Fourth
Five-Year Review Report

Des Moines TCE Site
Des Moines, Iowa

EPA ID: IAD980687933

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Date:

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Abbreviations

1,1-DCE	1,1-dichloroethene
1,2-DCE	1,2-dichloroethene
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
DMWW	Des Moines Water Works
EPA	Environmental Protection Agency
ERW	Extraction/Recovery Well
FS	Feasibility Study
FW	Floodway
gpm	gallons per minute
IC	Institutional Control
IDNR	Iowa Department of Natural Resources
MCL	Maximum Contaminant Level
MLK	Martin Luther King, Jr.
NA	Not Applicable
NCP	National Contingency Plan
ND	Not Detected
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SASC	South Area Source Control
TCE	Trichloroethene
TSCA	Toxic Substances Control Act
UAO	Unilateral Administrative Order
VOC	Volatile Organic Compound

Executive Summary

The Des Moines TCE Site in Des Moines, Iowa, consists of four Operable Units (OUs). OU1, referred to as the "Protection of Ground Water" OU, addresses actions necessary to prevent groundwater contamination from entering the Des Moines Water Work's (DMWW) underground gallery system. OU2, referred to as the "South Area Source Control" (SASC) OU, was initially identified to address the release of Volatile Organic Compound (VOC) contaminants on Dico's property into the groundwater. OU3, referred to as the "North Plume" OU, addressed possible sources of groundwater contamination north of the Des Moines Water Works and Raccoon River. OU4, referred to as the "South Pond/Drainage Area Source Control" OU, addresses pesticide contamination in soils and buildings in the southeast portion of the Site.

Three Records of Decision (ROD) have been signed selecting remedial actions for the Site. The remedy at OU1 includes groundwater extraction and treatment to contain contaminated groundwater on the east side of the Raccoon River and verification monitoring. The remedy at OU3 consists of groundwater monitoring. EPA selected a combined remedy for OUs OU2 and OU4 that includes maintenance of the asphalt cap constructed over areas with contaminated soils and building encapsulation materials in Dico Buildings 1-5 and the Maintenance Building and land use restrictions to address threats associated with contaminated soil on the Dico property.

The first five-year review of the remedies at the Site was conducted in December 1992 and addressed the remedial action for OU1. The second five-year review was conducted in December 1997, five years after construction completion of the groundwater extraction and treatment system and addressed the remedies for all four OUs. The third five-year review was completed in February 2003 and addressed all four OUs.

This fourth five-year review concludes that the remedies continue to be protective and are functioning as designed and in accordance with the RODs. Review of the analytical data indicate that the OU1 Remedial Action Objectives (RAOs) identified in the ROD are being achieved. Specifically, the groundwater extraction and treatment system continues to successfully control migration of the plume and provides the necessary protection of the public water supply. Continued operation and maintenance of

the groundwater extraction and treatment system and continued groundwater monitoring are necessary to ensure that the remedy continues to provide long-term protection.

A significant amount of risk reduction was achieved by a series of three removal actions conducted in OU2 and OU4. The removal actions accomplished the following activities:

- Building Removal Action: Contaminated dust was removed from interior surfaces of DICO Buildings 1 through 5 and the Maintenance Building. Protective coatings were applied to the walls and floors of the buildings to encapsulate any residual contamination. Polychlorinated Biphenyl (PCB) contaminated insulation materials were repaired, if possible, or replaced and the materials disposed of in accordance with Toxic Substances Control Act (TSCA) requirements. The former aldrin tank and surrounding structure were dismantled and removed from the Site. Contaminated soils around the aldrin tank were excavated and disposed.

- Surface Cap Removal Action: An asphalt cap was constructed as a protective cover over portions of the Site with soil contamination exceeding specified concentrations.

- South Pond Area Removal Action: Contaminated soils were excavated and transported off-site for disposal.

The remedies selected for OU2 and OU4 required long-term maintenance of these removal actions and institutional controls to restrict use of the property to industrial activities. The main components of the selected remedy include:

- Maintenance activities as called for by the response action Operation and Maintenance (O&M) Plans.

- Periodic seal coats applied to the existing asphalt cap.
- Sampling of soils at the South Pond discharge area during Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) reviews.

- Land use restrictions to maintain industrial use of the property.

Dico recently dismantled buildings 4 and 5 and shipped the component materials off-site for either reuse or disposal. Buildings 4 and 5 were among the buildings that had interior contamination, including PCB contamination in insulation. The demolition activities may have resulted in unacceptable short-term risks to construction workers and EPA is following up to determine whether PCB contaminated insulation may have been disposed of improperly. However, EPA does not believe the demolition of the building will affect the long-term integrity of the building encapsulation action.

Given the current use of the Site, adequate ICs are in place via the state Hazardous Waste Registry, recent zoning ordinances passed by the city, and the various unilateral orders. Additional ICs may be required if the land use is changed. Analytical results of the sediment sample from the South Pond overflow indicate that the sediments in the pond are above cleanup levels. Given the current use of the Site, no human exposure pathways are complete. However, future development of the Site will need to address the contaminated sediments in the South Pond. Land use and sediments will continue to be monitored at least every five years.

The no action alternative with groundwater monitoring for OU3 is protective of human health and environment. The remedy continues to meet the RAOs identified in the ROD. Monitoring data indicates that the contaminant levels in the OU3 groundwater have remained steady and are not migrating toward the Des Moines Water Works gallery. Therefore, OU3 continues to be protective.

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name *(from WasteLAN)*: **Des Moines TCE Site**

EPA ID *(from WasteLAN)*: **IAD980687933**

Region: 7	**State: IA**	**City/County: Des Moines / Polk**

SITE STATUS

NPL status: ☒ Final ☐ Deleted ☐ Other (specify)

Remediation status (choose all that apply): ☐ Under Construction X Operating ☐ Complete

Multiple OUs?* ☒ YES ☐ NO	**Construction completion date:** 09 / 21 / 1998

Has site been put into reuse? ☐ YES ☒ NO

REVIEW STATUS

Lead agency: ☒ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____

Author name: Mary Peterson

Author title: Project Manager	**Author affiliation: EPA**

Review period:** 05 / 02 / 2007 to 2 / 28 / 2008

Date(s) of site inspection: 9/19/2007

Type of review:

☒ 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) fourth

Triggering action:

Actual RA Onsite Construction at OU__ ☐ Actual RA Start at OU#____
☐ Construction Completion X☐ Previous Five-Year Review Report
☐ Other (specify)

Triggering action date *(from WasteLAN)*: 2 / 28 / 2003

Due date *(five years after triggering action date)*: 2 / 28 / 2008

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues / Recommendations and Follow-up Actions:

Issues	Recommendations and Follow-up Actions
Building 4/5 was being dismantled.	Coordinate with site owner to assure proper disposal of materials.
EW-7 shows reduced flow rate.	Coordinate with site owner to restore capacity of EW-7 necessary to maintain adequate plume capture.
Well MH1-S was damaged.	Coordinate with Des Moines Water Works to assure the repairs are made for well MH1-S in order to monitor the effectiveness of the mechanical packer.
TCE was detected in OU3 well MW-34.	IDNR plans to resample MW-34 in 2008.
Pesticides were detected in South Pond sediments.	Inform prospective purchasers/developers in order to protect against exposures to contaminated sediments.
An IC implementation plan is needed.	Develop an IC implementation plan.

Five-Year Review Summary Form, cont'd.

Protectiveness Statement(s):

OU 1: The remedy at OU1, groundwater extraction and treatment, is expected to be protective of human health and the environment as currently operated. Exposure pathways that could result in unacceptable risks are being controlled. The RAOs identified in the ROD are being achieved. Specifically, the groundwater extraction and treatment system is successfully controlling migration of the plume and providing necessary protection of the public water supply. Continued operation and maintenance of the groundwater extraction and treatment system and continued groundwater monitoring is necessary to ensure that the remedy continues to provide long-term protection.

OU2 and OU4: The remedies at OU2 and OU4, building encapsulation and soil capping, are protective for industrial uses of the buildings and properties. While the recent dismantling of buildings 4 and 5 may have resulted in unacceptable short-term risks to construction workers, the demolition of the building will not affect the long-term integrity of the remedial action. Given the current use of the Site, adequate institutional controls are in place via the state's Hazardous Waste Registry and the various unilateral orders. Additional ICs may be required if the Dico property is sold or if the land use is changed. Analytical results of the sediment sample from the South Pond overflow indicate that the sediments in the pond are above cleanup levels. Given the current use of the Site, no human exposure pathways are complete. However, future development of the Site will need to address the contaminated sediments in the South Pond. Sediments will continue to be monitored at least every five years.

OU 3: The no action alternative with groundwater monitoring for OU3 is protective of human health and environment. The remedy continues to meet the RAOs identified in the ROD. Monitoring data indicates that the contaminant levels in the OU3 groundwater have remained steady and are not migrating towards the Des Moines Water Works gallery. Therefore, OU3 continues to be protective.

Overall: Because the remedial actions at all the OUs are protective for the current land use, the Site is protective of human health and the environment.

1.0 Introduction

The purpose of the five-year review is to determine whether the remedy at a Site continues to be protective of human health and the environment. Five-year reviews are required whenever hazardous substances, pollutants, or contaminants remain at a Site above levels that allow for unlimited use and unrestricted exposure. The methods, findings, and conclusions of the reviews are documented in five-year review reports. In addition, five-year review reports identify issues of concern found during the review, if any, and identify recommendations to address them.

The U.S. Environmental Protection Agency (EPA) Region 7 prepared this five-year review report for the Des Moines TCE Site (Site), in Des Moines, Iowa, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121 and the National Contingency Plan (NCP). CERCLA § 121 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 initiation of remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such a site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to Congress a list of facilities for which such review is required, the results of such reviews, and any actions taken as a result of such reviews.*

The Agency interpreted this requirement further in the NCP; 40 CFR § 300.430(f)(4)(ii) 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 fourth five-year review EPA Region 7 has conducted of the remedial actions implemented at the Site. The review was initiated in August 2007 and this report documents the results of the review.

The Site consists of four operable units (OUs). OU1 includes the plume of contaminated groundwater that formerly threatened the public water supply. The primary contaminant is trichloroethylene (TCE). A groundwater extraction and treatment system was installed in 1987 and continues to be operated by Dico, Inc.

OU2 was initiated to investigate the source soils contributing to the groundwater contamination. However, data gathered during Site investigations found other contaminants, including metals and pesticides, in Site soils in addition to the VOC-contaminated soils contributing to the groundwater contamination. Because the metals and pesticides contamination initially appeared to geographically distinct from the VOC contamination, EPA subdivided OU2 to make a new OU4 to address the newly found pesticides and herbicides in soils. Ultimately EPA found the metals and pesticides were more widely distributed over the Site and OU2 and OU4 were recombined for the purposes of selecting a remedial action. Several removal actions were completed to address contaminated soils and buildings in OU2 and OU4. The remedial action selected in the OU2/OU4 Record of Decision (ROD) included long-term O&M of the removal actions which had been implemented, and Institutional Controls (ICs). Currently, Dico continues to conduct the long-term O&M components of the OU2/OU4 remedial action.

OU3 was initiated to investigate the source or sources of groundwater contamination that appeared in the northern OU1 monitoring and extraction wells when the OU1 extraction and treatment system was first turned on. The OU3 investigations concluded that there were no significant sources of groundwater contamination north of the Dico property, and a no-action ROD was signed in 1992.

2.0 Site Chronology

Table 2-1 presents a summary of the major Site events and relevant dates in the Site chronology.

Table 2-1
Chronology of Site Events

Event	Date
Volatile organic compounds (VOCs) including trichloroethene (TCE), 1,2-dichloroethene (1,2-DCE), and vinyl chloride were detected in the city of Des Moines water supply.	1975
Proposed for the National Priorities List (NPL).	12/30/1982
Final listing on the NPL.	09/08/1983
Remedial investigation (RI) completed.	12/1985
Feasibility study (FS) completed.	04/1986
Record of Decision (ROD) selecting remedy for OU1 signed.	07/21/1986
Unilateral Administrative Order (UAO) issued to responsible party to perform the remedial design and remedial action for the OU1.	07/21/1986
OU1 remedy implemented and placed into operation.	12/1987
Administrative Order on Consent (AOC) requiring an RI/FS for OU2 entered into Federal Court.	08/08/1989
Record of Decision selecting remedy for OU3 signed.	09/18/1992
The first five-year review was conducted.	12/1992
OU2 RI completed and approved by EPA.	02/1993
OU2 and OU4 FS completed.	1994
Unilateral Administrative Order issued to responsible party to conduct removal action at OU2 Buildings 1 through 5 and the Maintenance Building.	03/04/1994
Unilateral Administrative Order issued to responsible party to conduct a removal effort to addressing threats associated with OU2 and OU4 pesticide contamination in soils.	06/14/1994
Administrative Order on Consent issued requiring a removal action at the South Pond Area .	12/07/1995

Record of Decision selecting remedy for OU2 and OU4 signed.	12/13/1996
OU2 and OU4 removal action for soils completed.	2/5/1997
OU2 and OU4 removal action for buildings completed.	5/8/1997
OU4 South Pond removal action completed.	7/7/1997
The second five-year review was conducted.	12/29/97
The third five-year review was completed.	2/28/2003

3.0 Background

The Des Moines TCE Site is located in the south central portion of the city of Des Moines, Iowa, adjacent to the Raccoon River. This section presents Site background information including descriptions of the Site physical characteristics, land use, and past response actions.

3.1 Physical Characteristics

The Site includes a portion of the Des Moines Water Works (DMWW) facility, the Dico, Inc., (Dico) property; the industrial area north of the Dico property and north of the Raccoon River, an area EPA refers to as the Tuttle Street landfill east of the Dico property, and the Frank DuPuydt woods south of the Dico property. In all, the Des Moines TCE Site encompasses more than 200 acres. The Site is located in an industrial area of the city of Des Moines alongside the Raccoon River as shown on Figure 1 in Attachment 1. The Dico property occupies approximately 40 acres in an area historically used as a heavy industrial district. Several buildings still exist on the Dico property and most of the property is paved with an asphalt cap placed by Dico as part of a removal action pursuant to a 1994 unilateral order. Surface water across the Site generally drains from north to south and is carried by a drainage ditch just east of the Dico property. Surface water also collects in the South Pond and overflows into the east drainage ditch. The southern portion of the Site is in the Raccoon River flood plain. The South Pond on the Dico property is a wetland.

Site geology consists of about 50 feet of alluvial sands and gravel, underlain by about 500 feet of shale and limestone. However, the soil profile on the Dico property has been altered by the use of fill material to raise the elevation above flood elevations. The saturated zone begins at a depth of about 20 feet below ground surface. Natural groundwater flow direction at the Site follows regional groundwater flow patterns paralleling the Raccoon River.

3.2 Land and Resource Use

The Dico property has historically been used for a variety of industrial uses including a grey iron foundry, a steel wheels manufacturing plant, chemical and herbicide distribution, and pesticide formulation processes.

Effective June 13, 2005, a majority of the Dico property was rezoned to the C-3B (Central Business Mixed Use District) designation by the city. This use designation allows for a variety of uses including residential, office, commercial, and retail. Also implemented in June 2005 was a study overlay intended to reflect that environmental concerns need to be considered in plans for redevelopment of certain areas in the overlay area. Both the C3-B designation and the study overlay area extend far beyond the Dico property. The study overlay designation requires that any new construction be approved by the city. Small portions of the property remain zoned as Floodway (FW).

Currently, the Dico property is only being used for the purpose of operating and maintaining the OU1 groundwater extraction and treatment system, and maintenance of the asphalt cap. The Dico property is currently fenced and the Site owner provides site security. The land use of the area surrounding Dico is in a state of change. Much of this surrounding area was rezoned to the C3-B designation at the same time as the Dico property.

For several years, the city has been planning a major redevelopment project in the River Point West area adjacent to the east of the Dico property. At this time it is uncertain whether the Dico property will be redeveloped. The majority of the property is capped with an asphalt cap that prevents exposure to contaminated soils. EPA will need to be involved as plans for redevelopment progress in order to determine whether levels of contamination remaining at the Site are protective for the planned use. EPA supports redevelopment of the Dico property, and believes that a wide variety of uses are possible, provided that the groundwater extraction and treatment system continues to operate and that protective measures are in place to prevent exposure to contaminated soils.

The DMWW, which supplies potable water to the city of Des Moines, is located immediately across the Raccoon River to the west of the Dico property. The on-site groundwater extraction system is designed to prevent contaminated water from entering areas used by the DMWW. Under current operational conditions the Dico extraction system is containing the contaminated groundwater on the east side of the Raccoon River. Without the influences of either the Dico extraction system or the DMWW gallery system, the dominant groundwater flow direction is to the south-southwest. Without the Dico extraction system, if the DMWW gallery system were in operation, contaminated groundwater would resume flowing beneath the Raccoon River toward the public water supply.

3.3 History of Contamination

Degreasers containing TCE were used on-site during the manufacture of wheels and brakes. A large underground degreasing vat was located in a concrete containment pit inside Dico's main production building. Drums of TCE were also stored on a concrete slab along the western wall of the building. The degreasing vat leaked unknown quantities of TCE. The oily waste sludges from the degreasing vat were applied to the ground surface of the Dico property as a dust control measure. Dico also disposed of the sludge directly onto the ground and covered it with dirt. These waste disposal practices were reportedly discontinued in approximately 1979.

In addition, bulk chemical storage and distribution occurred on the Dico property. Dico received approximately 120,000 gallons per year of TCE from 1946 until 1980. At times the TCE was delivered to Dico by rail car. Using an above-ground pipeline, the TCE was transferred from the rail cars to a storage tank located near the southeast corner of the production building. Unknown amounts of TCE were spilled during the delivery and transfer operations.

From the mid-1950s through the early 1970s, pesticide and herbicide formulation was conducted in Buildings 1 through 5 and the Maintenance Building. The primary formulation activities were conducted in Buildings 2 and 3, while Buildings 4 and 5 were primarily used for chemical and product storage.

The major sources of the groundwater contamination at OU1 were releases of TCE that occurred as a result of operations on the Dico property. Contaminants detected in the OU1 groundwater include TCE; 1,2-DCE; vinyl chloride; 1,1-dichloroethene (1,1-DCE); chloroform; and 1,1,1-trichloroethane. This contamination was addressed under OU1 remedies.

OU2 was initially designated to address VOC-contaminated source soils and included all soils on the Dico property. Soil contamination had been detected in the saturated zone around 30 feet below ground surface. The contaminants detected in the subsurface soils acting as a source of the OU1 groundwater contamination include TCE and 1,2-DCE. During the OU2 RI, additional contaminants including pesticides and herbicides were discovered in surface soils of OU2 and in several buildings on the Dico property. Another OU, OU4, was then designated to address the buildings and surrounding soils and drainage areas on the Dico property and a drainage ditch just east of the Dico property. Table 3-1 lists the maximum concentrations of the contaminants of concern detected at the Site.

The contaminants in the OU3 groundwater include TCE, 1,2-DCE, and tetrachloroethene (PCE). The OU3 contamination was initially discovered during monitoring of the OU1 groundwater remediation system. Groundwater contamination was found at various isolated locations within the OU3 area but no specific sources were located. The maximum concentrations of contaminants detected in the groundwater at OU3 are listed in Table 3-1.

The primary contaminants detected in the OU4 buildings (Buildings 1 through 5 and the Maintenance Building) were aldrin, dieldrin, chlordane, polychlorinated biphenyls (PCBs), and dioxin. The highest levels of aldrin, dieldrin, and chlordane were detected in the concrete floor of the Maintenance Building, in association with the aldrin tank and annex structure. Lower levels of these compounds were detected in Buildings 2, 3 and 4. Dioxin was detected in the concrete floor of Building 2. PCBs were detected in the insulation of Buildings 2, 3, 4, and 5 and the Maintenance Building, with the highest concentration being detected in Building 3. The maximum concentrations of contaminants detected in the buildings at OU4 are listed in Table 3-1.

Table 3-1

Hazardous Substances Detected at the Site

Operable Unit	Media	Contaminant	Maximum Concentration
OU1	Groundwater	Trichloroethene	8,467 ug/L
		1,2-Dichloroethene	2,000 ug/L
		Vinyl chloride	95 ug/L
		1,1-Dichloroethene	6 ug/L
		Chloroform	7.3 ug/L
		1,1,1-Trichloroethane	6 ug/L
OU2	Surface Soils	Aldrin	0.036 mg/kg
		Dieldrin	7.9 mg/kg
		Lead	4,880 mg/kg
	Subsurface Soils	Trichloroethene	55 mg/kg
		1,2-Dichloroethene	130 mg/kg
OU3	Groundwater	Trichloroethene	100 ug/L
		1,2-Dichloroethene	59 ug/L
		Tetrachloroethene	350 ug/L
OU4	Buildings/Concrete Cores	Aldrin	30,500 ug/kg
		Dieldrin	6,370 ug/kg
	Buildings/Dust	Aldrin	520,000 mg/kg
		Dieldrin	8,800 mg/kg
		Dioxin	114 ug/kg
	Buildings/Insulation	PCBs	29,000 mg/kg
	Surface Soils	Aldrin	97,000 mg/kg
		Dieldrin	7,900 mg/kg
		Chlordane	18.4 mg/kg

Contaminants detected in the surface soils at OU4 were aldrin, dieldrin, and chlordane. The pesticides were detected above health-based cleanup levels in numerous locations across OU4. Contaminants detected in the surface soils in the South Pond area of OU4 were aldrin, dieldrin, and chlordane. These pesticides were detected in the surface soils along the northwestern edge of the South Pond, sediment samples from the South Pond, and in samples collected from the east drainage ditch. The maximum concentrations of contaminants detected in the surface soils at OU4 are listed in Table 3-1.

3.4 Initial Responses

After VOCs, including (TCE, 1,2-DCE, and vinyl chloride) were detected in the Des Moines water supply in the mid-1970s, the DMWW north infiltration gallery was taken off line. Extensive investigations were undertaken to identify the sources of the contamination. The Site was proposed for the NPL on December 30, 1982, and was finalized on the NPL on September 8, 1983. An RI was completed for OU1 in December 1985 that addressed the groundwater contamination, an FS for OU1 was completed in April 1986. The groundwater remedial action was placed into operation in December 1987.

Several removal actions have occurred at the Site to address the contamination in the soils and buildings. The removal action for the buildings addressed contamination associated with Dico Buildings 1 through 5 and the Maintenance Building, and the former aldrin mixing tank, annex, and surrounding soils. The removal action included cleaning the interior surfaces of the buildings including removing contaminated dust that was being released to Site soils, demolition and disposal of the aldrin tank and annex structure, excavation and disposal of the soils surrounding the aldrin tank, application of epoxy coatings to walls and a urethane coating to the floors of the building, and securing the building insulation.

The removal action for the soils included excavation and capping of contaminated soil. Soils from low-lying drainage areas were excavated and disposed of at an off-site

facility. An asphalt cap was constructed over the remaining contaminated soils at the Site.

3.5 Basis for Taking Action

The main contaminants that have been released at the Site in each media are listed in Table 3-1. In the mid-1970s, contaminated groundwater was found to be infiltrating the city's public water supply by entering the DMWW north infiltration gallery. Levels of TCE in the public water supply exceeded the safe drinking water standard (maximum contaminant levels [MCLs]). To protect the water supply, the DMWW shut down the north gallery and limited operation of the south gallery in 1984. The OU1 groundwater extraction and treatment system was installed in 1987 to prevent movement of the contaminated groundwater from the east side of the Raccoon River to the infiltration gallery on the west side of the river.

The remedial action selected for OU3 (no action with continued groundwater monitoring) was based on the results of the OU3 remedial investigation which showed no identifiable contaminant sources in the area north of the Dico property. Low levels of contaminants were detected in some of the OU3 monitoring wells. Because the north gallery had been shut down and the OU1 extraction and treatment system was operating, it was believed that groundwater from the OU3 area would not impact the public water supply. Therefore, a program of groundwater monitoring was selected for the OU3 area.

The cleanup actions taken for OU2 and OU4 were based on the presence of contaminants at levels above acceptable health risks for industrial exposures which had been spilled and then widely dispersed in the soils and sediments across the Dico property by pedestrian and vehicular traffic, surface runoff, and windblown dust. Several buildings on the Dico property contained contaminated dust which could escape into the environment via pedestrian and equipment traffic. Elevated levels of pesticides and metals were detected in the shallow soils across OU2 and OU4. In addition, drainage areas, including the South Pond and a ditch adjacent to the east of the Dico property, contained pesticides at levels exceeding the established health-based level.

4.0 Remedial Actions

4.1 Operable Unit 1

OU1 involves the VOC contamination in the groundwater that historically threatened the Des Moines public water supply.

4.1.1 Remedy Selection

The ROD for OU1 of the Des Moines TCE Site was signed on July 21, 1986. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI to aid in development and screening of remedial alternatives to be considered for the ROD. The RAOs for OU1 of the Des Moines TCE Site were:

- Cost effectively provide a remedial alternative that effectively mitigates and minimizes threats and provides adequate protection to the public health from exposure to contaminated water provided by the DMWW's that would be obtained through operation of the north gallery.

- Control the groundwater contaminant migration, and therefore reduce the threat to the public health by reducing the area where potential exposure could occur.

The major components of the OU1 remedy include the following:

- Installation and operation of a groundwater extraction and treatment system consisting of groundwater extraction wells and an air stripper.

- Groundwater monitoring of wells across the Site.

4.1.2 Remedy Implementation

In a UAO issued to Dico on July 21, 1986, Dico was ordered to perform the remedial design/remedial action (RD/RA). Several modifications were made during design and construction regarding certain aspects of the remedy, including the location and number of extraction wells, and the design of the barrier mechanism to block flow from the north gallery. The OU1 RA construction was completed in December 1987.

4.1.3 System Operations/O&M

O&M of the system has been and continues to be performed by Dico. O&M activities have included extraction well and treatment system maintenance and monitoring.

Monitoring has included periodic monitoring of the groundwater and surface water in the Raccoon River and routine monitoring of the air stripper influent and effluent. Based on review of the annual Performance Evaluation Reports for the past five years, the air stripper has continued to operate at an efficiency above the National Pollutant Discharge Elimination System (NPDES) permit level of 96 percent except on one occasion. For about three weeks early in 2005, the air stripper efficiency dropped below 96 percent due to fouling of the tower packing media. The media was replaced in February 2005 and the stripper efficiency was restored to above 96 percent. Figure 2-6 (provided in Attachment 2) from Performance Evaluation Report No. 21 shows the historical air stripper efficiency since startup of the system in December 1987.

The groundwater extraction and treatment system continues to contain the TCE- and 1,2-DCE- contaminated groundwater plume on the east side of the river as shown on Figures 2-12 and 2-13 (provided in Attachment 2) from the Performance Evaluation Report No. 21. However, the average extraction rate has declined steadily over the past five years, as indicated in the table below.

Calendar Year	Average Extraction Rate (gpm)
2002	475
2003	350
2004	297
2005	232
2006	168

gpm – gallons per minute

The primary reason for the large reduction in extraction rate between 2002 and 2004 is the shut down of three extraction wells including Extraction/Recovery Well (ERW) ERW-3, ERW-4, and ERW-8. ERW-3 and ERW-4 were shut down in March 2003 for two reasons: (1) the city's Martin Luther King, Jr. (MLK) Parkway construction project would have necessitated replacement of the wells, and (2) the contaminant concentrations in the wells had significantly declined. Well ERW-8 was shut down in November 2003 due to decreased contaminant concentrations. The shut down of these three wells resulted in a modified pumping scheme involving only ERW-5, ERW-6, and ERW-7 remaining in service. EPA approved these modifications in July 2003 for a one-year period, after which the capture zone under modified pumping conditions would be reevaluated.

Performance evaluation report No. 19 (January-December 2004) documented the first full year of operation under the modified pumping conditions. The report demonstrated that the modified pumping scheme still provided plume containment on the Dico side of the Raccoon River.

In addition to shutting down ERW-3, ERW-4, and ERW-8, other modifications were approved by EPA in the July 2003 work plan prepared by Dico. These modifications included the abandonment of 26 monitoring wells which reduced the monitoring network and frequency. The NPDES permit was modified to reflect the changes.

In performance evaluation report No. 21, Dico suggested further modifications to the extraction well network including the shutdown of ERW-5 and ERW-6. EPA responded to Dico's suggestion by indicating that it may approve of the shutdown of ERW-5 due to reduced contaminant concentrations, but that ERW-6 should remain in operation. EPA further indicated that the shutdown of ERW-5 is contingent upon the completion of maintenance activities needed for ERW-6 and ERW-7.

4.2 Operable Units 2 and 4

OU2 consists of the Dico property and a portion of the Frank DePuydt woods. OU2 originated to address the contaminated subsurface soils which serve as sources of the groundwater contamination being addressed under OU1. In 1989, EPA issued an the Administrative Order of Consent (AOC) to Dico for the performance of an RI/FS for OU2. During the OU2 RI, additional contaminants, primarily pesticides and herbicides, were detected in OU2 soils. The OU2 RI indicated the need for additional investigation to define the full nature and extent of the pesticide and herbicide contamination. At the time, it appeared that the portions of the Dico property associated with VOC contamination and pesticides and herbicides were geographically distinct. EPA identified OU4, which was originally part of OU2, to address the pesticides and herbicide contamination separately, thereby allowing the OU2 remedial action to proceed independently. However, as discussed in more detail below, the pesticide and herbicide contamination was more widespread than originally believed, and EPA ultimately selected a remedy for OU2 and OU4 combined. OU4 includes the portions of the Dico property including Buildings 1 through 5 and the Maintenance Building, soil and sediment associated with the former aldrin tank and the South Pond area, and the area associated with completed soil discing operations, and the low-lying area south and east of the Dico property up to the railroad spurs owned by the Union Pacific Railroad.

4.2.1 Remedy Selection

The ROD for OUs OU2 and OU4 of the Des Moines TCE Site was signed on December 13, 1996. RAOs were developed as a result of data collected during the OU2 RI and the OU4 RI to aid in development and screening of remedial alternatives to be

considered for the ROD. The following general RAO for OUs OU2 and OU4 of the Des Moines TCE Site was identified:

- Maintain the buildings, asphalt cap, and South Pond area so that exposure pathways continue to be controlled or minimized. This will minimize risk for both current and anticipated future industrial use of the Site, and will protect human health and the environment.

The following specific RAOs corresponding with the nature and extent of contamination at the Site and the associated findings of the baseline risk assessments were developed:

- For the buildings, maintain the control of potential exposure pathways related to contaminated materials in Buildings 1 through 5 and the Maintenance Building, and to protect human health and the environment during continued and future industrial uses.

- For the soils, maintain the control of potential exposure pathways related to contaminated soils and to protect human health and the environment during continued and future industrial uses similar to the current industrial operations and activities.

- For the South Pond Sediment, minimize the risks from potential exposure pathways related to contaminated soils and to protect human health and the environment during continued and future industrial uses similar to the current industrial operations and activities.

The major components of OUs OU2 and OU4 remedy include the following:

- Continued maintenance as called for by the response actions.

- Land use restrictions to maintain industrial uses.

- Periodic seal coats applied to the asphalt cap.

- Periodic sampling of sediments at the South Pond discharge area.

4.2.2 Remedy Implementation

The selected remedy for OU2 and OU4 included O&M of the previous removal actions involving Buildings 1 through 5 and the Maintenance Building, the asphalt cap placed over a large area of surface contamination, and the drainage area known as the South Pond Area. The remedy also called for land use restrictions to maintain an industrial use.

Dico has provided the necessary maintenance of the buildings and asphalt cap pursuant to the 1994 UAOs. O&M requirements for the South Pond Area action have been reduced to periodic monitoring which can be conducted as part of the five-year review.

Land use restrictions required by the ROD are provided in a variety of ways. The Site is listed on Iowa's Registry of Hazardous Waste Sites. The registry includes a provision whereby site use cannot be changed without prior notification of the state. The Iowa Department of Natural Resources has filed a notice with the deed (dated February 25, 2002) that hazardous substances are present at the property and that long-term maintenance is required. In addition, EPA's administrative orders requiring maintenance of the asphalt cap and the contaminated buildings remain in effect. In June 2005, the city passed new zoning ordinances affecting the Site and surrounding areas. These ordinances specifically restrict new development which is at risk from identified environmental concerns.

4.2.3 System Operations/O&M

O&M of OUs OU2 and OU4 started in 1994 after the building removal action and construction of the asphalt cap were completed. Initially, O&M activities included employee awareness, monthly inspections, annual inspections and reporting to EPA, and collection and analysis of wipe samples every two years. These requirements were based

on an industrial-use scenario where the Site was in full operation. However, at the end of 2001, all manufacturing operations ceased at the Site, and the buildings were used for storage of inventory. Over the past several years, Dico has reduced the inventory stored in the buildings and the buildings are essentially empty. As part of the July 2003 work plan for proposed modifications, EPA approved a reduction of the O&M requirements. Under the current-use scenario, Dico is required to conduct an annual cap inspection and repairs, and to submit a report to EPA indicating that the buildings remain unused and documenting completion of the cap inspection.

4.3 Operable Unit 3

OU3 consists of groundwater VOC contamination north of the Dico property. EPA completed the OU3 RI/FS in 1992. Contaminant levels detected in OU3 were significantly lower than contaminant levels detected to the south on and around the Dico property. Results of the OU3 RI did not indicate that any of the properties in the OU3 area are a source of the contamination.

4.3.1 Remedy Selection

The ROD for OU3 of the Des Moines TCE Site was signed on September 18, 1992. RAOs were developed as a result of data collected during the OU3 RI to aid in development and screening of remedial alternatives to be considered for the ROD. The RAO for OU3 of the Des Moines TCE Site is to assure continued protection of the Des Moines water supply.

The ROD selected a limited-action remedy consisting of continued groundwater monitoring and acknowledged that the OU1 remedy was capturing the contamination from OU3.

4.3.2 Remedy Implementation

The state of Iowa has been conducting groundwater monitoring of OU3 under agreement with EPA signed December 14, 1993. The Technical Progress Report on Groundwater Monitoring conducted November 2004 and October 2005 concludes that

there is no evidence of contamination from the North Plume (the OU3 groundwater contamination) migrating to the south-southwest toward the DMWW's gallery system. The progress report recommended that the next sampling event would be conducted for use in this five-year review, and if no significant changes are found, the sampling frequency would be limited to once every five years.

The OU3 sampling was conducted in conjunction with the Site inspection during the week of September 18, 2007. Results showed low levels of contamination in a well (NW-34) where contamination has not generally been detected in past sampling. Well NW-35 contains levels of contamination similar to previous monitoring events. Due to the detection of contamination in NW-34, the state recommended that this well be sampled again in one year. If results indicate continued increases in concentrations, then comprehensive biannual monitoring will continue. However, if no contamination is detected in NW-34, then the next comprehensive monitoring event for OU3 will be conducted in 2012 for use in the next five-year review.

4.3.3 System Operations/O&M

O&M activities at OU3 consist of periodic groundwater monitoring. The groundwater monitoring activities are conducted by the state of Iowa. As required, the sampling results have been submitted to EPA.

5.0 Progress Since Last Five-Year Review

During the last five-year review, EPA determined that the remedies implemented at all OUs of the Site were protective of human health and the environment. Specifically, EPA concluded that the OU1 groundwater extraction and treatment system continued to effectively capture and treat contaminated groundwater, and continued to protect the Des Moines public water supply. EPA also determined that the contaminant levels in OU3 groundwater have remained steady and are not migrating toward the DMWW gallery. The remedies for OU2 and OU4 continued to be protective for industrial uses of the buildings and property.

More specifically, EPA recommended that the OU1 groundwater extraction and treatment system continue to operate and that monitoring and reporting activities continue. However, EPA indicated that reduced monitoring would be considered and that a proposal should be provided by Dico. EPA approved Dico's proposal dated July 2, 2003, calling for a reduced pumping scheme, reduced monitoring network and frequency, and reduced O&M activities for OU2 and OU4.

In 2005, the city of Des Moines completed construction of the MLK Parkway over a narrow strip of the northern portion of the Dico property, which the city acquired under its imminent domain authorities. The city coordinated with EPA regarding any wells to be impacted by the construction project. A list of wells was generated which identified which wells could be abandoned and which wells needed to be replaced. As part of the MLK Parkway project, 11 wells were plugged and abandoned by the city, and 7 wells were replaced with new wells (see Attachment 3).

During the last five-year review, EPA recommended that the OU3 groundwater monitoring be continued, but indicated that the monitoring frequency could be reevaluated. The results of the September 2007 monitoring show low levels of contamination in a well where contamination has not generally been detected. Due to this change, the state has recommended that follow-up sampling of that well be conducted in 2008. Results of the 2008 sampling will determine the frequency of future monitoring events for OU3.

The last five-year review concluded that the remedies at OU2 and OU4 are protective for industrial uses of the buildings and property, but recommended that appropriate O&M activities continue to be implemented and ICs should be implemented. Appropriate O&M activities have been conducted by the Site owner since the last five-year review. Annual inspection reports have been submitted on schedule and cap repairs have been made as needed. In addition, a security fence has been installed around the perimeter of the Site, enclosing all of the buildings. This measure prevents trespassing and vandalism of the buildings and groundwater treatment system.

A review of ICs has been conducted since the last five-year review. In 2005, the city rezoned the Dico property and surrounding areas to a mixed-use designation with a special "study overlay district" designation for the Dico property to reflect that certain environmental conditions on the property may restrict the type of development that is appropriate. A current zoning map is provided as Attachment 9. A title search revealed that some additional ICs may be needed to address utility easements that give the easement holders access and the right to conduct activities on the Site that may negatively impact the remedial actions. EPA will develop a plan for implementation of additional ICs before the next five-year review.

6.0 Five-Year Review Process

6.1 Administrative Components

Members of Titan International, Inc., Dico's parent company, were notified of the initiation of the five-year review in May 2007. The Des Moines TCE Site five-year review team was led by Mary Peterson of EPA, the Remedial Project Manager (RPM) for the Site. The five-year review Site inspection was conducted by Mary Peterson, representatives from the Iowa Department of Natural Resources (IDNR), and representatives from Titan International, Inc., and its consultant.

6.2 Community Notification and Involvement

A fact sheet announcing the five-year review for the Des Moines TCE Site was developed in August 2007. The fact sheet was made available on EPA's web site and a notice was published in the *Des Moines Register* on August 16, 2007.

6.3 Document Review

This five-year review consisted of a review of relevant documents including O&M records and monitoring data for the Site. A complete list of documents reviewed as part of the five-year review process is included in Attachment 4. Applicable cleanup standards, as listed in the three RODs for the Site, were reviewed. The results of this review are listed in Attachment 5.

6.4 Data Review

6.4.1 Operable Unit 1 Monitoring

OU1 monitoring includes sampling of groundwater, air stripper influent and effluent, the north infiltration gallery, and two surface water locations on the Raccoon River and the Des Moines River. During this review period, concentrations of TCE in the air stripper influent have remained fairly steady, and are generally less than 500 ug/L as compared to influent concentrations near 3,000 ug/L when the system first began operating in 1987. Significant decreases in influent concentrations have not occurred over the course of the last few years because of the shutdown of extraction wells that generated large volumes of clean water and were no longer contributing significant contaminant mass. The only extraction wells still in service are those that contain significant concentrations of TCE.

The air stripper has continued to achieve the required 96 percent removal efficiency, except for a brief period early in 2005 when the packing media had become fouled and was changed out. Similar disruptions in stripper efficiency have occurred over the life of the system as seen on Figure 2-6 in Attachment 2.

Groundwater monitoring results indicate that under current Site conditions, the TCE plume is being contained by the extraction system on the east side of the Raccoon River. Monitoring wells on the west side of the Raccoon River show no or very low (less than 5 ug/L) concentrations of TCE. Figure 2-12 attached illustrates the TCE plume contours based on groundwater monitoring data collected in October 2006.

The results of the surface water monitoring indicate that the surface water quality criteria set in the ROD are being met. Table 6-1 presents a summary of the surface water quality criteria from the OU1 ROD and the surface water results from the October 2006 sampling event.

Table 6-1
Surface Water Monitoring Results

Contaminant	Raccoon River		Des Moines River	
	Oct 2006 Analytical Results (ug/L)	Surface Water Quality Criteria (ug/L)	Oct 2006 Analytical Results (ug/L)	Surface Water Quality Criteria (ug/L)
Trichloroethene	ND	80	ND	80
trans-1,2-Dichloroethene	ND	140	ND	140
1,1,-Dichloroethene	ND	7,100	ND	7,100
Vinyl chloride	ND	24	ND	24
Chloroform	ND	4,700	ND	4,700
1,2-Dichloroethane	ND	370	ND	370
1,1,1-Trichloroethane	ND	173,000	ND	173,000
Tetrachloroethene	ND	33	ND	33

ND - Not detected

6.4.2 Operable Unit 3 Groundwater Monitoring

The state of Iowa has monitored the groundwater quality in the OU3 area since April 1996; however, groundwater monitoring of OU3 has been ongoing since July 1989. Table 2 in Attachment 6 presents a summary of the PCE, TCE, and 1,2-DCE data from the OU3 groundwater monitoring wells. No discernable trends have been identified in the VOC contamination on the OU3 groundwater plume. The Technical Progress Report on Groundwater Monitoring conducted September 19, 2007, contains the conclusion that there is no evidence of contamination from the North Plume (the OU3 groundwater contamination) migrating to the south/southwest toward the DMWW's gallery system.

6.4.3 Operable Units 2 and 4 Data

During this review period, no samples were required for analysis from OU2 and OU4. Routine inspections of the on-site buildings and asphalt cap continue to be conducted by the Site owner, and reports are submitted annually.

As part of the five-year review Site inspection, one composite soil sample was collected from the South Pond overflow area. Analytical results showed that the sample contained 0.57 mg/kg aldrin and 3.2 mg/kg dieldrin. These concentrations are above the established cleanup level of 1.5 mg/kg for aldrin and dieldrin combined. The results for chlordane were below the cleanup level. Table 6-2 below summarizes the South Pond results.

Table 6-2

South Pond Overflow Soil Sample Results

Compound	Concentration (mg/kg)	Cleanup Level (mg/kg)*
Aldrin	0.57	1.5 **
Dieldrin	3.2	1.5 **
Chlordane	4.8	18

Notes:

* Cleanup levels were set in the OU2 and OU4 ROD dated December 13, 1996.

** The cleanup levels for aldrin/dieldrin are combined. The sum of the aldrin and dieldrin concentrations must be below 1.5 mg/kg.

6.5 Site Inspection

A Site inspection was conducted on September 19, 2007, by the EPA project manager. The Site inspection was also attended by representatives from the IDNR and from Titan International, Inc., and its consultant. The purpose of the Site inspection was to assess the protectiveness of the remedies. The operational status of the various components of the remedies was inspected. This included inspection of the condition of the groundwater treatment and extraction system, the buildings, asphalt cap, and South Pond were inspected. In addition, a sediment sample was collected for pesticide analysis from the South Pond overflow area. Results of the sampling effort are discussed in Section 6.4.3 above.

A Site Inspection Report was prepared and is included as Attachment 7. The following general observations were noted during the Site inspection:

- Maintenance of the asphalt cap appeared to be ongoing and adequate.

- Overall, the groundwater extraction system appeared to be adequately maintained. The extraction wells were operating and the air stripper unit and associated mechanical equipment were operating. The Site owner has installed a security fence around the perimeter of the Site to protect the electrical controls for the groundwater extraction system as well as the buildings from vandalism and trespassers. In addition, security guards are on duty at the Site 7 days a week, 24 hours per day.

- All of the on-site buildings had been vandalized (broken windows and doors, graffiti, etc). The addition of the security fence should help prevent further destruction. Buildings 4 and 5 were being dismantled at the time of the Site inspection. The Site owner reported that the steel support structure of the building has been sold and will be reconstructed at another location. Other building materials (siding, insulation, and roofing materials) have been transported off-site for disposal. EPA has requested the Site owner to provide information regarding the disposition of building demolition debris, in particular

the building insulation which was known to contain PCBs. While the buildings are in poor condition, only minimal maintenance activities are required because the Site is not being used. If industrial activities are resumed inside the buildings, then maintenance activities would again be required.

6.6 Interviews

Interviews were conducted with certain parties involved with the Site in various capacities. On September 18, 2007, EPA met with representatives of the DMWW to gain a better understanding of the city's underground gallery system, and to discuss potential operational changes in the extraction system. Mr. L.D. McMullen, Chief Executive Officer of the DMWW, emphasized the importance of the continued operation of the extraction system on the east side of the Raccoon River.

Mr. Brian Mills with Dico, and Mr. Louis Barrentine, a consultant for Dico, were also interviewed during the Site inspection. They provided information regarding the buildings and the extraction and treatment system, and assisted in locating the monitoring wells replaced by the city during construction of the MLK Parkway.

7.0 Technical Assessment

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

Review of documents, Applicable or Relevant and Appropriate Requirements (ARARs), risk assumptions, and results of the Site inspection indicates that the remedies for the Site (OU1, OU2, OU3, and OU4) are generally functioning as intended by the RODs for the current land use. Since the last five-year review, the only change in ARARs includes the revised surface water criteria reflected in Table 6-1. However, the Site inspection revealed a potential problem with the OU4 remedy as discussed below.

The groundwater extraction and treatment system for OU1, under current site conditions, has contained the contaminated groundwater plume on the east side of the Raccoon River and has met its discharge permit limits. O&M of the groundwater extraction system continues to be effective. A reduction of the number of extraction wells (and therefore a reduced extraction rate) has not adversely impacted containment of the plume on the east side of the Raccoon River. Routine monitoring of the air stripping system has allowed for quick identification of any problems with the mechanical systems, and repairs have been made. The capping of the soils and building remediation (OU2 and OU4) have prevented exposure to contaminants in the soils and within the buildings. O&M of the cap has been adequate for the current land use. Periodic cap inspections are conducted and repairs are made as needed. The Site inspection revealed that Buildings 4 and 5 were being dismantled, and that the Maintenance Building had previously been dismantled. Demolition of the buildings was not anticipated at the time of the ROD. EPA is following up with the Site owner to determine whether the disposal of demolition debris was performed in compliance with applicable regulations. All other on-site buildings have been adequately maintained for the current land use. O&M requirements have been minimized given that buildings are not currently being used. A security fence has been installed to prevent further vandalism and trespassing.

ICs are an important component of the OU2 and OU4 remedy. The ROD envisioned that land use restrictions would be implemented which would limit the types of development that could occur on the Dico property. Implementation of a restrictive covenant has not been possible since it would require a cooperative property owner. However, effective ICs have been achieved through a variety of means including the following:

- Listing on the state's hazardous waste registry – does not allow a change in use or sale of the property without notification to the state.
- The June 1994 unilateral order requires post-removal site controls to protect the integrity of the cap.
- A 2003 deed notice provides for an easement to allow construction of the MLK Highway expansion across the north part of the Dico property.
- Zoning ordinances passed by the city in 2005 rezoned the property to a mixed-use designation and provided that appropriate consideration is given to environmental conditions in any future redevelopment plan for the property.

Given the current use of the property, the existing ICs are sufficient. However, a title search has revealed a number of easement holders with rights to conduct actions inconsistent with the remedial actions. EPA will develop a plan prior to the next five-year review for implementation of additional ICs that may be necessary. With regard to ICs, it is important to note that redevelopment of the property may provide an opportunity to implement more comprehensive ICs for the Site.

Analytical results of the sample collected from the South Pond overflow area indicate that the South Pond remedy continues to be protective for the current land use. However, sediments collected from the overflow area of the South Pond contained aldrin and dieldrin above the health-based cleanup level. These results indicate that contaminated sediments remain in the pond and are subject to being washed out during periods of heavy rainfall when the pond overflows into the drainage ditch east of the Dico property. The continued existence of pesticides in South Pond sediments should be considered and reevaluated if the land uses changes and human exposures are expected to occur.

The OU3 groundwater monitoring continues to ensure that the North Plume (the OU3 groundwater contamination) is not flowing toward the DMWW gallery infiltration system. O&M of the OU3 groundwater monitoring network has been sufficient.

7.2 *Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?*

For this five-year review, EPA conducted a review of the 1995 risk assessment for OU2 and OU4. The purpose of the review was to evaluate any changes in toxicity data or risk assessment procedures since 1995, and to evaluate additional exposure scenarios that may not have been previously anticipated. The risk assessment review showed that while toxicity values for some compounds have changed and new procedures have been developed for the evaluation of dermal exposures and construction worker exposures, these changes would not have a significant impact on the overall conclusions of the risk assessment. Certainly some specific risk estimates for particular pathways and compounds would change, but these changes would not be significant enough to alter decisions made for the Site.

The 2007 risk assessment review included a screening-level evaluation of carcinogenic risks associated with exposure to soils at the Site, assuming the existing cap is removed. The purpose of this review was to determine the level of risk associated with exposure to soils at the Site in the event that a new property owner/developer wanted to remove the existing asphalt cap. This review included evaluation of residential, recreational, and construction worker scenarios. In all cases, soils that remain on-site present unacceptable risks. The 2007 risk assessment review memo is included as Attachment 8. The presence of this soil contamination would have to be taken into consideration as part of any future development of the Site. It may be feasible to manage the risks posed by site soils by leaving the existing cap in place (or to augment it) and to implement ICs to prevent activities that could lead to exposure to the contaminated soils.

RAOs and cleanup levels developed in the mid-1990s for OU2 and OU4 were based on an industrial exposure scenario because that was the most reasonably anticipated land use at that time. In 2001, Dico shut down their industrial operations at the Site. Since that time, the Site has been mainly unused, except for storage of Titan International, Inc., inventory in a few of the buildings. Currently, the only remaining activity on the Site is the operation of the OU1 groundwater extraction and treatment system, and Site security.

Since the last five-year review in 2003, the city has completed construction of a highway overpass across the northern portion of the Dico property. This project necessitated several modifications to the groundwater extraction and treatment system, and monitoring network. These modifications included the shutdown of three extraction wells and the abandonment and replacement of several monitoring wells. Completion of the highway overpass opened up the corridor through the southern end of the downtown area, making the entire area ripe for redevelopment. The city has been working for many years on a major redevelopment project adjacent to the east of the Dico property. This project is known as the Riverpoint West Redevelopment and includes a mixed-use area with luxury condominiums, retail space, commercial office space, recreational uses, and a retail anchor. Due to this large redevelopment project planned by the city, there may be interest in redevelopment of the Dico property as well.

Under the current-use scenario, the RAOs for all OUs remain valid and the remedies remain protective. The remainder of this section will focus on the validity of the RAOs for various potential redevelopment scenarios.

The RAOs established in the 1986 ROD for OU1 include:

- Cost effectively provide a remedial alternative that effectively mitigates and minimizes threats and provides adequate protection to the public health from exposure to contaminated water provided by the DMWW that would be obtained through operation of the north gallery.

- Control the groundwater contaminant migration, and therefore reduce the threat to the public health by reducing the area where potential exposure could occur.

These RAOs would remain valid under any land use scenario. Regardless of how the Dico property is used, protection of the public water supply would remain a top priority. Protection of the public water supply is achieved by operation of the groundwater extraction system to contain the TCE plume on the east side of the Raccoon River (and thereby prevent migration into the area which serves the underground infiltration gallery). These RAOs could also be achieved by more aggressively treating remaining source material using technologies such as air sparging and/or chemical oxidation. EPA would support a developer's interest in researching applicable technologies that would achieve the RAOs.

The following general RAO for OUs OU2 and OU4 of the Des Moines TCE Site was identified in the 1996 ROD:

- Maintain the buildings, asphalt cap, and South Pond area so that exposure pathways continue to be controlled or minimized. This will minimize risk for both current and anticipated future industrial use of the site, and will protect human health and the environment.

The following specific RAOs corresponding with the nature and extent of contamination at the site and the associated findings of the baseline risk assessments were developed for OU2 and OU4:

- For the buildings, maintain the control of potential exposure pathways related to contaminated materials in Buildings 1 through 5 and the Maintenance Building, and to protect human health and the environment during continued and future industrial uses.

- For the soils, maintain the control of potential exposure pathways related to contaminated soils and to protect human health and the environment during continued and future industrial uses similar to the current industrial operations and activities.

- For the South Pond sediment, minimize the risks from potential exposure pathways related to contaminated soils and to protect human health and the environment during continued and future industrial uses similar to the current industrial operations and activities.

Each of these RAOs established for OU2 and OU4 are valid only for industrial use, and would not be valid for uses other than industrial. If redevelopment of the site occurs, it will be necessary to develop new RAOs consistent with the new site use.

The RAO established in the 1992 ROD for OU3 is to ensure continued protection of the Des Moines water supply. This RAO would remain valid under any land use scenario.

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

No new or previously unidentified ecological risks have been discovered. The Site is prone to flooding during periods of heavy rainfall which generally occurs in the spring. During this reporting period, no significant flooding of the Site has occurred. High water levels in the Raccoon River have at times necessitated the temporary shut down of the groundwater extraction and treatment system, but these events have been short term and have not impacted the overall protectiveness of the remedy. There is no other information that calls into question the protectiveness of the remedies.

7.4 Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedies are functioning as intended by the RODs for the current land use, except for the dismantling of Buildings 4 and 5 in OU4 which was not addressed in the OU2 and OU4 ROD.

8.0 Issues

Table 8-1 summarizes the major issues identified during the five-year review and whether those issues affect the protectiveness of the remedies.

Table 8-1
Issues Identified During the Five-year Review

Issue	Currently Affects Protectiveness? (Y/N)	Affects Future Protectiveness? (Y/N)
Buildings 4 and 5 being dismantled	May affect protectiveness for construction workers dealing with building insulation.	N, if concrete slab remains in place.
Low flow from ERW-7	N	Y, if not resolved
Well MH1-S damaged	N	N
TCE detected in OU3 well MW-34	N	N
Pesticides detected in South Pond sediments	N	Y, depending on future land use.
Need to develop an IC implementation plan for easement holders	N	Y, if easement holders conduct activities that compromise the integrity of the cap.

9.0 Recommendations and Follow-Up Actions

Table 9-1 identifies the recommendations and follow-up actions identified during the five-year review.

Table 9-1
Recommendations and Follow-up Issues

Issue	Recommendations / Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N)	
					Current	Future
Buildings 4 and 5 being dismantled	Coordinate with site owner	EPA	n/a	3/30/08	N	N
Low flow from ERW-7	Repair ERW-7	Dico	EPA	3/30/08	N	Y
Well MH1-S damaged	Repair well MH1-S	DMWW	EPA	6/30/08	N	N
TCE detected in OU3 well MW-34	Resample in 2008	IDNR	EPA	9/30/08	N	N
Pesticides detected in South Pond sediments	Inform prospective purchasers/developers	EPA	n/a	As needed	N	Y, depending on site use
Need to develop IC implementation plan	Develop IC implementation plan	EPA	n/a	2/28/2013	N	Y, if easement holders compromise integrity of cap

10.0 Protectiveness Statements

10.1 Operable Unit 1

The remedy at OU1, groundwater extraction and treatment, is expected to be protective of human health and the environment as currently operated. Exposure pathways that could result in unacceptable risks are being controlled. The RAOs identified in the ROD are being achieved. Specifically, the groundwater extraction and treatment system is successfully controlling migration of the plume and providing necessary protection of the public water supply. Continued operation and maintenance of the groundwater extraction and treatment system and continued groundwater monitoring is necessary to ensure that the remedy continues to provide long-term protection.

10.2 Operable Units 2 and 4

The remedies at OU2 and OU4, building encapsulation and soil capping, are protective for industrial uses of the buildings and properties. While the recent dismantling of Buildings 4 and 5 may have resulted in unacceptable short-term risks to construction workers, the demolition of the building will not affect the long-term integrity of the remedial action. Given the current use of the Site, adequate institutional controls are in place via the state's Hazardous Waste Registry and the various unilateral orders. Additional ICs may be required if the Dico property is sold or if the land use is changed. Analytical results of the sediment sample from the South Pond overflow indicate that the sediments in the pond are above cleanup levels. Given the current use of the Site, no human exposure pathways are complete. However, future development of the Site will need to address the contaminated sediments in the South Pond. Sediments will continue to be monitored at least every five years.

10.3 Operable Unit 3

The no action alternative with groundwater monitoring for OU3 is protective of human health and environment. The remedy continues to meet the RAOs identified in the ROD. Monitoring data indicates that the contaminant levels in the OU3 groundwater have remained steady and are not migrating toward the DMWW gallery. Therefore, OU3 continues to be protective.

10.4 Overall Protectiveness

Because the remedial actions at all the OUs are protective for the current land use, the Site is protective of human health and the environment.

11.0 Next Review

The next five-year review for the Des Moines TCE Site is required by February 2013, five years from the date of this review.

Attachment 1
Site Figures

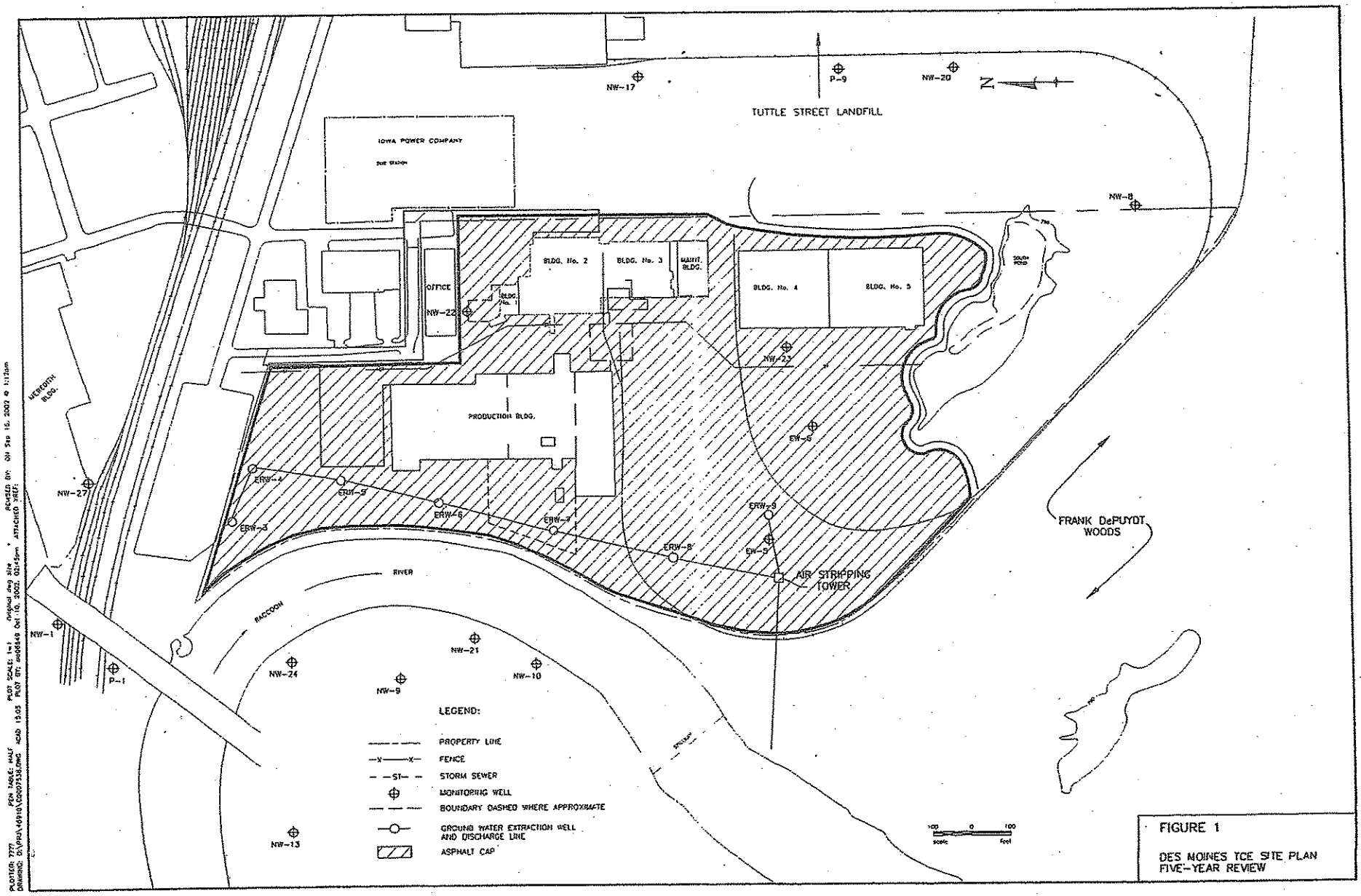
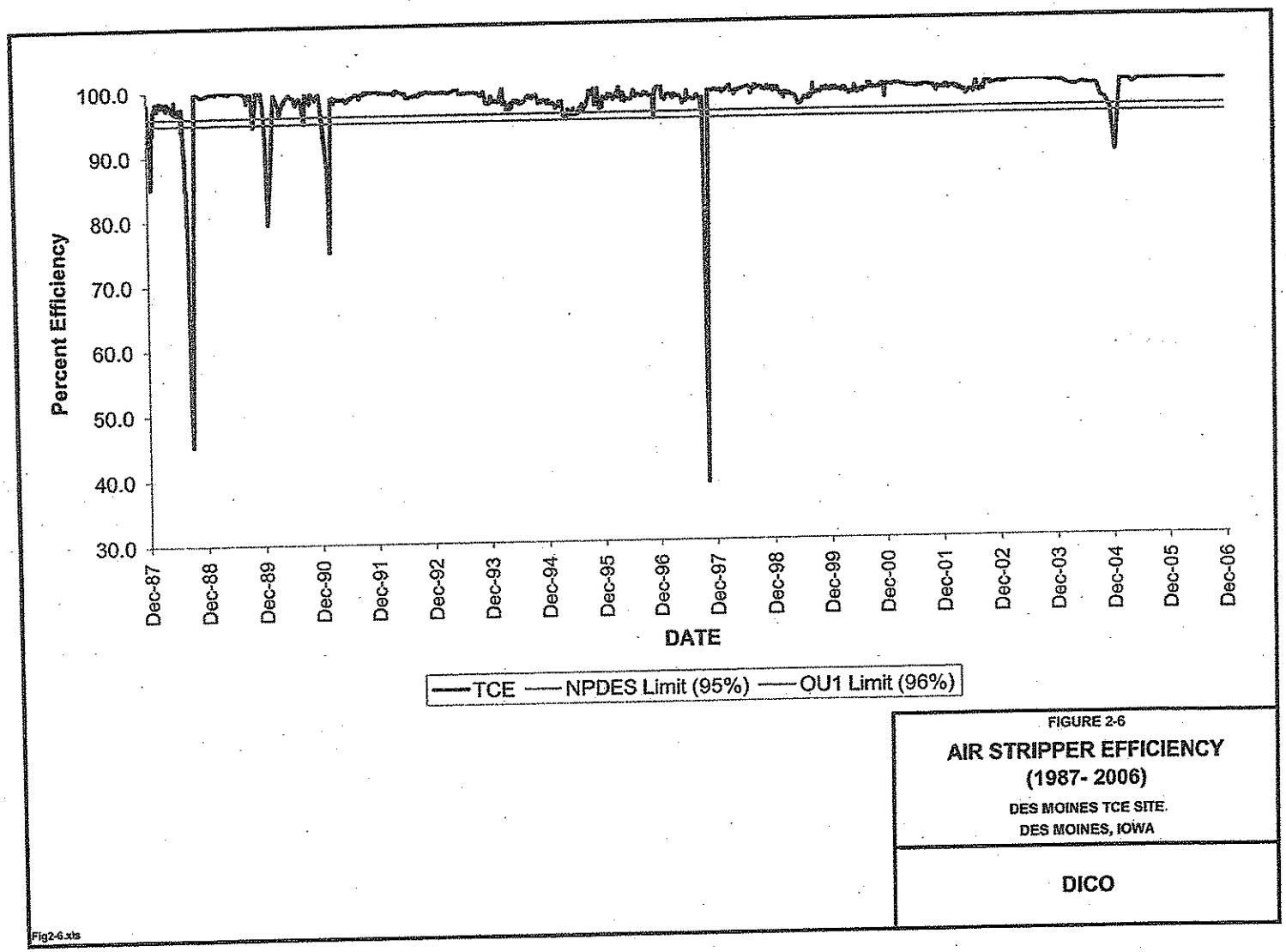


FIGURE 1

DES MOINES TCE SITE PLAN
FIVE-YEAR REVIEW

Attachment 2
Groundwater Remedial Action Figures


100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
Percent Efficiency
Dec-87
Dec-88
Dec-89
Dec-90
Dec-91
Dec-92
Dec-93
Dec-94
Dec-95
Dec-96
Dec-97
Dec-98
Dec-99
Dec-00
Dec-01
Dec-02
Dec-03
Dec-04
Dec-05
Dec-06
DATE
TCE
NPDES Limit (95%)
OU1 Limit (96%)
FIGURE 2-6
AIR STRIPPER EFFICIENCY
(1987- 2006)
DES MOINES TCE SITE.
DES MOINES, IOWA
DICO
Fig2-6.xls

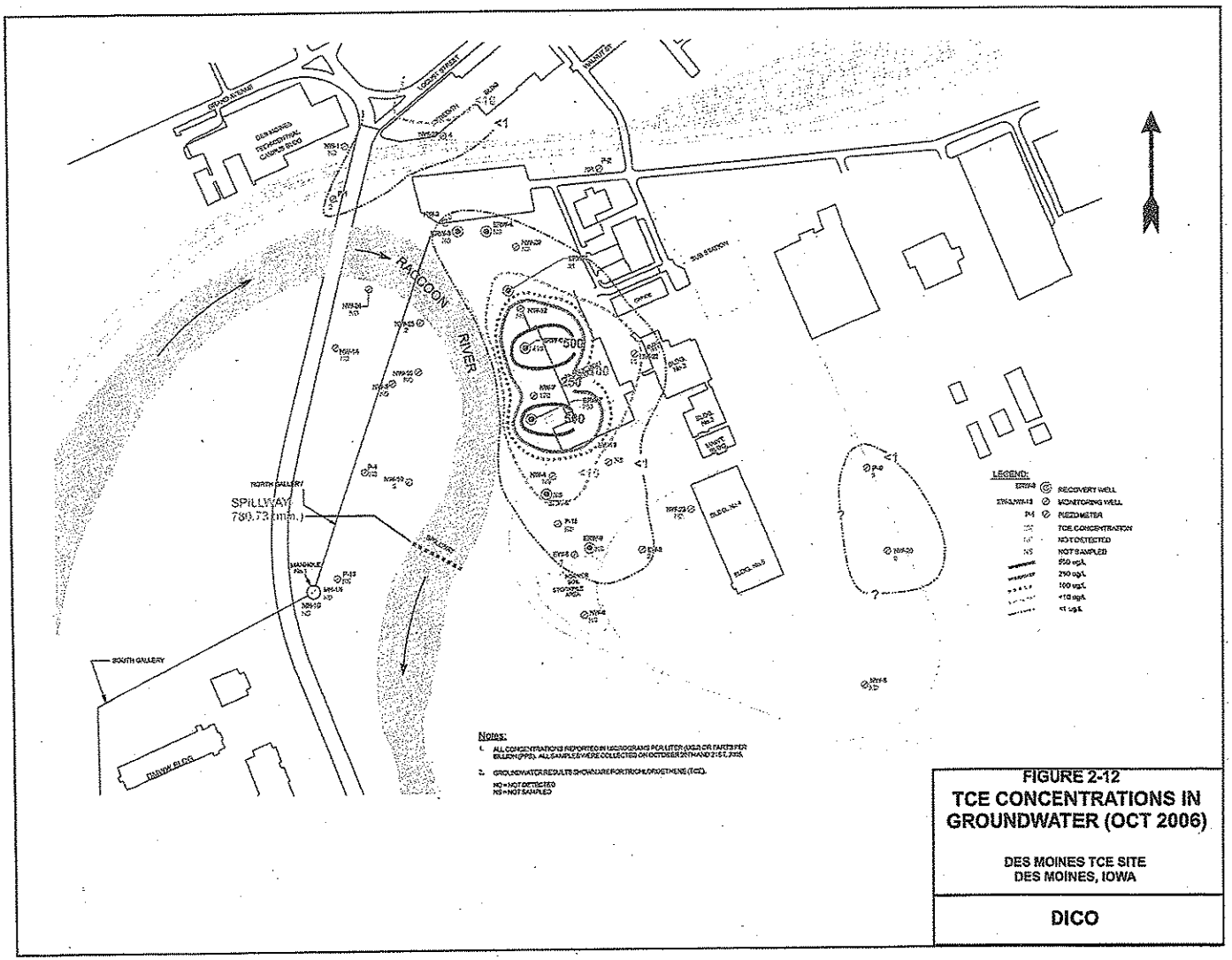


FIGURE 2-12
TCE CONCENTRATIONS IN GROUNDWATER (OCT 2006)

DES MOINES TCE SITE
DES MOINES, IOWA

DICO

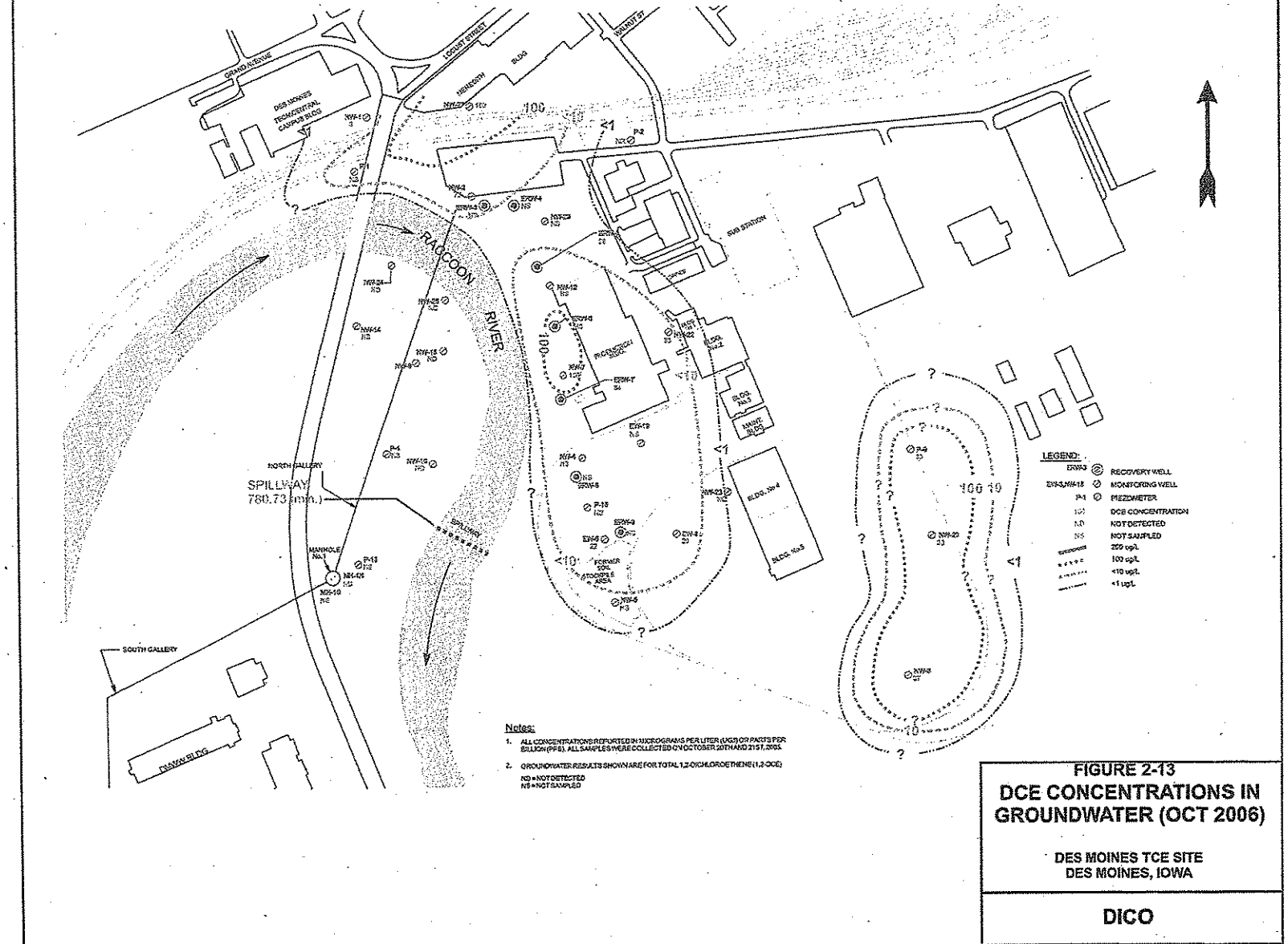


FIGURE 2-13

DCE CONCENTRATIONS IN GROUNDWATER (OCT 2006)

DES MOINES TCE SITE
DES MOINES, IOWA

DICO

Attachment 3

List of Wells Abandoned/Replaced

EarthTech
A tyco International Ltd. Company

500 S.W. 7th Street
Suite 301
Des Moines, IA 50309
P 515.244.1470
F 515.244.4803
www.earthtech.com

September 54, 2007

Ms. Mary P. Peterson
Project Manager
Iowa/Nebraska Branch
Superfund Division
United States Environmental Protection Agency
Region VII
901 North 5th Street
Kansas City, KS 66101

RE: Final Monitoring Well Impacts
at the Des Moines TCE Superfund Site
Activity ID No. 28-2001-047

Dear Ms. Peterson:

Please find enclosed a location map showing the final monitoring well impacts at the Des Moines TCE Superfund Site caused by the construction of the Martin Luther King, Jr. Parkway Project and the Raw Water Main Relocation Project. In all, seven (7) monitoring wells and four (4) piezometers were impacted. Four (4) wells and two (2) piezometers were replaced during construction as required in the Third Supplement to the Technical Proposal and Plan of Action. (Copy of Attachment 2, Revised Page 1 is attached.) The following list shows the wells and piezometers that were abandoned, as well as those that were replaced.

Wells and Piezometers Abandoned	Replacement Wells and Piezometers
P-2	P-2A, P-2B
P-3	
P-4	P-4R
P-12	
EW-3	
EW-9	
NW-9	NW-9R
NW-11	
NW-15	NW-15R
NW-25	NW-25R
NW-29	NW-29R

Please note that piezometer P-2 was replaced under both construction projects. Both replacement piezometers may be used for testing purposes.

If you have any questions or need additional information, please feel free to contact our office at your convenience.

Very truly yours,

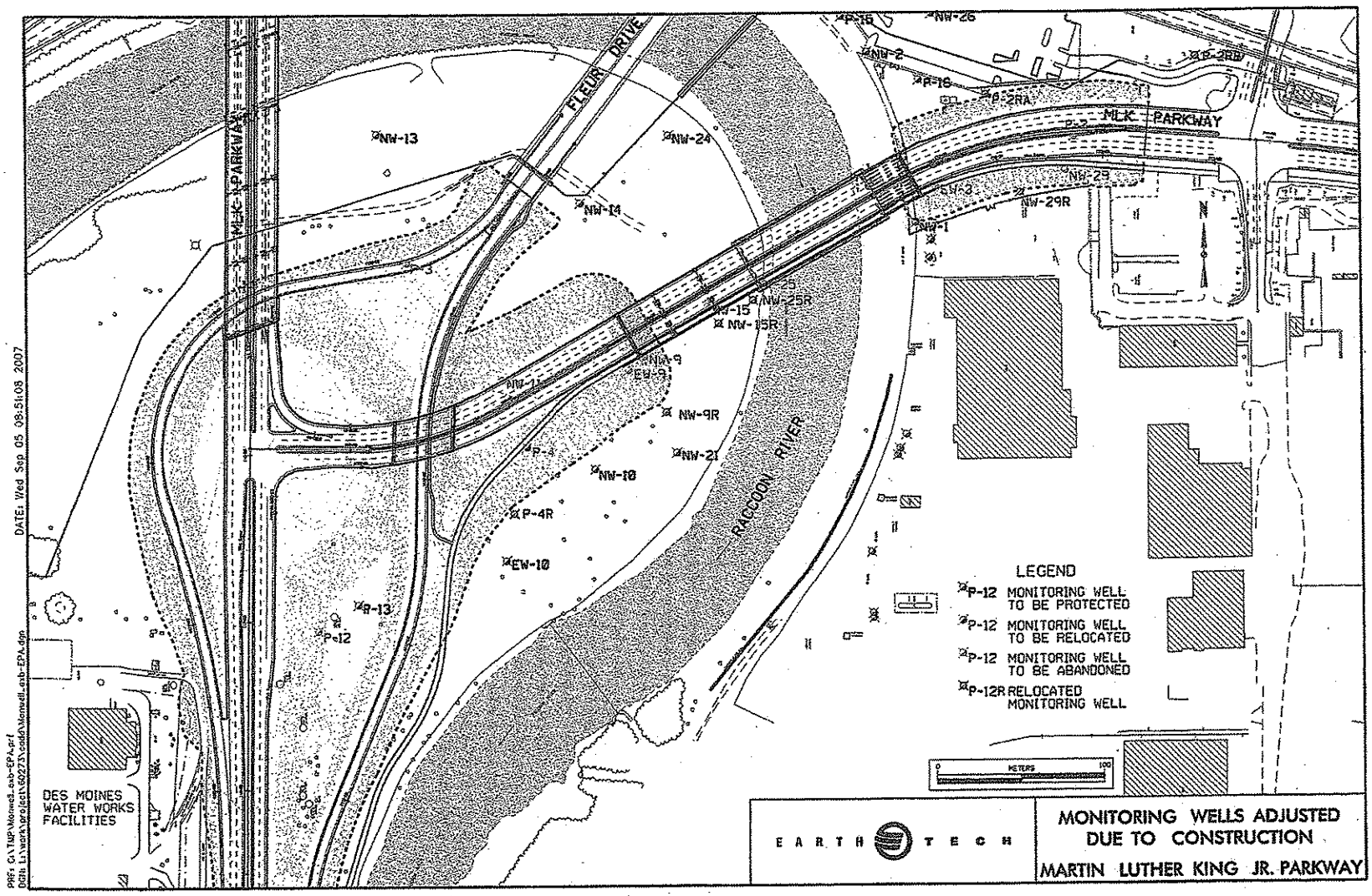
Earth Tech

Steven J. Eaton, P.E.

Enclosures: As noted

cc: Mr. Jeb Brewer, City of Des Moines (w/attachments)

L:\work\project\30511\wp\MP090507.finalwellimpactsltr.doc



PRF: G:\T&P\Monwells_eab-EPA.prf
DGN: L:\work\projects\60275\cadd\Monwells_eab-EPA.dgn
DATE: Wed Sep 05 08:51:08 2007

EME
ENVIRONMENTAL SOLUTIONS

• 2030 Castleman Drive • Nashville • Tennessee • 37216 •
• 615.463.0026 • 615.463.0169 (facsimile) •

October 30, 2003

Mr. Dan Buttars
Environmental Manager
Titan International, Inc.
2345 East Market Street
Des Moines, Iowa 50317

Re: Well Abandonment Reports
Dico Facility, Des Moines, Iowa

Dear Mr. Buttars:

Environmental Management and Engineering, Inc. (EME) and its Iowa-based drilling subcontractor, Allender Butzke Engineers, Inc., have completed the abandonment of twenty-two groundwater monitoring wells at the Dico Facility in Des Moines, Iowa. Well abandonment activities were performed in accordance with EME's proposal, dated March 31, 2003, the USEPA-approved July 2, 2003 Work Plan for the Proposed Modifications of the Des Moines TCE Site (Work Plan) and the Iowa Department of Natural Resources's (DNR) Guidelines for Plugging Abandoned Water Wells, Technical Information Series 15, dated October 1988. Specifically, wells were abandoned by filling the well casing with a flowable bentonite grout slurry. The bentonite grout slurry was injected into the bottom of the wells using a grout pump and flexible tremie pipe. The grout column was brought to within several feet of ground surface. Then, the protective steel risers and upper three feet of PVC casing were removed and the upper portion of the well boring was plugged to grade with either granular bentonite or Portland cement concrete. All of the wells listed in Table 1 were abandoned between October 6 and October 8, 2003. Per our previous discussions, a magnetometer was used to try to locate the four missing groundwater monitoring wells — wells P-3, P-14, EW-10, and MW-26. Our efforts were unsuccessful and these wells were not abandoned. Table 1 lists all of the wells that were abandoned.

Abandoned Water Well Plugging Records (DNR Form 542-1226) have been completed for each well and have been signed by an Iowa Certified Well Contractor. However, as the well owners' representative, you will need to complete Section 1 on each form and sign the shaded certification section. A copy of this letter and the completed and signed abandonment forms should be submitted to the Water Supply Section of the DNR at 900 East Grand Avenue, Des Moines, Iowa 503 19-0034 by November 7, 2003. A copy of this report should also be forwarded to Ms. Mary Peterson of the USEPA, Region VII.

Table 1
Summary of Well Abandonment Details

	Well	Well Depth	Depth of Casing	Depth to Water	Casing Dia.	Date Installed	Casing Materials	Type of Construction
1	P-5	40.5	40.0	20	2"	1984	plastic	drilled
2	P-6	42.6	42.0	20	2"	1984	plastic	drilled
3	P-7	38.0	37.5	20	2"	1984	plastic	drilled
4	P-8	39.1	38.5	20	2"	1984	plastic	drilled
5	P-10	41.0	40.5	20	2"	1987	plastic	drilled
6	P-11	30.0	29.5	20	2"	1987	plastic	drilled
7	P-12	28.5	28.0	20	2"	1987	plastic	drilled
8	P-15	45.0	45.0	20	2"	1987	plastic	drilled
9	P-16	60.0	60.0	20	2"	1987	plastic	drilled
10	P-17	35.5	35.0	20	2"	1987	plastic	drilled
11	EW-8	35.0	35.0	20	3"	1982	plastic	drilled
12	NW-3	35.0	35.0	20	2"	1984	plastic	drilled
13	NW-4B	30.0	30.0	20	2"	1984	plastic	drilled
14	NW-5	43.0	42.5	20	2"	1984	plastic	drilled
15	NW-12A	49.5	49.0	20	2"	1984	plastic	drilled
16	NW-12B	40.0	40.0	20	2"	1984	plastic	drilled
17	NW-13	36.4	36.0	20	3"	1984	plastic	drilled
18	NW-16	46.9	46.0	20	3"	1984	plastic	drilled
19	NW-17	39.0	39.0	20	3"	1984	plastic	drilled
20	NW-18	38.5	38.0	20	2"	1984	plastic	drilled
21	NW-21	35.0	35.0	20	2"	1987	plastic	drilled
22	NW-28	45.0	45.0	20	2"	1987	plastic	drilled

EME appreciates the opportunity to provide our services and we look forward to working with you again in the future. If you have any questions regarding the information contained within this abandonment report, please contact me at 615.463.0026 or by e-mail at qmacdonald@emetn.com.

Sincerely,
Environmental Management and Engineering, Inc.

Quintin G. Macdonald, PG
Project Manager

enc.

cc:
Gazi George

Attachment 4
Site Documents Reviewed

Attachment 4
Fourth Five Year Review
Des Moines TCE Site

Documents Reviewed

Document Title	Author	Date
Third Five Year Review	Black and Veatch for EPA	December 31, 2002
OU1 Record of Decision	EPA	July 1986
OU3 Record of Decision	EPA	September 1992
OU2/4 Record of Decision	EPA	December 1996
Unilateral Administrative Order for OU1 RD/RA	EPA	July 1986
Unilateral Administrative Order for OU4 – Buildings Encapsulation Action	EPA	March 1994
Unilateral Administrative Order for OU4 – Capping Action	EPA	June 1994
Administrative Order on Consent for OU4 South Pond Area	EPA and Dichem Customer Group	December 1995
Performance Evaluation Report No. 17	Dico	July 2003
Performance Evaluation Report No. 18	Dico	July 2004
Performance Evaluation Report No. 19	Environmental Management and Engineering, Inc. for Dico	July 2005
Performance Evaluation Report No. 20	Environmental Management and Engineering, Inc. for Dico	January 2007
Performance Evaluation Report No. 21	Environmental Management and Engineering, Inc. for Dico	July 2007
Work Plan for Proposed Modifications	Dico	July 2, 2003
OU2/4 Annual Cap Inspection Reports	Dico	2003-2007
OU2/4 Building Inspection Letters	Dico	2003-2007
Technical Progress Report on Groundwater Monitoring for the North Plume Site	IDNR	January 2006

Technical Progress Report on Groundwater Monitoring for the North Plume Site	IDNR	October 2007
Final Monitoring Well Impacts	Earth Tech for City of Des Moines	September 2007
Well Abandonment Report	Environmental Management and Engineering for Dico	October 2003
South Pond Sampling data	University of Iowa Hygienic Laboratory for IDNR	September 2007

Attachment 5
Changes in Chemical-Specific Standards

Attachment 5
Fourth Five Year Review
Des Moines TCE Site

Changes in Groundwater Chemical-Specific Numeric Standards

Contaminant	Standard (ug/L)		Citation
Chloroform	OU1 ROD	100	MCL. SDWA
	New	80	MCL. SDWA
Trans 1,2-DCE	OU1 ROD	None	MCL. SDWA
	New	100	MCL. SDWA
1,2-Dichloropropane	OU1 ROD	None	MCL. SDWA
	New	5	MCL. SDWA
PCE	OU1 ROD	None	MCL. SDWA
	New	5	MCL. SDWA
Vinyl Chloride	OU1 ROD	1	MCL. SDWA
	New	2	MCL. SDWA

Attachment 6
Cumulative Summary of OU3 Data

TABLE 2: CUMULATIVE SUMMARY OF CONTAMINANT LEVELS (µg/l) IN DES MOINES TCE OU3 MONITORING WELLS

Sample Date	Para-meter	NW-30	NW-31	NW-32	NW-34	NW-35	NW-36	NW-39	NW-40
July 1989	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	4J 1J ND	170 54J 24J	8J 2J 0.8J	-- -- --	-- -- --
Aug. 1989	PCE TCE DCE	0.7J ND ND	ND ND ND	ND ND ND	4 1 ND	94 32 17	2 ND ND	-- -- --	-- -- --
Sept. 1989	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	3J ND ND	138J 29J 14J	ND ND ND	-- -- --	-- -- --
Oct. 1989	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	2 ND ND	150J 42 22	ND ND ND	-- -- --	-- -- --
Jan. 1990	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	3 0.7J ND	350 100 48	0.7J ND ND	-- -- --	-- -- --
March 1990	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	2 ND ND	330 90 59	ND ND ND	-- -- --	-- -- --
April 1990	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	2 ND ND	185 44 28.5	1 ND ND	-- -- --	-- -- --
Sept. 1990	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	ND ND ND	335 88.5 54J	ND ND ND	-- -- --	-- -- --
Dec. 1990	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	2 ND ND	315 82.5 44.5	ND ND ND	-- -- --	-- -- --
June 1991	PCE TCE TCE	ND ND ND	ND ND ND	ND ND ND	ND ND ND	97.5 22 11	ND ND ND	3.2 5.1 20	5.4 2.6 7.7
Sept. 1991	PCE TCE DCE	ND ND ND	ND ND ND	ND ND ND	1.7 ND ND	21J 23J 14	ND ND ND	4.2J 3.8J ND	1.1 ND 3.0

TABLE 2 (Cont.): CUMULATIVE SUMMARY OF CONTAMINANT LEVELS (µg/l) IN DES MOINES TCE OU3 MONITORING WELLS

Sample Date	Para-meter	NW-30	NW-31	NW-32	NW-34	NW-35	NW-36	NW-39	NW-40
Apr. 1996	PCE*	ND	ND	ND	ND	--	ND	7	ND
	TCE*	ND	ND	ND	ND	--	ND	ND	ND
	DCE*	ND	ND	ND	ND	--	ND	ND	ND
	VC*	ND	ND	ND	ND	--	ND	ND	ND
Oct. 1996	PCE*	ND	ND	ND	ND	44	ND	5 (7)	17
	TCE*	ND	ND	ND	ND	16	ND	4J (5J)	ND
	DCE*	ND	ND	ND	ND	5J	ND	ND(ND)	ND
	VC	ND	ND	ND	ND	ND	ND	ND(ND)	ND
May 1997	PCE	ND	ND	ND	ND	22 (16)	ND	6	ND
	TCE	ND	ND	ND	ND	10 (8)	ND	4	ND
	DCE	ND	ND	ND	ND	4 (3)	ND	ND	ND
	VC	ND	ND	ND	ND	ND(ND)	ND	ND	ND
Nov. 1997	PCE	ND	ND	ND	ND	26	ND	--	2 (2)
	TCE	ND	ND	ND	ND	8	ND	--	ND(ND)
	DCE	ND	ND	ND	ND	3	ND	--	1 (1)
	VC	ND	ND	ND	ND	ND	ND	--	1 (1)
May 1998	PCE	ND	ND	ND	ND	31	ND	--	3
	TCE	ND	ND	ND	ND	8	ND	--	ND
	DCE	ND	ND	ND	ND	3	ND	--	2
	VC	ND	ND	ND	ND	ND	ND	--	ND
May 1999	PCE	ND	ND	ND	ND	140(130	ND	--	1
	TCE	ND	ND	ND	ND	36 (40)	1	--	ND
	DCE	ND	ND	ND	ND	20 (21)	2	--	ND
	VC	ND	ND	ND	ND	ND(ND)	ND	--	ND
April 2000	PCE*	ND	ND	ND	ND	67	ND	--	ND(ND)
	TCE*	ND	ND	ND	ND	42	ND	--	ND(ND)
	DCE*	ND	ND	ND	ND	18	ND	--	ND(ND)
	VC*	ND	ND	ND	ND	ND	ND	--	ND(ND)
July 2001	PCE	ND	ND	ND	ND	170(120	ND	--	2
	TCE	ND	ND	ND	ND	65 (63)	3	--	ND
	DCE	ND	ND	ND	ND	28 (25)	5	--	ND
	VC	ND	ND	ND	ND	ND(ND)	ND	--	ND
Sept. 2002	PCE	ND	ND	ND	ND	130(130	ND	--	ND
	TCE	ND	ND	ND	ND	40 (41)	4	--	ND
	DCE	ND	ND	ND	ND	18 (18)	10	--	ND

NOTES: ND = Not detected at detection limit. J = The associated value is an estimate
* Detection limit = 5 ug/l -- = Indicates no sample was collected.

TABLE 2 (Cont.): CUMULATIVE SUMMARY OF CONTAMINANT LEVELS (µg/l) IN DES MOINES TCE OU3 MONITORING WELLS

Sample Date	Para-meter	NW-30	NW-31	NW-32	NW-34	NW-35	NW-36	NW-39	NW-40
Nov. 2004	PCE	--	<0.5	<0.5	<0.5 (J)	21 (22)	1.5	--	<0.5 (J)
	TCE	--	<0.5	<0.5	<0.5 (J)	9.9 (11)	18	--	<0.5 (J)
	DCE	--	<0.5	<0.5	<0.5	3.0(3.3)	20	--	<0.5 (J)
	VC	--	<0.5	<0.5	<0.5	<0.5	<0.5 (J)	--	<0.5
Oct. 2005	PCE*	<5	<5	<5	<5	22 (20)	<5	--	<5
	TCE*	<5	<5	<5	<5	13 (10)	<5	--	<5
	DCE*	<5	<5	<5	<5	<5 (<5)	<5	--	<5
	VC*	<5	<5	<5	<5	<5 (<5)	<5	--	<5
Sept. 2007	PCE	<0.5	<0.5	<0.5	0.7	25 (23)	<0.5	--	<0.5 (J)
	TCE	<0.5	<0.5	<0.5	<0.5 (J)	7.3 (7.4)	1.9	--	<0.5
	DCE	<0.5	<0.5	<0.5	<0.5	2.1(2.1)	4.2	--	<0.5
	VC	<0.5	<0.5	<0.5	<0.5	<.5(<.5)	<0.5 (J)	--	<0.5

NOTES: ND = Not detected at detection limit.
* Detection limit = 5 µg/l
J = Compound detected below quantification limit.
-- = Indicates no sample was collected.

Attachment 7
Site Inspection Report

Site Inspection Report

Des Moines TCE Site
September 2007

Prepared by:

Mary Peterson
Project Manager
IANE/SUPR

Introduction

In support of a Five Year Review, a site inspection was conducted on September 19, 2007. The site inspection included an interview with a representative of the site owner, review of all remedial actions at the site including operable units (OUs) 1-4, a walk-through inspection of all operating equipment, monitoring wells, buildings, and affected property. The inspection also included sampling of sediments around the South Pond overflow area and groundwater sampling of the OU3 monitoring wells.

Participants

People who participated in the site inspection are listed below.

Mary Peterson, EPA Region 7
Bob Drustrup, IDNR
Hilton Jackson, IDNR
Doug Pospisil, Dico
Brian Mills, Dico
Louis Barrentine, EME

Description of Activities

OU1: The mechanical equipment associated with the operating extraction wells (EW-5, 6, and 7) and the air stripper was inspected. The chemical injection system to control iron fouling was moved to EW-5. Dico has recommended shutting down EW-5. EPA indicated to the Dico representative that if EW-5 is removed from service, then the chemical feed system should be moved to EW-6.

The flow rate from EW-7 has been extremely low in recent months. Brian Mills with Dico stated that he believes the cause is a bad flow meter which is due to be replaced in the near future. Mary Peterson suggested that if the new flow meter does not solve the problem, then the well screens in the extraction wells should be examined for fouling and possibly cleaned to increase their production rates. This recommendation will be noted in a letter to Dico.

The air stripping tower remains in good condition. The tower packing was replaced within the last two years. Given the reduced total system flow, the current stripping tower and blower are over-sized. It was discussed that when the tower packing needs replacing again, or when any other major equipment repair is needed, Dico should consider replacing the tower with a tray air stripper and smaller blower that would be more appropriately sized for the reduced flow rate. This suggestion will be noted in a letter to Dico.

The monitoring well network was inspected. Brian Mills indicated that MH1-S was damaged during construction of the Martin Luther King Parkway and he has e-mail correspondence with the city that he will forward to Mary Peterson. All other monitoring wells appeared to be in good condition. A few of the replacement wells installed by the city do not have protective posts around them. Brian Mills indicated that all well locks were recently replaced.

OU2/OU4: The buildings, the asphalt cap, and the South Pond drainage area and ditch east of the site were included in the inspection of OU2 and OU4. The most notable change is the demolition of building 4/5. Dico indicated that the building support structures are being sold and will be erected at another site. Sheet metal will be recycled and other materials will be sent offsite for disposal. The concrete foundation will remain in place. Louis Barrentine indicated that he will provide documentation to EPA regarding the disposition of materials leaving the site. Photographs 1, 2, and 3 depict building 4/5 in the process of demolition.

All other buildings remain intact. However, all windows have been broken out and most doors have been knocked in. Approximately 18 months ago, Dico erected a six foot chain link fence with barbed wire across the top to prevent trespassers from accessing the buildings on the property. Photograph 4 shows the fence and the Production building with the guard shack in the foreground. Photograph 5 depicts the general condition of the buildings at the site. Photograph 6 shows buildings 1-3 and the Maintenance building.

The asphalt cap remains in fair condition. Evidence of repairs was noted during the site inspection. Given that there is very little traffic on the site, the cap remains in good condition and requires little maintenance.

The South Pond area and drainage ditch east of Dico were inspected. The South Pond was full and stagnant with a thick layer of algae on the surface (see photograph 7). The overflow area contained water. Sediments from the overflow area were collected by IDNR and will be analyzed for pesticides of concern. The drainage ditch east of the Dico property was also full and stagnant with algae growing on the surface (see photograph 8).

OU3: The Iowa Department of Natural Resources (IDNR) performs the operation and maintenance of OU3. The IDNR conducted a monitoring event of the OU3 well network and will provide analytical results for inclusion in the Five Year Review Report.

Follow-up Items

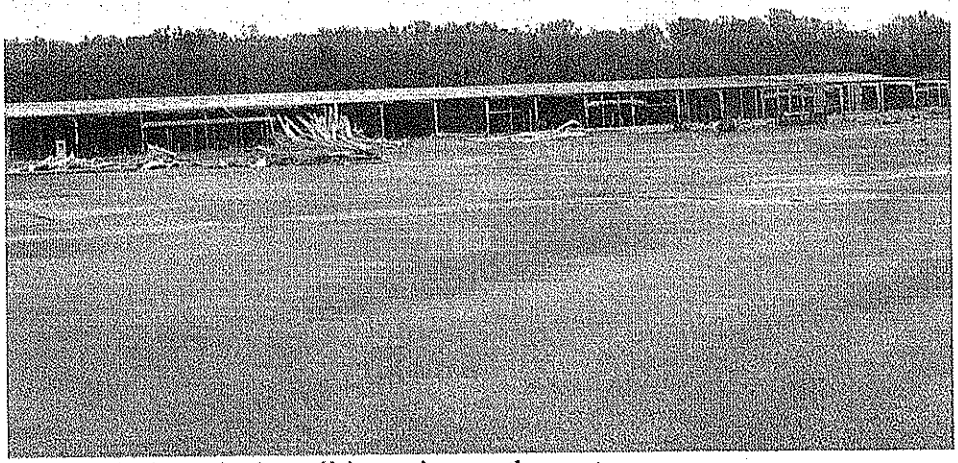
1. Send IDNR a copy of the Performance Evaluation Report No. 21.

2. Contact city regarding repair of monitoring well MH1-S.

3. Send a letter to Dico regarding the disposition of demolition debris from building 4/5, extraction system maintenance items, and responding to recommendations in the PER No. 21 report.

4. Contact city economic development office to get an update on the status of the Riverpoint West redevelopment project.

5. Consider an update of the risk assessment for soil exposures to evaluate potential future uses, and to incorporate any new risk assessment guidelines established since the original risk assessment was completed.

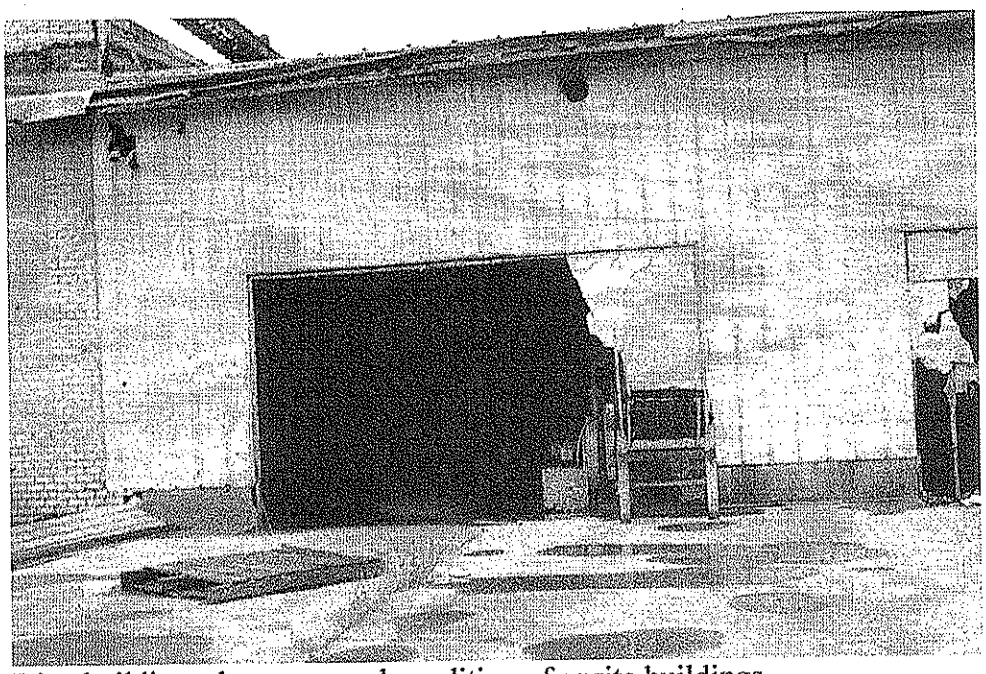


Dico Building 4/5 demolition; view to the east
9/19/07

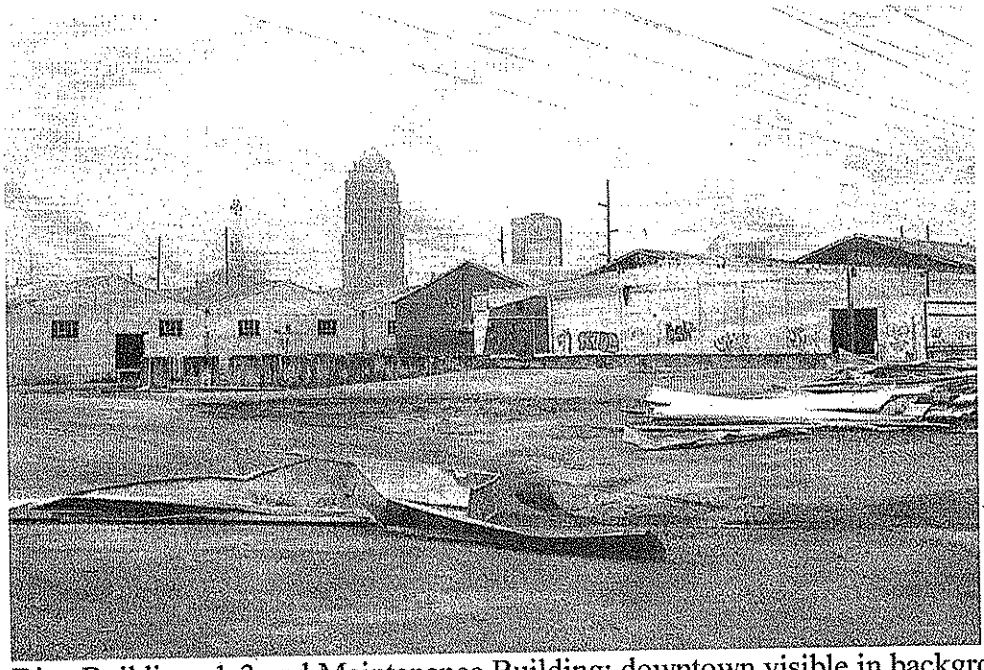
Dico Building 4/5 demolition; view to the south
9/19/07

Dico Building 4/5 demolition; view to the northwest
9/19/07

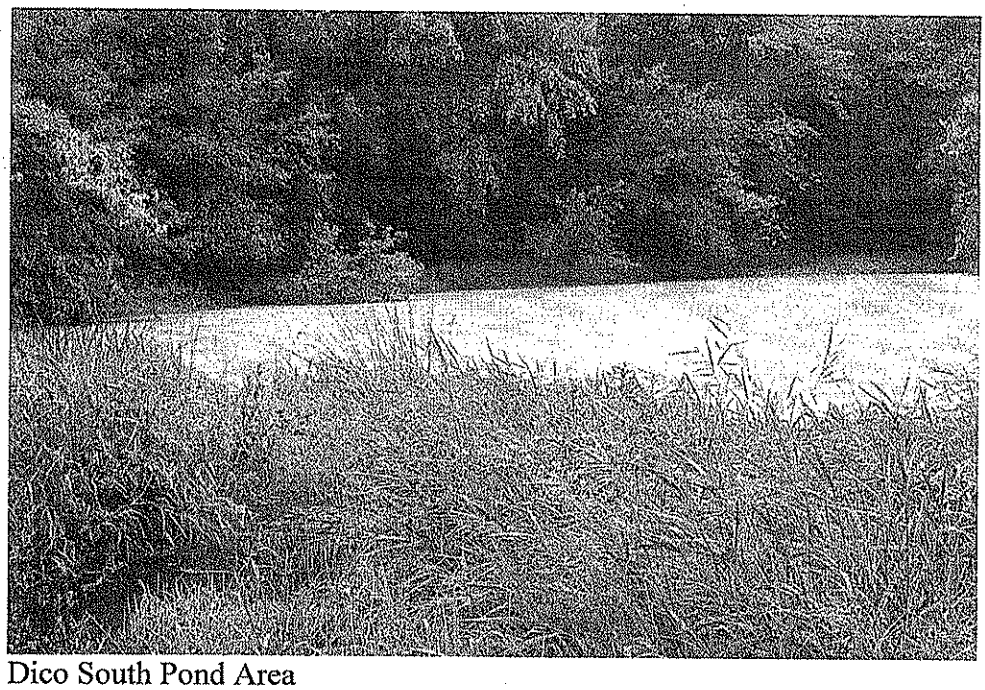
Dico Production Building; view to the east
Shows new security fencing and guard shack
9/19/07



Dico building; shows general condition of onsite buildings
9/19/07



Dico Buildings 1-3 and Maintenance Building; downtown visible in background
9/19/07



Dico South Pond Area
9/19/07

Dico East drainage ditch; full and stagnant
9/19/07

Attachment 8
Risk Assessment Review

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII
901 NORTH 5TH STREET
KANSAS CITY, KANSAS 66101

JAN 22 2008

MEMORANDUM

SUBJECT: DICO Site Updated Risk Estimates for Five-Year Review

FROM: Greg McCabe
ENSV/EAMB

TO: Mary Peterson
SUPR/IANE

Per your request, we are providing updated risk estimates for several potential exposure scenarios developed for the DICO (aka Des Moines TCE) site in Des Moines, Iowa. Our understanding is that updated risk estimates are required in order for you to prepare an adequate Five-Year Review report, and to provide you with more up-to-date risk estimates using current EPA risk assessment guidance.

As part of our effort we evaluated information contained in the following documents which were provided for our review: "Draft Des Moines South Area Source Control Operable Unit, Remedial Investigation Report, Volume I of V," dated April, 1992; "Final Remedial Investigation Report for the Des Moines TCE Site, Operable Unit No. 4, Des Moines, Iowa, Volume I," dated July 27, 1995; and, "Final Remedial Investigation Report for the Des Moines TCE Site, Operable Unit No. 4, Des Moines, Iowa, Volume II, Final Baseline Risk Assessment," dated July 27, 1995. Please note that our risk estimates are based on the summary data tables provided to us. We made no attempt to locate and identify any laboratory data packages which may or may not be located in the Superfund site file.

According to the 1995 Remedial Investigation (RI) report (Black & Veatch, 1995a), nearly all of the DICO property was covered with an asphalt cap under the auspices of an Administrative Order issued by EPA in 1994. The 1995 Risk Assessment for the site states that "there are no current risks to contaminated soil that is under the cap because the cap has essentially eliminated a complete exposure pathway." Our understanding is that the integrity of that cap has been maintained, and that there continues to be no current exposure of site workers to the contaminated soil underneath the cap. Therefore, the focus of our effort has been on the development of potential risk

estimates for a variety of potential future-use scenarios, assuming a future absence of the asphalt cap.

The results of our effort generally concur with the earlier risk assessment (Black & Veatch, 1995b) done on the site. That is, our effort shows that the levels of contamination present at the site would present an unacceptable potential risk to human health if exposure pathways to site contamination were to become complete, for example, by the removal of the asphalt cap. We should note here that our review was done using current EPA guidance. Changes to EPA guidance since the completion of the 1995 risk assessment include the development of updated toxicity values for a number of compounds, development of dermal exposure guidance, development of guidance governing exposure of construction workers, development of the Johnson & Ettinger model for evaluating vapor intrusion of volatile contaminants into buildings, and the development of guidance for evaluating early-life exposure to carcinogenic contaminants with a mutagenic mode of action. However, it is unlikely that these changes would result in any significant impact to the overall conclusion of the 1995 risk assessment; i.e., exposure to site contaminants could result in potential risks to human health.

Scope of Review

We would like to stress that our effort did not evaluate all areas of contamination at the site, nor did we attempt a detailed examination of risks that may be present at the site. There are several reasons for the screening level nature of our review. First, the assessment of the presence or absence of potential health risks in the absence of the existing remedy for the completion of the Five-Year review does not warrant an extensive evaluation of potential site risks. Beyond that, the information available for our review would not support a detailed risk assessment for a number of reasons. Essentially, all of the soil data we evaluated is over ten years old, making a detailed assessment of current conditions impossible. Data presentation in the available reports is also poor in some aspects. For example, the results from surface soil sampling locations SB15-SB28 appear to be missing from Appendix 7 of the 1995 RI report. Also, surface soil sampling has been insufficient to identify any "hot spots," or isolated areas of elevated contaminant concentrations, which might be present in site soils.

We made no attempt to verify the adequacy of the soil removal action in the area of the former Aldrin tank, where exceedingly high levels of pesticide were found, nor did we include the apparent "soil pile" located in the eastern portion of the facility in our review. Our review also did not include an evaluation of building interiors at the site. Thus, any potential health risk which may, or may not, result from exposure to contaminants in these areas was not addressed in our review. We also did not consider any potential ecological risks associated with the site, and would suggest that the Region 7 ecological risk assessors be consulted regarding any such potential risk. Finally, because risk management decisions are usually based on the presence of carcinogenic contaminants, our review focused only on potential risks from exposure to carcinogens.

Given these caveats, we did attempt to perform a screening level evaluation of potential health risks to future users of the site. Our evaluation included the main exposure scenarios we thought one might expect to be present, should the site property ever be released for unrestricted use. These exposure scenarios include future residential exposure, future construction worker exposure, future 'recreational' use of the South Pond area, and vapor intrusion into building interiors from contaminated groundwater. Following are the results of our evaluation.

Future Residential Scenario

EPA risk assessment guidance is based on the concept of a "reasonable maximum exposure" (RME), which is defined as "the highest exposure that is reasonably expected to occur at a site" (EPA, 1989). RMEs are estimated for individual pathways. If an individual or a population is exposed via more than one pathway, then the combination of exposures across all those pathways also represents an RME. Typically, EPA calculates risk assuming a particular "exposure area." EPA guidance states that "...if you assume that an exposed individual moves randomly across an exposure area, then the spatially-averaged soil concentration can be used to estimate the true average concentration over time" (EPA, 1992). Because of the inherent uncertainty in knowing precisely the true average, or mean, contaminant concentration at a site, EPA generally uses an Upper Confidence Limit (UCL) of the mean concentration to represent the exposure point concentration (EPC) for a given contaminant at a site. Typically, a 95% UCL is used, though other UCLs can also be derived (for purposes of our evaluation, only the 95% UCL was used). These UCLs can be readily calculated using EPA's ProUCL software program which is able to calculate 15 different UCL values, and recommend the most statistically valid UCL (EPA, 2007). It is important to note that it is possible for the UCL of a given data set to be higher than the greatest possible mean concentration for that data set, due to issues such as small sampling size or a large degree of data variability. In those instances, EPA recommends that the risk assessment be based on the maximum detected contaminant concentration, rather than on the exceedingly high UCL of the mean (EPA, 1989).

In our review, we attempted to identify areas where an individual could receive an RME based on Figures 6-11 through 6-21 of the 1992 RI report (Eckenfelder,1992), and Figure 3-2 of the 1995 RI report. The main contaminants of potential concern (COPCs) in surface soil at the DICO facility are volatile organic compounds (VOCs) and pesticides, though other contaminants are present in specific areas. To evaluate exposure of future potential residents to contaminants in the surface soil, we selected as the exposure area roughly a one-half acre location directly west of the production building. This area was selected for two reasons: 1) there were sufficient samples collected to allow for the determination of a 95% UCL for TCE and PCE, and 2) it was felt this area could present an RME to future on-site residents. The surface sample locations evaluated are generally identified as locations SB-28 through SB-39, and other nearby sampling locations. According to Section 4.2.5 of the 1992 RI report, these samples were taken from the top two feet of soil. Because our risk estimates for future residential use here are based on standard default exposure assumptions, it is possible to develop residential risk estimates using health-based screening levels which were also based on those same

default assumptions. The screening levels used in our evaluation were published by EPA Region 6 (EPA, 2006). These screening levels are based on a 1E-06 lifetime cancer risk. By comparing the Region 6 screening levels with contaminant concentrations at the DICO facility, one can quickly derive potential risk estimates for future residential use of the site using the following equation:

$$\text{estimated risk} = \frac{\text{contaminant concentration}}{\text{residential soil screening level}} \times 1E\text{-}06$$

We should note that for TCE and PCE there was wide variability in the sample results, as evidenced by isolated high concentrations of each contaminant. Because of the known presence of these contaminants, it is possible that the highest contaminant concentrations are not outliers, but rather, represent localized areas of higher concentrations. According to EPA guidance (EPA, 1989), it would be inappropriate to simply disregard such sampling results in the absence of any valid scientific reason for doing so. Thus, these values were retained in the calculation of the 95% UCL. In Table 1 below, in accordance with EPA guidance (EPA, 1989), risk estimates for TCE and PCE are based on the lower of the 95% UCL of the data or the maximum contaminant concentration. For all other contaminants, the EPC used in estimating risk is the maximum concentration, because insufficient sampling has been conducted to support a statistically valid 95% UCL of the arithmetic mean.

Table 1 – Residential Scenario, Surface Soil, Risk Estimates

Contaminant	Maximum concentration, µg/kg	95% UCL, µg/kg	EPC, µg/kg	Region 6 screening level, µg/kg	Cancer risk estimate
TCE	55,000	66,841	55,000	43	1E-03
PCE	17,000	576,102	17,000	550	3E-05
Vinyl chloride	760		760	43	2E-05
Aroclor-1254	1600		1600	220	7E-06
Aroclor-1260	2200		2200	220	1E-05
Chromium (assume 1:6 Cr^{+6}:Cr^{+3})	1,284,000		1,284,000	210,000	6E-06
Aldrin	300		300	29	1E-05
Dieldrin	12,000		12,000	30	4E-04
Chlordane	14,000		14,000	1600	9E-06
2,3,7,8-TCDD	0.093		0.093	3.9E-03	2E-05
			Total risk		2E-03

As shown in Table 1, the total risk estimate for the residential scenario is outside EPA's target risk range of 1E-04 to 1E-06 (EPA, 1990). The primary potential cancer risk from surface soil at this location results from the presence of VOCs, pesticides, and dioxin. We would note that Table 3, Appendix 7, of the 1995 RI report shows the presence of dioxin in the following surface soil sample locations: SB-2, SB-6, SB-11, SB-20, SB-21, and SB-33.

In this same area, lead was identified at a concentration of 4,880 mg/kg, which is significantly greater than EPA's residential soil screening level of 400 mg/kg. EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model was used to evaluate the potential health risk to a child living in a residential setting at this location. The potential risk from lead contamination is estimated in terms of the probability of a child having a blood lead concentration of 10 µg/dL. EPA guidance states that such a probability greater than 5% is not acceptable (EPA, 2002a). As shown in the attached IEUBK printout (Attachment 1), given the default model assumptions, there is a 98% probability that a child exposed to the identified lead concentration at this location in a residential setting would have a blood lead level greater than the allowable 10 µg/dL. This is far above EPA's health protection goal of <5% probability of a child blood lead concentration of 10 µg/dL. Please keep in mind that this finding is based on one sample result at this specific location, and cannot be considered representative of other locations at the facility. This finding does, however, show that there are lead concentrations in the surface soil at the facility which could present an unacceptable risk to children living on-site in a residential setting.

Because pesticides are a significant contaminant at the site, we evaluated a residential scenario based on potential future occupant exposure to pesticides alone. Because samples analyzed for pesticides in the surface soil are more widely spread across the site, we were unable to identify any areas where sufficient samples were collected in an exposure area to support the use of a 95% UCL as the EPC. Therefore, our evaluation is based on the maximum contaminant concentrations at each location. In examining the site data for areas most likely to represent a RME due to pesticides in surface soil, we selected data from two separate sampling locations. We felt that evaluating two distinct locations from opposite sides of the site might give a somewhat more representative picture of potential risk to hypothetical future residents from pesticide contamination in the surface soil. Sample SP-J is located in the southwest corner of the facility in an area which appears to receive runoff from the former production buildings and the South Pond. Sample SB-33 (aka OG-33) is located south of the production building. As in Table 1, we again compared the maximum concentrations at each location with the Region 6 screening levels for residential soil. Again, by comparing those screening levels with the pesticide concentrations at the DICO facility, one can quickly derive potential risk estimates for future residential use of the site. This comparison is shown in Table 2 below.

Table 2: Residential scenario, pesticides in surface soil, risk estimates

Location	Contaminant	Maximum concentration, µg/kg	Region 6 screening level, µg/kg	Cancer risk estimate
SP-J	Aldrin	820,000	29	3E-02
	Dieldrin	93,000	30	3E-03
			Total risk	3E-02
SB-33	Aldrin	300	29	1E-05
	Dieldrin	12,000	30	4E-04
	Chlordane	14,000	1600	9E-06
			Total risk	4E-04

As can be seen in Table 2, the potential risk to a resident living in either of the two locations evaluated is outside of EPA's target risk range.

Future Construction Worker Scenario

We selected boring DB-56 as the location for evaluation of the future construction worker scenario. As shown in Figure 3-2 of the 1992 RI report, this boring is located in the western portion of the property. Again, because of the widespread nature of the subsurface sampling locations, we could find no areas with sufficient sampling to allow the statistically valid calculation of a 95% UCL using ProUCL. Therefore, the maximum concentrations from boring DB-56 were used in the risk estimate calculation. This location was selected because, based on the data summary in Appendix 1 of the 1995 report, it appears most likely to present the reasonable maximum exposure to a future construction worker. Sample results evaluated here are from the 6 – 8 foot depth interval. When evaluating a construction worker scenario, we typically assume that a construction worker may be exposed to soil contaminants to a depth of 10 feet, roughly what one would expect to be the maximum depth of excavation for a building foundation or utility trench.

Because there are no screening levels which have been developed based on default exposure assumptions for construction workers, it was necessary for us to develop risk estimates. The default exposure assumptions we used are shown in Table 3.

Table 3: Default exposure assumptions for future construction worker scenario

Parameter	Value	Reference
Ingestion rate, IR	330 mg/d	EPA, 2002
Exposure frequency, EF	250 d/yr	EPA, 2002
Exposure duration, ED	1 yr	EPA, 2002
Body weight, BW	70 kg	EPA, 2002
Surface area, SA	3,300 cm^2	EPA, 2002
Events per day, EV	1	EPA, 2002
Averaging time, AT	25,550 days	EPA, 2002
Adherence factor, AF	0.3 mg/cm^2-event	EPA, 2002
Dermal absorption factor,	Contaminant specific	EPA, 2004a

ABSd		
Contaminant Concentration in soil, Cs	Contaminant specific	
Conversion Factor, CF	1E-09 kg/µg	
Cancer Slope Factor, oral, CSF_o	Contaminant specific	
Cancer Slope Factor, dermal, CSF_d	Contaminant specific	

The risk estimates were derived from the following equation, and are shown in Table 4, below.

$$\text{Cancer risk} = Cs \times EF \times ED \left[\frac{(CSF_o \times IR) + (CSF_d \times AF \times ABSd \times SA \times EV)}{BW \times AT}\right] \times CF$$

Table 4: Future construction worker scenario, risk estimates

Compound	Maximum concentration, µg/kg	CSF_o*, $(mg/kg\text{-}d)^{-1}$	CSF_d#, $(mg/kg\text{-}d)^{-1}$	Cancer risk estimate
Aldrin	5,500	17	17	6E-06
Chlordane	7,900	0.35	0.35	1E-07
Heptachlor	5,000	4.5	4.5	1E-06
Dieldrin	335	16	16	3E-07
			Total risk	7E-06

* all values taken from Integrated Risk Information System (IRIS)
# extrapolated from oral cancer slope factor

As shown in Table 4, the total risk to a future construction worker excavating in this particular location is estimated to be 7E-06, which is within EPA's target risk range. As a reminder, soil sampling efforts at the site do not appear to have been sufficiently detailed to identify any "hot spots" which might exist.

Future Youth Visitor Scenario

There are also no readily available health-based screening levels which have been developed based on default exposure assumptions for recreational use scenarios. Therefore, it was necessary for us to develop cancer risk estimates based on assumptions we believe would represent a reasonable maximum exposure for recreational use of the site. We assumed that the most likely reasonable maximum exposure would be to a youth hiking in the area surrounding the South Pond.

For this evaluation, we assumed an exposure area which would encompass the following surface soil sample locations: SB (OG)-6, SB (OG)-9, SB (OG)-10, SB (OG)-11, SB (OG)-12, SP-F, SP-G, SP-H, and SS-5. With one exception, only detected surface soil concentrations were used. Sample results for SB-6, SB-9, SB-10, SB-11, and SB-12 can be found in Appendix 7 of the 1992 RI report. Sample results for SP-F, SP-G, and

SP-H can be found in Appendix 2 of the 1992 RI report. Sample results for SS-5 can be found in Appendix 1 of the 1992 RI report. Sample SS-5 is the one sample where non-detect (ND) concentrations were used in our evaluation. All of the detection limits reported for contaminants at this particular location are much higher than what one would expect. We suspect that this is the result of interference with laboratory analytical tools due to high concentrations of contaminants. Therefore, for those contaminants which are known to be present at the site, we elected to use ½ the detection limit as a proxy for the true contaminant concentration. This is consistent with EPA guidance (EPA, 1989) which recommends against the omission of non-detected results from the risk assessment without justification, and recommends instead the use of ½ the detection limit as a proxy concentration.

Our youth visitor scenario anticipated a youth visiting the South Pond area on average one time per week, from the age of 7 to the age of 16, over a period of 10 years. We also assumed that the youth visitor would walk randomly throughout the South Pond area, favoring no one location over another. Because as many as nine different sampling locations plausibly occur in the South Pond area, we calculated 95% UCLs for the contaminants in question. These UCLs were calculated using EPA's ProUCL statistical software program (EPA, 2007). In accordance with EPA guidance (EPA, 1989), in instances where UCLs were calculated, the lower of the UCL or maximum concentration for each contaminant was used as the exposure point concentration (EPC) in our risk estimates. For several of the contaminants, an insufficient number of samples were taken, or exhibited contamination, to allow the calculation of a statistically valid UCL. For those contaminants, the maximum concentration was used as the EPC. Exposure was assumed to occur by incidental ingestion of, and dermal contact with, contaminated surface soil. The main exposure assumptions we used are shown in Table 5, and the risk estimates we arrived at are shown in Table 6.

Table 5: Future youth visitor scenario, exposure assumptions

Parameter	Value	Reference
Concentration in soil, Cs	Contaminant specific	
Ingestion rate, IR	50 mg/d	BPJ
Skin surface area, SA	4,000 cm^2	EPA, 1997
Exposure frequency, EF	52 d/yr	BPJ
Exposure duration, ED	10 yr	BPJ
Body weight, BW	43 kg	EPA, 1997
Averaging time, AT	25,550 d	EPA, 1989
Event frequency, EV	1 event/d	BPJ
Dermal absorption fraction, ABSd	Contaminant specific	EPA, 2004a
Adherence factor, AF	0.2 mg/cm^2-event	EPA, 2004a

The equation used to evaluate this scenario is essentially the same as the one for the future construction worker scenario shown above:

$$\text{Cancer risk} = Cs \times EF \times ED \frac{[(CSF_o \times IR) + (CSF_d \times AF \times ABSd \times SA \times EV)]}{BW \times AT} \times CF$$

Table 6: Future youth visitor scenario, risk estimates

Compound	Maximum concentration, µg/kg	95% UCL, µg/kg	EPC, µg/kg	CSF_o*, $(mg/kg\text{-}d)^{-1}$	CSF_d#, $(mg/kg\text{-}d)^{-1}$	Cancer risk estimate
Aldrin	9,400	10,487	9,400	17	17	1E-05
Dieldrin	59,000	47,462	47,462	16	16	5E-05
Chlordane	27,000	27,537	27,000	0.35	0.35	4E-07
BHC (Lindane)	1,300	Insufficient samples	1,300	1.3	1.3	7E-08
DDD	2,750	2,422	2,422	0.24	0.24	2E-08
DDE	520	Insufficient samples	520	0.34	0.34	6E-09
DDT	3,500	4,966	3,500	0.34	0.34	4E-08
2,3,7,8-TCDD	0.14	Insufficient samples	0.14	1.5E+05	1.5E+05	7E-07
					Total risk	6E-05

* all values taken from IRIS
# extrapolated from oral cancer slope factor

Given the exposure assumptions used here, the potential lifetime cancer health risk is within EPA's target risk range. Again, we would caution that soil sampling efforts at the site do not appear to have been sufficiently detailed to identify any "hot spots" which might exist.

Vapor Intrusion Scenario

Finally, we developed risk estimates which consider the migration of VOCs from groundwater into on-site buildings. For this estimate, we relied on groundwater concentrations taken from the October 2006 annual report. There is an insufficient number of groundwater sampling results to allow the statistical development of a groundwater EPC. Therefore, the maximum contaminant concentration was used in our risk estimate. Wells ERW-6 and ERW-7 both contain high concentrations of TCE, with the concentration being slightly higher in Well ERW-7. Therefore, the TCE concentration of 560 µg/l from this well was selected for our evaluation. We relied on the Johnson & Ettinger vapor intrusion software contained in the most recent EPA vapor intrusion guidance (EPA, 2004b). Because of the limited amount of groundwater data available, we used the 'groundwater screen' software portion of the Johnson & Ettinger model. Most of the parameters relied on in our evaluation are given default values in the model, with the exception of the following parameters for which more specific values could be found in other references:

Parameter	Value or Type	Reference
Groundwater temperature	11° C	EPA, 2004b
Depth to groundwater	20 feet	1992 RI report, boring log for DB-6
Most permeable subsurface soil type	Sand	1992 RI report, boring log for DB-6

The results of our evaluation are contained in Attachment 2 which identifies the parameters and assumptions used in the J&E model's calculation of potential incremental risk. In this case, the potential risk from the intrusion of TCE vapors into on-site buildings, given the assumptions and contaminant concentration used, is estimated by the model to be 4.5E-03. Based on this result, one can conclude that the intrusion of VOCs from groundwater into on-site buildings could result in a potential health risk to building occupants outside of EPA's target risk range. Therefore, if on-site buildings are to be occupied by workers or residents, additional investigation of the soil gas and/or building interiors would be warranted to more adequately determine whether unacceptable exposure to VOCs could exist in building interiors.

Conclusion

In summary, our screening level review evaluated four different scenarios: future residential use, future construction worker, future recreational use, and vapor intrusion. Based on the available data, and the exposure assumptions used, both the future residential use scenario and the vapor intrusion pathway demonstrated the potential for development of cancer over a lifetime is outside of EPA's target risk range. So long as the existing cap remains in place and is well-maintained, site access is restricted, and workers are not exposed to VOCs which may be inside the buildings, we would expect no completed exposure pathways to exist. However, if in the future the cap were to be removed and use of the site were to become possible, it appears that completed exposure pathways resulting in the potential for unacceptable risks to human health could exist, without additional site investigation and cleanup.

The risk estimates for both the future construction worker scenario and the future youth visitor scenario were within EPA's target risk range. However, we would caution that soil sampling at the site appears to have been insufficient to identify any contaminant "hot spots" which might exist.

We would also like to reiterate the screening level nature of our review, and the limited data upon which it is based. Because of the limited amount of data collected to date, one should expect there to be considerable uncertainty in our risk estimates. Actual risks could be greater or less than those presented here.

Please do not hesitate to contact me at x7709 if you have any questions regarding our review.

References

Black & Veatch. 1995a. Final Remedial Investigation Report for the Des Moines TCE Site, Operable Unit No. 4, Des Moines, Iowa; Volume I.

Black & Veatch. 1995b. Final Remedial Investigation Report for the Des Moines TCE Site, Operable Unit No. 4, Des Moines, Iowa; Volume II, Baseline Risk Assessment.

Eckenfelder, Inc. 1992. Draft Des Moines South Area Source Control Operable Unit, Remedial Investigation Report.

EPA. 1989. Risk Assessment Guidance for Superfund, Part A. Office of Emergency and Remedial Response, Washington, D.C.

EPA. 1990. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule. Federal Register, 55, No. 46.

EPA. 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. Office of Solid Waste and Emergency Response. Washington, D.C.

EPA. 1997. Exposure Factors Handbook. Office of Research and Development. Washington, D.C.

EPA. 2002a. User's Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK). Office of Solid Waste and Emergency Response. Washington, D.C.

EPA. 2002b. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. Office of Solid Waste and Emergency Response, Washington, D. C.

EPA. 2004a. Risk Assessment Guidance for Superfund, Part E, Supplemental Guidance for Dermal Risk Assessment. Office of Superfund Remediation and Technology Innovation, Washington, D.C.

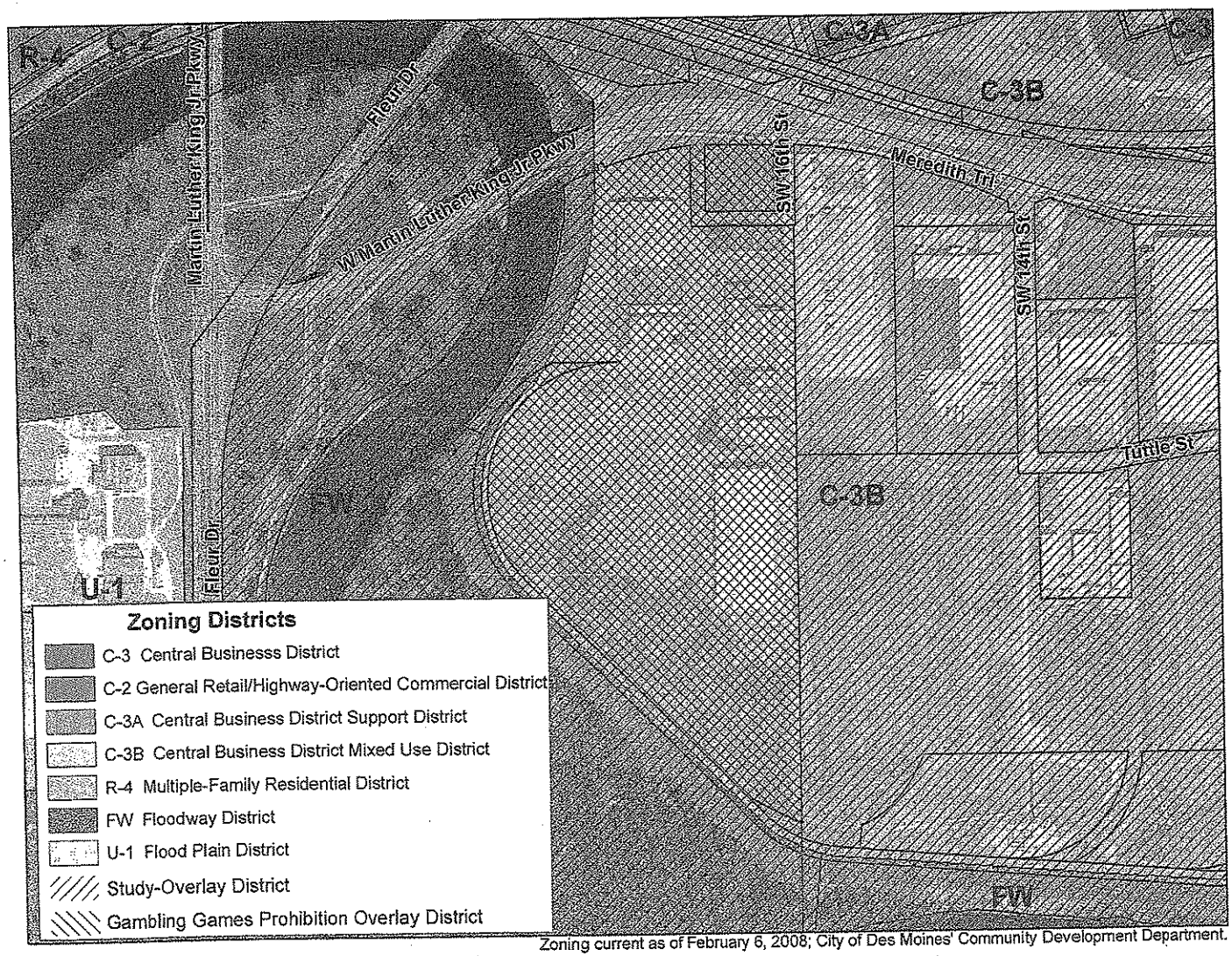
EPA. 2004b. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. Office of Emergency and Remedial Response. Washington, D.C.

EPA. 2006. Human Health Medium-Specific Screening Levels. EPA Region 6, Dallas, TX.

EPA. 2007. ProUCL Version 4.0 User Guide. Office of Research and Development, National Exposure Research Laboratory, Las Vegas, NV.

Attachment 9

Current Zoning Map
February 6, 2008



Zoning current as of February 6, 2008; City of Des Moines' Community Development Department.