface water discharge, yet more costly
	Offsite: POTW	Not acceptable to York River WWTP; no advantage for the discharge of treated wastewater
	Industrial WWTP	Not cost effective for flow rates anticipated at the site
Soil/Flyash Onsite Treatment	Stabilization/Solidification: Excavate/Mix/Replace	Technical implementation constraints due to high water table; high cost
	In-Situ Injection (Permix™ PF-5 Stabilization System)	Relative impermeability of flyash makes this technology infeasible; difficult to assure complete mixing; primarily applicable to sludges and semi-solids

Table [illegible]

INAPPLICABLE TECHNOLOGIES
(Continued)

General Response Action	Technology/Technology Option	Comments
Soil/Flyash Disposal	Onsite RCRA Landfill	Site is unsuitable for construction of a RCRA landfill due to high water table, floodplain location, and constricted area

Table
TECHNICAL COMPARISON OF ALTERNATIVES

Technical Evaluation Criteria	Alternative 1 No Action	Alternative 2 Soil Cap, I&I	Alternative 3 Low-Perm Cap, Slurry Wall, Groundwater Control/ Treatment, I&I	Alternative 4 Low-Perm. Cap, Gradient Control/ Treatment, I&I	Alternative 5 Excavation, Offsite Disposal, AWS	Alternative 6 Stabilization/ Solidification, I&I
Performance	Allows continued potential for direct contact with flyash and ingestion of contaminated groundwater. The potential for continued contaminant migration is not mitigated.	Soil capping and land use restrictions effectively reduce the potential for direct contact with flyash. Alternate water supply (AWS) reduces the potential for human consumption of contaminated groundwater. The contaminant source will not be contained, offsite migration will continue.	Capping effectively reduces the potential for direct contact with flyash and reduces recharge of water from the surface to the pits. To ensure effectiveness, the cap must be maintained indefinitely. Therefore, replacement will be necessary in the future. Slurry wall, collection/ treatment and alternate water supply reduces the potential for human consumption of contaminated groundwater. Offsite groundwater contamination will be near background levels in 20-30 years once containment is in place. Small amount of water will have to be treated for an indefinite period of time. Treatment system will be effective in meeting water quality standards if properly operated.	See Alternative 3 for capping and AWS discussion. Will reduce the potential for human consumption of contaminated groundwater. Will effectively reduce the migration of contaminated groundwater from Pit C.	Flyash excavation and disposal offsite will greatly reduce the long-term potential for direct contact with flyash or contaminated groundwater. Offsite groundwater contamination will be near background levels in 20-30 years once onsite contamination is removed. Short-term groundwater treatment will be necessary while dewatering excavation. See Alt. 3 for groundwater treatment discussion.	Effectiveness of S/S is unproven. Bench-scale tests will determine the achievable level of contaminant immobilization. Effectiveness of auger/mixing rigs is unproven; pilot tests onsite will be necessary to determine if performance goals can be met.
Reliability	Not Applicable	Soil capping and land use restrictions have proven performance. Long-term effectiveness is dependent on strict inspection and maintenance.	Caps have proven performance. Multi-layer cap gives additional safety factor. Proper maintenance must be performed indefinitely to insure long-term effectiveness. Slurry walls have a proven performance. Drains must be deep enough to maintain no discharge of groundwater into the Yorktown during times of low water table. Groundwater treatment system has proven performance. Requires pilot study, regular monitoring, and trained operating personnel.	See Alternative 3 for capping discussion. O&M requirements for drains are minimal. See Alternative 3 for groundwater treatment discussion.	No O&M is required upon completion of the R.A. Reliability is high.	Soil cap would require inspection and maintenance program to ensure integrity. Performance of the proposed S/S system not well demonstrated, would require long-term monitoring.

Table
(continued)

Technical Evaluation Criteria	Alternative 1 No Action	Alternative 2 Soil Cap, I&I	Alternative 3 Low-Perm Cap, Slurry Wall, Groundwater Control/ Treatment, I&I	Alternative 4 Low-Perm. Cap, Gradient Control/ Treatment, I&I	Alternative 5 Excavation, Offsite Disposal, AMS	Alternative 6 Stabilization/ Solidification, I&I
Implementability	Not Applicable	Soil capping is easily implemented with conventional methods. The legal basis for necessary land use restrictions is uncertain.	Cap can be constructed with conventional equipment. Installation of cap will require strict quality control. Construction of cap runoff conveyance structures may impact adjacent roads, streams and ponds.	See Alternative 3 for capping and AMS discussion.	Excavation, transport, and disposal can be implemented with conventional methods. Steep slopes make excavation near pit edges difficult. May require several years to implement.	Availability of auger/mixing rigs could pose a constraint. May require several years to implement.
			Slurry wall and drain system can be implemented with conventional equipment. Steep slopes and digging in flyash add extra difficulty to standard procedures.	Drain system can be constructed with conventional equipment. Proximity of road to west side of flyash pit makes implementation difficult.		
			Construction of treatment system is routine. Pilot study required.			
Safety	Not Applicable	Installation of cap requires conventional site safety procedures. Potential exposure to flyash is minimal.	Installation of cap requires standard site safety procedures.	See Alternative 3 for capping and treatment discussion.	Safety during construction is a concern due to direct exposure to flyash. Transport of flyash over public roads is a concern. Possible dust generation or accidental spills.	Potential generation of flyash dusts during the mixing process.
			Safety during construction of slurry wall and drain is of concern due to direct exposure to flyash.	Safety during construction of the drain system is of concern due to exposure to contaminated groundwater and deep excavation.		
			Short-term groundwater extraction and treatment system failure is not expected to introduce substantial health risks.			

Table 3

PUBLIC HEALTH, WELFARE, AND ENVIRONMENTAL EFFECTS OF ALTERNATIVES

Evaluation Category	Alternative 1 No Action	Alternative 2 Soil Cap I & I	Alternative 3 Low Perm. Cap, Slurry Wall Groundwater Control/Treatment, I & I	Alternative 4 Low Perm. Cap, Gradient Control Treatment I & I	Alternative 5 Excavation/ Offsite Disposal AND	Alternative 6 Stabilization/ Solidification I & I
Public Health and Welfare Evaluation						
Long-term Impacts	Continued potential exposure to flyash and contaminated groundwater.	Cap and fence reduce potential for human contact with flyash. Deed restrictions reduce exposure and alternate water supply prevents injection of contaminated groundwater. Groundwater contamination is not contained. Requires enforcement of land use restrictions and proper cap maintenance. Potential reduction in property values.	Cap reduces potential for human contact with flyash. I&I controls reduce the potential for ingestion of contaminated groundwater. Requires enforcement of land use restrictions and proper cap and WWTP maintenance. Potential reduction in property values.	Cap reduces potential for human contact with flyash. I&I controls as in Alternative 3. Exposure prevention requires enforcement of land use restrictions and proper cap and WWTP maintenance. Potential reduction in property values.	Eliminates potential for human contact with flyash and contaminated groundwater at the site by removing the source. Prevention of offsite exposure requires proper operation and maintenance of disposal facilit;.	Reduces potential for human contact with flyash. Flyash left in place, potential for treatment to fail.
Construction-Related Impacts	None	Construction may expose workers to flyash. Proper health and safety protection should mitigate potential risk.	Slurry wall and drain construction could cause direct exposure of workers to flyash. Proper health and safety protection should mitigate potential risk. Traffic and construction related noise and dust generation may affect adjacent residents	See Alternative 3	Potential for exposure of construction workers to flyash. Dust entrainment and noise are a concern to workers and to surrounding residents. Increased traffic and construction related noise and dust generation may affect surrounding residents.	Potential for worker exposure to entrained dust. Noise could be a concern to workers. Increased traffic and construction related noise and dust generation may affect surrounding residents.
Environmental Impacts						
Long-term Impacts	Continued presence and migration of contamination in the environment. Detailed evaluations of these impacts are the subject of further study.	Potential for exposure of terrestrial and aquatic life to flyash is reduced. Altered drainage at site may reduce wetland habitat at adjacent ponds and streams. Increased freshwater runoff may alter salinity of adjacent estuary, affecting habitat quality.	Potential exposure of terrestrial and aquatic life to flyash is reduced. Environmental impacts of contaminated groundwater are mitigated over time. Direct surface water discharge created. This may alter and/or enhance aquatic environment, depending on duration, characteristics of the discharge, i.e., flow, temperature, etc. Altered drainage may reduce wetland habitat at adjacent ponds and streams. Increased freshwater runoff may alter salinity of adjacent estuary, affecting quality.	See Alternative 3	Exposure of terrestrial and aquatic life to flyash is eliminated at the site.	Same as Alternative 3, except no surface discharge.

- Although fencing of the site was included as part of Alternatives 2, 3, 4 and 6 in the Feasibility Study, from which this Table is excerpted, [illegible]s decided to eliminate the fencing from each of these alternatives becau[illegible] restrictions and land use will be considered as an appropriate access restri[illegible] remedy. This modification is minor and does not materially affect the comparison of [illegible]

Table [illegible]
(continued)

Evaluation Category	Alternative 1 No Action	Alternative 2 Soil Cap I & I	Alternative 3 Low Perm. Cap, Slurry Wall Groundwater Control/Treatment, I & I	Alternative 4 Low Perm. Cap, Gradient Control Treatment I & I	Alternative 5 Excavation/ Offsite Disposal AWS	Alternative 6 Stabilization/ Solidification I & I
Construction-Related Impacts	None	Temporary loss of wildlife from areas on and adjacent to construction site.	Construction activities may affect wetlands habitat, Noise may cause temporary loss of wildlife.	See Alternative 3	Excavation activities may affect wetlands habitat, streams and excavation may cause erosion and sediment loading to adjacent to creeks. Temporary loss of wildlife from areas on and adjacent to construction site. Potential for creation of additional wetlands habitat from excavated area.	Temporary loss of wildlife from areas on and adjacent to construction site.

Table 4 *

ASSEMBLED ALTERNATIVE EVALUATION SUMMARY

Criteria	A1: No Action, I&I	A2: Soil Cap, I&I	A3: Low Perm. Cap, Slurry Wall, GW Control/ Treatment, I&I	A4: Low Perm. Cap, Gradient Control/ Treatment I&I	A5: Excavation/Offsite Disposal, AWS	A6: Stabilization/ Solidification, I&I
Technical Feasibility	N.A.	Readily implementable; least time required for implementation	Some construction impacts on adjacent areas; extensive O&M required	Same as A3, except O&M requirements less	Construction impacts on adjacent properties could be significant	Technology unproven, dependent on bench- and field-scale testing
Public Health and Welfare	Public health hazards and contaminant migration unmitigated	Mitigates direct contact hazard; ingestion of contaminated water prevented	Same as A2	Same as A2	Risk of direct contact eliminated; ingestion of contaminated water eliminated; risks are transferred to another site; some short-term exposure risk	Risk of direct contact less than A2 and A3; ingestion of contaminated water prevented
Environmental Impact	Contaminant migration unmitigated	Contaminant migration unmitigated	Contaminant source contained; aquifer naturally restored within 20-30 years; some potential construction impacts on adjacent environments.	Same as A3	Similar to A3, but more extensive construction impacts	Similar to A3
Present Worth Cost						
Area A	$ 61,409	$3,457,000	$11,204,000	--	$21,197,000	$19,418,000
Area B	$ 38,255	1,194,000	6,983,000	--	5,616,000	2,991,000
Area C	$ 61,409	3,147,000	12,146,000	$10,500,000	22,293,000	19,536,000
Area D	$ 19,127	98,000	--	--	--	--
Total (All Operable Units)	$180,200	$7,896,000	$30,333,000	$10,500,000	$49,106,000	$41,945,000

I&I - Institutional & Infrastructural (Deed restrictions, fencing, AWS, monitoring)
AWS - Alternate Water Supply

* These costs do not reflect deletion of "fencing" from Alternatives 2, 3, 4 and 6. The cost of fencing was estimated in the FS to be $216,000. Deletion of this cost from Alternatives 2, 3, 4 and 6 does not materially affect the cost-effectiveness comparison of these alternatives, as the $216,000 figure is minor in relation to the total estimated cost of each alternative.

REMEDIAL ALTERNATIVES

Elements Common To Most Alternatives

All of the alternatives include the provision of an alternative water supply to homes that currently rely on the Tabb or Yorktown Formations for potable water downgradient of the site. The homes along Wolf Trap Road will be connected to the existing Newport News waterline and the homes along Allens Mill will be served by extending the existing waterline to Allens Mill Road. During the design of the remedial alternatives, a survey of the existing water supplies will be conducted. The survey will determine the number of homeowners currently using the Tabb or Yorktown Formations for drinking water and the corresponding number of connections to the alternate water supply lines.

All of the alternatives except Alternative 5 (excavation and disposal) would incorporate the following actions. The description of these technologies is not repeated in the discussion of each of the alternatives.

° Deed Restrictions

  Efforts will be made to obtain deed restrictions on the flyash pits and immediately adjacent areas. These restrictions would prohibit excavation of soil and restrict building construcion onsite. Withdrawal of ground water would also be restricted to prevent contact with or ingestion of contaminated groundwater.

° Monitoring Program

  Post closure monitoring program for ground water and surface water consistent with "applicable" or "relevant and appropriate" federal public health standards will be designed and implemented. Ground water and surface water will be monitored over time to evaluate the effectiveness of remedial actions and to determine whether receptors are threatened. Samples will be taken periodically at various locations to determine if the remedial action should be adjusted and/or if additional corrective actions are warranted.

Alternative 1 - No Action

This alternative includes the deed restrictions and monitoring program described in the introduction of the section.

Under the no action alternative, no remedial actions will be implemented at the site and the site will remain in its current state.

- Environment and Public Health

  Under this alternative, contamination of the surrounding environment of the fly ash pits may remain.

  At the Chisman Creek site, the continued presence of contamination from the fly ash pits may have adverse effects on the public health and environment. The human consumption of ground water may present a cancer risk. Exposure to fly ash through ingestion and/or inhalation presents a health concern for area residents. Dermal contact or ingestion of contaminated surface waters and sediments during recreational activities may add to the health risk. Fish and other aquatic biota would continue to be exposed to contamination, which could be passed onto the local population through ingestion.

  This alternative would not prevent, mitigate or minimize threats to public health and the environment and also does not meet the "applicable" or "relevant and appropriate" Federal public health requirements.

- Cost

  The operation and maintenance (O&M) costs associated with this alternatve are for periodic monitoring, which are estimated to be $17,900 annually for 30 years.

<u>Alternative 2 - Soil Caps</u>

This alternative includes the deed restrictions and monitoring program described in the introduction of this section.

This alternative would involve placement of a 14.3-acre soil cap over Area A, a 4.8-acre soil cap over Area B, and a 13.4-acre soil cap over Area C and the construction of runoff diversion and conveyance facilities. Regrading of the areas would be necessary prior to placement of the caps. The cap would be a soil layer overlaid with topsoil and vegetative growth. Runoff detention measures would be implemented as necessary.

- Environment and Public Health

  Capping protects the public by eliminating direct contact with the fly ash and by eliminating wind and surface water erosion.

- Cost

  The cost of this alternative depends primarily on the amount and availability of materials used for capping. O&M costs include the cost of inspection and maintenance of the caps and periodic monitoring. The total estimated cost for this alternative is $7,680,000.

Alternative 3 - Construction of a Slurry Wall and Cap

This alternative includes the deed restrictions and monitoring program described in the introduction of this section.

This alternative involves the construction of a slurry wall around each of the fly ash pits in order to contain the contaminated waste and divert the ground water (Figure 5). The pits would then be capped to minimize infiltration and leachate generation in the manner described in Alternative 2 above. A discussion of slurry wall construction follows.

At the Chisman Creek site a slurry wall could be constructed around the fly ash pits and keyed into the Yorktown formation which is of low permeability and also has a chemical composition that minimizes migration of contaminants (Figure 6). At the Chisman Creek site, a soil-bentonite slurry wall would be used. This type of slurry wall offers the lowest installation cost, the lowest permeability, and the widest range of chemical compatabilities. While a number of chemical compounds may affect permeability of a soil-bentonite slurry wall, metals are not included in these compounds.

- Environment and Public Health

  The major environmental and public health concerns presented by this alternative involve the excavation of contaminated materials for the constuction of the slurry walls. The excavated material must be properly disposed of and precautions must be taken to prevent emissions from the site and protect workers and the public.

  The slurry walls would be constructed into the Yorktown Formation and would be, in affect, a hanging slurry wall, which would allow ground water to migrate under the wall into the Yorktown Formation and up into the fly ash pits. The continued flow of ground water requires ground water gradient controls, most likely accomplished by interior drains with the flow pumped to adjacent streams. This pumping would continue forever, thus reducing the long-term reliability and effectiveness of this alternative.

- Cost

  Costs for slurry walls are usually expressed in costs per unit area of wall (dollars per square foot). Total costs are determined by the length and the depth of the walls as well as the soil type in which the wall is constructed. The estimated cost for this alternative is $30,117,000.

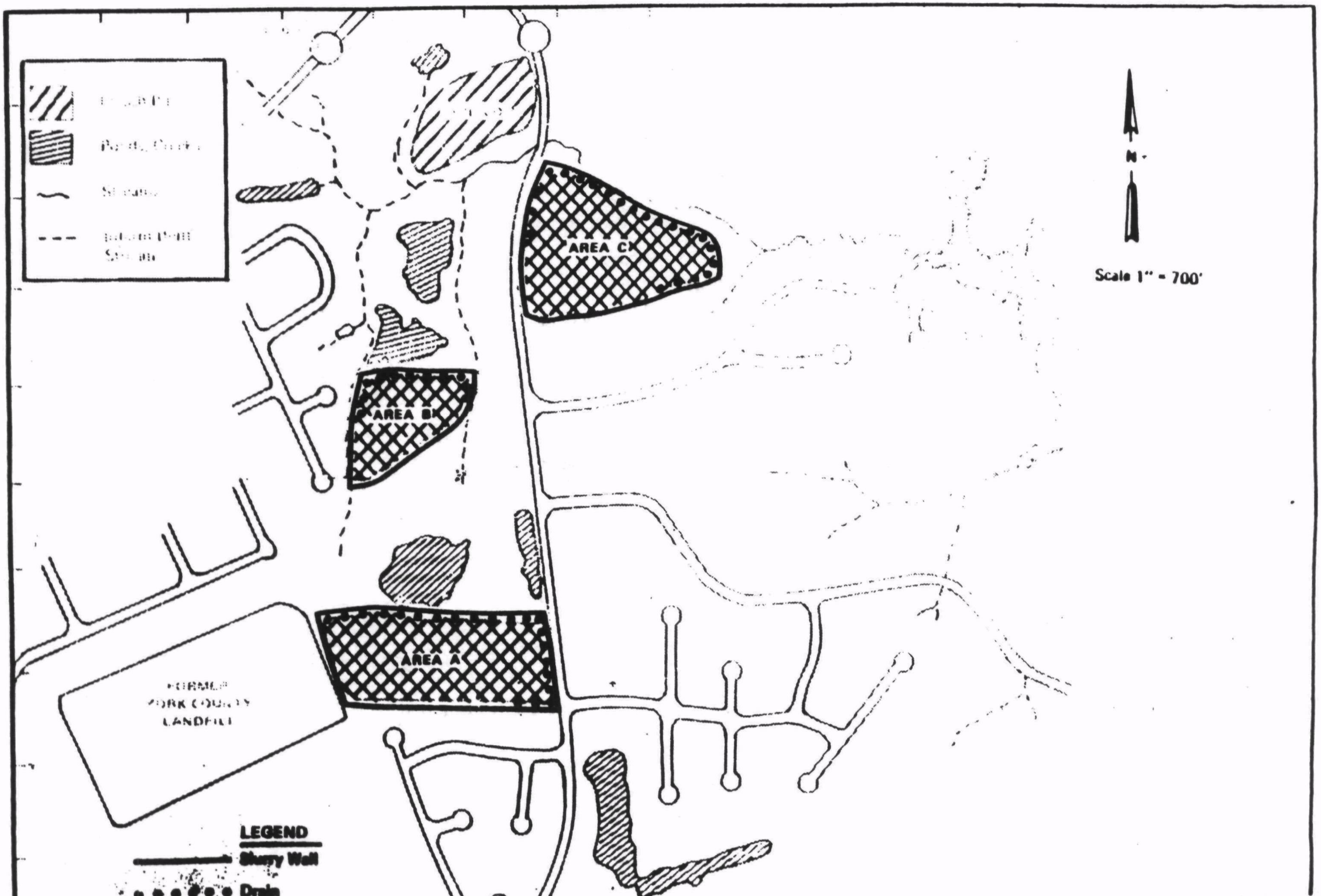
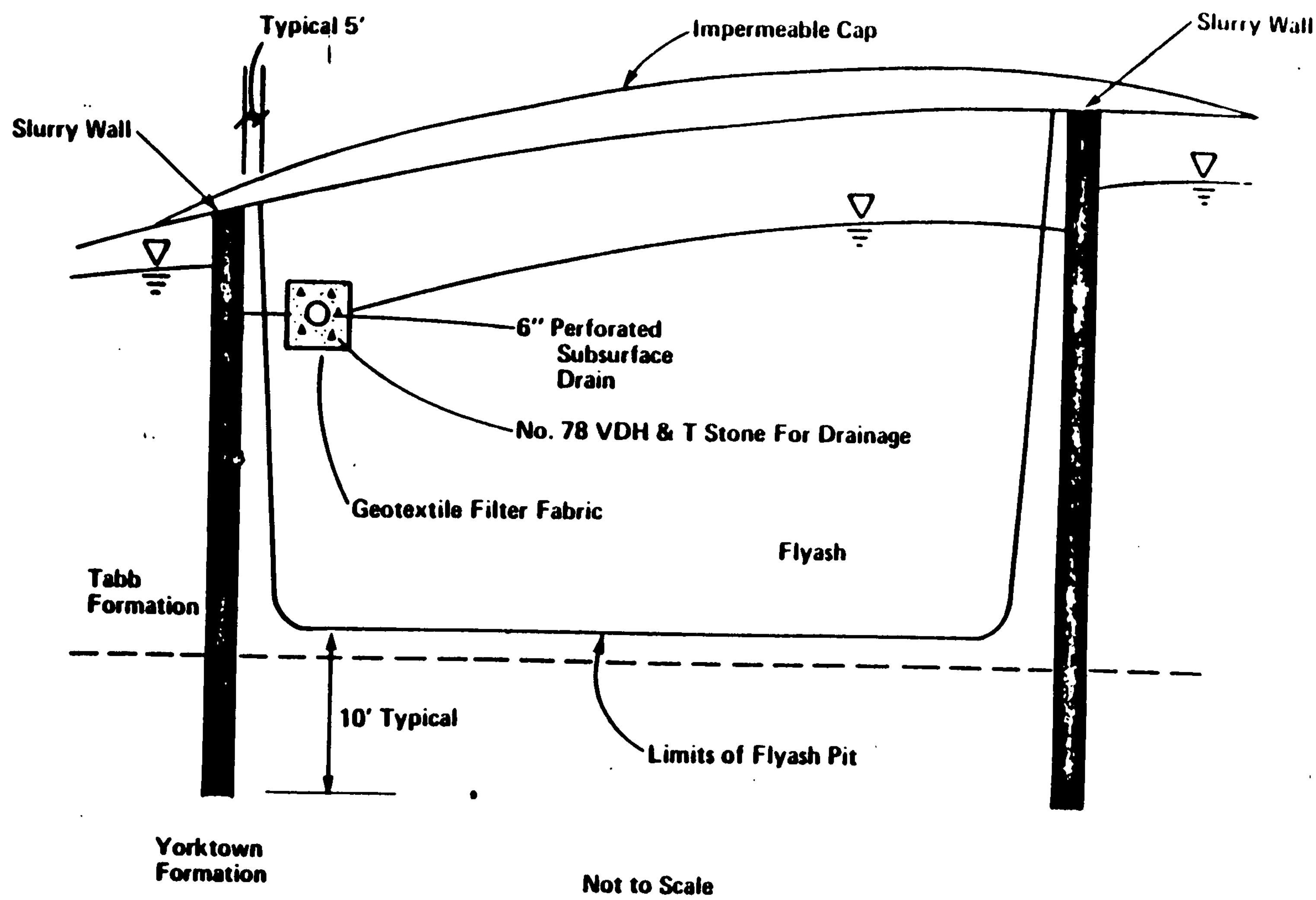


Figure 5
ASSEMBLED ALTERNATIVE A
CHISMAN CREEK FS



Water Table

Figure 6
TYPICAL SECTION
SLURRY WALL WITH PERIMETER
SUBSURFACE DRAINS
CHISMAN CREEK

Alternative 4 - Low-permeability Cap, Gradient Control/Treatment

This alternative includes the deed restrictions and monitoring program described in the introduction of this section.

This alternative applies only to Area C. This alternative, considered as a whole, was determined to be unsuitable for Areas A and B because it would have negative impacts on nearby surface waters and the Yorktown Formation. (See FS at 3-12).

This alternative would include the construction of a low-permeability cap over Area C. A subsurface drain would be installed around the pit in order to lower the water table below the bottom of the flyash. A 6-inch perforated pipe drain system would extend around the west, south, and east sides of the pit (Figure 7). The drain would be approximately 15 feet below the surface along the west side of Area C (800 feet in length) and 10 feet in depth along the south and east sides (1,400 feet in length).

The drain would collect approximately 30 gpm imitially and 8 gpm upon attainment of steady-state conditions, approximately one year after installation. Ground water collected during the initial drawdown period would be conveyed to a treatment plant onsite having a capacity of 50 gpm. After the ground water table was lowered beneath the flyash pit, the quality of the collected ground water would improve. The quality of the ground water would be verified by the periodic sampling. It is expected that after approximately one year, the collected ground water would not require treatment and could be directly discharged to Chisman Creek or its tributaries.

- Environmental and Public Health

  The major environmental and public health concerns involve the excavation of contaminated materials for the contruction of the sub-surface drain. The excavated material must be properly disposed of and precautions must be taken to prevent emissions from the site and protect workers and the public.

- Cost

  Costs for the subsurface drain is dependent on final depth of the drain and the amount of excavation necessary for the construction and soil type in which the wall is constructed. The estimated cost of this alternative for Area C is $10,409,000.

Alternative 5 - Excavation and Offsite Disposal

This alternative involves the excavation of approximately 504,700 cubic yards of fly ash from the pits and its transport to a sanitary landfill.

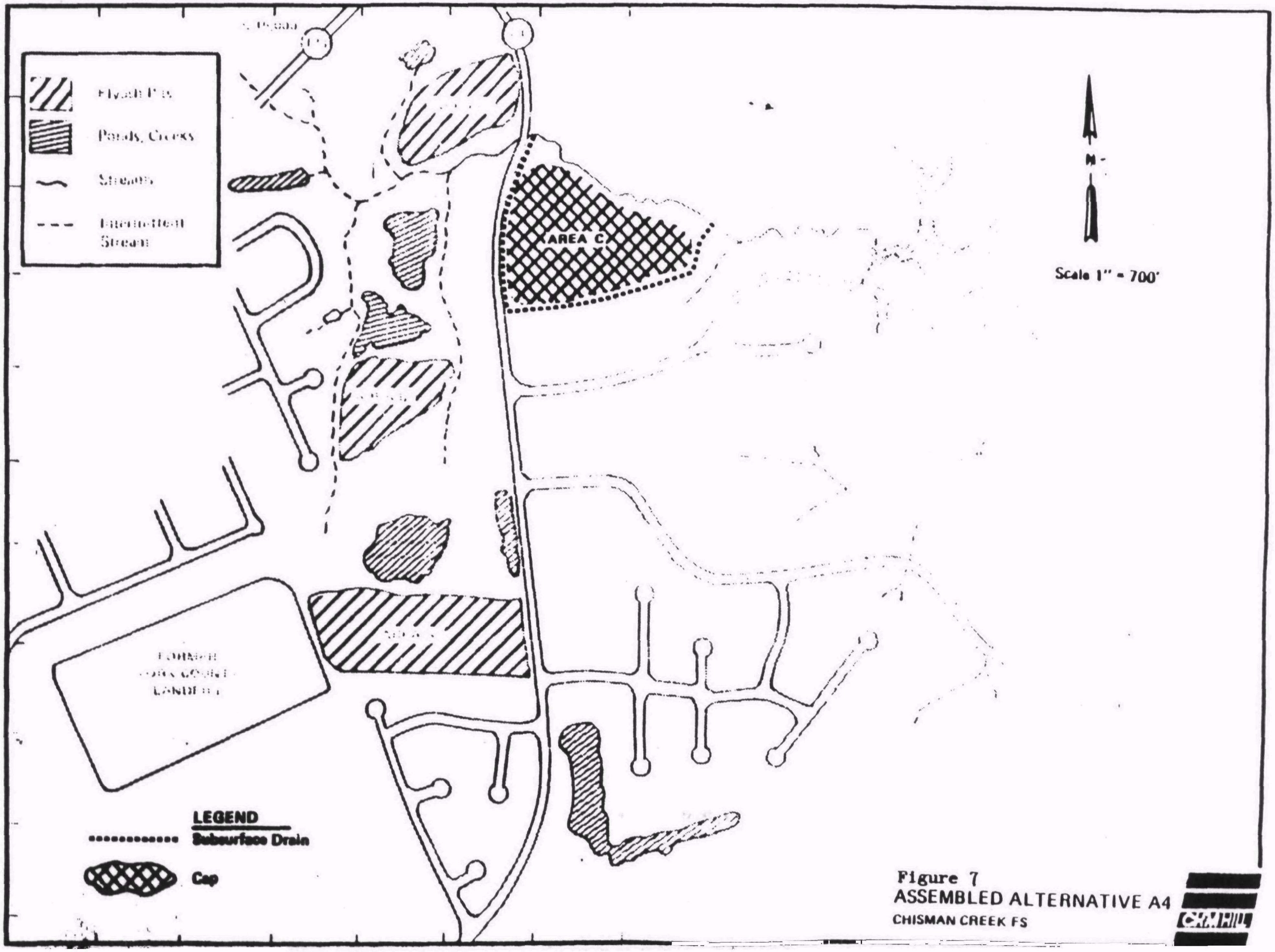


Figure 7
ASSEMBLED ALTERNATIVE A4
CHISMAN CREEK FS

This alternative would provide one of the highest levels of cleanup at the Chisman Creek site. It would also be one of the most expensive.

Excavation and removal of contaminated soil and fly ash would eliminate the source of contamination at the site and shorten the time required for long-term monitoring. Problems associated with excavation, removal, and off-site disposal are of concern due to worker safety, short term impacts and cost. Short term impacts include dust emissions and contaminated run-off. Additionally, care must be taken during transport to prevent spreading of the contaminated material. Costs associated with off-site disposal are high and therefore may exclude complete excavation and removal as a viable alternative. Additionally, proximity of a sanitary landfill willing to accept these wastes may have a substantial impact on transportation costs. It is estimated that three years would be required to complete this removal and disposal operation.

° Environment and Public Health

The implementation of this alternative would eliminate any long term problems and concerns associated with fly ash in the pits. Environmental and public health risks are those associated with excavation and transport of contaminated material. Careful planning and execution would minimize many of these concerns.

° Cost

Costs for excavation and disposal are given in dollars per cubic yard. The estimated cost of this alternative is $49,106,000. Factors affecting the cost of this alternative include:

- Volume of waste to be excavated
- Hauling distance
- Health and safety requirements
- Disposal fee

The excavation and off-site disposal alternative would be the most costly alternative for the Chisman Creek site due to the large volumes involved.

Alternative 6 - Solidification/Stabilization and Cap

This alternative includes the deed restrictions and monitoring program described in the introduction of this section.

Under this alternative, proprietary equipment would be utilized to convert the flyash in the pits into a relatively impermeable concrete-like monolith. Prior to the initiation of operations, bench-scale testing would be conducted to determine treatment requirements for the flyash. Three rigs would be utilized to implement a two-step treatment process at the site: immobilization using ferrous sulfate and solidification with hydrated lime. Approximately 2-1/2 to 3 years would be required to complete the stabilization/solidification of the three pits. Upon completion of the treatment process, a vegetated soil cover would be installed over the solidified monolith. Implementation of the process would be virtually identical for all three flyash pits.

° Environment and Public Health

This alternative prevents surface infiltration and leachate generation at the site. The soil cover isolates the waste from the surrounding environment and public.

° Cost

Cost for the S/S processes depends on a number of factors including the reagents used for solidification/stabilization, dosage rates and transportation costs. The pounds of reagent required per volume of waste is generally used as a basis for cost estimation. The estimated cost of this alternative is $41,729,000.

RECOMMENDED ALTERNATIVE

Section 300.68(i) of the National Contingency Plan (NCP) states that the appropriate extent of remedy shall be determined by the lead agency's selection of the remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technologically feasible and reliable) and which effectively mitigates and minimizes threats to, and provides adequate protection of public health and welfare, and the environment.

This provision further states that, except as otherwise provided, this will require selection of a remedy that attains or exceeds "applicable" or "relevant and appropriate" Federal public health and environmental requirements that have been identified for the site. In selecting the appropriate extent of remedy from among the alternatives that achieve adequate protection of public health and welfare and environment, the lead agency must consider cost, technology, reliability, administration and other concerns, and their relative effects on public health and welfare and environment NCP §300.68(i)(2).

Based on our evaluation of the proposed alternatives, the public comments and the information received from State of Virginia, we recommend the following remedial alternative, which is a combination of Alternatives 2 and 4.

1. Areas A and B - These flyash pits will be capped with a soil layer overlaid with topsoil and vegetative growth.

2. Area C - This fly ash pit will be capped with a low-permeability cap. This would consist of a compacted soil layer overlaid with topsoil and vegetative growth. A subsurface drain will be installed on the west, south, and east sides of the pit in order to lower the water table below the bottom of the fly ash. Ground water collected during the initial drawdown period will be contaminated from the fly ash and will be conveyed to an onsite treatment plant. Once the ground water is uncontaminated, the treatment will cease. This alternative is preferred at Pit C because, in addition to controlling surface runoff and direct contact, it would eliminate the migration of ground water contaminated with Nickel by drying out the pit.

3. Alternate Water Supply - The homes along Wolf Trap Road will be connected to the existing Newport News waterline and the homes along Allens Mill Road will be served by extending the existing waterline to Allens Mill Road. During the design of the remedial alternative, a survey of the existing water supplies will be conducted. The survey will determine the number of homeowners currently using the Tabb or Yorktown Formations for drinking water and the corresponding number of connections to the alternate water supply.

4. Land Use Controls, and Monitoring - EPA will attempt to obtain deed restrictions or other controls should be placed on the fly ash pits and immediately adjacent areas. These restrictions will prohibit excavation of soil and restrict building onsite. These controls should also include restrictions of ground water use in the fly pits and down gradient of the fly pits in the Table Formation.

   Post-closure monitoring program for the ground water and surface water will be designed and implemented

Operation and Maintenance

At Area C, the subsurface drains will initially collect ground water that has been in the fly ash pits. This ground water will be contaminated with inorganics and require treatment by an onsite treatment plant. The treatment will eventually cease once the level of contaminants decrease to acceptable levels.

The caps will require periodic inspection to maintain the caps and eliminate any bore animals.

Monitoring will continue adjacent to the fly ash pits to track the migration of any inorganics that would cause an adverse effect on human health.

Consistency With Other Environmental Laws

The decision to select a remedy which will lower the ground water table at Area C was based on consideration of relevant and appropriate criteria, advisories and guidance. Nickel is an Appendix VIII constituent regulated under the Resource Conservation and Recovery Act (RCRA). The level of nickel (up to 1400 mg/l) found in monitoring well 3 to the east of Area C was above EPA's recommended intake for the prevention of chronic effects (350 ug/l) and EPA's recommended intake for the prevention of subchronic effects (700 ug/l) identified in EPA's Health Effects Assesment Document For Nickel (EPA/540/1-86-018, September 1984). Additionally, the levels in well 3 and well 5, which is to the west of Area C (up to 300 ug/l) were above EPA's draft Drinking Water Health Advisory level (150 ug/l). EPA's Ambient Water Quality Criteria for protection of fresh water aquatic life (88 ug/l to 280 ug/l) and EPA's Ambient Water Quality Criteria for the protection of salt water aquatic life (17 ug/l) were exceeded in both wells. Since these ground waters discharge to nearby surface waters, the Ambient Water Quality Criteria were appropriate for consideration. The recommended action is designed to lower the water table around Area C so that the relevant and appropriate criteria, advisories, and guidance for nickel will not be exceeded.

Ground water outside of Areas A and B is contaminated with TDS and sulfates. EPA has concluded that achievement of the SMCL's for these compounds also is not an "appropriate" Federal public health or environmental requirement because these standards were established merely to minimize tase and odor problems for public drinking water supplies. No exceedances of primary MCL's, which are established to protect public health, have been identified. Also, around all the fly ash pits there are elevated levels of vanadium and molybdenum. There are no "applicable" or "relevant and appropriate standards" for vanadium and molybdenum. Vanadium and molybdenum are not RCRA Appendix VIII constituents nor are there Federal Ambient Water Quality Criteria, Federal Health Assessment Documents or Drinking Water Health Advisories for these two compounds. EPA has concluded that actions to remediate the vanadium and molybdenum ground water contamination are not necessary to protect human health.

RCRA hazardous waste requirements are not legally "applicable" at this site because fly ash is specifically exempted under RCRA (See 40CFR §261.4(b)(4)). However, portions of the RCRA closure requirements pertaining to closure and post-closure care of landfills (see 40 CFR §264.112 - §264.120 and 40 CFR §264.310) and ground water monitoring (40 CFR Part 264, Subpart F), as well as corrective action requirements (40 CFR §264.100) are "relevant and appropriate" requirements for this site.

The RCRA final cover requirements of 40 CFR §264.310 are relevant and appropriate to the actions recommended at Area C because these requirements are designed to apply to situations where the migrations of liquids through a site must be minimized. Since an objective of the preferred alternative for Area C is to mitigate the ground water contamination, percolation from rain water and surface run-on and run-off must be minimized. For Areas A and B, the objectives of the remedial action are only to prevent direct contact and to minimize erosion, therefore, only those portions of 40 CFR §264.310 which address minimization of erosion and prevention of direct contact are relevant and appropriate.

Certain ground water monitoring requirements of 40 CFR Part 264, Subpart F are relevant and appropriate to all three areas because it is necessary that EPA monitor the ground water to verify the effectiveness of the remedial action. The placement and construction of the wells will be determined during design. Those portions of the RCRA regulations requiring the monitoring of Appendix VIII constituents are not appropriate. The RI data shows that sampling is only necessary for priority pollutant metals plus TDS, sulfates, vanadium and molybdenum. The latter four compounds will be analyzed for because they are good indicators of fly ash contamination.

The corrective action requirements of 40 CFR §264.100 are relevant and appropriate at Area C because the contamination outside of Area C represents a release of a hazardous constituent(s) which may threaten public health, as discussed above. At Areas A and B the groundwater contamination will not threaten public health, therefore, 40 CFR §264.100 is not appropriate for application at these two areas.

Offsite surface water discharges from the drain system around Area C must comply with the technical National Pollutant Discharge Elimination System (NPDES) requirements. The treatment system must have adequate capacity to meet the NPDES requirements.

Flood Plain/Wetlands Assessment

The recommended alternative may affect the flood plains/wetlands near Area C to the extent that flows in the streams may be slightly altered. The drain and cap may change shallow ground water movement resulting in a minor altering of the flow in the intermittent area west of Area C and in the segment of Chisman Creek which receives ground water from Area C.

Impacts in the flows of these surface water bodies is unavoidable because Area C is located so close to these streams. As the ground water outside of Area C is contaminated, particularly with Nickel, a remedial action is necessary for the ground water (see the previous discussion). The other remedial alternatives considered were rejected because they would not remediate the ground water contamination at Area C (no action and alternative 2), were unreliable (alternative 3) or were not cost-effective (alternative 5 and 6). The recommended alternative has received the approval of the State and local governments.

With proper design flow, changes should be minimal and, therefore, the proposed action should have little or no impact on the natural or benefical values of the flood plain and wetlands. It should, in fact, have a net positive impact because contaminant loading to the creeks will be reduced. To insure this, the alternative will be designed so that one drain can discharge on the northwest side of Area C and the other can discharge on the eastern side of Area C.

The small ponds in the area will not be affected by the action at Area C because there is a topographic divide between Area C and the ponds, which separates the ground flow systems. The actions at Areas A and B will have no negative effects on the ponds or any other wetlands because the low-permeable soil cover will have no impact on ground water flows. The actions at Pits A and B should, in fact, have a positive impact on the ponds by reducing runoff and erosion into the ponds.

The impact of the site on the creeks, ponds, and aquatic life is being further evaluated as part of the study being conducted by the U.S. Fish and Wildlife Service. Another Record of Decision will be developed to directly address the need, if any, for remedial action in these areas after the studies are completed.

EVALUATION OF ALTERNATIVES NOT SELECTED

Alternative No. 1 - The no action alternative was not selected because the fly ash would erode into adjacent streams and ponds may continue to pose threat to public health and the environment. Also, the fly ash pits would remain accessible to residents and ground water contamination outside of Area C would not be remediated.

Alternative No. 2 - This alternative is rejected for Area C because a soil cap alone will not effectively mitigate the ground water contamination caused by Area C.

Alternative No. 3 - The alternative includes a low-permeability cap, slurry walls, interior drains for ground water control. The slurry walls would be constructed into the Yorktown Formation and would be, in effect, a hanging slurry wall, which would allow ground water to migrate under the wall into the Yorktown Formation and up into the fly ash pits. The continued flow of ground water requires ground water gradient controls, most likely accomplished by interior drains with the flow pumped to adjacent streams. This pumping would continue forever, thus reducing the long-term reliability and effectiveness of this alternative. Additionally, the degree of risk to human health and environment presented by ground water from Areas A and B does not warrant the added expense of eliminating ground water from these areas.

Alternative 5 - This alternative includes excavation of offsite disposal of fly ash and was not selected because it is not cost-effective. Excavation and off-site disposal would only move the fly ash to a different location. During construction, this alternative would cause dust emissions for a number of years while the fly ash is being excavated. Since the risks posed by the fly ash can be effectively and reliably mitigated for a cost of $14,119,000, the significant cost, $49,106,000, for off-site disposal and management of the fly ash is unjustified.

Alternative 6 - This alternative calls for in-place stabilization/solidification and was not selected because of it not cost-effective. As discussed in Alternative 5, the long-term risk of the fly ash pits can be effectively and reliably mitigated with alternative 2 and 4 at a cost of $14,110,000, as opposed to a cost of $41,945,000 for this alternative.

Estimated Schedule *

Approve ROD	9/86
Award Superfund IAG to US Corps of Engineers for Design	11/86
Start Design	5/87
Design Complete	10/87
Award Construction Contract	2/88
Start Construction	4/88

* Dependent upon CERCLA reauthorization

CHISMAN CREEK SUPERFUND SITE
GRAFTON, YORK COUNTY, VIRGINIA

RESPONSIVENESS SUMMARY

SEPTEMBER 1986

This community relations responsiveness summary is divided into the following sections:

Section I. Overview. This section discusses the EPA's preferred remedial action alternative and the anticipated public reaction to this alternative.

Section II. Background of Community Involvement and Concerns. This section briefly describes the history of community interest and concerns that arose during remedial planning activities at the Chisman Creek site.

Section III. Summary of Major Comments Received during the Public Comment Period and the EPA's Responses to these Comments. Comments received are summarized and categorized according to topics. Comments are separated into 3 groups:

A. Oral comments received before the public meeting, September 22.
B. Oral comments received during and after the public meeting, September 22.
C. Written comments.

Section IV. Remaining Concerns. All remaining concerns that the EPA or the State of Virginia should be aware of during future remedial activities for this site are discussed in this section.

In addition to the above sections, Attachment A provides a listing of community relations activities that were conducted during the remedial response activities at the Chisman Creek site.

I. OVERVIEW

A short site history, as well as the Feasibility Study findings and cleanup options have been discussed previously in this ROD. The preferred alternative consists of installation of a clay cap over Pit C and soil caps over Pits A & B. Pit C would be dewatered through use of a subsurface drain. In addition, an alternate water supply would be provided for those residents on Allens Mill and Wolf Trap Roads whose wells draw from the shallow aquifer. Land use controls would be needed to prevent damage to the caps.

A primary concern of local officials and residents is the nature of land use controls intended for implementation. Citizens have voiced a strong preference that the pits not be fenced. It is suggested they be used as parks. There is little argument from the community regarding the overall goals and techniques outlined in the Preferred Alternative Fact Sheet and in this ROD. However, further study of ground water movement and area hydrogeology have been suggested.

II. BACKGROUND OF COMMUNITY INVOLVEMENT AND CONCERNS

Several community groups have been involved in the study process at the Chisman Creek Site since it was placed on the NPL in 1981. That involvement has been coordinated by the York County government and the Chesapeake Bay Foundation and has now grown to include many environmental and academic institutions. EPA's community relations effort began with a public meeting to discuss the RI/FS workplan in April 1984 and has continued with door-to-door visits, small group meetings and additional public meetings. The level of concern and awareness has varied, reaching peaks at the RI public meeting in December 1985 attended by 120 residents, and the FS public comment period from August 26 to September 25.

The primary emphasis of the community has been on protecting the ground water which is threatened by the site and on improving the overall quality of Chisman Creek. Other issues include: the dangers of direct exposure to flyash, Virginia Power's liability for the flyash pits and the future use of the pits and the land surrounding them.

Near the outset of the public comment period, the York County Board of Supervisors organized a Stewardship Committee to act as an advisory board regarding the Chisman Creek Site. This board included approximately 13 members representing such organizations as the Chesapeake Bay Foundation, the Virginia Institute of Marine Sciences, William and Mary College, etc. This board provided most of the public input during the comment period.

III. SUMMARY OF MAJOR COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND THE EPA'S RESPONSES TO THESE COMMENTS

A. Oral Comments Received Before the Public Meeting, September 22.

1) Areas of Responsibility

Commentor: Who in the state is involved with the ROD?

Responder: The State Health Department and the State Department of Natural Resources have been working with EPA.

Commentor: Where does the York County Board of Supervisors come in? The Stewardship Committee serves as an advisor to that group.

Responder: EPA solicits recommendations from local government and comments from both the community and the responsible party. Local government is not in the chain as a decisionmaking body, but local officials have a very important role in stating what they believe is correct or not correct to the state and EPA. EPA is seeking guidance from those officials in preparing the ROD.

Commentor: What happens if the responsible party does not implement the cleanup?

Responder: EPA will initiate the cleanup under Superfund and seek reimbursement from the responsible party. Under the current CERCLA law, the ability to tax has expired; however, the authority to clean up sites remains. Both houses of Congress have passed reauthorization of a Superfund bill, and the conference committee has agreed on all issues except one, the tax issue. We hope to have a resolution of the tax issue by the beginning of October. If we do not, EPA will not have the ability to fund the next step: preparation of plans and specifications (remedial design). EPA can complete existing phases but cannot start new phases.

2) Costs and Phasing

Commentor: At what point does the state become committed to he cleanup?

Responder: The state's commitment occurs when plans and specifications are complete and available for use when selecting a contractor to implement the cleanup. Prior to that time, EPA signs a contract with the state of Virginia to arrange for the money to be paid.

Commentor: Is there a process of reparation for the owners of property comprising Superfund sites?

Responder: There is no provision for compensation of site owners in the current Superfund legislation. Property owners are potentially responsible parties.

Commentor: How long will it be before remedial action begins?

Responder: We are not sure; it depends on who does the work and the planning and on when a final decision is made.

Commentor: Could Pits A and B be addressed, and the best remedy for Pit C be decided on later?

Responder: EPA may negotiate with Virginia Power later concerning this possibility. Such negotiations would address those details that might call for the Stewardship Committee's alternative suggestions. The purpose of this meeting is to focus on the FS alternatives.

3) Property Ownership and Use

Commentor: Who owns the property once the problem is corrected?

Responder: Property does not change hands unless the owner decides to sell it. The state would enforce land use restrictions. The county has mentioned using the land for recreational purposes. EPA does not want any disturbance of the site that would destroy the cap. Since integrity of the cap must be preserved, there must be limited usage.

Commentor: Who enforces the limited usage? Who is responsible if someone is injured because of the fence?

Responder: The purpose of the fence is to prevent unintentional access. The operation and maintenance of the site will be the state's responsibility. However, liability is still with the property owner.

Commentor: What kind of uses are acceptable in the eyes of EPA?

Responder: An acceptable use is any use that would not affect (1) the integrity of the caps at the site, (2) the state's ability to monitor the wells, and (3) the public health, which would eliminate use of the groundwater in the area. Upon completion of the cap, EPA will outline what it believes will be necessary to ensure the integrity of the land.

Commentor: We do not want to see fences on the property. We would rather see some use of the property.

Responder: EPA will consider alternative access restrictions.

4) Leachate

Commentor: Does it make any difference if vanadium and nickel get into Chisman Creek? What happens if those substances migrate into that area?

Responder: The ecological effects of vanadium and nickel contamination are being examined in the U.S. Fish and Wildlife study now underway.

5) Drainage Ditch and Cap

The Stewardship Committee and EPA discussed the effectiveness of digging a drainage ditch on three sides of the pit.

Responder: We have evaluated this option on a very conservative basis and we believe it would be successful. We feel the combination of the drainage ditches and the cap will dewater Pit C.

Commentor: The studies were conducted during a dry period. You haven't really seen the pits during wet periods. What type of vegetation would be suitable?

Responder: Regarding the vegetative cover of the cap, certain types of vegetation are unsuitable (deep rooted trees, etc.). EPA will propose a type of vegetation to be used that will not have a negative impact on the cap. This issue will be addressed further at the time of design.

6) Public Comment Period

Commentor: The Stewardship Committee indicated it did not believe it had been given sufficient time to review the FS. The Committee wrote a letter to the Director of the Hazardous Waste Management Division stating this opinion.

Responder: EPA prefers to avoid delays in signing the ROD and beginning cleanup action. EPA is concerned that undue delay could be caused if the comment period were extended indefinitely. (The comment period subsequently was extended from September 15 to September 25).

B. Oral Comments Received During and After the Public Meeting, September 22.

1) Wells and Health Risks

Commentor: I live along the affected section of Wolftrap Road. There has been a definite change in my well water. What does EPA plan to do?

Responder: EPA will survey wells to see which ones could be affected. Those homes will be connected to the public water supply.

Commentor: When will we know what is currently in our well water?

Responder: Samples have already been taken from some of the wells, and we do not expect to take more samples. City water lines will be extended to the owners of the problem wells so that those people can tap into the city water lines for drinking water.

Commentor: Who will pay for any new lines?

Responder: Under CERCLA, EPA or the responsible parties will install the lines. EPA will not, however, pay for monthly service charges once the lines are installed. The wells to be removed from service are the shallow wells; based on the remedial investigation.

Commentor: What is an acceptable concentration of nickel in the wells?

Responder: An acceptable level is 600 micrograms per liter or less.

Commentor: How far away from the pits has EPA tested to see how far the contamination has spread? Can you give a radius in miles?

Responder: All wells around Pit C have been examined. These wells are located at the homes where we originally found contaminants (directly across Wolftrap Road). Significant contamination is found only in the shallow aquifer. If you go below about 20 feet deep, there is a higher pH and contamination is not found.

Commentor: Are there other health hazards besides drinking water, such as children playing in the water? On a scale of 1 to 10, can you rate the dangers?

Responder: Beside the fact that the groundwater is somewhat contaminated, EPA doesn't see an immediate danger to, for example, children playing in the water. The danger is in the flyash contained in the pits. EPA plans to cover this flyash and to be sure there is no additional damage to whatever cap is put on the pits.

Commentor: People are generally unaware of what is going on at that site. Some people are here because I knocked on their doors. I'm surprised at the lack of representation.

Responder: A year ago when we first began to work in York County, EPA representatives went out and knocked on doors to notify people of what we were doing. We worked through the county offices to get an insert in the county newsletter. We will continue to try to keep the public informed through meetings and mailing lists, but we appreciate your efforts in speaking to your neighbors.

2) Land Use

Commentor: Did the subject of land use or acquisition of private property come up?

Responder: CERCLA allows EPA to take the action we are proposing. The laws allow EPA to take remedial response actions it deems necessary at Superfund sites. All property owners have been sent notice letters identifying them as potential responsible parties EPA has the legal ability to go in and take action.

Commentor: Does the proposed cleanup remove the Chisman Creek site from the Superfund list? Somehow the problem sounded much more serious when we first met than it sounds now.

Responder: The cleanup action will not immediately remove the site from the Superfund list. Only when it can be shown that there is no longer any significant danger due to the site can it be removed from the list.

Commentor: At the first meeting, many of us were prepared for a conflict. A Virginia Power representative said that if EPA did not correct the problem, Virginia Power would. Virginia Power would pay all bills and take fast action. In newspaper reports since then, Virginia Power keeps trying to downgrade the problem. Virginia Power now says that if EPA doesn't clean up the problem, they will do it -- if they have to. If Virginia Power was willing to pay for the cleanup when it was a lot more than it is now, why doesn't EPA clean up the site now and send Virginia Power a bill?

Responder: It is a fact that Virginia Power can clean up the site faster. Rather than using EPA's money up front, EPA would like to reach an agreement with the responsible parties so they assume the cost. EPA prefers not to spend the taxpayer's money first. Some cleanups cannot be accomplished through agreements with responsible parties, and EPA prefers to use Superfund for those instances.

3) General Questions and Comments

Commentor: How do you determine liability?

Responder: For questions regarding release of liability, you should contact the EPA legal department.

Commentor: Are there other places like this in the U.S.? Is technology being used from these other sites?

Responder: Yes, there are similar sites, but not on the NPL. EPA representatives were not aware of the specific technologies being used at those sites.

Commentor: Is there a health risk after the pits are capped at those sites?

Responder: We do not have much information about exposure risks at capped sites. Under the new laws, the Center for Disease Control will select an area and will perform extensive studies to obtain information about how people's health is being affected by these sites.

Commentor: What is the cost to excavate the pits?

Responder: To excavate the pits would cost about $49 million.

Commentor: Why is that figure so high?

Responder: There will be approximately one million cubic yards of ash haul away from all pits, and that material must be disposed at a federally approved hazardous waste facility. Tipping fees at such facilities are extremely high.

Commentor: When will the water lines be installed?

Responder: The answer depends on who pays for installation and how long it takes to get a contractor. When an agreement is reached with the responsible party, EPA can set up a timetable.

Commentor: In the meantime, should residents have their water examined?

Responder: EPA does not believe there is currently a problem with the water related to this site.

(From the director of the County Department of Public Utilities) My office will help you find a place to have water samples examined. However, the water in Chisman Creek area was "bad" to start with. There is no "good" water in any well below the Naval Weapons Station. You will probably want to find out whether there has been pollution of the well from nearby septic tanks.

Commentor: Is there something such as putting up signs that can be done to keep people out of the area, particularly from kicking up the flyash?

Responder: We can explore the options for keeping people out. Only in emergency conditions can EPA put up signs. We will see if something can be done, however.

C. Written Comments

1) The following comments were received from the Stewardship Committee in a resolution through York County Board of Supervisors Chairman Ben Rush.

Commentor: The committee generally endorses the preferred remedial alternative, but believes the following issues should be studied further:

Ground water flow through the pits. The committee is concerned that the RI data was collected during a particularly dry period and may not be representative of typical conditions.

Equilibrium and exchanges between water bound particles and the water flowing through those particles.

Geological and hydrogeological conditions and the permeability of flyash deposits.

Alternate access restrictions. The committee does not support an option which calls for chain link and barbed wire fencing around the pits.

Final remedial actions should be contingent upon the findings of the U.S. Fish and Wildlife study now underway.

Responder: EPA will continue to work with the Stewardship Committee and York County to make sure the cleanup is accomplished efficiently and based on accurate and complete data. It seems that we do have an agreement in principle on the remedial alternative. EPA will evaluate the effectiveness of the proposed cleanup upon completion of the U.S. Fish and Wildlife study.

2) The following comments were received from Virginia Power Company in communications dated September 18, September 23, and September 25.

Commentor: Permanent fences that interfere with the beneficial use of the site should not be constructed.

Responder: EPA agrees with this comment. During design, EPA will select an alternative method to insure soil caps are protected, such as landscaping with dense vegetation.

Commentor: Low-permeability soil covers are preferable to clay caps at the site. Virginia Power's staff of engineers and consultants have stated that low-permeability can be achieved using soil or synthetic liners instead of clay.

Responder: EPA agrees with the comment for Areas A and B. A soil layer overlaid with topsoil and vegetative growth will be sufficient to meet the objective of preventing direct contact and minimizing erosion.

For Area C, EPA will not at this time require clay although, for cost estimating purposes, clay was assumed. However, a low-permeability cover is necessary to minimize infiltration so that the fly ash pit can be dewatered and treatment of the discharge from the drain system can cease relatively quickly, i.e. one to three years after installation of the drain. During design of the remedial alternative, value engineering will be conducted to select the best cover material. The value engineering will also study measures to minimize the negative impacts to the environment during construction.

As discussed in the Record of Decision (ROD) under the section titled "Consistency With Other Environmental Laws", the cover on Area C should be designed to meet all the general performance standards of the RCRA landfill closure regulations.

For Areas A and B, only those portions of the RCRA regulations that address minimization of erosion and prevention of direct contact will be used in the design of the cover.

Commentor: Area C should not be dewatered because the level of nickel in the ground water in Area C meets all environmental standards, criteria and advisories. To dewater Area C is to close the barn door after the cows have left. If any ground water treatment is necessary, it should be conducted at monitoring well 3. Additionally, Virginia Power believes there is no scientific or legal basis for any remedial action based on current criteria and guidance for nickel.

Responder: The NCP requires, with limited exceptions, EPA to select a remedy that attains or exceeds applicable or relevant and appropriate Federal public health and environmental requirements (see section 300.68 (i)). Guidance for implementing this requirement is provided in an EPA memorandum titled "CERCLA Compliance With Other Environmental Statutes" dated October 2, 1985 (see 50 Federal Register 47946 - 47950, November 20, 1985).

The commentor correctly notes that there are no MCLs for nickel established under the Safe Drinking Water Act. However, EPA policy identifies other Federal criteria, advisories, guidance, and state standards to be considered (see 50 Federal Register 47949). Relevant and appropriate guidance to be considered in the case of nickel are: Health Effects Assessments (HEA), Federal Water Quality Criteria (AWQC), and Health Advisories. For nickel there is a HEA (see EPA/540/1-86-018, September 1984 or NTIS-PB86-134293/AS)*, there is a proposed AWQC (see 51 Federal Register 8361, March 11, 1986) and there is a draft drinking water Health Advisory (October, 1985). Since the ground waters discharge to nearby surface waters, the AWQC were appropriate for consideration. As discussed in the Record of Decision, under "Compliance With Other Environmental Laws", the measured levels at monitoring well 3 exceed all the guidance levels and at monitoring well 5 some of the levels are exceeded. Nickel is also an Appendix VIII constituent under RCRA.

Because the levels of nickel outside of Area C exceed appropriate guidance and because nickel is an Appendix VIII constituent that has been released beyond the boundaries of Area C, and because it is necessary to protect public health from these releases, the relevant and appropriate sections of RCRA would authorize a corrective action to be taken. Additionally, under EPA's CERCLA authorities, EPA believes a remedial action at Area C is necessary to effectively mitigate and minimize the threats and to provide adequate protection of public health and welfare and the environment.

After screening technologies and evaluating alternatives, as described in the Feasibility Study, EPA found that dewatering of Area C could be accomplished in a cost-effective manner through the use of drains and a very low-impermeability cap along with a temporary treatment unit. Dewatering of the fly ash pits will insure that there will be no release of contaminants into the ground water.

Commentor: The drain system proposed by EPA will be technically infeasible to implement.

Responder: EPA believes that the drain system can be implemented as proposed. Construction technologies can be fully evaluated during design to insure slope stability of the fly ash pit during installation of the drains.

*Note: EPA's letter of September 17, 1986 transmitted a draft copy of the HEA, and referenced a federal register notice with a drinking water guidance on nickel. The HEA was published in final form, as reference above, with no significant changes from the draft (i.e. the AIC and AIS values are the same), and the guidance level (150 ug/l) is the same as the health advisory level.

The slopes required for the drains could be less than the 1%-2% suggested by the commentor. The drain must only function to keep the water level from rising into the pits; it does not function like a storm sewer, which is designed to insure a strong gravity flow of water. The drain must be designed only to insure that the fluid potential in the drain is at atmospheric pressure so that the water level around Area C will be lowered.

The drains should not cause any significant contamination of the Yorktown Formation. The commentor was concerned that in its natural condition, the Yorktown Formation is relatively impermeable to ground water flow from the Tabb Formation and that the drain would alter these natural conditions. The RI found that the Yorktown, as defined in the RI, is naturally permeable and the commentor has not provided any information to show that the installation of the drains will have a significant impact on the degree of interconnection currently existing between the Tabb and Yorktown Formations.

Commentor: The Public Health and Environmental Evaluation (PHEE) unnecessarily and inaccurately overstates the potential adverse health effects.

Responder: The basis for the PHEE calculations are clearly described in the report. EPA is making its decisions primarily on filtered samples, as suggested by the commentor (i.e. nickel levels outside of Area C). EPA recognizes that there is debate over the carcinogenicity of arsenic, and has taken this uncertainty into consideration. As sampling results have shown, there are compounds other than nickel that are elevated in all these disposal area (i.e. chromium, selenium, etc.). EPA believes the information in the PHEE is useful for evaluating the risks posed by the site. Based on the RI, FS, the PHEE, and the documents listed on the ROD's declaration page, EPA believes that there is sufficient information to select the recommended alternative.

IV. REMAINING CONCERNS

Community members are adamantly opposed to a remedial solution which would render the pit areas completely unuseable. EPA has indicated that it will examine other options for land use control. York County, the Chisman Creek Stewardship Committee and Virginia Power have voiced several suggestions and concerns related to the information in the RI and FS documents. These concerns are outlined in this document. All 3 groups particularly and the community in general should be a continuing part of the decision making process regarding this site.

Appendix A

- April 23, 1984 -- EPA held a public meeting on the workplan for the RI/FS.
- September 10-13, 1984 -- EPA visited residents and distributed a fact sheet which explained future plans for the site.
- December, 1985 -- EPA issued a press release on the RI.
- December, 1985 -- Public meeting on the Remedial Investigation.
- August 25, 1986 -- Local officials and residents were contacted regarding the release of the Feasibility Study.
- August 26, 1986 -- The FS was distribued to 4 information centers in the community. A press release on the FS was issued.
- September 11, 1986 -- EPA met with the Stewardship committee.
- September 15, 1986 -- The comment period was extended to September 24.
- September 22, 1986 -- EPA held a public meeting on the FS.