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**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**REGION V**

EPA Region 5 Records Ctr.
274172

**DATE:** July 17, 1997

**SUBJECT:** Draft Proposed Plan for the North Bronson Industrial Area Superfund Site

**FROM:** Rosita Clarke-Moreno, RPM for RCM
Superfund Division

**TO:** Addressees

Attached for your review and comment is the draft Proposed Plan for the North Bronson Industrial Area Superfund Site.

Your cooperation in providing comments before July 24, 1997 would be appreciated. If you have any questions, feel free to contact me at (773) 847-6077.

Addressees:

Wendy Carney, Branch Chief, SD, SR-6J
Sally Averill, Section Chief, SD, SR-6J
Jeanette Marrero, ARD, AE-17J
Sheila Wells, WD, W-15J
Edward Karecki, SD, SRT-4J
Todd Goeks, CRC5, NOAA, SRT-4J
Andrew Podowski, SD, SRT-4J
James Chapman, SD, SRT-4J
Bonnie Gitlin, HQ, 5202G

**PROPOSED PLAN**
**North Bronson Industrial Area Superfund Site**
**July 1997**

Inside this Proposed Plan Fact Sheet:

- Background information
- Summary of Site risks
- Evaluation of alternatives and the preferred alternative
- The proposed plan
- Community involvement opportunities
- Glossary (defined terms are printed in bold type)
- Mailing list/Comment return mailer

## INTRODUCTION

This **Proposed Plan** presents the preferred remedy for the North Bronson Industrial Area Superfund site (the site). This plan was developed and selected by the Michigan Department of Environmental Quality (MDEQ) and the Environmental Protection Agency (U. S. EPA) This proposed plan, protects human health and the environment by consolidating waste from several source locations into one pre-existing repository (western lagoons), eliminating direct contact hazards, and treating groundwater impacted by waste material deposited into the managed repository. (Note: Words highlighted in bold print are defined in the attached glossary.)

This remedy is based on the results of the **Remedial Investigation (RI)** and **Feasibility Study (FS)** conducted by the MDEQ. The RI collected and analyzed information to determine the nature and extent of contamination present at the site. The FS identified and evaluated the most appropriate technologies for addressing contamination problems at the site. The MDEQ completed the RI in July of 1993 and the FS in May 1995. The FS was later revised to reflect changes in Michigan's clean-up law and to incorporate a new technology that was not reviewed in the original FS. The revision (FS addendum) was completed in July of 1997.

Public input on the alternatives and the information that supports these alternative is an important contribution to the remedy selection process. Based on public comment or new information, the MDEQ and the U.S. EPA may elect to adopt the preferred remedy as originally proposed, modify a component o the preferred, or select a different alternative. Therefore, members of the Bronson community and any interested parties are strongly encouraged to review and comment on the remedial investigation or all of the technologies and alternatives considered in the FS for the cleanup of this site.

All of this information is available for your review in the North Bronson Superfund site Public Repository. The repository is located at the Bronson Public Library. For the location of the library and other sources of information, please see "Available Information" on page ***.

The comment period begins July 25, 1997 and ends on August 25, 1997. The MDEQ and the U. S. EPA will also hold a public meeting at 7:00 PM in the Bronson Theater on August 13, 1997. The purpose of this meeting is to further explain the proposed plan and to accept any oral or written comments offered from the public during the meeting.

After the public comment period ends, the MDEQ will summarize and respond to all public comments in a document called the **Responsiveness Summary**. The MDEQ and the U.S. EPA will then select the final remedy and sign the **Record of Decision (ROD)** for the site.

## SITE BACKGROUND

The North Bronson Industrial Area Superfund site is a two hundred-acre parcel located in the City of Bronson, Branch County, Michigan (Figure 1). The site is bordered to the east by Lincoln Street, to the south by Filmore and Union Streets, to the west by Burr Oak Street, and to the north by County Drain #30 (CD#30). The predominant features of the site are two sets of seepage lagoons (Eastern and Western) located in the northeast and northwest sections of the site, next to CD#30 (see map).

This proposed plan addresses those areas adversely impacted by the disposal of hazardous waste into the seepage lagoons. The impacted areas are the eastern and western lagoons, and CD#30. The media or source material addressed by this plan include lagoon soil, sludge, and sediment; groundwater impacted by waste seeping from the lagoons, and CD #30 surface water and sediment.

The eastern and western lagoons were built in 1938 and 1949 respectively, to contain metal-laden plating and other industrial waste generated by several industries in the area. An industrial sewer system was used to transport waste from industrial facilities to the lagoons. Between 1938 and 1970, the City of Bronson owned and operated both sets of lagoons. The Bronson Plating Company purchased the Eastern lagoons from the city in 1970. The Western lagoons, which the city owns today, were used until 1980. Bronson Plating continued to discharge to the Eastern lagoons until 1981. Other businesses that used the lagoons and industrial sewer included but was not limited to, Scott Fetzer and LA Darling.

The contaminants detected at the site are **chlorinated organic compounds (TCE, 1,2-DCE, and vinyl chloride)**, metals (cadmium, chromium, copper, nickel, and zinc), and **cyanide**. The lagoons are the main source of metals and cyanide at the site. The main source of chlorinated organic compounds appears to be soils beneath the Scott Fetzer and LA Darling properties. The original source of this contamination appears to be the industrial sewer which probably leaked contaminants into the underlying soil and groundwater. At this time, the MDEQ is investigating the industrial sewer as a source area. If the sewer does prove to be a source of contamination at the site, the MDEQ and the EPA will address this problem at a later date.

The groundwater flows northwest across the site through the source areas picking up contaminants that seep from contaminated soil or sludge. Groundwater contaminated with a mixture of chlorinated organic compounds, metals, and cyanide discharges to CD #30. CD#30 is an open drain that eventually empties into Swan Creek. The discharge of contaminated groundwater to the CD#30 degrades the sediment and surface water quality of the drain and potentially Swan Creek.

Contaminant releases from soils, sludge, and groundwater are expected to continue at the site until remedial actions at the source areas are undertaken.

## Summary of Site Risks

### The Western Lagoons

There are 5 western lagoons ranging in size from approximately 1,360 square feet to 19,700 square feet. The lagoons are surrounded by berms approximately 4 to 5 feet in height. Most of the western lagoons contain standing water througout the year.

Heavy metals, chlorinated organic compounds, cyanide and semi-volatile organic compounds were detected in the surrounding berms, surface and subsurface soil, and lagoon sludge or sediment. Contaminants were detected at levels that present a risk to human health and the environment. Contaminated sludge and soil are also releasing contaminants to the groundwater.

The western lagoon area is zoned for industrial use only. Based on the state's clean-up standards for industrial property the amount of soil or sludge contaminated with metals, chlorinated organic compounds, or semi-volatile organic compounds that must be addressed covers a 176,000 square foot area to a depth of at least 20 feet or 132,000 cubic yards.

The MDEQ conducted a Human Health and Environmental Risk Assessment to determine whether contaminants detected at the site may effect human health or the environment. The assessment compared contaminant levels found at the site to State and Federal standards or guidelines; considered how people, animals, or plants could be exposed to the contamination; and evaluated whether these contaminants posed a threat to human health or the environment.

**Human Health**

Human health risks are quantified by calculating the noncancer and the cancer risk factors for each chemical detected at the site. For noncancer risks, the contaminant concentration detected on site must not exceed a reference dose concentration for that chemical. Numerically this comparison is expressed as the a **hazard quotient (HQ)** for the chemical or for multiple contaminants the **hazard index (HI)**. The HQ or HI cannot be greater than 1.00.

The acceptable risk range for cancer causing chemicals established by the U. S. EPA is no more than one additional case of cancer for every 10,000 (1x10-4) to 1,000,000 (1X10-6) people exposed. The MDEQ manages cancer risk to no more than one additional case of cancer for every 100,000 (1X10-5) people exposed to a chemical.

**Western Lagoon Area** - Risks were estimated for trespassers exposed to contaminants detected within the western lagoon area. Trespassers were assumed to be exposed to contaminated sludge, surface water, and air. Under these conditions, the western lagoon area presents both a noncarcinogenic and a carcinogenic health hazard. The majority of the noncancer risk (HI=6) is from skin contact with cadmium, and chromium contaminated sludge. The majority of the cancer risk (CR=5X10-6) is from the ingestion of arsenic in surface water and sludge.

**Eastern Lagoon Area** - Risks were estimated for trespassers exposed to contaminants detected within the eastern lagoon area. Trespassers were assumed to be exposed to contaminated surface soil. Under these conditions the eastern lagoon area appears to pose a noncancer health concern. The majority of the noncancer risk (HI=20) is from direct contact with the skin and the incidental ingestion of antimony, chromium, and nickel.

**County Drain #30 (CD#30)** - Risks were quantified for children playing in CD#30 and residents living near CD#30. Children who wade in CD#30 are assumed to be exposed to contaminated surface water, sediment and organic vapors in the air. Residents are potentially exposed to organic vapors in the air. Under these conditions there is a cancer risk to children exposed to sediment and residents exposed to volatile chlorinated organics. The majority of cancer risk (CR=1X10-5) was associated with children ingesting sediment contaminated with arsenic. The majority of cancer risk (CR=2X10-5) is associated with residents inhaling vinyl chloride.

**Area-wide Groundwater** - The most concentrated portion of the chlorinated organic plume lies below the former Scott Fetzer and LA Darling properties. The organic plume generally decreases in concentration as it flows west and north toward CD#30. Risks were quantified for residents assuming that they will use the contaminated shallow groundwater in the future. Health risks were developed separately for groundwater consumption and exposure to groundwater contaminants through skin contact and inhalation while showering. Based on the concentration of contaminants in the groundwater, residential use would pose a noncancer (HI=60) and cancer (CR=2X10-1) risk to future residents. The noncancer risk was associated with ingestion of 1,2-dichloroethene. The majority of the cancer risk is associated with the ingestion of vinyl chloride in the groundwater.

**Lagoon Area Groundwater** - The baseline risk assessment did not characterize risk specifically associated with groundwater impacted by the lagoons. However, health risks associated with exposure to lagoon area groundwater would be essentially the same as those estimated for exposures to the area-wide groundwater contamination. The contaminants detected in both groundwater beneath the lagoon and the groundwater beneath the entire industrial area are the same. Therefore, the risks from exposure to groundwater should be

the same regardless of the source. The majority of the health risks comes from chlorinated organic compounds.

**Ecological Concerns**

***County Drain #30*** - *The MDEQ evaluated ecological risks to County Drain #30 by comparing the* concentrations of site-related contaminants in CD#30 surface water and sediment to U. S. EPA and MDEQ criteria or guidance documents if agency standards were not available.

Impacts to CD#30 surface water were evaluated against U. S. EPA Ambient Water Quality Criteria (AWQC) and MDEQ GSI criteria. Several volatile organic compounds or metals were detected in CD#30 surface water or in groundwater discharging to the drain at levels above AWQC or MDEQ GSI values.

*Impacts to CD#30 sediment were evaluated by comparing contaminant concentrations found in CD#30 to* sediment guidance documents or background conditions. The guidance documents used are the Ontario Ministry of the Environment, Guidelines for the Protection and Management of Aquatic Sediment Quality in Ontario, and the NOAA Technical Memorandum NOS ONA 52, The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. Sediment background levels were used if they were higher than the lowest impact level established by either guidance, but did not exceed the severe impact level quantified in the Ontario guidelines.

**Risk Assessment Summary**

The risk assessment conducted as part of the RI indicates the site presents an unacceptable risk to current residents, trespassers and the environment. Therefore, under CERCLA, the agencies must take action to reduce this risk to acceptable levels.

**Summary of Alternatives**

Based on the results of the RI, the MDEQ conducted a feasibility study to identify, develop and evaluate appropriate alternatives for reducing risks to human health and the environment. To be considered, an alternative had to meet two basic clean-up objectives identified for the site.

1. Eliminate direct contact concerns for both human and animal receptors, and

2. Prevent excessive releases of contaminants beyond site boundaries and into CD #30.

To meet these objectives, the alternatives had to meet the chemical-specific requirements for eastern and western lagoon sludge and soils, groundwater, and County Drain #30 sediment, or eliminate pathways of exposure. The chemical-specific clean-up goals for the alternatives evaluated are presented in Tables 1 through 3.

**The Alternatives**

The MDEQ developed clean-up alternatives for each area of concern. These areas are the Eastern Lagoons (EL), and Eastern Lagoon Groundwater (ELG), the Western Lagoons (WL) and Western Lagoon Groundwater (WLG), and County Drain #30 (CD). The alternatives developed for each area are described below. A comparative analysis of the alternatives is provided in Tables 4 through 6. The costs presented for each alternative include capital costs (equipment, labor, and other construction expenses), operation and maintenance (O&M) expenses, (monitoring groundwater or maintaining a cap), and total present worth. The total present worth is the money that needs to be set aside now, at the prevailing interest rate, to pay for all capital and future costs. The present worth estimate assumes a 30 year project life.

**Common Elements**

With the exception of alternatives WL-4 and EL-4, the alternatives considered for the site include a number of common elements. These elements are:

I. Institutional Controls/Access Restrictions - This generally refers to perimeter fencing, warning signs, permanent markers and deed restrictions on the property to control future site development or the use of impacted resources like groundwater.

I. Further Characterization - Further characterization of impacted areas may be required to further refine the horizontal and vertical extent of soil, sludge and groundwater contamination in the source areas.

a)

II. Groundwater monitoring - Groundwater monitoring will be required to confirm the effectiveness of the selected remedy.

a)

III. Five year reviews

For alternatives WL-4 and EL-4 contaminated soil and sludge would be removed from the site. Groundwater would no longer be impacted, and future use of the impacted areas would not be restricted. Therefore, there would be no need for institutional controls, long term monitoring or five year reviews. These alternatives were, at $52,000,000 and $10,500,000 respectively, the most costly alternatives evaluated

Alternative (WL-1, WLG-1, EL-1, ELG-1 and CD#30-1): No Action
The Superfund program requires that a "no action" option be considered at every site. Under a no action remedy the site would remain as it is today. This option is used as the benchmark for comparing and evaluating the effectiveness of all other alternatives.

The costs associated with a no action alternative are those related to the 5-year reviews and groundwater monitoring. 30 year present worth estimates are $10,000 for reviews and $500,000 for groundwater monitoring. However, a no action remedy does not meet the clean-up objectives for the site.

**WESTERN LAGOON AREA**
Alternative WL-2: Area Cap
WL-2 requires constructing a cap over the Western Lagoon area. The purpose of the cap is to cover the waste prevent exposures and to stop rainwater from infiltrating and leaching contaminants into the groundwater. The cap however, will not prevent the leaching of contaminants from waste deposited below the water table.

Alternative WL-3: Soil Fixation
The intent of soil fixation is to slow the release of contaminants into the environment. This process involves a deep soil mixing technique that directly applies stabilizing agents to the soils. These agents are designed to reduce the mobility of the contaminants. An area cap would also be required to prevent exposures and to reduce the infiltration of rainwater.

Alternative WL-4: Excavation With Treatment
The intent of excavation with treatment is to prevent exposure and the release of western lagoon contaminants to the environment by removing, treating and properly disposing contaminated sludge and soil.

**WESTERN LAGOON AREA GROUNDWATER**
Alternative WLG-2: Groundwater Pumping.
The intent of groundwater pumping is to capture and treat contaminated groundwater before it migrates from the site. This prevents the movement of contaminants into the surrounding environment. Treated groundwater would be discharged to CD#30.

Alternative WLG-3: Containment By Slurry Wall And Groundwater Pumping.
The intent of this alternative is to prevent the movement of contaminants via the groundwater by surrounding the

lagoons with a subsurface wall. The wall would create a cell isolating the contaminants from the environment. Groundwater seeping into the cell would be pumped out and treated before discharging it to CD#30. This alternative would not prevent contaminated groundwater from sources upgradient from the lagoons from moving around the cell and discharging to CD#30.

Alternative WLG-4: Partial French Drain/Wetland Treatment of Groundwater.
The intent of this alternative is to prevent exposures and the movement of site-related contaminants into the surrounding environment. A french drain would intercept contaminated groundwater emanating from the Western Lagoon area. An wetland would be designed and constructed to treat contaminated groundwater pumped from the french drain.

**EASTERN LAGOON AREA**
Alternative EL-2: Area Cap
EL-2 requires constructing a cap over the Eastern Lagoon area. The purpose of the area cap is to prevent exposure to eastern lagoon contaminants and to slow the leaching of contaminants into the groundwater by preventing the infiltration of rainwater.. The cap however, will not prevent the leaching of contaminants from waste that is below the water table.

Alternative EL-3: Soil Fixation
The intent of soil fixation is to slow the movement of contaminants into the environment via the groundwater. This process involves a deep soil mixing technique that directly applies stabilizing agents to the soils. These agents are designed to reduce the mobility of the contaminants. An area cap would also be required to prevent exposures and to reduce the infiltration of rainwater.

Alternative EL-4: Excavation and Treatment
The intent of excavation and treatment is to prevent exposure and the movement of contaminants into the surrounding environment by removing, treating and properly disposing contaminated sludge, and soil.

**EASTERN LAGOON GROUNDWATER (ELG)**
Alternative ELG-2: Groundwater Pumping
The intent of groundwater pumping is to capture and treat contaminated groundwater before it migrates from the site. This prevents the movement of contaminants into the surrounding environment. Treated groundwater would be discharged to CD#30.

Alternative ELG-3: Containment Wall and Groundwater Pumping
The intent of this alternative is to isolate the contaminants beneath the Bronson Plating Company Building by surrounding the facility with a subsurface containment wall. Groundwater would be pumped from within the contained area and treated to slow the movement of eastern lagoon contaminants into the environment.

Alternative ELG-4: Containment Wall, Slurry Wall, and Groundwater Pumping
The intent of this alternative is to isolate the contaminants beneath the Bronson Plating Company Building with a containment wall and to build a slurry wall around the remaining lagoons. Groundwater would be pumped from within the containment and slurry walls to slow the movement of eastern lagoon contaminants into the environment

**COUNTY DRAIN #30 (CD)**
Alternative CD-2: Access Restrictions and Monitoring
The intent of access restrictions and monitoring is to prevent exposure to contaminants in CD#30 by institutionally controlling access to the drain.

Alternative CD-3: Partial Sediment Dredging and Treatment
The intent of partial sediment dredging is to reduce exposure to and the movement of contaminants into the surrounding environment by removing and treating contaminated sediments from the drain near the lagoon areas.

Alternative CD-4: Full Sediment Dredging and Treatment
The intent of full sediment dredging and treatment is to prevent exposure and the movement of contaminants into the surrounding environment by removing and treating contaminated sediment from the entire length of CD#30.
a)
Alternative CD-5: Sediment Dredging with Channeling - This alternative would only redirect the path of groundwater and would spread the contamination down stream. This alternative has been eliminated as a possible option.

Alternative CD-6: Full Sediment Dredging/French Drain Along Selected Areas
The intent of this alternative is to prevent exposure to contaminated sediment and prevent the movement of contaminated groundwater into the environment. To accomplish the goals of this alternative the entire length of the drain would be dredged. Also contaminated groundwater emanating from the lagoon areas would be intercepted by the french drain before it could enter CD#30 and recontaminate that portion of the county drain.

Alternative CD-7: Full Sediment Dredging and Full French Drain
The intent of this alternative is to prevent exposure to contaminated sediment and the movement of contaminated groundwater into the environment. To accomplish the goals of this alternative the entire length of the drain would be dredged. Also contaminated groundwater along the entire length of the drain would be intercepted by the french drain before it could enter CD#30 and re-contaminate the drain.

**Evaluation of Alternatives and the Preferred Alternative**
In selecting a preferred remedy, the MDEQ uses nine criteria required by CERCLA to evaluate the alternatives developed in the FS. Seven of the criteria are used to evaluate and compare the alternatives on protection, cost, and engineering feasibility issues. The last two criteria, U. S. EPA acceptance and community acceptance, are completed after reviewing comments received during the public comment period. The nine criteria are as follows:

1. **Overall protection of human health and the environment** Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled with treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable or Relevant and Appropriate Requirements** ( ARARs or Federal and State Laws). Compliance with ARARs addresses whether a remedy will meet all of the ARARs of other state and federal environmental laws or justify invoking a waiver.

3. **Long-term effectiveness and permanence** Long term effectiveness and permanence refers to the amount of remaining risk and the ability of a remedy to maintain reliable protection of human health and the environment over time after clean-up goals have been met.

4. **Reduction of contaminant toxicity, mobility, and volume** Reduction of toxicity, mobility and volume through treatment is the anticipated performance of the treatment technologies that may be employed in a remedy.

5. **Short-term effectiveness** Short term effectiveness refers to the speed with which the remedy achieves protection, and any adverse impacts on human health and the environment that may result during the construction and implementation period.

6. **Implementability** Implementability is the technical and administrative feasibility of a remedy, including the availability of material and services needed to implement the chosen solution.

7. **Cost** Cost includes the total capital cost and operation and management (O&M) costs for thirty years.

8. **State acceptance** State acceptance indicates whether the MDEQ, based on its review of the Proposed Plan and comparison with state laws, concurs with, opposes, or has no comment on the preferred alternative.

9. **Community Acceptance** Community acceptance summarizes the publics general response to the alternatives described in the proposed plan. This criterion will be assessed in the Responsiveness Summary following a review of the public comments received on this proposed plan.

**The Proposed Plan**

To protect human health and the environment from contaminated soil, sludge, sediments, and groundwater associated with the eastern and western lagoons the MDEQ and the U.S. EPA proposes to:

I. Cap or excavate eastern lagoon soil,
II. Dredge CD#30 sediment,
III. Deposit contaminated waste into the western lagoons;
IV. Cap the Western Lagoon Area;
V. Install a french drain between the western lagoons and County Drain #30 to capture contaminated groundwater;
VI. Pump contaminated water from the french drain;
VII. Construct a treatment wetland to treat contaminated water collected by the French drain;
VIII. Discharge treated water to County Drain #30; and
IX. Monitor groundwater and surface water quality to assess the effectiveness of the remedy.
X. Install permanent warning markers or post signs,
XI. Fence off the western lagoon area,
XII. Incorporate restrictions on land use, and
XIII. Restrict the use of groundwater.

**The Eastern Lagoons and Groundwater**

Contaminated soils and sludge in the eastern lagoon area would be capped or excavated (without treatment) to eliminate direct contact with contaminated waste. In addition, capping or excavating contaminated material would reduce the impact of this waste material on the groundwater. This would lower the concentration of contaminants in the groundwater and lower the impact of contaminated groundwater and at the GSI (Groundwater Surface Water Interface) to acceptable levels. Groundwater monitoring at the in the area would be required after this action to ensure all eastern lagoon area groundwater objectives are met by the remedy.

The cap would be designed to minimize the impact of contaminated waste on groundwater by preventing the infiltration of rain water. To estimate the cost of this alternative, a **Michigan Public Act 451 Part 115 641 Cap** was used as the standard. Future excavations in the eastern lagoon area would be prohibited unless proper precautions were taken to maintain the integrity of the cap, protect workers from possible exposures to site contaminants, and if necessary, to ensure contaminated sludge or soil is properly managed. The Bronson Plating Co. building is assumed to be acting as a cap over any residual sludge that is present beneath the building. Therefore, the building is considered to be a piece of the remedy that must be maintained until there is evidence to prove otherwise.

Excavating the material to a depth approximately ten feet may also achieve the desired clean-up goals for the eastern lagoon area. The highest concentrations of contaminants are generally found in the upper ten feet of soil. Removal of the most contaminated material would eliminate direct contact concerns and minimize the leaching of contaminants from the soil into the groundwater. The excavated material would be treated under this remedy. All excavated material would be consolidated and buried in the western lagoons. If sludge is present beneath the building it would remain in place "capped" by the building. After this action groundwater monitoring would be required in the area to evaluate the effectiveness of the remedy.

The estimated amount of contaminated sludge and soil to be excavated is 26,000 cubic yards. The excavated area would be backfilled with clean soil. Future excavations below ten feet in the removal area or beneath the building would be prohibited unless proper precautions were taken to maintain the integrity of the building.

protect workers from potential exposure to contamination, or if necessary, ensure contaminated soil is properly managed.

**County Drain #30**
Sediment in CD#30 contaminated above the clean-up goals would be dredged from the drain buried in the western lagoons.

**The Western Lagoon Area**
The Western Lagoon area would be capped to prevent direct contact exposures and to reduce the infiltration of rainwater. After this action, contaminated soil will remain on site to a depth of at least 20 feet. The amount of contaminated waste that would remain on site is estimated at 150,000 cubic yards. The area would be fenced off and identified with a permanent marker to prevent any future activities in the area other than maintenance requirements for the remedy

**Western Lagoon Groundwater**
Groundwater impacted by the western lagoons would be intercepted by a trench drain. Contaminated water would be pumped from the drain and discharged into a **treatment wetland**. Contaminated groundwater would flow through the wetland for treatment before discharging to CD#30.

Hundreds of treatment wetlands have been built and used to successfully treat various sources of surface water containing individual contaminants. However, in this case, the MDEQ and the U.S. EPA consider a treatment wetland as an innovative technology. Innovative because there is an element of uncertainty about the ability of a treatment wetland to remove the large number and types of contaminants found in the groundwater at North Bronson. Therefore the assessment and approval of this technology was based on other applications that would apply in a generic sense but not specifically to the site. However the substantial cost savings of this technology over the other alternatives screened for the North Bronson site makes this plan worth the risk.

A treatment wetland is a technology that requires land instead of mechanical devices to clean the water. In the FS addendum for North Bronson, the amount of land necessary to meet groundwater treatment goals was estimated at 11.3 acres. This estimate was based on capturing and treating groundwater from both the eastern and western lagoon area. However by consolidating the eastern lagoon waste into the western lagoons, the overall amount of groundwater requiring treatment can be reduced. By reducing the volume of groundwater requiring treatment, the wetland can be made smaller. Current estimates indicate the size of the wetland may reduced by 50% or around 6 acres.

The overall remedy would cost an estimated $5 million. The plan would take up to 9 months to implement. The cost of the remedy include the following elements.

| | |
|---|---|
| EL-2/4 Capping/Excavating Eastern Lagoon Area | $450,000 |
| WL-2 Western Lagoon Area Cap | $1,000,000 |
| WLG- Western Lagoon Groundwater | |
| 1. Wetland(6 acre Subsurface Flow) | $650,000 |
| CD-6 | |
| 1. Dredging | $950,000 |
| 2. French Drain (1,500 ft) | $100,000 |
| Construction Management(%15) | $380,000 |
| **Subtotal of Construction Costs** | $2,930,000 |

| | |
|---|---|
| Engineering(20%*) | $586,000 |
| Permitting(8%) | $234,400 |
| Contingency(20%) | $586,000 |
| **Total Capital Costs** | $4,300,000 |
| Annual O&M Cost | |
| 1. Monitoring | $35,000 |
| 2. Wetland Treatment | $15,000 |
| **Total O&M Costs** | $50,000 |
| Five Year Review | $5,000 |
| Total Present Worth(7% for 30 years) | $4,900,000 |

** In the FS addendum engineering costs for the wetland was estimated at 30% of the capitol costs. In the original FS, 20% was used to estimate this cost. To make the comparisons between the original alternatives and the wetland the same, this estimate was revised to 20%.*

This proposed plan reduces risks to human health and the environment by eliminating or controlling direct contact with contaminants and preventing contaminants from leaving the site. Except for the complete removal and treatment of contaminated sludge, soil and sediment, this remedy provides at least as much protection of public health and the environment as any other plan considered in the feasibility study. The cost to remove, treat, and dispose of sludge, soil and sediment contaminated at levels above the clean-up goals was estimated at $60 million dollars.

This remedy will result in hazardous substances remaining on-site above health based levels. Therefore, according to requirements in **CERCLA**, a review will be conducted within 5 years after implementing the remedy. This review is to ensure the remedy continues to provide adequate protection of human health and the environment.

Under **Part 201 of the Natural and Environmental Protection Act 451 of 1994 as amended,** the proposed remedy for the industrial area (the lagoons and groundwater) will meet MDEQ criteria for a limited Industrial cleanup. A limited industrial cleanup will require perimeter fencing around the western lagoon area, permanent warning markers identifying the location of the buried waste material, and land use restrictions to limit future development in the area to industrial use only. Also, restrictions on groundwater use will be required for the entire North Bronson Industrial Area. The area is currently zoned by the City of Bronson for industrial use only.

However, the clean-up goals of County Drain #30 are based on ecological concerns and the MDEQ criteria to protect the residents in the area. Residential standards are higher than industrial clean-up standards and are necessary for CD #30 because public access to the drain cannot be controlled.

**Public Comment Period**

The MDEQ and the U. S. EPA will hold a 30 day public comment period on this proposed plan. The comment period extends from July 25, 1997 through August 25, 1997. The purpose of the comment period is to offer the public an opportunity to give the agencies their views on this plan and the other cleanup plans evaluated in the FS. The agencies will not make a final decision until it has reviewed and considered all of the comments it has received. Written comments must be postmarked no later than August 25, 1997. The comments should be sent to Bill Harmon of the MDEQ or Rosita Clarke-Moreno of the U. S. EPA at the addresses below. Based on your comments or new information, the MDEQ and the U. S. EPA may considerably modify the preferred alternative or choose another alternative developed in the FS.

**Public Meeting**
You are also encouraged to attend a public meeting to learn more about the alternatives developed for this site. The meeting will provide you and other interested individuals an opportunity to submit oral or written comments on the FS and proposed plan to the MDEQ and the U. S. EPA. The meeting will be held on:

Date: August 6, 1997
Time: 7:00 P.M.
Location: The Bronson Theater

**Signing of the ROD**
Following the public comment period, the MDEQ and the U. S. EPA will sign the Record of Decision (ROD) for the site. The ROD will detail the remedial action chosen for the site and include our responses to comments received during the public comment period. After the ROD is signed, a design plan for implementing the cleanup plan will be prepared. Once the design is complete, construction of the remedy can begin.

**Site Updates**
The MDEQ will keep the Bronson community informed about new developments by continuing to work with the **Community Advisory Group**, preparing articles for the local paper and by mailing updates to individuals on the mailing list. If you would like to become a member of the CAG please contact Dave O'Rourke at

City of Bronson
141 S. Matteson Street
Bronson, Michigan 49028
(517) 369-7334

**Available Information**
Copies of the documents the MDEQ prepared during this investigation and study of the North Bronson site are available for review at:

Bronson Public Library
207 North Matteson Street
Bronson, Michigan 49028.
(517) 369-3785.

To obtain further information or to comment on the proposed plan, please contact the following MDEQ or U. S. EPA personnel:

Bill Harmon
MDEQ Project Manager
Knapps Centre

Lansing MI. 48909-7926
Phone: (517) 373-4951
Fax: (517) 335-4887
E-Mail: Harmonw@state.mi.us

or

Rosita Clarke-Moreno
U. S. EPA Project Manager, mail code: SR-6J
P.O. Box 30425
U.S. Environmental Protection Agency
77 west Jackson Boulevard
Chicago, Illinois 60604
Phone: (312) 886-7261
Fax: (312)
E-Mail: Clarke.Rosita@epamail.epa.gov

**Mailing List Additions**

If you would like to be added to the MDEQ mailing list please fill out the attached form and mail it to Bill Harmon.

This document fulfills the public participation requirements of CERCLA 117(a), which requires the MDEQ and

the U.S. EPA to publish the proposed plan outlining the preferred alternative and all other alternatives developed in the FS.

## *Glossary*

**Applicable or Relevant and Appropriate Requirements (ARARs)** - the federal and state requirements that a selected remedy will attain. These requirements may vary between alternatives.

**Aquifer**- A water bearing rock, rock formations, or group of rock formations.

**Capped**- Layering with a material, such as clay or a synthetic material used to prevent rainwater from penetrating and spreading contaminated materials. A RCRA or municipal landfill type cap can substantially limit dermal contact with potential human animal receptors. The cap also minimizes rain water from infiltrating through the contaminate soils and sediments.

**MPA (Michigan Public Act) 64** and **MPA 641** are types of RCRA caps.

**Chlorinated organic compounds (TCE, 1,2-DCE, and vinyl chloride)**- A carbon based substance containing one or more chloride atoms.

**Community Advisory Group (CAG)** A U. S. EPA community relations initative designed to enhance community involvement in the Superfund process. The group is comprised of concerned citizens to ensure that all segments of the community have an opportunity to participate in the decision-making process at the site. The CAG meets regularly to review and comment on technical documents and plans for the North Bronson Industrial Area Superfund Site.

**Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) - CERCLA,** or more commonly "Superfund", was authorized by Congress in 1980 and established the National Priorities List (NPL), the National Oil and Hazardous Substance Contingency Plan (NCP), and a system of liability for potentially responsible parties to remediate or pay for remediation at hazardous waste sites.

**Cyanide**- Any of various salts or esters of hydrogen cyanide containing a CN group.

**Dewater** - To remove water from wastes, soils, or chemicals.

**Excavated**- To remove by digging or scooping out.

**French drain**: A crushed rock drain system constructed of perforated pipes, which is used to drain and disperse wastewater

**Hazard Index (HI)**- The sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways.

**Hazard Quotient (HQ)**- The ratio of a single substance exposure level over a specified time period (e.g., subchronic) to a reference cose for that substance derived from a similar exposure period.

**Leaching**-Dissolving and washing away of a subetance by action of a percolating liquid.

**Proposed Plan**- A clean-up plan to address the contamination. This plan is presented to the public and they then have a 30 day comment period. These comments can be written or given verbally at public meetings that the U. S. EPA or state agency are required to hold. Neither the U. S. EPA or the state can select a remedy without evaluating and providing written answers to specific community comments.

**Record of Decision (ROD)** - A public document that explains which cleanup alternative will be used at a National Priorities List site and the reasons for choosing the cleanup alternative over other possibilities.

**Remedial Investigation/Focused Feasibility Study (RI/FFS)** - Two distinct but related studies, normally conducted together, intended to define the nature and extent of contamination at a site and to evaluate appropriate, site-specific remedies.

**Responsiveness Summary**- A summary of written or oral comments made by the public on key agency documents and the agency responses to these comments. This document will accompany the Record of Decision.

**Slurry wall**- A barrier used to contain the flow of contaminated groundwater of subsurface liquids. Slurry walls are constructed by digging a trench around a contaminated area and filling the trench with an impermeable material that prevents water from passing through it.

**Superfund** - The common name for the federal program established by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended in 1986. Superfund is a trust fund to investigate and clean up abandoned or uncontrolled hazardous waste sites.

**Treatment wetland**- A wetland constructed for the purpose of remediating a hazardous waste site.

**Mailing List / Public Comment Return Mailer**

If you did not receive this Proposed Plan by mail, you are not on the North Bronson Industrial Area Superfund Site mailing list. If you wish to be placed on the mailing list, please print your name and address below, and then fold, tape, stamp, and mail this form to:

MDEQ-ERD
Superfund Section
PO Box 30426
Lansing, Michigan 48909-7926

Name_____

Address_____

City/State: _____

Zip:_____ Day-Time Phone Number:_____

Representing:_____

Or you may contact Mr. William Harmon of the MDEQ at 517-373-4951

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The MDEQ and the U. S. EPA want to hear from you regarding the North Bronson Industrial Area Superfund Site and the proposed remedial action plan described in this fact sheet. You may use the space below to comment on this proposed plan. You may mail your comments on this form by August 23, 1997 to the MDEQ project manager or attend the public meeting scheduled for August 6, 1997 and present your comments during the meeting. You may also call the project manager at the number provided above.

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**Table 1**
**Determination of North Bronson Lagoon Soil, and Sludge Cleanup Goals (ug/kg)**

| Chemical of Concern | Ave. Exposure Point Conc. | EPA Child Trespasser Noncancer Risk | EPA Child Trespasser Risk-Based Values Cancer Risk Lower 1E-6 | Upper 1E-4 | MDEQ GSI SWP | MDEQ 20 x GSI Mixing Zone | MDEQ Industrial Direct Contact Criteria Cancer 1E-5 | Noncancer HQ | MDEQ Soil Inhalation Criteria Infinite Source VSIC | PSIC | Soil Background Conc.** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 600,000 | **150,000** | NA | NA | | NA | NA | 1,600,000 | ID | 48,000,000 | |
| Arsenic | 14,000 | NA | 7,000 | 700,000 | | NA | 83,000 | NA | ID | 540,000 | |
| Barium | 2,200,000 | 75,000,000 | NA | NA | | NA | NA | 320,000,000 | ID | 170,000,000 | |
| Cadmium | 2,500,000 | **1,200,000** | NA | NA | 770* | 124 | NA | **2,300,000** | ID | 1,300,000 | |
| Chromium IV | 9,000,000 | 6,000,000 | NA | NA | 2,200* | NA | NA | **22,000,000** | ID | | NC |
| Copper | 2,500,000 | NA | NA | NA | | 740 | NA | 1.7E+8 | ID | 69,000,000 | |
| Lead | 1,100,000 | NA | NA | NA | ID | NA | **400,000** | NA | ID | 52,000,000 | |
| Mercury | 81 | NA | NA | NA | 1.1* | 0.26 | NA | 1,400,000 | ID | 10,000,000 | |
| Nickel | 38,000,000 | **20,000,000** | NA | NA | | 11,200 | NA | 3.4E+8 | ID | 9,600,000 | |
| Selenium | 1,000 | NA | NA | NA | | NA | NA | 23,000,000 | ID | 69,000,000 | 410 |
| Silver | 28,000 | 4,000,000 | NA | NA | 13* | | NA | 21,000,000 | ID | 3,500,000 | |
| Vanadium | 230,000 | NA | NA | NA | | NA | NA | 39,000,000 | ID | ID | 41,000 |
| Zinc | 2,600,000 | NA | NA | NA | | 20,000 | NA | 1E+9 | ID | ID | |
| Cyanide | 2,600,000 | 20,000,000 | NA | NA | ID | 380 | NA | 99,000,000 | ID | 1.7E+9 | |

Exposure limits in **BOLD** are limits exceeded by the chemical. The shaded limits = the selected clean-up goals for each chemical of concern.
** Site-specific or Michigan default background concentration whichever was higher was selected as background.
* Interim value, currently under review.

NA - Not Applicable; NC- Not Calculated; ND - Not Detected; NL - Non Leaching; ID - Insufficient Data;

**Table 2**
**Determination of North Bronson County Drain #30 Sediment Cleanup Goals (ug/kg)**

| Chemical of Concern | Exposure Point Conc. | EPA Child Trespasser Noncancer Risk | EPA Child Trespasser Risk-Based Cancer Risk Lower 1E-6 | Upper 1E-4 | Ontario Lowest Effect Level | Ontario Severe Effect Level | Part 201 Residential Direct Contact Values Cancer 1E-5 | Noncancer HQ | NOAA ER-L | NOAA ER-M | Background Concentrations |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Antimony | 5,000 | 150,000 | NA | NA | NC | NC | NA | 150,000 | | 25,000 | NC |
| Arsenic | 23,000 | NA | 7,000 | 700,000 | 6,000 | 33,000 | | NA | 33,000 | 85,000 | 1,300 |
| Barium | 230,000 | 75,000,000 | NA | NA | NC | NC | NA | 30,000,000 | NC | NC | |
| Cadmium | 200,000 | 1,200,000 | NA | NA | 600 | 10,000 | NA | 210,000 | | NC | NC |
| Total Chrom | 1,900,000 | NA | NA | NA | 26,000 | 110,000 | NA | 65,000,000 | | 140,000 | 37,000 |
| Copper | 4,500,000 | NC | NA | NA | 16,000 | 110,000 | NA | 16,000,000 | | 390,000 | NC |
| Lead | 510,000 | NC | NA | NA | 31,000 | 250,000 | 400,000 | NA | | NC | 5,500 |
| Manganese | 330,000 | NA | NA | NA | 46,000 | 1,100,000 | NA | 2,000,000 | NC | NC | |
| Mercury | 130 | NA | NA | NA | | 2000 | NA | 130,000 | 150 | NC | NC |
| Nickel | 1,200,000 | 20,000,000 | NA | NA | | 75,000 | NA | 32,000,000 | 30,000 | NC | 4000 |
| Silver | 7,500 | 4,000,000 | NA | NA | 500 | NC | NA | 2,000,000. | | 2,200 | NC |
| Vanadium | 30,000 | 2,700,000 | NA | NA | NC | NC | NA | 3,700,000 | NC | NC | |
| Zinc | 770,000 | NA | NA | NA | | 820,000 | 1.4E+8 | 1.4E+8 | 120,000 | 270,000 | 14,000 |
| Cyanide | 9,400 | 28,000,000 | NA | NA | | NC | NA | 9,300,000 | NC | NC | NC |
| uPAH(total) | 15,000 | NC | NC | NC | | 10,000,000 | NA | NA | 4,000 | 35,000 | NC |

Exposure limits in **BOLD** are limits exceeded by the chemical. The shaded limits = the selected clean-up goals for each chemical of concern.

NA - Not Applicable to the category. NC- Not Calculated

uPAH (total) is the sum of 16 PAH compounds: Acenaphthene, Acenaphthylene, Anthracene, Benzo(k)fluoranthene, Benzo(b)fluorene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(g,h,i)perylene, Chrysene, Dibenzo(a,h,)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3-cd)pyrene, Naphthalene, Phenanthrene and pyrene.

**Table 3**
**Determination of North Bronson Lagoon Area Groundwater Cleanup Goals (ug/L)**

| Chemical of Concern | Ave Exposure Point Conc. | EPA Future Residential Noncancer Risk | EPA Future Residential Cancer Risks Lower 1E-6 | EPA Future Residential Cancer Risks Upper 1E-4 | MDEQ GSI Mixing Zone | MDEQ Industrial Drinking Water Values Cancer 1E-5 | MDEQ Industrial Drinking Water Values Noncancer | MDEQ Groundwater Contact Criteria | Background Conc. |
|---|---|---|---|---|---|---|---|---|---|
| Cadmium | 111 | 5.0 | NA | NA | 6.2 | NA | | 110,000 | ND |
| Lead | 3 | NA | NA | NA | NA | | NA | ID | 3.3 |
| Mercury | 0.15 | 1.4 | NA | NA | **0.00136#** | NA | 2 | >Solubility | |
| Nickel | 550 | 350 | NA | NA | | NA | | 1.6E+8 | ND |
| Silver | 2.0 | NA | NA | NA | | NA | 98 | 1,700,000 | NC |
| Zinc | 5,000 | 1,100 | NA | NA | | NA | | 1.2E+8 | ND |
| Cyanide | 100 | 320 | NA | NA | | NA | | 650,000** | ND |
| Nitrate+Nitrite | 400,000 | NC | NA | NA | NC | NA | | 361,000,000 | 2000 |
| Trichloroethylene | 450 | NA | 0.1 | 9.5 | | | NA | 11,000 | ND |
| 1,2 DCE | 600 | 4.2 | NA | NA | | NA | | 200,000 | ND |
| Vinyl Chloride | 60 | NA | **0.00023** | **0.023** | | | NA | 290 | ND |

Exposure limits in **BOLD** are limits exceeded by the chemical. The shaded limits = the selected clean-up goals for each chemical of concern.

a. GSI remedial action goal. b. Industrial site boundry remedial action goal. c. Industrial use remedial action goal. * Asthetic drinking water value.
** Value based on acute systemic toxicity and is currently under review.
# State-of-the-art analytical techniques are not sensitive enough to detect mercury at this level. Therefore, the cleanup level for mercury is the target method detection limit (TMDL) which should not exceed 0.2 ug/ml or background.

NC - Not Calculated

NA - Not Applicable to the category.

**Table 4**

**Comparative Analysis of Clean-up Alternatives - County Drain #30**

| Alternatives | Protection of Public Health & Environment | Total Cost | Implementability | Reduction of Toxicity, Mobility, and Volume | Compliance with Federal & State Regulations | State & Community Acceptance | Long-Term Effectiveness | Short-Term Effectiveness |
|---|---|---|---|---|---|---|---|---|
| CD-1 No Action | Minimal or no protection. | $473,600 | Easily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity, mobility, or volume of sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Ineffective. No feasible future use, area would be considered harmful. | Ineffective. |
| CD-2 Access Restrictions & Monitoring | Reduces direct contact. Provides some protection | $748,300 | Readily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity, mobility, or volume of sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | No protection except health advisories, will increase public awareness. | No protection except health advisories, will increase public awareness. |
| CD-3 Partial Sediment Dredging | Provides some protection. Reduces direct contact. | $995,200 | Readily implemented. Requires long term management & 5 yr. reviews. | Some reduction in volume of contaminants. No reduction of toxicity or mobility. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces contaminant volume, but need other contaminant source controls from upstream. | Health advisories only. Increased public awareness. |
| CD-4 Full Sediment Dredging | Provides protection. Reduces direct contact. | $2,580,000 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces contaminant volume, but need other contaminant source controls from upstream. | Health advisories only Increased public awareness. |
| CD-5 Sediment Dredging with channeling | No Protection to human health and the environment. | $2,779,000 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces contaminant volume, but need other contaminant source controls from upstream. | Health advisories only. Increased public awareness. |
| CD-6 Sediment dredging & French Drain along selected areas | Provides protection to human health and environment. | $4,129,000 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces contaminant volume, but need other contaminant source controls from upstream. | Health advisories only. Increased public awareness. |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| CD-7 Sediment dredging and French Drain | Provides protection to human health and environment. | $8,348,000 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces contaminant volume, but need other contaminant source controls from upstream. | Health advisories only. Increased public awareness. |

**Table 5**

**Comparative Analysis of Clean-up Alternatives for Western Lagoons**

| Alternatives | Protection of Public Health & Environment | Total Cost | Implementability | Reduction of Toxicity, Mobility, and Volume | Compliance with Federal & State Regulations | State & Community Acceptance | Long-Term Effectiveness | Short-Term Effectiveness |
|---|---|---|---|---|---|---|---|---|
| WL-1 No Action | No protection to human health or environment. | $10,800 | Easily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity, mobility, or volume of soil & sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Ineffective. No feasible future use - area would be considered harmful. | Ineffective. |
| WL-2 Area Cap | Provides some protection. Soil & sediments will continue to leach contaminants to groundwater. | $1,560,800 | Readily implemented. Requires long term management & 5 yr reviews. | No reduction in toxicity, mobility, or volume of soil & sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| WL-3 Soil Fixation | Provides protection. Mobility of contaminants in soil & sediment greatly reduced. | $12,319,300 | Readily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity or volume of contaminants. Provides reduction of mobility. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| WL-4 Excavation with treatment | Provides protection. Contaminants in soil & sediment removed. | $52,289,200 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| WLG-1 No Action | Minimal or no Protection to human health and the environment. | $473,800 | Easily implemented. Requires long term management & 5 yr. reviews. | Provides no reduction in toxicity, mobility, or volume of ground-water contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Ineffective | Ineffective |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| WLG-2 Groundwater pumping | Provides protection to human health and environment. | $4,321,100 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of ground-water contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period | Limited future use unless implemented w/ another alternative. | Effective by supplying potable water. |
| WLG-3 Containment by slurry wall | Provides protection to human health. No control of groundwater outside slurry wall. | $2,836,100 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of groundwater contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Limited future use unless implemented w/ another alternative. | Effective by supplying potable water. |
| WLG-4 Treatment Wetland | Provides protection to human health and environment. | $2,500,000 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of ground-water contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Sustainable long term operation (several decades). | Requires start-up time of 1-2 years. |

**Table 6**

**Comparative Analysis of Clean-up Alternatives - Eastern Lagoons**

| Alternatives | Protection of Public Health & Environment | Total Cost | Implementability | Reduction of Toxicity, Mobility, and Volume | Compliance with State & Federal Regulations | State & Community Acceptance | Long-Term Effectiveness | Short-Term Effectiveness |
|---|---|---|---|---|---|---|---|---|
| EL-1 No Action | No protection to human health or environment. | $10,800 | Easily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity, mobility, or volume of soil & sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Ineffective. No feasible future use. | Ineffective. |
| EL-2 Area Cap | provide protection to human health. Soil & Seds will continue to leach. | $802,100 | Readily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity, mobility, or volume of soil & sediment contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| EL-3 Soil Fixation | Provides protection. Mobility of contaminants in soil & sediment greatly reduced. | $3,297,400 | Readily implemented. Requires long term management & 5 yr. reviews. | No reduction in toxicity or volume of contaminants. Provides reduction of mobility. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| EL-4 Excavation with treatment | Provides protection. Contaminants in soil & sediment removed. | $10,444,400 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of sediment contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Reduces exposure to contaminants in seds & soil but not groundwater | Exposure to trespassers reduced by perimeter fence. |
| EUG-1 No Action | Minimal or no Protection to human health and the environment. | $473,800 | Easily implemented. Requires long term management & 5 yr. reviews. | Provides no reduction in toxicity, mobility, or volume of groundwater contaminants. | There are no location or action specific ARARs. | Will be evaluated after public comment period. | Ineffective | Ineffective |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| ELG-2 Groundwater pumping | Provides protection to human health and environment | $1,176,800 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of groundwater contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Limited future use unless implemented w/ another alternative. | Effective by supplying potable water. |
| ELG-3 Containment wall and groundwater pumping. | Provides protection to human health. | $3,962,500 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of groundwater contaminants. | Will comply with location or action specific ARARs. | Will be evaluated after public comment period. | Limited future use unless implemented w/ another alternative. | Effective by supplying potable water. |
| ELG-4 Containment wall, slurry wall, & ground-water pumping. | Provides protection to human health. No control of ground-water outside of slurry wall. | $3,607,100 | Readily implemented. Requires long term management & 5 yr. reviews. | Provides for reduction in toxicity, mobility, or volume of groundwater contaminants. | Will comply with location or action specific ARARs | Will be evaluated after public comment period. | Limited future use unless implemented w/ another alternative. | Effective by supplying potable water. |