269151

Technical Memorandum
Remedy Selection Process

1190505040 -- Madison County -- ILR000128249
The Hartford Area Hydrocarbon Plume Site
Hartford, Illinois

Prepared for:

THE HARTFORD WORKING GROUP

Hartford, Illinois

Clayton Project No. 15-03095.16-001
March 9, 2005

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1.0 INTRODUCTION

This technical memorandum has been prepared to outline the process to be undertaken for selecting a final remedy in the Village of Hartford, Illinois. The AOC requires that vapors, liquid LNAPL and groundwater be addressed as part of the active recovery design. The vapors are currently being addressed through the upgrade and expansion of the Vapor Control System (VCS) throughout the Village of Hartford. The dissolved-phase remedy selection is planned for completion in the future following the implementation of the dissolved-phase groundwater investigation plan that is currently in the planning stages. Therefore, the groundwater remedy selection process will be completed as a separate activity and submittal.

The information obtained from the pilot testing and additional data gathering will be used to complete the remedy selection process. The primary focus of the pilot testing is to determine if other LNAPL removal approaches besides soil vapor extraction will assist in optimizing LNAPL removal. At present, the information available indicates that the soil vapor extraction will be the primary component of the final LNAPL removal remedy. The volatile nature of the LNAPL (i.e., lighter end hydrocarbons) and the permeability of the Main Sand, provide the appropriate environment for removal of LNAPL through vapor extraction.

Air discharge samples collected during previously conducted soil vapor extraction pilot testing indicated that the mass of petroleum hydrocarbons that can be removed with the VCS is at least 2 orders of magnitude higher than conventional liquid removal. Using the lowest concentration data collected during the soil vapor extraction pilot test (i.e., 60,000 ppbv TPH as gasoline), and the design flow capacity of the upgraded system (2,250 scfm), it is estimated that approximately 50,000 gallons per month of LNAPL might be removed through SVE alone. In comparison, the skimmer pumps deployed in RW-2 and

2.0 SITE DESCRIPTION

2.1 LOCATION

The location and lateral extent of the LNAPL plume within Hartford has been defined by previous investigations (see the October 29, 2004 *Free-Phase Hydrocarbon Investigation Report*). In general, the LNAPL plume in the Main Sand is bounded as follows:

- Rand Avenue to the north;
- North Olive Street to the east;
- E. Watkins Street to the south and;
- Old St. Louis Road to the west.

The LNAPL plume in the Main Sand is generally present at depths ranging from approximately 29 to 33 feet below ground surface (bgs). The largest apparent free product thickness, ranging above 2 feet, is observed on the eastern side of the northern portion of Hartford, generally between East Cherry Street to the north, East Forest Street to the south and North Market Street to the west. This area is proximate to both the Elm Street and North Olive Street petroleum pipeline corridors.

Monitoring wells in Hartford and the surrounding area have been gauged on a monthly basis since September 2004. From these gauging events, apparent product thickness maps have been developed for each month (September, October, November, and December 2004 and January and February 2005). These maps (Figures 2-1, 2-2, 2-3, 2-4, 2-5, and 2-6) highlight those areas where the apparent product thickness is greater than one foot thick. Comparing these current product thickness maps to historic maps prepared by others more than 10 years ago shows that the product plume location appears to be stable but that the product's apparent thickness appears to be less.

MP-55C recovered less than 60% during the first hour and recovered to 98 % after 1,125 minutes.

Four of the eight wells (HMW-48C, MP-39C, MP-45C, and MP-53C) recovered less than 40 % of their initial apparent thickness during the measured recovery period. The recovery at MP-47C generally stabilized at approximately 40% of initial apparent thickness after 55 minutes, then spiked to approximately 147% during the next 27 minutes, remaining at that level over the next 40 minutes.

Figure 2-1 includes the bail-down test results for seven of the eight wells. HMW-48C is screened in the EPA Stratum so therefore is not shown on Figure 2-1.

Free product recovery has been ongoing at RW-2 & RW-5 (located in the secure area next to 507 North Olive Street) and RW-4A (located in the secure area on the south side of East Birch Street) since September 2004 after the conclusion of the multi-phase extraction tests conducted at these locations. The total free product recovered between September 2004 and February 22, 2005 is 1,134 gallons (578 gallons from RW-2 and RW-5 and 556 gallons from RW-4A). Table 2-1 presents the free product recovered from these locations.

with daily events and be modified based on the recharge rate observed. Water and LNAPL level measurements will be made prior to each removal event and tracked to evaluate the recharge of LNAPL thickness and volume in each well. Monitoring for the 2-month period will provide information on the potential impact of groundwater elevation on LNAPL recovery efficiency.

Following the 2-month test, the HWG will continue to periodically remove liquids from these wells while the remedy selection process and design proceeds. The frequency of removal events (after the pilot test) will be based on the speed of recovery of the LNAPL. The Agency will be provided with the proposed frequency for recovery events following the pilot test completion.

3.1.2 LNAPL Recovery Pump Installation

The results of the vacuum removal of LNAPL will be evaluated to determine if additional LNAPL recovery pumps are warranted. If additional recovery pumps are deemed appropriate, they will be deployed in selected areas with the discharge directed to secondary-contained tanks. These tanks can be located and secured with a permanent fence. Product piping from these wells would be installed below ground and connected to the aboveground tanks. The discharge hoses would be secondarily contained in a 4-inch ID HDPE sleeve within the trench. Concrete access vaults would be installed at each well to allow for access to the wells and maintenance of the pumps. Compressed air lines would be installed in the discharge piping trench and connect to a compressor system installed within the secured tank compound.

The operation of these recovery pumps would continue until the flowable LNAPL is removed from the area of the well. During the operation, LNAPL thickness in the recovery wells and surrounding wells would be monitored monthly (as part of the ongoing groundwater elevation measurements). In addition, recovered LNAPL volume

3.1.4 Vapor Control System Startup

As part of the initial start-up of the Vapor Control System (VCS), extensive monitoring of vacuum influence and mass removal will be conducted to determine its effectiveness. Air discharge samples were collected during previously conducted pilot testing, prior to the design of the current VCS upgrade. Using the lowest concentration data, i.e., 60,000 ppbv TPH as gasoline, and the design flow capacity of the upgraded system (2,250 scfm), it is estimated that approximately 50,000 gallons per month of LNAPL might be removed through SVE alone.

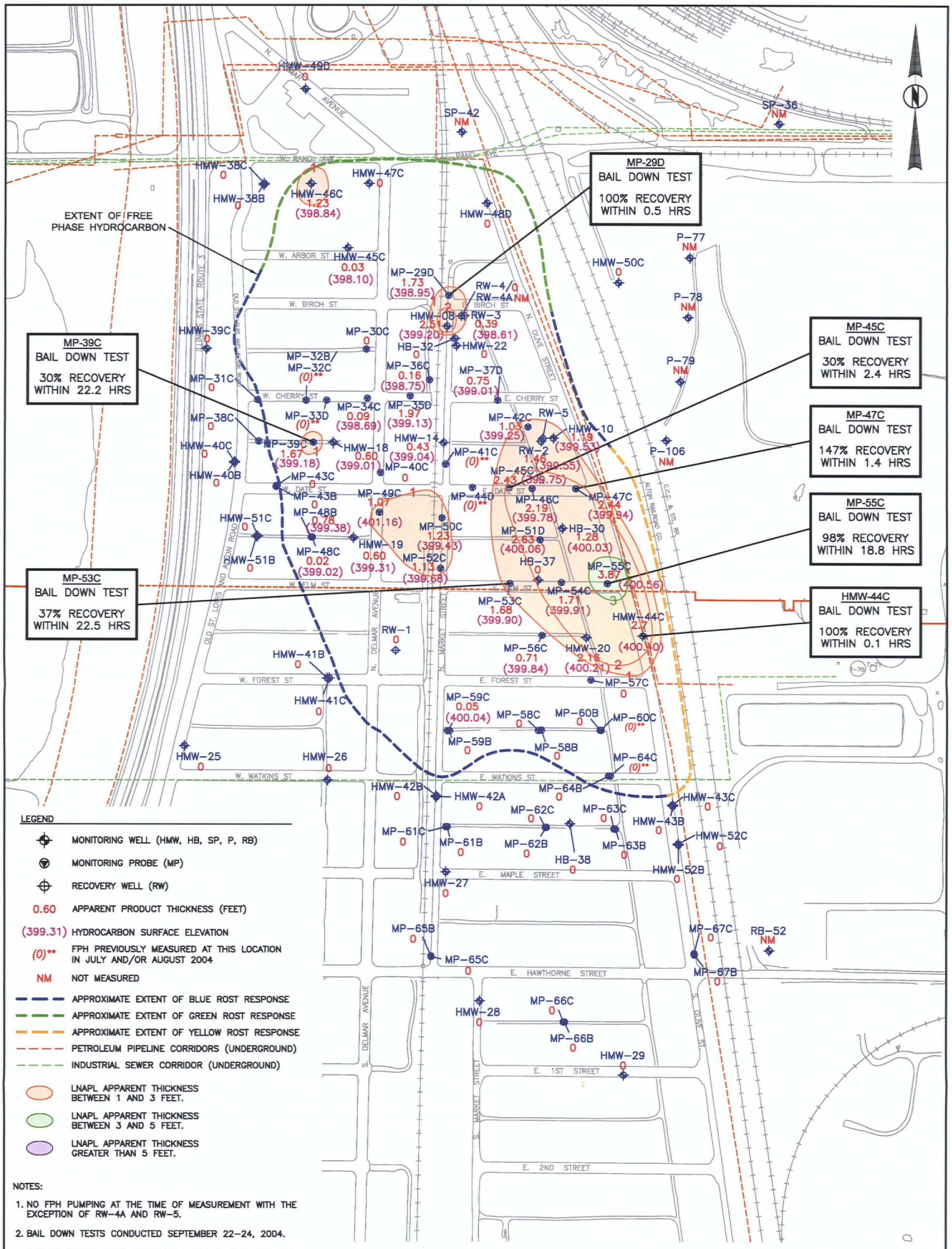
Based on these expected results from the VCS, monitoring of system extraction rates and concentrations will be conducted to calculate the expected mass removal rate for LNAPL using vapor extraction. We consider the first 2 months of operation as a pilot test for evaluating both mitigation of vapor intrusion into homes and effectiveness as an LNAPL recovery/removal approach.

5.0 SCHEDULE

Figure 5-1 presents the proposed schedule for gathering the necessary design data and completing the remedy selection technical memorandum for LNAPL removal in the Village of Hartford.

Figures

FIGURES



NOTES:

1. NO FPH PUMPING AT THE TIME OF MEASUREMENT WITH THE EXCEPTION OF RW-4A AND RW-5.
2. BAIL DOWN TESTS CONDUCTED SEPTEMBER 22-24, 2004.
3. TOP OF CASING (TOC) ELEVATIONS USED IN THIS MAP FOR VILLAGE WELLS WERE OBTAINED BY SURVEY COMPLETED BY CMT, INC. IN 2003 AND 2004. TOC ELEVATIONS FOR ALL OTHER WELLS WERE OBTAINED FROM 2003, 2004, AND HISTORICAL SURVEYS BY CMT, INC.
4. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.

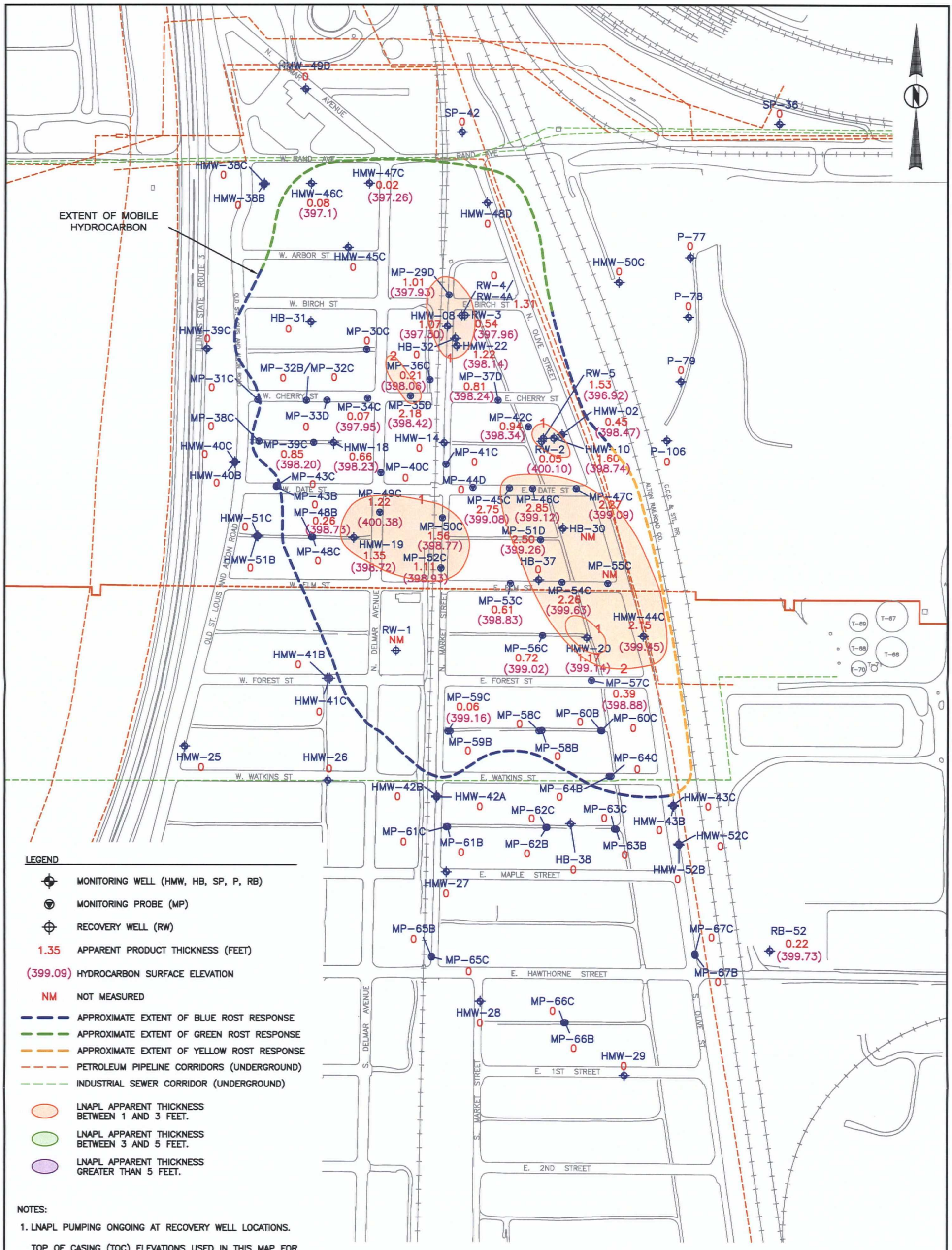
CHECK BY	KDC
DRAWN BY	BCP
DATE	10-15-04
SCALE	AS SHOWN
CAD NO.	0309514006J
PRJ NO.	15-03095

APPARENT LNAPL THICKNESS AND ELEVATION MAP
SEPTEMBER 20-22, 2004 - MAIN SAND

THE HARTFORD HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS

Clayton GROUP SERVICES

FIGURE 2-1



LEGEND

- MONITORING WELL (HMW, HB, SP, P, RB)
- MONITORING PROBE (MP)
- RECOVERY WELL (RW)
- 1.35 APPARENT PRODUCT THICKNESS (FEET)
- (399.09) HYDROCARBON SURFACE ELEVATION
- NM NOT MEASURED
- APPROXIMATE EXTENT OF BLUE ROST RESPONSE
- APPROXIMATE EXTENT OF GREEN ROST RESPONSE
- APPROXIMATE EXTENT OF YELLOW ROST RESPONSE
- PETROLEUM PIPELINE CORRIDORS (UNDERGROUND)
- INDUSTRIAL SEWER CORRIDOR (UNDERGROUND)
- LNAPL APPARENT THICKNESS BETWEEN 1 AND 3 FEET.
- LNAPL APPARENT THICKNESS BETWEEN 3 AND 5 FEET.
- LNAPL APPARENT THICKNESS GREATER THAN 5 FEET.

NOTES:

1. LNAPL PUMPING ONGOING AT RECOVERY WELL LOCATIONS.
2. TOP OF CASING (TOC) ELEVATIONS USED IN THIS MAP FOR VILLAGE WELLS WERE OBTAINED BY SURVEY COMPLETED BY CMT, INC. IN 2003 AND 2004. TOC ELEVATIONS FOR ALL OTHER WELLS WERE OBTAINED FROM 2003, 2004, AND HISTORICAL SURVEYS BY CMT, INC.
3. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.

SCALE IN FEET

0 150 300 600

CHECK BY	KDC
DRAWN BY	BCP
DATE	12-15-04
SCALE	AS SHOWN
CAD NO.	0309514007d1
PRJ NO.	15-03095

APPARENT LNAPL THICKNESS AND ELEVATION MAP
OCTOBER 18-21, 2004 – MAIN SAND

THE HARTFORD AREA HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS

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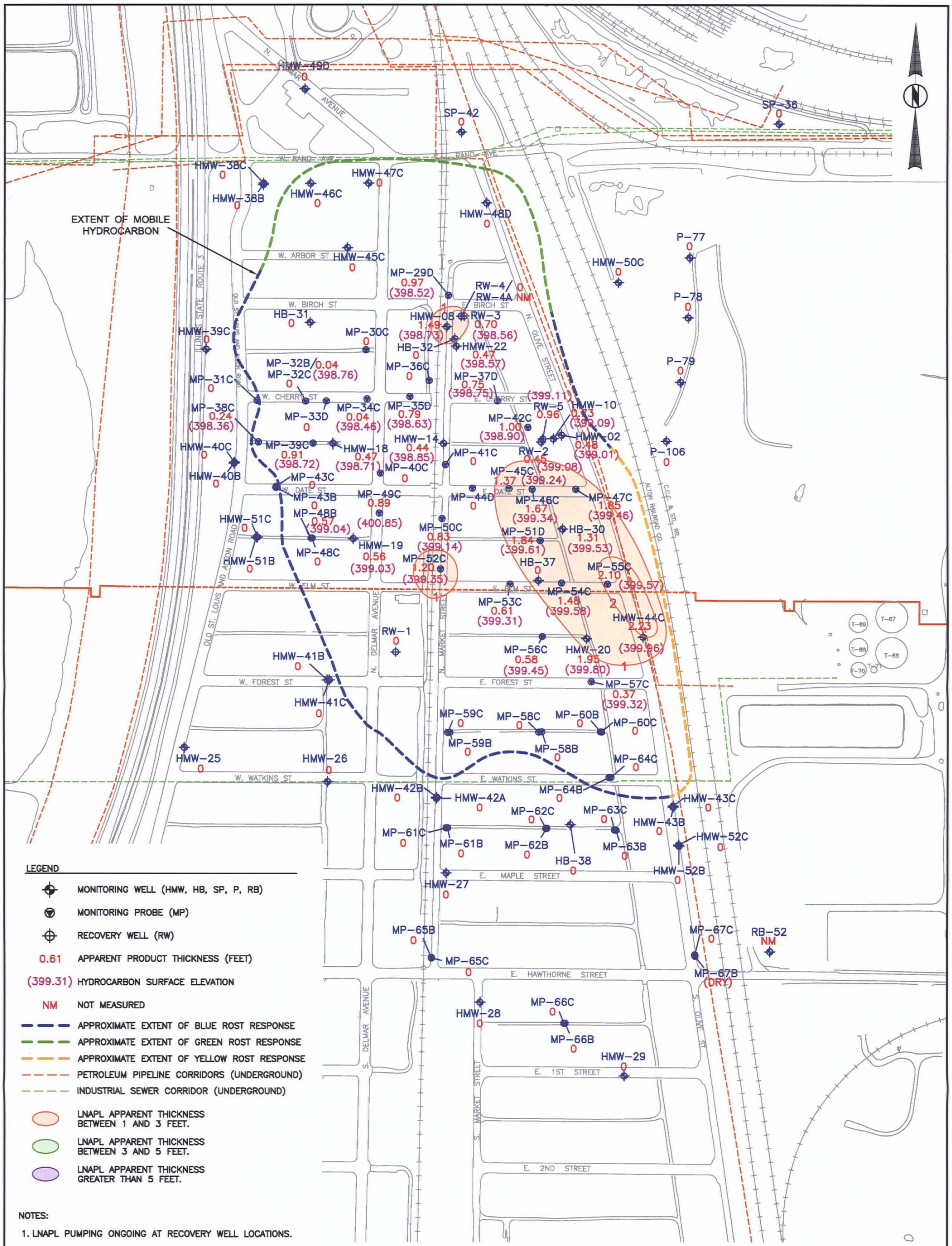
FIGURE 2-2



LEGEND

- MONITORING WELL (HMW, HB, SP, P, RB)
- MONITORING PROBE (MP)
- RECOVERY WELL (RW)
- 0.61 APPARENT PRODUCT THICKNESS (FEET)
- (399.31) HYDROCARBON SURFACE ELEVATION
- NM NOT MEASURED
- APPROXIMATE EXTENT OF BLUE ROST RESPONSE
- APPROXIMATE EXTENT OF GREEN ROST RESPONSE
- APPROXIMATE EXTENT OF YELLOW ROST RESPONSE
- PETROLEUM PIPELINE CORRIDORS (UNDERGROUND)
- INDUSTRIAL SEWER CORRIDOR (UNDERGROUND)
- LNAPL APPARENT THICKNESS BETWEEN 1 AND 3 FEET.
- LNAPL APPARENT THICKNESS BETWEEN 3 AND 5 FEET.
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3. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.

SCALE IN FEET

0 150 300 600

CHECK BY	
DRAWN BY	BCP
DATE	12-15-04
SCALE	AS SHOWN
CAD NO.	0309514007d4
PRJ NO.	15-03095

APPARENT LNAPL THICKNESS AND ELEVATION MAP
NOVEMBER 15-17, 2004 - MAIN SAND

THE HARTFORD AREA HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS

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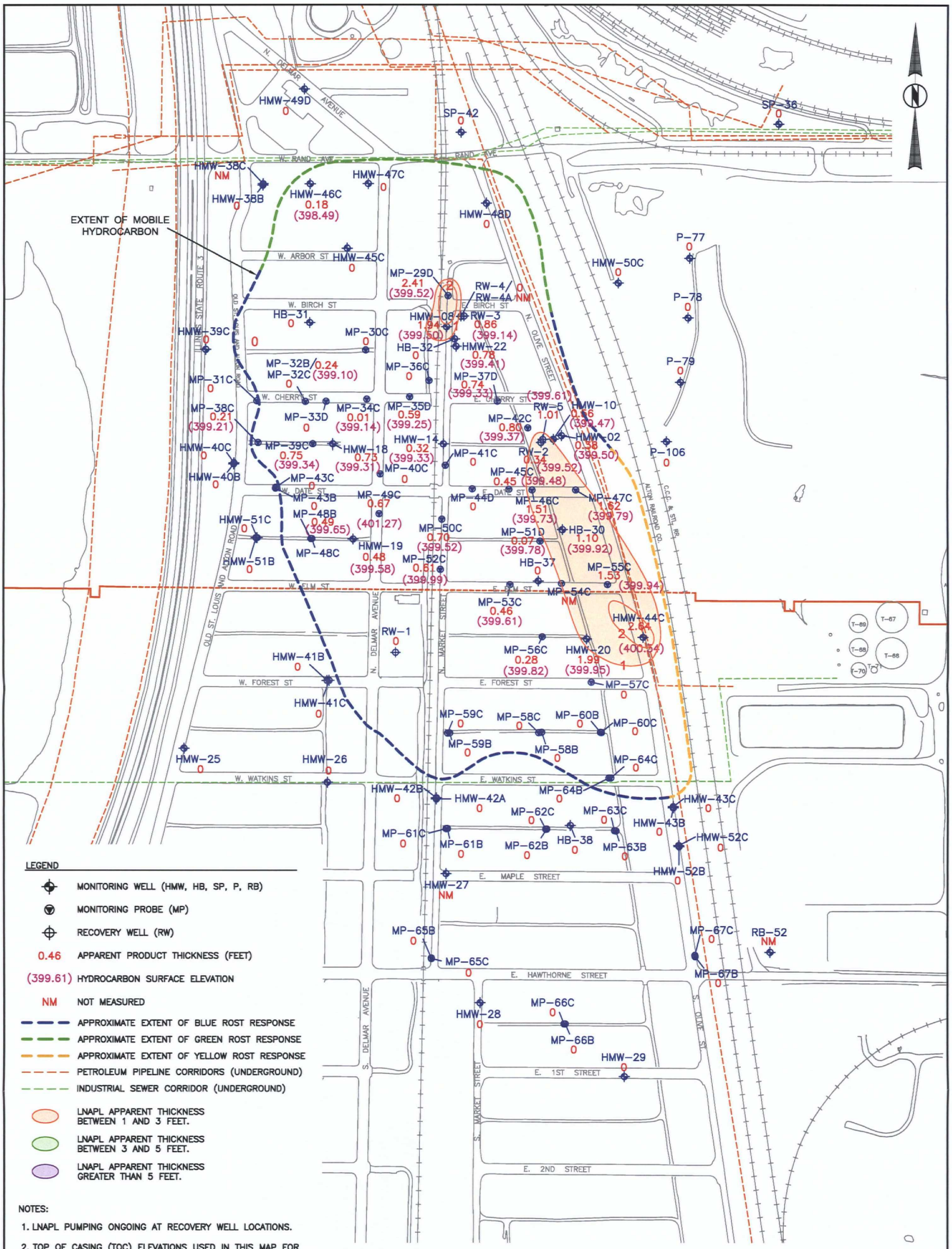
FIGURE 2-3



LEGEND

- MONITORING WELL (HMW, HB, SP, P, RB)
- MONITORING PROBE (MP)
- RECOVERY WELL (RW)
- 0.46 APPARENT PRODUCT THICKNESS (FEET)
- (399.61) HYDROCARBON SURFACE ELEVATION
- NM NOT MEASURED
- APPROXIMATE EXTENT OF BLUE ROST RESPONSE
- APPROXIMATE EXTENT OF GREEN ROST RESPONSE
- APPROXIMATE EXTENT OF YELLOW ROST RESPONSE
- PETROLEUM PIPELINE CORRIDORS (UNDERGROUND)
- INDUSTRIAL SEWER CORRIDOR (UNDERGROUND)
- LNAPL APPARENT THICKNESS BETWEEN 1 AND 3 FEET.
- LNAPL APPARENT THICKNESS BETWEEN 3 AND 5 FEET.
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NOTES:

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3. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.

SCALE IN FEET

0 150 300 600

CHECK BY	
DRAWN BY	BCP
DATE	1-11-05
SCALE	AS SHOWN
CAD NO.	0309514007d9
PRJ NO.	15-03095

APPARENT LNAPL THICKNESS AND ELEVATION MAP
DECEMBER 6-9, 2004 - MAIN SAND

THE HARTFORD AREA HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS

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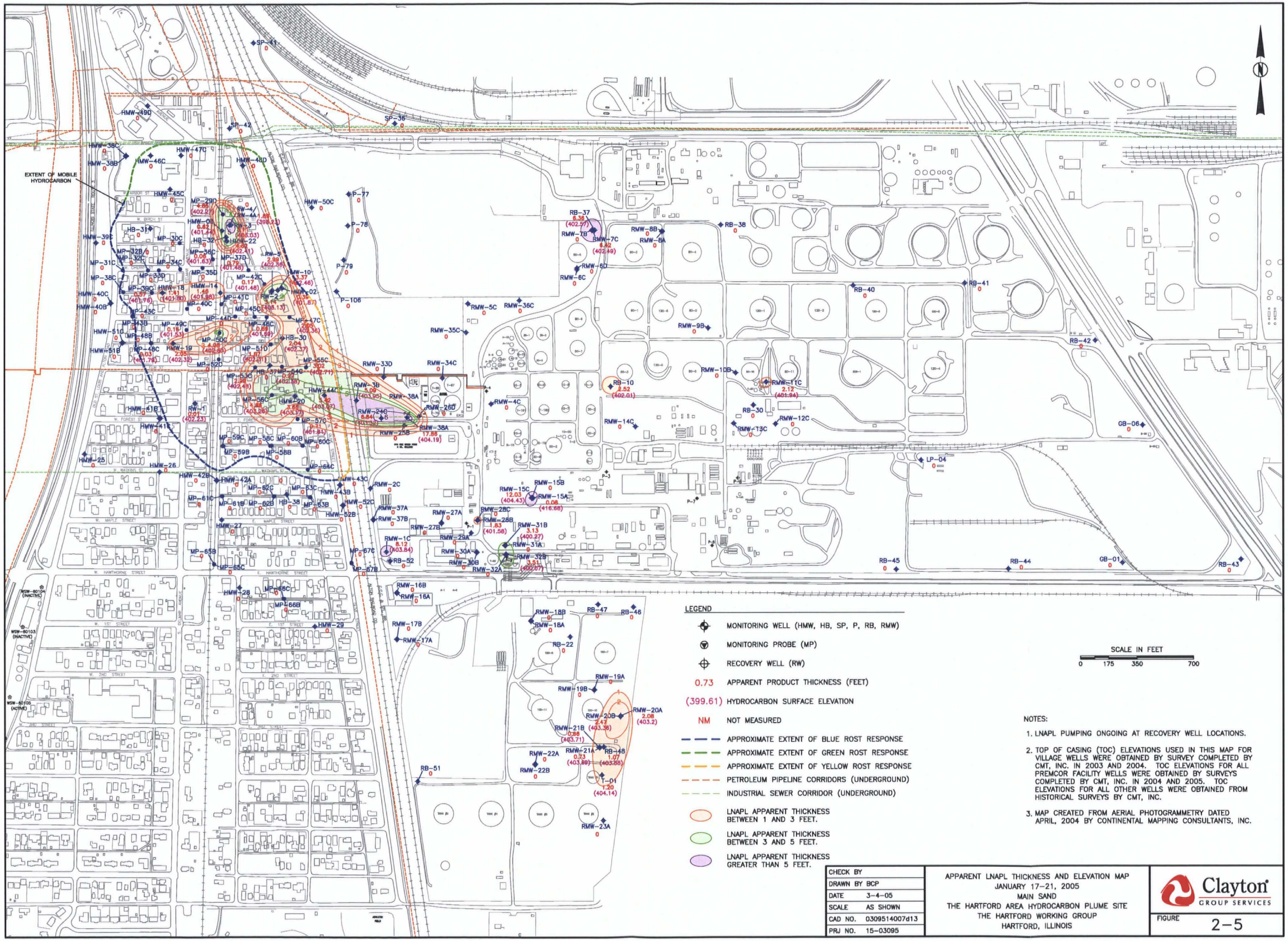
FIGURE 2-4


EXTENT OF MOBILE HYDROCARBON
LEGEND
MONITORING WELL (HMW, HB, SP, P, RB, RMW)
MONITORING PROBE (MP)
RECOVERY WELL (RW)
0.73 APPARENT PRODUCT THICKNESS (FEET)
(399.61) HYDROCARBON SURFACE ELEVATION
NM NOT MEASURED
APPROXIMATE EXTENT OF BLUE ROST RESPONSE
APPROXIMATE EXTENT OF GREEN ROST RESPONSE
APPROXIMATE EXTENT OF YELLOW ROST RESPONSE
PETROLEUM PIPELINE CORRIDORS (UNDERGROUND)
INDUSTRIAL SEWER CORRIDOR (UNDERGROUND)
LNAPL APPARENT THICKNESS BETWEEN 1 AND 3 FEET.
LNAPL APPARENT THICKNESS BETWEEN 3 AND 5 FEET.
LNAPL APPARENT THICKNESS GREATER THAN 5 FEET.
SCALE IN FEET
0 175 350 700
NOTES:
1. LNAPL PUMPING ONGOING AT RECOVERY WELL LOCATIONS.
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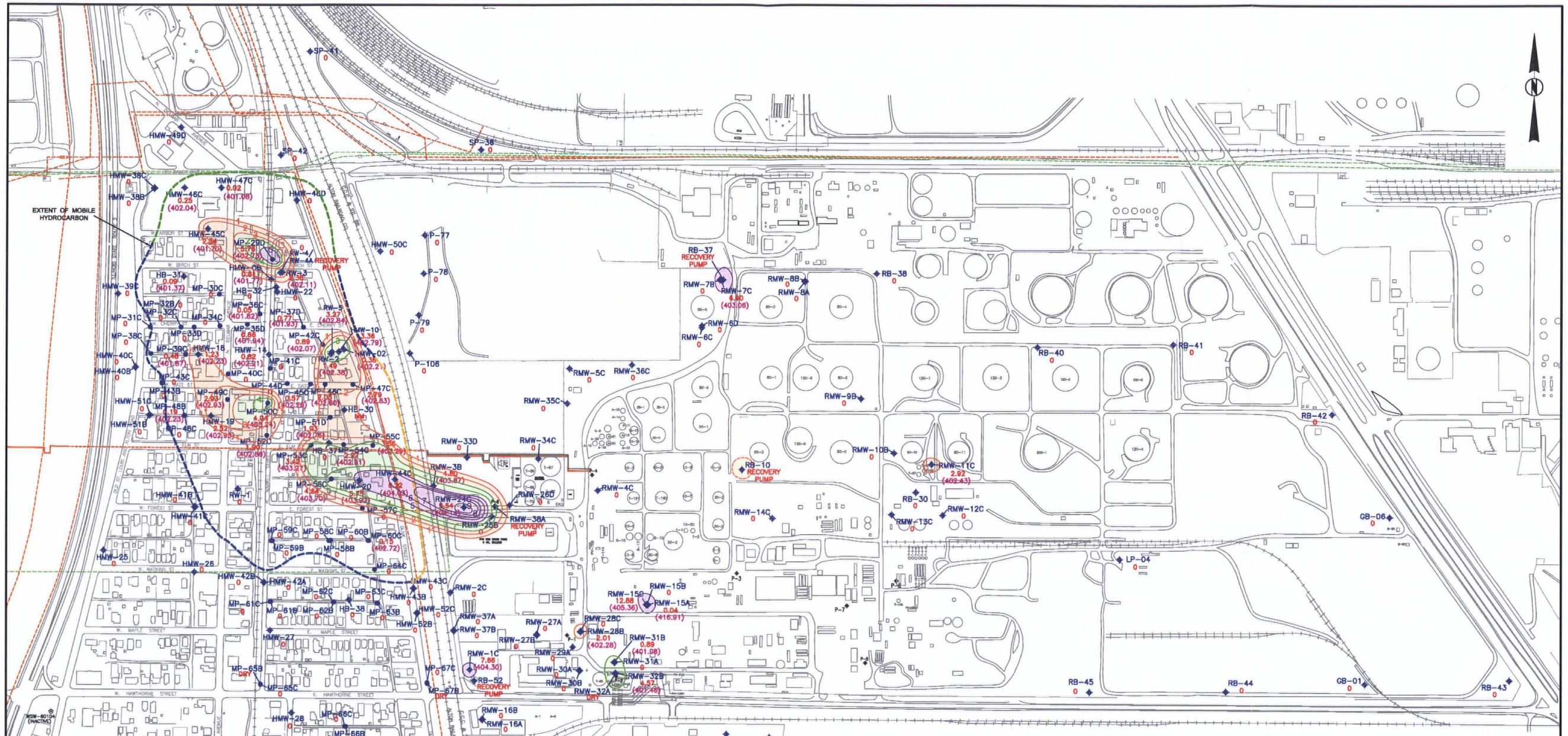
3. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.
CHECK BY
DRAWN BY BCP
DATE 3-4-05
SCALE AS SHOWN
CAD NO. 0309514007d13
PRJ NO. 15-03095
APPARENT LNAPL THICKNESS AND ELEVATION MAP
JANUARY 17-21, 2005
MAIN SAND
THE HARTFORD AREA HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS
Clayton GROUP SERVICES
FIGURE 2-5



LEGEND

- MONITORING WELL (HMW, HB, SP, P, RB, RMW)
- MONITORING PROBE (MP)
- RECOVERY WELL (RW)
- 0.86 APPARENT PRODUCT THICKNESS (FEET)
- (401.94) HYDROCARBON SURFACE ELEVATION
- NM NOT MEASURED
- APPROXIMATE EXTENT OF BLUE ROST RESPONSE
- APPROXIMATE EXTENT OF GREEN ROST RESPONSE
- APPROXIMATE EXTENT OF YELLOW ROST RESPONSE
- PETROLEUM PIPELINE CORRIDORS (UNDERGROUND)
- INDUSTRIAL SEWER CORRIDOR (UNDERGROUND)
- LNAPL APPARENT THICKNESS BETWEEN 1 AND 3 FEET.
- LNAPL APPARENT THICKNESS BETWEEN 3 AND 5 FEET.
- LNAPL APPARENT THICKNESS GREATER THAN 5 FEET.

SCALE IN FEET
0 175 350 700

NOTES:

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3. MAP CREATED FROM AERIAL PHOTOGRAMMETRY DATED APRIL, 2004 BY CONTINENTAL MAPPING CONSULTANTS, INC.

CHECK BY	
DRAWN BY	BCP
DATE	3-8-05
SCALE	AS SHOWN
CAD NO.	0309514007d13
PRJ NO.	15-03095

APPARENT LNAPL THICKNESS AND ELEVATION MAP
FEBRUARY 23-24, 2005
MAIN SAND
THE HARTFORD AREA HYDROCARBON PLUME SITE
THE HARTFORD WORKING GROUP
HARTFORD, ILLINOIS

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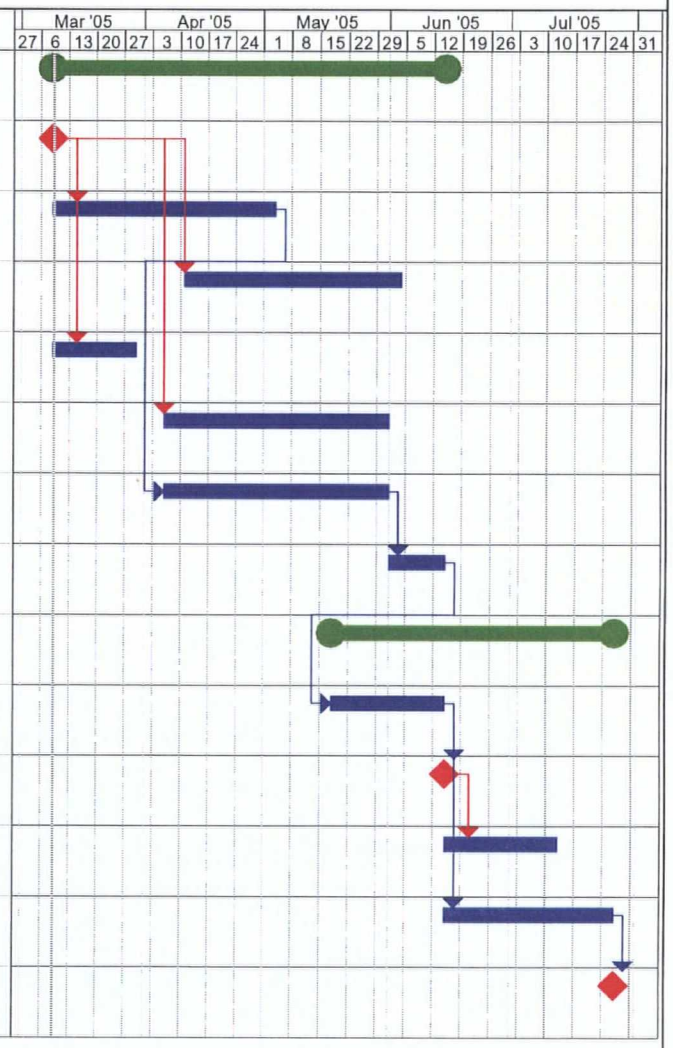
FIGURE 2-6

Figure 5-1
LNAPL Remedy Selection Schedule
Hartford, Illinois

ID	Task Name	Duration	Start	Finish
1	**Additional Data Gathering**	**70 days**	**Wed 3/9/05**	**Tue 6/14/05**
2	Submit Remedy Selection Process Technical Memo to USEPA	0 days	Wed 3/9/05	Wed 3/9/05
3	*Review and Approval of Technical Memo*	*8 wks*	*Wed 3/9/05*	*Tue 5/3/05*
4	Implement LNAPL Removal via Portable Vacuum Truck	8 wks	Mon 4/11/05	Fri 6/3/05
5	Dual-Phase Pilot Test - Premcor Property	3 wks	Wed 3/9/05	Tue 3/29/05
6	LNAPL Recovery Pump Installation and Operation (if necessary)	8 wks	Wed 4/6/05	Tue 5/31/05
7	Upgraded VCS Operation as Pilot Test	8 wks	Wed 4/6/05	Tue 5/31/05
8	Data Evaluation	2 wks	Wed 6/1/05	Tue 6/14/05
9	**Remedy Design**	**50 days**	**Wed 5/18/05**	**Tue 7/26/05**
10	Develop Proposal for Active Recovery (per AOC)	4 wks	Wed 5/18/05	Tue 6/14/05
11	Submit Active Recovery Proposal	0 days	Tue 6/14/05	Tue 6/14/05
12	Review and Approval of Active Recovery Proposal by USEPA	4 wks	Wed 6/15/05	Tue 7/12/05
13	Develop 90% Remedy Design	6 wks	Wed 6/15/05	Tue 7/26/05
14	Submit 90% Remedy Design to USEPA	0 days	Tue 7/26/05	Tue 7/26/05



Project: LNAPL Remedy Selection Prc
Date: Wed 3/9/05

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	

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TABLES

TABLE 2-1
Free Product Recovery Volumes

The Hartford Working Group / Hartford, Illinois

TANK GAUGING DATE	WELL ID	ESTIMATED VOLUME OF PRODUCT RECOVERED (gallons)	ESTIMATED TOTAL VOLUME OF PRODUCT RECOVERED TO DATE (gallons)
09/16/04	RW-2/5	23	23
12/16/04	RW-2/5	271	294
02/22/05	RW-2/5	284	578
09/16/04	RW-4A	127	127
12/16/04	RW-4A	236	363
02/22/05	RW-4A	193	556
Total Product Recovered Since August, 2004 =			**1,134**

NOTES:
9/16/04 and 12/16/04 were vacuum events. 2/22/05 is hydrocarbon/water mix presently in AST.