

Five-Year Review Report

First Five-Year Review Report for the Bailey Waste Disposal Site Orange County, Texas



September 2000

**U.S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202-2722**

FIVE-YEAR REVIEW

**Bailey Waste Disposal Site
EPA ID# TXD980864649
Orange County, Texas**

This memorandum documents EPA's approval of the Bailey Waste Disposal Site Five-Year Review Report prepared by Tetra Tech EM Inc. on behalf of EPA.

Summary of Five-Year Review Findings

The site's remedy called for excavation and off-site disposal of the most problematic (i.e., mobile) waste followed by the on-site consolidation and capping of the remaining contaminated soils. The site's construction activities were completed in August 1997. The site's caps are effective at containing contaminants by preventing infiltration of rainwater and preventing direct contact with contaminated soils. In general, the site's caps, fences, and access bridge are in good condition. However, an area with some differential settlement was observed on the site's North Dike Area during the site inspection. Small desiccation cracking, areas with sparse vegetative cover, a debris pile and other minor maintenance deficiencies were also identified during the site inspection. The lack of institutional controls is a noted deficiency.

Actions Needed

Differential settlement observed on the North Dike Area and other site maintenance issues identified during the five-year review will need to be closely monitored and corrected, as needed. To achieve long-term effectiveness of the remedy, it will be necessary to maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. The long-term effectiveness of the remedy will also be contingent upon the implementation of all necessary institutional controls.

Determinations

I have determined that the remedy for the Bailey Waste Disposal Site is protective of human health and the environment, and will remain so provided the action items identified in the Five-Year Review Report are addressed as described above.



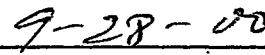
Myron O. Knudson, P.E.

Director

Superfund Division

U.S. Environmental Protection Agency

Region 6



Date

CONCURRENCES

FIVE-YEAR REVIEW

for the

Bailey Waste Disposal Site
EPA ID# TXD980864649

Chris G. Villarreal - 9/22/00

Chris G. Villarreal/RPM

Anne Foster 9/27/00

Anne Foster/Staff Attorney

Gustavo Chavarria 9/22/00

Gustavo Chavarria/Program Section Chief

William Honker 9/22/00

William Honker/Program Branch Chief

Mark Peycke 9/27/00

Mark Peycke/ORC Branch Chief

Pam Phillips 9/28/00

Pam Phillips/Deputy Division Director

8/28
9/28

FIVE-YEAR REVIEW REPORT

**FIVE-YEAR REVIEW REPORT
FOR
THE BAILEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS**

September 2000

PREPARED BY:

**REGION 6
United States Environmental Protection Agency
1445 Ross Avenue
Dallas, TX 75202-2733**

Work Assignment No.	:	034-FR-FE-06ZZ
EPA Region	:	6
Date Prepared	:	September 8, 2000
Contract No.	:	68-W6-0037
Prepared by	:	Tetra Tech EM Inc.
Telephone No.	:	214-754-8765
EPA Work Assignment Manager	:	Ms. Linda Carter
Telephone No.	:	(214) 665-6665

CONTENTS

<u>Section</u>	<u>Page</u>
ACRONYMS AND ABBREVIATIONS	iv
EXECUTIVE SUMMARY	ES-1
1.0 INTRODUCTION	1
2.0 SITE CHRONOLOGY	2
3.0 BACKGROUND	2
3.1 SITE DESCRIPTION AND HISTORY	2
4.0 REMEDIAL ACTIONS	8
4.1 REMEDY SELECTION	8
4.2 REMEDY IMPLEMENTATION	8
4.2.1 Phase I: Implementation of Original Remedy	8
4.2.2 Phase II: Interim Remedial Action	9
4.2.3 Phase III: Revised Remedial Action	10
4.3 SYSTEM OPERATIONS	11
4.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW	13
5.0 FIVE-YEAR REVIEW PROCESS	13
6.0 FIVE-YEAR REVIEW FINDINGS	14
6.1 INTERVIEWS	14
6.2 FIVE-YEAR REVIEW SITE INSPECTION	18
6.3 ARAR REVIEW	20
6.3.1 Chemical-Specific ARARs	21
6.3.2 Location-Specific ARARs	21
6.3.3 Action-Specific ARARs	22
6.4 DATA REVIEW	23
7.0 ASSESSMENT	24
8.0 DEFICIENCIES	25
9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS	27

CONTENTS (Continued)

<u>Section</u>	<u>Page</u>
10.0 PROTECTIVENESS STATEMENTS	28
11.0 NEXT REVIEW	28
12.0 OTHER COMMENTS	28

Appendices

- A RELEVANT DOCUMENTS
- B PUBLIC NOTICE
- C FIVE-YEAR REVIEW SITE INSPECTION REPORT
- D BSSC INSPECTION SUMMARY
- E INTERVIEW DOCUMENTATION FORMS

Attachment

- 1 SEPTEMBER 9, 1999 LETTER FROM MR. RODNEY TOWNSEND II TO JOHN KIMBROUGH

TABLE

<u>Table</u>		<u>Page</u>
1	CHRONOLOGY OF SITE EVENTS	3
2	ANNUAL INSPECTION, MAINTENANCE, AND MONITORING COSTS	12
3	IDENTIFIED DEFICIENCIES	26

FIGURES

<u>Figure</u>		
1	BAILEY WASTE DISPOSAL SITE LAYOUT MAP	ES-2

ACRONYMS AND ABBREVIATIONS

ARARs	Applicable or relevant and appropriate requirements
BWD	Bailey Waste Disposal
BSSC	Bailey Site Settlor's Committee
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Contaminants of concern
CWM	Chemical Waste Management
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FFS	Focused Feasibility Study
FS	Feasibility Study
GeoSyntec	GeoSyntec Consultants
HLA	Harding Lawson Associates
IMMP	Inspection, Maintenance, and Monitoring Plan
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
OHM	OHM Remediation Services
O&M	Operation and maintenance
OSWER	Office of Solid Waste and Emergency Response
Parsons	Parsons Engineering Science, Inc.
PRP	Potentially responsible party
RAC	Response Action Contract
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
USEPA	United States Environmental Protection Agency
TAC	Texas Administrative Code
TBC	To be considered
Tetra Tech	Tetra Tech EM Inc.
TNRCC	Texas Natural Resource and Conservation Commission
TSWQS	Texas Surface Water Quality Standard
TWC	Texas Water Commission
WCC	Woodward-Clyde Consultants

EXECUTIVE SUMMARY

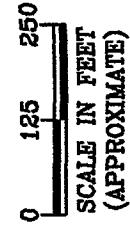
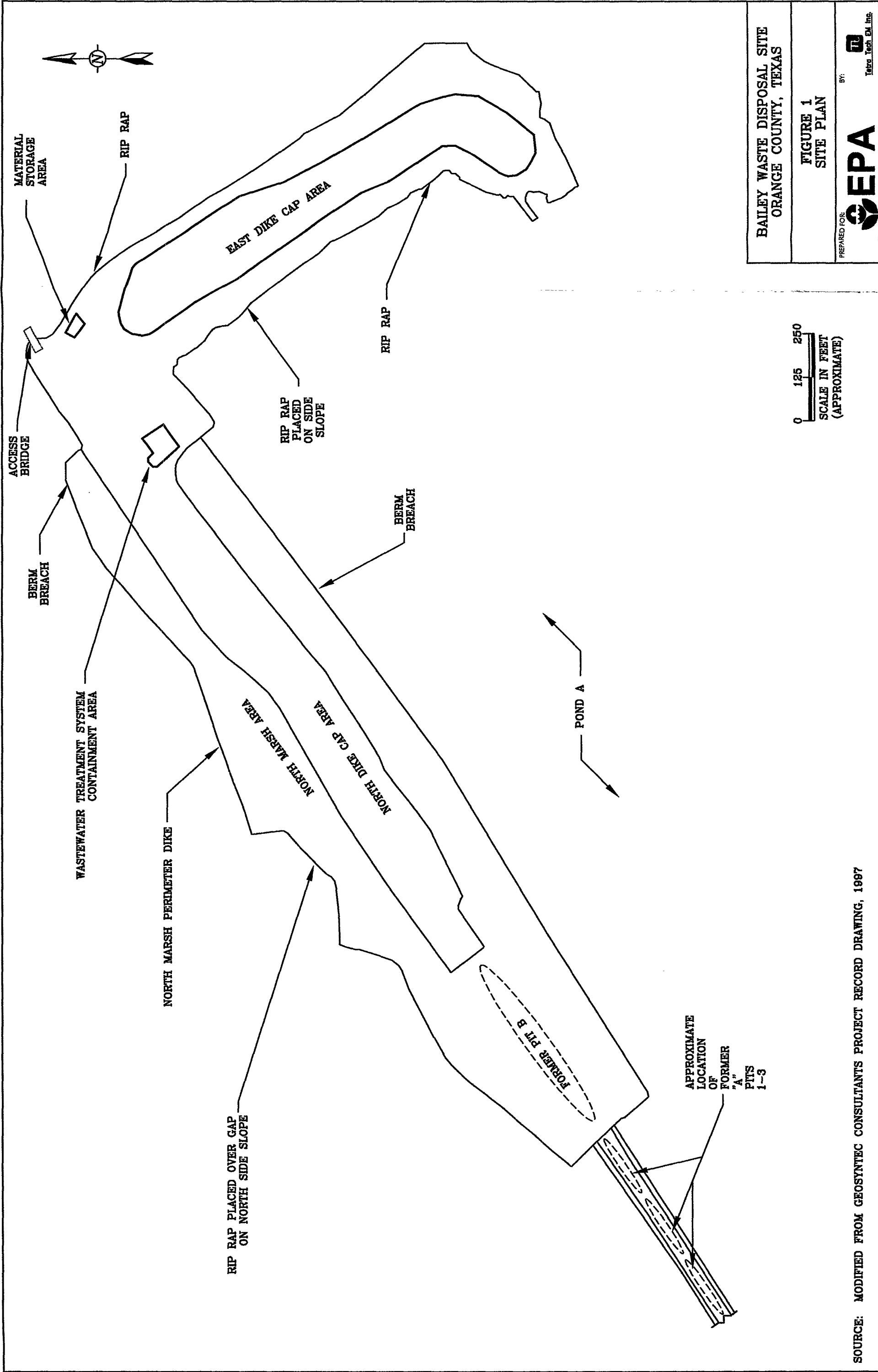
The purpose of the five-year review is to evaluate if the selected remedy for the Bailey Waste Disposal (BWD) site is protective of human health and the environment.

The BWD site is located approximately 3 miles southwest of Bridge City in Orange County, Texas. The site was originally part of a tidal marsh near the confluence of the Neches River and Sabine Lake. Mr. Joe Bailey operated the site pursuant to his ownership and leasehold interests from the early 1950s through March or April 1971. Mr. Bailey allowed the disposal of industrial and municipal waste within the levees along the north and east margins of one of the ponds. Those areas are now respectively referred to as the North Dike Area and the East Dike Area. In addition to the waste located within the levees, which includes waste contained in Pits A-1, A-2, A-3, and B, waste was also present north of the pond in what is now known as the North Marsh Area. Waste disposal operations at the BWD site ceased in 1971.

The site was initially defined by the Environmental Protection Agency (EPA) in the 1980s. The total site area includes two rectangular ponds and occupies approximately 280 acres. Based on the numerous years of site investigations and remedial activities, the actual area where contamination was identified and addressed by remedial activities was much smaller than the initial 280 acre site designation. The areas of the site that required remediation comprised (1) the North Marsh Area (approximately 4 acres); (2) the North Dike Area (approximately 9 acres); and (3) the East Dike Area (approximately 6 acres)(see Figure 1).

A remedial investigation (RI) was conducted consisting of a surface and subsurface field investigation to assess the distribution of waste materials and to evaluate the potential for the migration of chemical constituents away from the waste locations outlined above. The RI identified contaminants such as ethylbenzene, styrene, benzene, chlorinated hydrocarbons and polynuclear aromatic hydrocarbons, industrial wastes and debris, rubbery chunks, municipal wastes, corroded drums, and tarry wastes.

Based on the feasibility study (FS) completed in April 1988, EPA selected in-situ stabilization and capping as the preferred alternative for cleanup and issued the Record of Decision (ROD) for the entire site in June 1988.



BAILEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS

FIGURE 1
SITE PLAN

PREPARED FOR: **EPA**
BY: Tetra Tech EM, Inc.

SOURCE: MODIFIED FROM GEOSYNTEC CONSULTANTS PROJECT RECORD DRAWING, 1997

Before starting the site's remedial design, the EPA, the Department of Justice, and potentially responsible parties negotiated a settlement for performance of the site's remedial design and remedial action (RD/RA). The settlement requires the Bailey Site Settlers Committee (BSSC) to conduct the RD/RA and for EPA to reimburse them for 20% of the eligible RD/RA costs. A Consent Decree defines the terms of this settlement. The Consent Decree became legally binding when entered by the U.S. District Court for the Eastern District of Texas on April 30, 1990.

The remedial design was completed in November 1991. In August 1992, the BSSC awarded Chemical Waste Management (CWM) the remedial action contract. CWM mobilized to the site in September 1992. After mobilization, CWM's next task was to better define the extent and volume of site wastes by boring and trenching the waste areas. As a result of this task, the estimated volume of site waste increased from approximately 100,000 cubic yards to 156,000 cubic yards. Other initial activities included the construction of an onsite water treatment plant and the construction of a seven foot earthen dike around the East Dike Area. The purpose of the earthen dike was to prevent storm water from coming in contact with site contaminants during the waste solidification activities. Any storm water coming in contact with the waste during waste stabilization activities was contained within the earthen dike, processed in the site's water treatment plant, and discharged into Pond A.

Upon completion of the earthen dike around the East Dike Area in the summer of 1993, CWM excavated and relocated waste from the site's Drum Disposal Area and placed this waste into the south end of the East Dike Area. In-situ stabilization activities then commenced. Over the next several months, CWM tried several in-situ stabilization techniques but was unable to consistently meet the project stabilization specifications. By January 1994, CWM decided to stop its in-situ stabilization efforts, claiming the project's in-situ stabilization specifications were not achievable.

In order to determine if the in-situ stabilization specifications were achievable, the BSSC hired contractors to conduct a pilot scale in-situ stabilization demonstration within the site's East Dike Area. The in-situ stabilization demonstration started in the later part of 1994 and was completed in February 1995. The contractors were able to achieve the project stabilization specifications in the pilot area; however, verification of the stabilization specifications relied upon sampling the stabilized material in the uncured (wet sampling) state. The "wet sampling" method differed from the previous specified sampling method in that samples were taken from the pilot test area shortly after mixing waste with stabilizing

agents and allowing the sample to cure (i.e., harden) in the laboratory before testing. The previous specified sampling method required letting the waste and stabilization agent mixture cure in the field followed by obtaining (i.e., coring out) samples for testing. While samples collected using the wet sampling method consistently passed the stabilization specifications, it remains uncertain as to whether samples collected by this method accurately represent field conditions. The pilot study estimated that full-scale stabilization would cost at least twice as much per cubic yard as was estimated by CWM. The pilot study did not address potential stabilization problems in the northern end of the East Dike or in the North Dike Area where the waste is deeper and contains a larger percentage of municipal solid waste, debris, rubber crumb, and tarry waste.

In the summer of 1995, the EPA requested that the BSSC conduct a Focused Feasibility Study (FFS) to identify whether more expedient and effective remedial actions for the site might be available. Reasons for conducting the FFS included the demonstrated difficulties in achieving the project's in situ stabilization specifications and the fact that successful implementation of the original remedy would, if possible at all, be significantly more difficult, more time-consuming, and more costly to implement than was contemplated at the time the original ROD was issued. In conjunction with the FFS, interim remedial actions that addressed the most problematic (i.e., mobile) site waste occurred. The interim remedial actions included remediation of Pits A-1, A-2, A-3, and B which were located within the North Dike Area. Wastes from the North Marsh Area and Pit B were disposed of off-site, and Pit A wastes (including Pits A-1, A-2, and A-3) were conditioned and relocated to the East Dike Area.

EPA selected and approved a revised remedy consisting of consolidating the remaining waste material into areas to be capped and constructing lightweight composite caps. The revised remedial action was completed in August 1997. Some of the major activities performed during the Final Revised Remedial Action were (1) relocation and consolidation of surficial waste from the south edge of the North Dike Area to a location within the limits of the area to be capped; (2) relocation and consolidation of bulk waste from the area adjacent to the former Pit B area to a location within the limits of the area to be capped; (3) installation of a consolidation water collection system to intercept and remove ground water that was elevated in the short term (i.e. during construction of the cap) due to consolidation of the waste (this water was taken off-site for disposal); (4) construction of a lightweight composite cap over the East and North Dike Areas; (5) construction of rip-rap slopes for erosion and scour protection along the edges of the capped areas; (6) installation of storm water management controls to route storm water runoff from

disturbed areas during construction to the treatment system, and divert storm water runoff from inactive or completed areas of the site away from the active areas of the site; (7) construction of maintenance roads; and (8) installation of a passive gas venting system on both the North and East Dike Areas.

The long-term effectiveness and permanence of the remedy will be achieved by maintaining the integrity of the cap. The cap will be maintained by preventing desiccation and/or settlement cracking, penetration by plant roots, and erosion. The maintenance and monitoring program for the site includes site inspections, site maintenance, and submission of regularly scheduled reports to EPA.

The five-year review for the BWD site consisted of the following activities: a review of relevant documents; interviews with local government officials and representatives of the construction and the operations contractors; and a five-year review site inspection.

The EPA and Tetra Tech completed a five-year review inspection of the BWD site on July 10, 2000. The inspection verified that the landfill caps were functioning as designed; overall, the cap is being operated and maintained in an appropriate manner, with only a few deficiencies not expected to immediately impact the protectiveness of the remedy noted. As a result, the remedy is expected to be protective of human health and the environment; however, the long term protectiveness would be enhanced by adding institutional controls.

One other requirement of a five-year review is to determine if there are any new requirements that may pertain to the site. No newly promulgated requirements that pertain to the BWD site were identified.

The remedies at both the North Dike Area and the East Dike Area are protective of human health and the environment. The caps are effective at containing contaminants by preventing infiltration of rainwater and preventing direct contact with contaminated soils. To achieve long-term effectiveness of the remedy, it will be necessary to maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. The long-term effectiveness of the remedy will also be contingent upon the implementation of all necessary institutional controls. The legal and administrative institutional controls are necessary to prevent exposure to contaminants of concentrations above health-based risk levels that remain at the site.

Since hazardous substances will remain at the site above health-based levels, ongoing five-year reviews are required. The next review will be conducted within five years of the completion of this five-year review report.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site Name (from WasteLAN): Bailey Waste Disposal

EPA ID (from WasteLAN): TXD980864649

Region: 06

State:
TX

City/County: Orange County

SITE STATUS

NPL Status: Final Deleted Other (specify) _____

Remediation Status (choose all that apply): Under Construction Operating Complete

Multiple OUs? YES NO

Construction Completion Date: May 1998

Has site been put into reuse? YES NO

REVIEW STATUS

Reviewing Agency: EPA State Tribe Other Federal Agency _____

Author Name: Mark H. Taylor

Author Title: Site Project Manager

Author Affiliation: EPA Region 6 Contractor

Review Period: 09/92 to 8/00

Date(s) of Site Inspection: 07/10/00

Type of review: Statutory
 Policy (Post-SARA Pre-SARA NPL-Removal only
 Non-NPL Remedial Action Site NPL State/Tribe-lead
 Regional Discretion)

Review Number: 1 (first) 2 (second) 3 (third) Other (specify) _____

Five-Year Review Triggering Action:

Actual RA Onsite Construction Actual RA Start
 Construction Completion Previous Five-Year Review Report
 Other (specify) _____

Five-Year Review Triggering Action Date (from WasteLAN): 9/10/92

Due Date (Five Years After Triggering Action Date): 9/97

Five-Year Review Summary Form

Deficiencies:

Five general deficiencies were identified:

- Institutional controls absent
- Evidence of differential settlement
- Damage to landfill cover
- Grounds maintenance of East Dike Area between toe of rip-rap and border security fencing not adhering to the Inspection, Maintenance, and Monitoring Plan
- Debris on site

Recommendations and Follow-up Actions:

Three actions are required to correct these deficiencies and ensure that protectiveness is maintained in the future:

- Establish and implement institutional controls
- Increase the frequency of mowing and vegetation assessment; water, seed, and fertilize when necessary, continue quarterly inspection
- Properly eliminate debris

Protectiveness Statement(s):

The remedial action at the BWD site is protective. Because the remedial action at the BWD site is protective, the remedy for the site is protective of human health and the environment. To achieve long-term effectiveness of the remedy, it will be necessary to maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. Long-term protection of human health and the environment is also dependent upon the establishment of institutional controls.

Other Comments:

None

1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) has conducted the first five-year review of the remedial actions implemented at the Bailey Waste Disposal site (BWD) in Orange County, Texas. This report documents the results of the review conducted from March 2000 to August 2000. The purpose of a five-year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of a review are documented in the five-year review report. In addition, the five-year review report identifies deficiencies found during the review and presents recommendations to address them.

This review is required by statute. EPA must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121(c), as amended, states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented.

The NCP Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

This is the initial five-year review for the BWD site. The triggering action for this review is the commencement of remedial action construction activities which began in September 1992, and ended in August 1997. Due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unrestricted use and unlimited exposure, another five-year review is required.

2.0 SITE CHRONOLOGY

Table 1 lists the chronology of events for the Bailey Waste Disposal site.

3.0 BACKGROUND

The following sections discuss the physical characteristics of the site, the land and resource use, and the history of contamination.

3.1 SITE DESCRIPTION AND HISTORY

The BWD site is located approximately 3 miles southwest of Bridge City in Orange County, Texas. The site was originally part of a tidal marsh near the confluence of the Neches River and Sabine Lake. Two ponds, A and B, were constructed on the property by the landowner, Mr. Joe Bailey, as part of the Bailey Fish Camp in the early 1950s by dredging the marsh and piling the sediments to form levees which surround the ponds. The fish camp was active until September 1961, when it was destroyed by Hurricane Carla, which introduced saline waters into the ponds, killing the freshwater fish.

Mr. Bailey operated the site pursuant to his ownership and leasehold interests from the early 1950s through March or April 1971. Following the hurricane, Mr. Bailey allowed the disposal of industrial and municipal waste within the levees along the north and east margins of Pond A (the North Dike Area and the East Dike Area, respectively). In addition to the waste located within the North Dike Area (which includes waste contained in Pits A-1, A-2, A-3, and B) and East Dike Area, waste was also present in the North Marsh Area. Waste disposal operations at the BWD site ceased in 1971.

The site was initially defined by the EPA in the 1980s. The total site area includes two rectangular ponds and occupies approximately 280 acres. Based on the numerous years of site investigations and remedial activities, the actual area where contamination was identified and addressed by remedial activities was much smaller than the initial 280 acre site designation. The areas of the site that required remediation comprised (1) the North Marsh Area (approximately 4 acres); (2) the North Dike Area (approximately 9 acres); and (3) the East Dike Area (approximately 6 acres) (see Figure 1).

TABLE 1

**BAILEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS
CHRONOLOGY OF SITE EVENTS**

Date	Event
1950s-1960s	Industrial wastes, primarily organics, were disposed of along the north and east margins of Pond A
1979	EPA released a report stating that industrial wastes were disposed of at the site
1980	Texas Water Commission did a preliminary assessment of the site
1981-1982	Gulf States Utility (landowner at the time) investigated dimension and chemical characteristics of the waste pits
October 1984	BWD site proposed for the National Priorities List
December 1984	State of Texas entered into a cooperative Agreement with EPA to conduct a Remedial Investigation and Feasibility Study
1986	Site included on the National Priorities list
October 1987	Remedial investigation completed by Woodward-Clyde Consultants
April 25, 1988	PRP's feasibility study completed by Engineering-Science
June 28, 1988	Record of Decision (ROD) signed
April 30, 1990	Consent Decree (CD) signed and entered by the court.
November 1991	Remedial Design completed by Harding Lawson Associates (HLA)
September 1992	Chemical Waste Management mobilizes to implement Original Remedy
January 1994	Work implementing the Original Remedy ceases due to Chemical Waste Management inability to achieve the project's in-situ waste stabilization specifications
November 1994	North Marsh Design Completed by HLA
June 1995	EPA recommends a Focused Feasibility Study (FFS)
June 1995	Chemical Waste Management demobilizes from the site
June 1995	GeoSyntec begins FFS and associated studies (i.e.; North Dike Technical Memorandum and East Dike Technical Memorandum); Parsons ES assumes Contract Administration/Construction Management (CA/CM) Services
November 1995	Modified North Marsh Design is completed by GeoSyntec, which revised the technical specifications of the North Marsh Design
January 1996	OHM mobilizes to conduct Interim Remedial Action
February 8, 1996	Explanation of Significant Differences (ESD) issued by EPA for the treatment and handling of the North Marsh Wastes
May 1, 1996	ESD issued by EPA for remedial actions associated with Pit B
September 1996	OHM completes Interim Remedial Action Activities

TABLE 1 (Continued)

BAILLEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS
CHRONOLOGY OF SITE EVENTS

Date	Event
October 24, 1996	FFS Report approved by EPA
December 1996	ROD Amended
December 1996	Design of Final Revised Remedial Action completed by GeoSyntec
January 1997	OHM mobilizes to conduct final remediation (i.e.; begin construction of two separate lightweight composite caps, one each over the North and East Dike Areas
August 1997	Final Revised Remedial Action completed
October 10, 1997	EPA approves the Final Inspection, Maintenance, and Monitoring Plan.
May 4, 1998	EPA approves the Final Remedial Action Report
September 14, 1998	Preliminary Close Out Report completed.

Notes:

HLA Harding Lawson Associates
RA Remedial action
OHM OHM Remediation Services

In 1984, EPA proposed the site for inclusion on the National Priorities List (NPL). The site was placed on the NPL in 1986. Originally, this site was a State led Superfund Site, and the Texas Water Commission (TWC) was the lead agency. Woodward-Clyde Consultants (WCC) completed a remedial investigation (RI) in October 1987 under TWC's direction.

The RI consisted of a surface and subsurface field investigation to assess the distribution of waste materials and to evaluate the potential for chemical constituents to migrate away from the waste locations. The RI identified contaminants such as ethylbenzene, styrene, benzene, chlorinated hydrocarbons and polynuclear aromatic hydrocarbons, industrial wastes and debris, rubbery chunks, municipal wastes, corroded drums, and tarry wastes.

After the RI was completed, EPA took over as the lead agency. Under the terms of an administrative order on consent, a group of potentially responsible parties (PRPs) conducted a feasibility study (FS). Engineering Science completed the FS in April 1988. Prior to the selection of the remedy, EPA provided members of the public, including the PRPs, an opportunity to comment on the RI, FS, and the preferred alternative for cleanup. EPA selected the in situ stabilization and capping remedy and issued the Record of Decision (ROD) for the entire site in June 1988. In July 1988, EPA, pursuant to section 122 of CERCLA, issued special notice letters to the PRPs providing them an opportunity to enter into an agreement to perform the remedial action. On September 30, 1988, the Bailey Site Settlor's Committee (BSSC), submitted to EPA its "Good Faith Offer." As a result, an agreement in principle to conduct the remedial action was reached. This agreement provided that the Settlers, as defined in the Consent Decree, would carry out the remedy selected by EPA, and that EPA would reimburse the Settlers for 20% of eligible RD/RA costs.

The remedial design was completed in November 1991. In August 1992, the BSSC awarded Chemical Waste Management (CWM) the remedial action contract. CWM mobilized to the site in September 1992. After mobilization, CWM's next task was to better define the extent and volume of site wastes by boring and trenching the waste areas. As a result of this task, the estimated volume of site waste increased from approximately 100,000 cubic yards to 156,000 cubic yards. Other initial activities included the construction of an onsite water treatment plant and the construction of a seven foot earthen dike around the East Dike Area. The purpose of the earthen dike was to prevent storm water from coming in contact with site contaminants during the waste solidification activities. Any storm water

coming in contact with the waste during waste stabilization activities was contained within the earthen dike, processed in the site's water treatment plant, and discharged into Pond A.

Upon completion of the earthen dike around the East Dike Area in the summer of 1993, CWM excavated and relocated waste from the site's Drum Disposal Area and placed this waste into the south end of the East Dike Area. In-situ stabilization activities then commenced. Over the next several months, CWM tried several in-situ stabilization techniques but was unable to consistently meet the project stabilization specifications. By January 1994, CWM decided to stop its in-situ stabilization efforts, claiming the project's in-situ stabilization specifications were not achievable.

In order to determine if the in-situ stabilization specifications were achievable, the BSSC hired contractors to conduct a pilot scale in-situ stabilization demonstration within the site's East Dike Area. The in-situ stabilization demonstration started in the later part of 1994 and was completed in February 1995. The contractors were able to achieve the project stabilization specifications in the pilot area; however, verification of the stabilization specifications relied upon sampling the stabilized material in the uncured (wet sampling) state. The "wet sampling" method differed from the previous specified sampling method in that samples were taken from the pilot test area shortly after mixing waste with stabilizing agents and allowing the sample to cure (i.e., harden) in the laboratory before testing. The previous specified sampling method required letting the waste and stabilization agent mixture cure in the field followed by obtaining (i.e., coring out) samples for testing. While samples collected using the wet sampling method consistently passed the stabilization specifications, it remains uncertain as to whether samples collected by this method accurately represent field conditions. The pilot study estimated that full-scale stabilization would cost at least twice as much per cubic yard as was estimated by CWM. The pilot study did not address potential stabilization problems in the northern end of the East Dike or in the North Dike Area where the waste is deeper and contains a larger percentage of municipal solid waste, debris, rubber crumb, and tarry waste.

In the summer of 1995, the EPA requested that the BSSC conduct a Focused Feasibility Study (FFS) to identify whether more expedient and effective remedial actions for the site might be available. Reasons for conducting the FFS included the demonstrated difficulties in achieving the project's in situ stabilization specifications and the fact that successful implementation of the original remedy would, if possible at all, be significantly more difficult, more time-consuming, and more costly to implement than

was contemplated at the time the original ROD was issued. In conjunction with the FFS, interim remedial actions that addressed the most problematic (i.e., mobile) site waste occurred. The interim remedial actions included remediation of Pits A-1, A-2, A-3, and B which were located within the North Dike Area. Wastes from the North Marsh Area and Pit B were disposed of off-site, and Pit A wastes (including Pits A-1, A-2, and A-3) were conditioned and relocated to the East Dike Area.

EPA selected and approved a revised remedy consisting of consolidating the remaining waste material into areas to be capped and constructing lightweight composite caps. The revised remedial action was completed in August 1997. Some of the major activities performed during the Final Revised Remedial Action were the following:

- Relocation and consolidation of surficial waste from the south edge of the North Dike Area to a location within the limits of the area to be capped;
- Relocation and consolidation of bulk waste from the area adjacent to the former Pit B area to a location within the limits of the area to be capped;
- Installation of a consolidation water collection system to intercept and remove ground water that was elevated in the short term (i.e. during construction of the cap) due to consolidation of the waste (this water was taken off-site for disposal);
- Construction of a lightweight composite cap over the East and North Dike Areas;
- Construction of rip-rap slopes for erosion and scour protection along the edges of the capped areas;
- Installation of storm water management controls to route storm water runoff from disturbed areas during construction to the treatment system, and divert storm water runoff from inactive or completed areas of the site away from the active areas of the site;
- Construction of maintenance roads; and
- Installation of a passive gas venting system on both the North and East Dike Areas.

The BWD site is essentially in the same condition it was at the completion the remedial action construction activities. Mr. Rodney Townsend, currently owns 390 acres of the BWD site and his company, R & R Recreation, Inc., leases an additional 400 acres of the BWD site. His company is pursuing plans to develop the property as an outdoor sportsman recreational facility (i.e., for duck hunting, fishing, etc.).

4.0 REMEDIAL ACTIONS

The following sections discuss the remedy selected at the site, the remedy implemented at the site, and systems operations.

4.1 REMEDY SELECTION

According to the Remedial Action Statement of Work (Appendix E of the 1990 Consent Decree), the objectives of the remedial action were the following:

- Minimize the potential for waste migration;
- Protect human health and the environment;
- Prevent future contamination of surface water and ground water; and
- Minimize the potential short-term air emissions resulting from remedial activities.

4.2 REMEDY IMPLEMENTATION

The remedial action was conducted in three phases; (1) implementation of some components of the Original Remedy, (2) the Interim Remedial Action (mainly remediation of the North Marsh Area and Pit B), and (3) the Final Revised Remedial Action. Each phase is described below.

4.2.1 Phase I: Implementation of Original Remedy

The original remedy discussed in the 1988 ROD consisted of the following three components:

- Consolidation of affected sediments from the marsh, drainage channel, drum disposal, and Pit A-3 sectors into the Waste Channel (North Dike Area) sector;
- In situ stabilization of the waste in the Waste Channel sector and the sector East of Pond A (East Dike Area); and
- Construction of a cover on top of the stabilized waste.

The design of the original remedy was completed in February 1992. CWM was selected as the remedial action contractor and mobilized to the site in September 1992. Initial construction activities completed by CWM included the following:

- Waste/soil interface evaluation;
- Consolidation and relocation of shallow wastes within the East Dike Area;
- Construction of clay dikes around the East Dike Area;
- Construction of access roads and support laydown area;
- South drum disposal area waste relocation to the East Dike Area;
- Closure of wells and piezometers;
- Construction of a wastewater treatment plant to treat potentially contaminated water generated during the construction operations, including decontamination water, storm water from active areas, and ground water from dewatering operations;
- Air monitoring to ensure action levels on site were not exceeded; and
- Waste stabilization attempted on approximately one-third of the East Dike Area.

After numerous in situ stabilization attempts, subsequent investigations, and a stabilization field pilot study, it was determined that the waste stabilization performance standards established in the ROD and the remedial design would, if possible at all, be significantly more difficult, more time-consuming, and more costly to implement than was contemplated at the time the original ROD was issued. Due to these difficulties, implementation of the original remedy was not completed.

4.2.2 Phase II: Interim Remedial Action

The following activities were accomplished during the Interim Remedial Action:

- Excavation of waste and affected sediments from the North Marsh Area and Pit B and transportation of this material to an off-site industrial landfill for solidification and disposal;
- Excavation and on-site relocation of waste and affected sediments from pits A-1, A-2 and A-3;

- Verification (to a visually clean performance standard) that waste and affected sediments from the drainage channel and the south drum disposal area were removed during the original remedy;
- Waste and affected sediment relocation from the drum disposal area located on the North Dike Area to the East Dike Area;
- Placement of interim soil cover over the south portion of the East Dike Area, which had waste material exposed (active area);
- Closure of an existing water supply well on site; and
- Air monitoring during intrusive activities to ensure that on-site action levels were not exceeded.

4.2.3 Phase III: Revised Remedial Action

The ROD was amended in December 1996 consistent with the conclusions of the FFS. The objective of the FFS was to identify if more effective remedies were available for remediation of the BWD site. Proposed alternatives were developed as part of the FFS and compared to the original remedy. The amended ROD replaced the in situ stabilization component of the original remedy with a lightweight composite cap over the site. Major activities performed during the revised Remedial Action are summarized below:

- Relocation and consolidation of surficial waste from the south edge of the North Dike Area to a location within the limits of the area to be capped;
- Relocation and consolidation of bulk waste from the area adjacent to the former Pit B area to a location within the limits of the area to be capped;
- Installation of a consolidation water collection system to intercept and remove ground water that was elevated in the short term (i.e. during construction of the cap) due to consolidation of the waste (this water was taken off-site for disposal);
- Construction of a lightweight composite cap over the East and North Dike Areas;
- Construction of rip-rap slopes for erosion and scour protection along the edges of the capped areas;
- Installation of storm water management controls to route storm water runoff from disturbed areas during construction to the treatment system, and divert storm water runoff from inactive or completed areas of the site away from the active areas of the site;

- Construction of maintenance roads;
- Air monitoring during intrusive activities to ensure action levels on site were not exceeded; and
- Installation of a passive gas venting system on both the North and East Dike Areas.

4.3 SYSTEM OPERATIONS

The long-term effectiveness and permanence of the remedy, as outlined in the Amended ROD, will be achieved by maintaining the integrity of the cap through efforts targeting the prevention of desiccation or settlement cracking, penetration by plant-roots, or erosion. The maintenance and monitoring requirements to be completed by the BSSC are outlined in the EPA approved Final Inspection, Maintenance, and Monitoring Plan (IMMP) submitted by Parsons (Parsons 1997). The maintenance and monitoring program for the site includes a site inspection, site maintenance, and submission of regularly scheduled reports to the EPA. A visual inspection of the site was performed every quarter during the first year after construction was completed. Annual inspections have been performed subsequently and are scheduled to occur through 2002. The IMMP specifies that the inspection frequency will decrease after the first five years of inspections.

The costs associated with site maintenance will vary according to the task performed. Table 2 lists annual costs for the site according to the September 1997 Final Inspection, Maintenance, and Monitoring Plan. Actual costs were not made available by the PRPs at the time Tetra Tech prepared this report.

TABLE 2

BAILEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS
ANNUAL INSPECTION, MAINTENANCE, AND MONITORING COSTS

Dates		Total Cost (Rounded to nearest \$100)
From	To	
October 1997	October 1998	\$49,400*
October 1998	October 1999	\$25,900**
October 1999	October 2000	\$25,900**
October 2000	October 2001	\$25,900**
October 2001	October 2002	\$25,900**

* Based on four scheduled site inspections for the year, ground maintenance, fence and sign repair, bridge maintenance, road maintenance, quarterly reports, and contractor oversight.

** Based on one site inspection for the year, ground maintenance, fence and sign repair, bridge maintenance, road maintenance, quarterly reports, and contractor oversight.

4.4 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the first five-year review conducted for this site. The second five-year review is scheduled for 2005. Prior to this review, five inspections (four quarterly and one annual) have been performed as stipulated in the IMMP and identified a limited number of deficiencies that required correction. The observed deficiencies, a suggested action, and the actual actions taken have been summarized in Appendix D.

5.0 FIVE-YEAR REVIEW PROCESS

EPA performed the five-year review with the assistance of Tetra Tech EM, Inc. The EPA Remedial Project Manager is Chris Villarreal. The Tetra Tech BWD site five-year review team was lead by Matt Garcia, Project Manager for the Multi-Site Five-Year Reviews. The following team members assisted in the review:

- Mark H. Taylor, Tetra Tech Task Manager
- Mark Lewis, Tetra Tech
- Bob Harris, Tetra Tech
- Cristina Radu, Tetra Tech
- Therese Gioia, Tetra Tech

The five-year review was conducted in accordance with EPA's document, Comprehensive Five-Year Review Guidance. The purpose of a five-year review is to determine whether the remedy implemented at the site is protective of human health and the environment. It is an evaluation of the implementation and performance of the selected remedy. The five-year review also documents any deficiencies identified during the review and recommends specific actions to ensure that a remedy is protective.

The five-year review for the BWD site consisted of the following activities: (1) a review of relevant documents (see Appendix A); (2) interview surveys with property owners, government officials, and representatives of the BSSC and their construction and the operations contractors; and (3) a five-year review site inspection. In addition, a notice regarding the forthcoming review was placed in the local

newspaper on June 30, 2000 (see also Appendix B). The report summary of the five-year site inspection is included as Appendix C. Several photographs of the site have been presented as Exhibits 1 and 2 of Appendix C. Also included in Appendix C is the inspection checklist used as guidance. A summary of the previous five inspections can be found in Appendix D. The completed report will be available in the information repository. Notice of its completion will be placed in the local newspaper, and local contacts will be notified by letter. A brief summary of this report will be distributed to community members.

6.0 FIVE-YEAR REVIEW FINDINGS

The following sections discuss interviews, the five-year review site inspection, the ARAR review, and the data review.

6.1 INTERVIEWS

Site surveys were sent to the following people based on their knowledge of the site:

- Rodney Townsend, Land Owner, R & R Recreation, Inc.
- Steve Doss, Allied Waste Industries, Inc.
- Ernie Schroeder, Parson's Engineering Science, Inc.
- Chuck Orwig, DuPont Corp. Remediation Group
- Debra Baker, BSSC Legal Counsel, Mayor, Day, Caldwell, and Keeton, LLP
- Julie Tysor, Attorney for Les Appelt (Land Owner)
- Patricia Burchette, John Kirk Burchette Trustee
- G. Grant Roane, Land Owner
- Eddie Schroeder, Attorney for Peter Hebert
- Peter Hebert, Ex-Land Owner (Rainbow Recreation, Inc.)
- Emmanuel Ndam, TNRCC Project Manager

Of those receiving the survey, responses were obtained from Mr. Townsend, Mr. Emmanuel Ndame, Mr. Steve Doss, Ms. Debra Baker, and Mr. Chuck Orwig. The responses have been summarized in this review. The full responses are located in Appendix E.

Mr. Rodney Townsend, Land Owner, R & R Recreation, Inc.

Mr. Townsend, a current site land owner, expressed several concerns regarding site maintenance, the remedy chosen, and site trespassing. With regard to the maintenance, he believes that the BSSC could do more to keep up the site, and that those they contract to do repairs show a lack of consideration to him by leaving debris (e.g., trash lumber from the bridge repair, paint cans, etc.) behind for him to pick up. Overall, he wishes the BSSC would be more proactive towards maintenance. It should be noted that the BSSC has been performing the maintenance activities outlined in the IMMP. However, earlier this year, there was a delay in the frequency of grounds maintenance (i.e., quarterly mowing grass on the capped areas as called for in the IMMP) due to a delay in the procurement of a new grounds maintenance contractor.

Mr. Townsend stated that he believes that the surrounding community is unaware of the remedy chosen for this site. He feels that if the community was actively made aware of the fact that hazardous material still exist at the BWD site, they would agree with his preference for 100 percent removal and offsite disposal of waste. It should be noted that the EPA met all public participation requirements as defined in Section 117 of CERCLA. Public participation activities performed by EPA included the following:

- The distribution of numerous fact sheets to the community throughout the site investigation, remedy selection, and remedy implementation process;
- The issuance of proposed plans with corresponding newspaper notifications, public meetings, and public comment periods;
- Open houses and community workshops;
- Setting up and updating a local information repository; and
- Maintaining a fact sheet on the EPA Region 6 internet web site.

Mr. Townsend stated that the site's access control fencing has not eliminated trespassing. Three groups of trespassers and their vehicles have been removed from the property on three different occasions.

Certain damage to the cap could have occurred had the trespassers breached the site after heavy rains when the topsoil on the cap was most susceptible to impact damage. It should be noted that Mr. Townsend has notified the District Attorney's Office in Orange County, Texas, that he will prosecute anyone trespassing on his property. A copy of Mr. Townsend's letter to the District Attorney's Office in Orange County, Texas, has been included as Attachment 1 to this report. Photographs submitted by Mr. Townsend have been included in Appendix C as Exhibit 2 and are identified as pictures 18 through 24.

Mr. Emmanuel Ndame, TNRCC Project Manager

Mr. Ndame from the Texas Natural Resources Conservation Commission reported that no concerns or complaints have been raised to him by the public, and that there have been no violations since his involvement with the site.

Mr. Steve Doss, Allied Waste Industries, Inc.

Mr. Doss had nothing to add to this review due to his limited involvement and knowledge.

Ms. Debra Baker, BSSC Legal Counsel, Mayor, Day, Caldwell, and Keeton, LLP

Ms. Debra L. Baker responded on behalf of the BSSC. Ms Baker stated that the construction phase of the project was ultimately satisfactorily completed. With respect to post-closure issues, it was recommended in Ms. Baker's response that O&M activities from the BSSC be phased out in the near future and that the current landowners assume any future O&M activities that the EPA believes may be necessary.

It should be noted that pursuant to the Consent Decree, Section VII (Work To Be Performed), paragraph G, "The Settlers will perform the work required by this Decree in accordance with the Decree and the attached Statement of Work." The remedial action Statement of Work, Task 12.0 (Prepare Final Inspection, Maintenance, and Monitoring Plan) and Task 15.0 (Post Closure Activities), address O&M activities. Task 12 states, "The final Inspection, Maintenance, and Monitoring Plan will be prepared consistent with applicable or relevant and appropriate requirements and submitted to EPA. . . . The plan

will include sampling program, QA/QC program, maintenance program, monitoring program, schedule for implementation, and reporting requirements." This plan was approved by EPA on October 10, 1997. Task 15 states, "At the completion of the remedial action field activities, the inspection, maintenance, and monitoring plan will be implemented." Pursuant to the IMMP, "the maintenance and monitoring program will be initiated as long as the access to the private property can be obtained and/or maintained." The IMMP also states that the "EPA shall review the remedial action at least every five years and will modify the requirement that the IMMP continue, as appropriate." Based on the Five-Year Review, it is clear that the IMMP program should continue, and in fact should be modified to incorporate the recommendations and follow-up actions discussed in Section 9.0 of this report. The BSSC is obligated to implement the IMMP pursuant to the Consent Decree.

Ms. Baker stated that the Committee is not aware of any effect that site operations have had on the surrounding community or of any community concerns regarding the site or its operation and administration. Ms. Baker stated that the Committee is aware of only one act of vandalism (external perimeter gate was found destroyed) at the site, and that a significant number of trespassing incidents have been reported by a current site owner, Mr. Rodney Townsend.

In regards to site activities and progress, Ms. Baker stated that with respect to the O&M conducted by the Committee's consultants, the Committee feels that it is informed about O&M issues. However, the Committee is not privy to the usage of the site and activities upon the site conducted by the landowners or other third parties not associated with the Committee.

Mr. Chuck Orwig, DuPont Corp. Remediation Group

Mr. Orwig concurred with Ms. Baker on several accounts. In regards to O&M, he stated the following:

- O&M operations are periodic only (quarterly mowing and inspections); as a consequence, there is no on-site O&M staff. The only on-site presence is provided by a current site owner, Mr. Rodney Townsend, who is constructing limited improvements to the property in association with its current use as a private hunting preserve for wild birds.
- The BSSC has completed almost three years of post-remedy O&M and no significant changes, other than reduced frequency of inspections (from monthly to quarterly), have occurred. Cap maintenance operations have consisted primarily of quarterly mowings, with some limited placement of fill (and reseeding/fertilization) in areas where minor subsidence was noted. The only major maintenance items have been repair of a

perimeter access gate damaged by an act of vandalism and the repair/replacement of deteriorated wooden decking on the site access bridge.

- The Final Inspection, Maintenance, and Monitoring Plan (September 1997) was developed specifically to address current conditions at the site, so there has been no need for an update.
- Other than access bridge decking repair (\$50,000) and perimeter access gate repair (\$3,500), there have not been any unexpected O&M difficulties or costs. The act of vandalism that destroyed the perimeter access gate did not result in any damage to the remedy, although it was evident that an off-road vehicle drove over areas of the cap.
- Absent major catastrophic events, such as damage that may result from hurricanes, no future O&M problems are foreseen. The cap and dikes are in good condition and should remain so indefinitely. The perimeter fence is secure, but public interest in hunting, fishing, and crabbing in the local area, and the act of vandalism that resulted in damage to the access control gate, indicate that the potential for future damages due to unauthorized access is a reality.

6.2 FIVE-YEAR REVIEW SITE INSPECTION

The five-year site inspection was conducted on July 10, 2000. The five-year site inspection evaluated the landfill cap, access road, access bridge, dikes, and site fencing. The following individuals were present during the site inspection:

- Chris Villarreal, U.S. EPA
- Rodney Townsend, R&R Recreation, Inc.
- Ed W. Barton, Law Office of Ed W. Barton
- Debra Baker and Associates, Mayor, Day, Caldwell & Keeton, L.L.P.
- Llewellyn Levi, "L" Environmental Consultant Services
- Chuck Orwig, DuPont Corporate Remediation
- Allison Merz, Parsons Engineering Science, Inc.
- Mark H. Taylor, Tetra Tech
- Mark Lewis, Tetra Tech

A summary of the five-year review site inspection findings is presented below. A copy of the Five-Year Review Site Inspection Report is attached as Appendix C.

The weather conditions during the five-year review site inspection were partly sunny, light rain, no wind, and a temperature in the 90s. Measurable precipitation had not fallen on the site since at least a month prior to the inspection. Vegetation on the East Dike Area and North Dike Area was mowed 2 weeks prior to the five-year review site inspection but had grown enough in certain areas to impede visual determination of grade changes on the East Dike Area.

The landfill caps were found to be in good condition. Overall, the vegetative cover was thorough, though sparse and distressed in several areas. No trees or shrubs were observed to be growing on either the East or North Dike Area caps. The depression in the rip-rap noted in earlier inspections had been regraded, and to date remains comparatively contoured with the adjacent material. A new area of differential settlement seems to have formed in the protective rip-rap on the north side of the North Dike Area between the second and third vents as counted from the east.

The location of the exposed geocomposite drainage layer noted in the November 1997 inspection report was inspected. The erosion control measures employed to abate the erosion appear to remain effective.

Small desiccation cracking was observed throughout both the East and North Dike Area caps but not to the extent of revealing the underlying geocomposite drainage layer. No excessive cracks, leachate seeps, odors, or other indications of distress were noted.

Grounds maintenance is outlined in Section 3.1 of the Final Inspection, Maintenance, and Monitoring Plan. Section 3.1 states, "The area to be mowed includes the area between the fence and the toe of the rip-rap along the southern end of the East Dike." The five-year review site inspection observed vegetation below the rip-rap in the southern end of the East Dike Area, which indicated that this area has not received sufficient mowing. Vegetation within the rip-rap was not observed; however, within the 10-foot shoulder between the bottom edge of the rip-rap and the bordering fence exist several young trees. Although the security fencing appeared in good condition all along the entire east and south sides of the East Dike Area and appeared to be well posted with warning signs, small trees had begun to penetrate the

mesh, and there were areas present that a gap of greater than a half of foot existed between the bottom of the fence and the surface below the fence.

Prompted by the land owner, an inspection of the laydown and staging area identified a “debris pile” of discarded lumber consisting of the matting material once used as foundations for the heavy equipment that worked on the cap, planking and subframing material removed from the access bridge in March 2000, and other unidentified debris and discarded material. Also the foundation and containment structures associated with the construction of the on-site water treatment plant still remain.

The access bridge and control fencing and gating were in good condition. According to Mr. Orwig, repairs to the bridge were completed in March 2000. Repairs included complete replacement of the decking material. The bridge consists of two control gates, one on the east side of the tidally influenced drainage canal, and one on the west. The bridge could be accessed (to fish, crab, seine, etc.) on the north side of the gate via the adjoining pier. However, once on the bridge, access to the site would still be impeded by the gate on the west side of the bridge.

Since significant precipitation at the site has not been reported within the last month, evidence of ponding greater than 2 inches was difficult to assess. Other than a very small area on the East Dike Area’s access road, which may or may not have exceeded the 2-inch depth action criteria, no ponding evidence was noted during the five-year review site inspection.

6.3 ARAR REVIEW

The original 1988 ROD and the amended 1996 ROD identified the following applicable or relevant and appropriate requirements (ARAR) for the BWD site remedial action:

- 40 CFR 264.18(b) (RCRA)—Facilities in the 100-year flood plain must be designed, constructed, operated, and maintained to avoid washouts.
- Executive Order 11988 (Flood Plain Management)—Action taken must avoid adverse effects and minimize potential harm to the surrounding area.
- 40 CFR 264 (RCRA) construction requirements for hazardous waste storage facilities.

- Texas Surface Water Quality Standards (TSWQS) 30 Texas Administrative Code (TAC) Chapter 307 for establishing surface water discharge criteria.

The amended ROD identified the following criteria or guidance to be considered (TBC):

- EPA's Design and Construction of RCRA/CERCLA Final Covers, May 1991, for the design and construction of the lightweight composite cap.

One of the requirements of a five-year review is to determine if there are any new requirements that may pertain to the site. Tetra Tech's analysis indicates that there are no newly promulgated requirements that pertain to the BWD site. ARARs pertaining to remedial action activities at the BWD site are divided into chemical, location, and action-specific categories discussed below.

6.3.1 Chemical-Specific ARAR

Chemical-specific ARARs are usually health or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may remain in or be discharged to the ambient environment. If more than one chemical-specific ARAR exists for a contaminant of concern (COC), the most stringent level will be identified as an ARAR for the remedial action. The only chemical-specific ARARs for the BWD site were surface water discharge criteria based on TSWQS. These discharge limitations were applied to the discharge of storm water and ground water collected during the consolidation of wastes. The storm water and ground water collection systems were dismantled after remedial action construction activities were completed, and currently, no ground water or surface water is collected, treated, or discharged.

6.3.2 Location-Specific ARAR

Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in special locations. Some examples of locations that might prompt a location-specific ARAR include wetlands, sensitive ecosystems or habitats, flood plains, and areas of historical significance. The ROD identified two location-specific ARARs pertaining to the BWD site:

- 40 CFR 264.18(b) (RCRA)—Facilities in the 100-year flood plain must be designed, constructed, operated, and maintained to avoid washouts.
- Executive Order 11988 (Flood Plain Management)—Action taken must avoid adverse effects and minimize potential harm the to surrounding area.

These location-specific ARARs were met by constructing perimeter flood control dikes around the East Dike Area and the North Dike Area. These dikes remain in place and provide a buffer to the areas. Based on the most recent five-year review site inspection report, the location-specific ARARs continue to be met. No new location-specific requirements pertaining to the BWD site have been promulgated.

6.3.3 Action-Specific ARAR

Action-specific ARARs are usually technology or activity-based requirements or limitations on actions taken with respect to hazardous wastes or requirements to conduct certain actions to address particular site circumstances. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. Because there are usually several alternative actions for any remedial site, very different requirements can come into play. These action-specific requirements do not in themselves determine the remedial alternative; rather, they indicate how a selected alternative must be achieved.

One action-specific ARAR was identified in the original 1988 ROD for the BWD site. RCRA construction requirements for hazardous waste storage facilities in 40 CFR 264 were identified as an ARAR in the original ROD. The amended 1996 ROD incorporated all ARARs identified in the original ROD. The construction quality assurance program used during the remedial actions met the substantive requirements of 40 CFR 264 by addressing surface and storm water run-on and runoff, ground water collection, treatment during waste consolidation, and installation of the final cover.

The TBCs identified in the amended ROD addressed design and construction of the composite cap and required the cap to be designed and constructed to do the following:

- Provide long-term minimization of migration of liquids through the cap;
- Function with minimum maintenance;

- Promote drainage and minimize erosion or abrasion of the cover;
- Accommodate settling and subsidence so that the cover's integrity is maintained; and
- Have a permeability less than or equal to the permeability of the natural subsoils present.

As stated in the Remedial Action Report, the composite cap was designed and constructed to meet these requirements.

The TBCs also identified the following post-construction requirements for the composite cap:

- Maintaining the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events; and
- Preventing run-on and runoff from eroding or otherwise damaging the final cover.

EPA approved the Final Inspection, Maintenance, and Monitoring Plan (IMMP) for the BWD site in October 1997 (Parsons & GeoSyntec 1997). Inspection reports dated November 1997 (Parsons 1998), February 1998 (Parsons 1998), June 1998 (Cecos 1998), August 1998 (Cecos 1998), and August 1999 (Browning-Ferris 1999), which were issued since the approval of the plan, indicate that the remedy is functioning in compliance with the action-specific TBCs for the composite cap.

6.4 DATA REVIEW

A review of the previous five inspection reports through September 8, 1999, indicates that the procedures outlined in the IMMP have insured, up to the time of this review, that the remedial action for the BWD site as designed and as constructed is being maintained.

There is no method established in the IMMP for long-term assessment of the remedial action objective of preventing future contamination of surface water or ground water. No data are being collected at this site as part of the operations and maintenance (O&M) requirements. However, it was established in the December 1996 Record of Decision Amendment that the 25 to 35 feet of "very soft gray clay to silty

clay" underlying and surrounding the cap provides adequate containment against vertical and lateral migration.

7.0 ASSESSMENT

The following conclusions support the determination that the remedy at the BWD site is protective of human health and the environment.

Question A: Is the remedy functioning as intended by the decision documents?

- **Implementation of Institutional Controls and Other Measures**—The security fencing around the site is intact. When all gates are locked, access to the site is reasonably prevented. Warning signs are clear and abundant. The long-term effectiveness of the remedy will be contingent upon the implementation of all necessary institutional controls. The legal and administrative institutional controls are necessary to prevent exposure to contaminants at concentrations above health-based risk levels that may remain at the site. The institutional controls may also limit activities at or near the site and include requirements for providing a notice (i.e., deed recordation) in the real property records of the remaining residual contamination.
- **Remedial Action Performance**—The landfill cover system has been effective in isolating waste and contaminants. As previously discussed, some minor erosion/rutting has occurred on the cap, but it does not affect the performance or integrity of the cover system. There is no evidence of wetland deterioration at the site or due to the site. Only a minimal amount of settling has been observed. Areas in the cap with thin vegetation will continue to need attention. Concentrated efforts of seeding, fertilizing and watering the cultivated area to promote growth may minimize future costs associated with these thinly vegetated areas on the cap. Overall, the remedial action continues to be effective.
- **System Operations/O&M**—System operations procedures are consistent with requirements.
- **Cost of System Operations/O&M**—As noted above in Section 4.0, costs for the most part should have been within an acceptable range. No unforeseen maintenance activities have been recorded in any of the O&M inspection reports.
- **Opportunities for Optimization**—Activities at the site as mandated in the IMMP are already minimal. However, as mentioned above, areas in the cap with thin vegetation will continue to need attention. Concentrated efforts of seeding, fertilizing and watering the cultivated area to promote growth may minimize future costs associated with these thinly vegetated areas on the cap.

- **Early Indicators of Potential Remedy Failure**—No early indicators of potential remedy failure were noted during the review.

Question B: Are the assumptions used at the time of remedy selection still valid?

- **Changes in Standards and TBCs**—This five-year review did not identify new any new requirements that would pertain to the BWD site.
- **Changes in Exposure Pathways**—No changes in the site conditions that affect exposure pathways were identified as part of the five-year review. First, there are no current or planned changes in land use. Second, no new contaminants, sources, or routes of exposure were identified as part of this five-year review. Because of the unique hydrogeological features at the site, ground water was not a media of concern and is not monitored as part of the remedial action. The RI concluded that the site has had no impact on drinking water and in the unlikely event that site constituents were to migrate via a ground water pathway, it would take more than 800 years for them to reach potable ground water. The shallow ground water beneath and adjacent to the site is saline and not suitable for human consumption. The hydrogeological conditions at the site have not changed.
- **Changes in Toxicity and Other Contaminant Characteristics**—The remedial action relies on containment of contaminants rather than cleanup or removal of contaminants. Therefore, changes in toxicity or other factors for contaminants of concern do not impact the protectiveness of the remedial action.
- **Changes in Risk Assessment Methodologies**—The remedial action relies on containment of contaminants rather than cleanup or removal of contaminants to a risk-based concentration. Therefore, changes in risk assessment methodologies since the time of the ROD do not impact the protectiveness of the remedial action.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

No additional information has been identified that would call into question the protectiveness of the remedy.

8.0 DEFICIENCIES

Deficiencies were discovered during the five-year review and are noted in Table 3. None of these are sufficient to warrant a finding of not protective as long as corrective actions are taken.

TABLE 3

**BAILEY WASTE DISPOSAL SITE
ORANGE COUNTY, TEXAS
IDENTIFIED DEFICIENCIES**

Deficiencies	Currently Affects Protectiveness (Y/N)
Differential Settlement	
Observed on the north side of the North Dike Area	N
Damage to Landfill Cover	
Vegetative cover sparse in several areas	N
Small desiccation cracking observed throughout both the North and South Dike Areas	N
Maintenance Deficiencies	
Grounds maintenance of East Dike Area between toe of rip-rap and border security fencing not adhering to IMMP	N
Debris from construction and repair activities still onsite	N
Security Measures Required	
Institutional controls remained to be outlined	N

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Even though the North Dike Area and East Dike Area appear to be working as designed and protecting human health and the environment, the deficiencies identified in Table 3 should be addressed in order to insure long-term protection from the hazardous waste contained within each of the diked areas. Based on the differential settlement observed on the north side of the North Dike Area, the material within or composing the dike has not fully stabilized. Given the fact that a geosynthetic clay liner has been placed under the rip-rap, continued monitoring of this area is necessary.

Desiccation cracking has been an issue in the past. Since the inspection frequency has been changed from quarterly to annually, and the IMMP only commits to short inspections after storms, the desiccation cracking could potentially go unnoticed for several months. It is therefore recommended to include short inspections during drought conditions in order to assess vegetation and desiccation on the caps. Furthermore, since good vegetative growth and cover did not fully establish in the first year after construction (as noted in the first four quarterly inspections and as assumed in the IMMP) it is recommended that quarterly inspections continue so that actions such as watering, seeding, and fertilizing to reverse any further deterioration of the cap or vegetation stabilizing the cap could be addressed in a timely manner. Lastly, based on the pictures supplied by Mr. Townsend (Pictures 18 through 23 in Exhibit 2), quarterly mowing of the cap has not been effective at minimizing weed growth. As outlined in Section 3.1 of the IMMP, more frequent mowing is required.

It is recommended that the debris pile be properly removed. No recommendation is being made at this time concerning the wastewater treatment facility foundation, only recognition of its existence at the site.

In response to these recommendations and follow-up actions, appropriate revisions will be made to the IMMP. Additionally, efforts will be made by EPA to encourage all of the involved parties (e.g., landowners, BSSC, TNRCC, State and local regulatory agencies, etc.) to develop and implement all necessary institutional controls.

10.0 PROTECTIVENESS STATEMENTS

Because the remedial actions at the BWD site are protective, the remedy for the site is protective of human health and the environment. The caps are effective at containing contaminants by preventing infiltration of rainwater and preventing direct contact with contaminated soils. There is no evidence of wetland degradation. Continuing site maintenance and institutional controls at the site are needed to insure long term protectiveness.

11.0 NEXT REVIEW

This is a statutory site that requires ongoing five-year reviews. The next review will be conducted within five years of the completion of this five-year review report.

12.0 OTHER COMMENTS

To achieve long-term effectiveness of the remedy, it will be necessary to maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events. The long-term effectiveness of the remedy will also be contingent upon the implementation of all necessary institutional controls. Legal and administrative institutional controls are necessary to prevent exposure to contaminants at concentrations above health-based risk levels that may remain at the site. The institutional controls may also limit activities at or near the site and include requirements for providing a notice (i.e., deed recordation) in the real property records of the remaining residual contamination.