1.0 INTRODUCTION

This report documents the Washington Department of Ecology's (Ecology) periodic review of post-cleanup conditions at the North Market Street Superfund Site (Site). The purpose of the review is to ensure that the remedial actions selected in Cleanup Action Plan (CAP) and implemented at the Site continue to protect human health and the environment. The potentially liable persons (PLPs), Tosco Refining Company (Tosco) and Phillips Petroleum Company (Phillips), conducted the cleanup action at the Site. The PLPs implemented the CAP with Consent Decree 00207012-2 dated December 12, 2000. Phillips and Tosco merged during the completion of the cleanup action and retained the Phillips Petroleum name. In 2002, Phillips and Conoco Inc. merged to form the ConocoPhillips Company. Contaminants of concern include petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene (BTEX); polycyclic aromatic hydrocarbons (PAHs); arsenic and manganese.

The cleanup action consisted of shallow soil removal and on-site thermal treatment, installation and operation of an air sparging groundwater treatment system, and installation and operation of a vadose zone bioventing system. The shallow soil excavation removed soils from 15 to 20 feet below ground surface for treatment. This depth range is below the soil point of compliance for direct contact. Due to the proximity of underground utilities (i.e. natural gas and fuel pipelines) and contamination below practical excavation techniques, contaminated soil remains on-site. Residual soil contamination and a contaminated groundwater plume exceed cleanup levels established for the Site. In accordance with WAC 173-340-420(4), Ecology considers the following factors in determining whether human health and the environment are being protected:

(a) The effectiveness of ongoing or completed cleanup actions;
(b) New scientific information for individual hazardous substances of mixtures present at the site;
(c) New applicable state and federal laws for hazardous substances present at the Site;
(d) Current and projected site use;
(e) Availability and practicability of higher preference technologies; and
(f) The availability of improved analytical techniques to evaluate compliance with cleanup levels.

The department shall publish a notice of all periodic reviews in the site register and provide an opportunity for public review and comment.

2.0 SUMMARY OF SITE CONDITIONS

The following sections provide a brief Site history and a remedial action summary completed at the Site. In addition, the cleanup levels and the points of compliance for the Site are also discussed.

2.1 Site Description and History

The North Market Street Site (Site) is located in portions of Sections 15, 16, 21, 22, 27, and 28 Township 26 North, Range 46 East Willamette Meridian (WM), about one-mile north of the City of Spokane (Figure 1). Underlying the Site is the Spokane-Rathdrum Prairie Aquifer, which was designated as a "Sole Source Aquifer" in 1978 and provides the drinking water for approximately 500,000 people.

The Site is defined as the area of soil contamination and the groundwater contaminant plume. This definition includes the fuel terminal currently operated by the Holly Energy Partners, LP (Facility) and the groundwater plume where contaminants above background have been detected. Petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene (BTEX), polycyclic aromatic hydrocarbons (PAHs), arsenic, and manganese are indicator substances for the Site.

Several of the properties which comprise the North Market Street Site were developed as industrial or commercial facilities that were involved in or related to the refinement, recycling, and sale of petroleum products. In the late 1930s, several properties were developed as part of an oil refinery complex. Waste management practices common during that era resulted in releases of liquid refinery-related petroleum wastes into the environment. Refinery operations were discontinued in 1953. The facility continued operations as a petroleum tank farm after refinery decommissioning.

As early as 1978 local land owners and businesses located north of the present day Holly Energy Partners fuel terminal reported the presence of petroleum-laden soils on lands immediately north of the decommissioned oil refinery complex (Figure 2). In 1984 state officials confirmed the presence of petroleum contamination to groundwater from samples collected at three private water supply wells in the area. Use of those wells was discontinued and Ecology began supplying bottled water to users at that time. In 1991, the North Spokane Irrigation District No. 8 completed a 16-inch water line loop as far north as Magnesium Road to provide a potable water supply to users previously requiring alternate supplies.

In 1990 the US Environmental Protection Agency (EPA) listed the North Market Street Site on the federal Superfund National Priorities List (NPL) of hazardous waste sites requiring cleanup. After the Site was listed, EPA and Ecology agreed to have Ecology direct investigation and cleanup under the authority of the Model Toxics Control Act (MTCA) (Chapter 70.105D RCW).

The Phase I remedial investigation (RI) was completed in 1993. During the Phase I RI, Several borings and test pits were completed in order to characterize soil conditions and the extent of contamination. Ten groundwater monitoring wells were installed, which

provided an assessment of soil and groundwater conditions. Results from the Phase I RI indicated that petroleum hydrocarbon contaminants were present in the Spokane Aquifer beneath the Site above the Washington State cleanup level of 1 part per million (ppm). In addition, BTEX, arsenic, and manganese were present above their cleanup levels. Soil contamination in the surface and near-surface was delineated and characterized at the Site. The contamination included petroleum hydrocarbons, BTEX, PAHs, and metals.

The Phase II program was developed to further characterize and define the soil and groundwater information. The Phase II program was conducted in 1995 and was comprised of: installation and sampling of nine additional monitoring wells and two borings to bedrock; installation and sampling of thirteen vapor probes; excavation and soil sampling of 89 test pits; and treatability testing of select soil samples.

Phase II RI results showed the presence of petroleum hydrocarbon, PAH, BTEX, and metal contamination in Site near-surface soil (less than 15 feet); in deep soil to depths of 60 feet; and in soil at the water table (smear zone) about 150 to 170 feet below ground surface. Petroleum hydrocarbon and BTEX concentrations in soil vapor at depths of 50, 100 feet and below also were documented, and continue to be present in groundwater. Petroleum and BTEX chemicals in groundwater are detectable extending for about one-mile within the Spokane Regional Aquifer. The groundwater flow direction beneath the site is north-northwest.

The Phase I and II work is documented in a report titled Final-Draft Phase II Remedial Investigation Report – North Market Street Site, Spokane, Washington. June 1996. The Phase II RI Report presents a summation of previous investigations conducted at the site and the findings of the Phase II RI program.

Following completion of the Phase II report, additional RI work was conducted at the Site. The work was focused on defining areal extent of the groundwater plume. The work began in July 1996 and consisted of installing five monitoring wells along with collecting two quarterly rounds of groundwater and soil vapor samples for analyses. Quarterly groundwater and vapor monitoring began again in May 1998 and has continued to present. Groundwater contamination continues to be present at the facility and beyond facility boundaries. Free product has not been observed for over seven years.

In July 1998, Ecology requested four soil borings be drilled to the smear zone and the soil samples were to be collected for treatability testing. The sample testing indicated that microbes capable of biodegrading the petroleum hydrocarbon and BTEX contamination are present and a large reduction in contaminant mass is achievable. The work was completed to support the feasibility study and cleanup action plan. The feasibility study (FS) was finalized in June 1998 and the Cleanup Action Plan was finalized in November 1999.

The CAP was designed to provide source control measures in shallow soil contamination, and contaminant removal in vadose zone soil vapor and groundwater. The cleanup action for the shallow soil was excavation and thermal treatment of the excavated soil. The treated soil was returned to the excavation and compacted to 90 percent of maximum dry density. Bioventing was selected to address soil contamination beyond the excavation depth limit of 20 feet by enhancing biodegradation in the subsurface. Treatability testing results identified the presence of petroleum degrading bacteria and indicated that a large reduction in contaminant mass was probable with the addition of oxygen into the subsurface. A line of air sparging wells coupled with natural attenuation was chosen as the cleanup action for the groundwater plume. The air sparging line is located about 1,400 feet downgradient of the fuel terminal in an area where the groundwater plume contracts to about 300 feet laterally. Monitored natural attenuation was selected for the remedy downgradient of the sparge system.

2.2 Cleanup Levels and Points of Compliance

The soil and groundwater cleanup levels set in the CAP were calculated to provide a total Site risk less than 1×10^{-5} and a hazard index equal to or less than one for each toxic endpoint. The soil cleanup level for TPH was set using the interim TPH Policy (Ecology Publication No. ECY97-600, January 97) and was set at 6,000 mg/kg. The residential soil cleanup level used for property outside the fuel terminal was 3,000 mg/kg. The soil cleanup level for benzene is set at 0.5 mg/kg, and 1 ppm for total carcinogenic PAHs. The ethylbenzene and xylene cleanup level is 20 mg/kg while the toluene cleanup concentration is 40 mg/kg. The groundwater cleanup levels for TPH and benzene are 1,000 ug/kg and 5 ug/kg, respectively. The ethylbenzene and toluene cleanup concentrations are set at 30 and 40 ug/kg, while xylene is 20 ug/kg. Arsenic cleanup levels are set at 5 ug/kg and manganese concentrations are set at 50 ug/kg.

The groundwater point of compliance is established from the uppermost level of saturated zone to the lowest depth which could be potentially affected by the Site over the entire site. Ground water cleanup levels shall be met in all groundwater from the point of compliance to the outer boundary of the hazardous waste plume.

2.3 Remedial Construction Activities

The shallow soil excavation and treatment, air sparging, and bioventing were conducted in general accordance with the Cleanup Action Plan, Washington State regulations, and the Model Toxics Control Act (MTCA) WAC 173-340.

Dust Coatings Inc. was the selected contractor and began mobilizing equipment on-site by July 12, 2001. A medium temperature thermal desorption unit was utilized to treat the contaminated soil. The thermal desorption unit (TDU) was operated between 950 to 1050 degrees Fahrenheit with a throughput of 25 to 40 tons per hour. The TDU is comprised of a two stage counter flow direct fired rotary desorber that uses a thermal

oxidizer to treat the resulting vapor stream. The thermal oxidizer was operated between 1100 and 1200 degrees Fahrenheit and provided 99.9 percent destruction efficiencies.

Remedial construction activities were monitored and inspected by Dalton, Olmsted, & Fuglevand Consultants. A fifty-foot grid was established over the excavation area and confirmation soil samples were collected from the excavation sidewalls and bottom on that grid. Contamination was left in-place on the northern portion of the fuel terminal near the Chevron Pipeline due to setback requirements for the pipeline safety.

Confirmation samples were also collected from the treated soil per 1,000 treated tons. The shallow soil remediation was completed in February 2002. A total of 81, 910 tons of soil were treated and returned to the excavation. Representatives from Phillips, Dust Coatings Inc., Dalton, Olmsted, & Fuglevand Consultants, and Ecology completed a final inspection of the shallow excavation area in March 2002.

Air sparging wells were drilled to depths of about 170 feet below ground surface (bgs) in September 2001. A total of ten sparge wells were completed perpendicular or across the groundwater flow direction (Figure 3). The wells were placed in two rows with approximately sixty (60) feet between each well. An alternating well placement was utilized in order to minimize stagnation zones between sparge points. The wells were constructed with five feet of two-inch diameter stainless steel well screen with a slot opening of 0.020 inches. The screen is flush threaded with two-inch diameter polyvinyl chloride (PVC) casing to ground surface.

The sparge wells are connected from the wellhead to the twenty horsepower, three-phase motor with one-inch schedule 80 PVC piping. The piping is routed through ball valves and flow meters, which allows for balancing the sparge system by providing similar flow volumes to each well. A 3/8-inch polyethylene tubing line is connected from the well head to a pressure gauge that provides the direct pressure readings of each sparge well. The system typically operates at a volume of 11-12 standard cubic feet per minute (scfm) with a pressure of about 5.5 to 7 pounds per square inch (psi) for each well.

Four groundwater monitoring wells were installed in conjunction with the sparge system. One well was installed upgradient with the other three downgradient of the sparge system. In addition, two existing monitoring wells, one upgradient and one downgradient are used to monitor sparge system performance. The sparge wells began operating in August 2002.

The bioventing wells were installed in December 2002. The wells are located in Areas 1 and 2, which is within fuel terminal property near the storage tanks (Figure 2). The thirteen wells were installed to depths ranging from 110 to 150 feet bgs. The bioventing wells are screened with 50 feet of 0.010-inch, 4 slots per inch PVC well screen. The screens are designed to mechanically limit flow so an even pressure distribution is realized along the screen length. A 120 feet radius of influence (ROI) was assumed for

design purposes and was confirmed with pilot testing. The bioventing wells were installed with 200-foot grid spacing.

Two-inch PVC pipe connects each bioventing wellhead to the system. In order to meet facility fire safety standards, piping that is exposed at the surface is constructed of galvanized pipe. The system is comprised of a Rotron regenerative blower capable of producing 130 scfm with 30-inches of water column pressure or 1.08 pounds per square inch (psi). Pressure and flow volumes for each well are controlled individually with valves. The bioventing system is operated with a differential pressure gradient. This allows for the wells on the outside perimeter to be operated at a higher pressure, which provides a flow gradient toward the soil vapor plume center and limit fugitive migration of vapors. At the time of construction five vapor monitoring points were installed and added to the existing vapor monitoring points that are used to monitor the bioventing system performance.

MTCA requires that where cleanup levels are exceeded, a restrictive covenant must be placed with the deed. A restrictive covenant was placed on the fuel terminal property as well as property of other landowners over the groundwater plume. The covenants included the following restrictions: no withdrawal of water, maintenance of fences and locked gates, and no actions that may facilitate a release or create an exposure pathway. Institutional controls were placed on the Site by January 2003.

3.0 PERIODIC REVIEW

The purpose of periodic reviews is to ensure that human health and the environment remain protected when hazardous substances remain on site as part of the remedial action. This is the second period review for the North Market Street Site. The Cleanup Action Plan has been implemented at the Site and the receptors and exposure pathways identified in the CAP have not changed. The completed remedy, which included institutional controls, has eliminated exposure pathways and remains protective.

Groundwater contamination remains above cleanup levels set for the Site in the CAP. Post-closure monitoring began in August 2002 and will continue in accordance to the compliance monitoring plan.

Monitoring well NM-34 is upgradient of the sparge system and is indicative of water quality prior to treatment. Monitoring wells NM-31, 32, and NM-33 are located about 120 feet downgradient of the sparge system. Groundwater quality downgradient of the sparge system has improved dramatically and in plan view over 2,000 feet of aquifer has been restored. In part, natural attenuation has also contributed to the restoration.

Operation and maintenance activities continue at the Site. ConocoPhillips has contracted with Tetra Tech to conduct Operations and Maintenance (O&M) at the Site. The sparge system has been down for repairs on four separate occasions. The system was down for

parts replacement and maintenance for two days in 2003. The sparge system was non-operational from December 2006 through January 2007 for parts and repair. The system was down again in February through May 2007 for compressor replacement. Another interruption in operation occurred in July 2007 through August 2007 when the air cooler failed and required replacement. O&M will continue to be required until the cleanup goals are reached.

3.1 Effectiveness of Cleanup Actions

The shallow soil excavation and thermal treatment has removed the potential pathway for direct dermal contact and ingestion. In addition, the excavation and soil treatment has removed a large contaminant mass that was a contaminant source for groundwater. The air sparging system continues to operate and is reducing groundwater contamination downgradient of the sparge system. The bioventing system appears to be reducing contaminant vapor in the subsurface as evidenced by the decrease in concentrations.

Due to fuel terminal improvements, two bioventing wells, BV-1 and BV-4, were abandoned in November 2006. The bioventing wells were replaced in August 2008 and designated as bioventing wells, BV-1R and BV-4R.

Groundwater concentrations remain above cleanup levels in some facility wells and wells immediately downgradient of the facility. The groundwater plume has reduced in size since the cleanup actions were completed. The overall trends indicate a general decline in contamination and a portion of the aquifer has been returned to below cleanup levels.

Institutional controls were placed on the fuel terminal property as well as other properties overlying groundwater above cleanup levels. The controls are in-place and will remain until Ecology determines they are no longer warranted.

3.2 New Scientific Information

There is no new scientific information that affects the Site.

3.3 New Applicable State and Federal Laws

The CAP, written in 1999, was based on the 1996 edition of the Model Toxics Control Act (MTCA). Since the CAP was completed, MTCA has been amended once. The Site soil cleanup levels were developed using Ecology's total petroleum hydrocarbons (TPH) Interim TPH Policy (1/97). The interim policy is no longer in use since the 2001 MTCA amendment. However, the shallow contaminated soil was excavated to or below the 15-foot point of compliance and treated to concentrations well below current MTCA standards.

Groundwater Method A cleanup levels changed with the 2001 MTCA amendment. This affects the cleanup levels for toluene, ethylbenzene, and xylene. The cleanup level for manganese has changed since the MTCA amendment also. Although the cleanup levels have changed as a result of these modifications, site cleanup levels determined in the CAP will not change. WAC 173-340-702(12)(c)[2001 edition] provides that: "A release cleaned up under the cleanup levels determined in (a) or (b) of this subsection shall not be subject to further cleanup action due solely to subsequent amendments to the provision in this chapter on cleanup levels, unless the department determines, on a case-by-case basis, that the previous cleanup action is no longer sufficiently protective of human health and the environment." Since the cleanup levels have increased for the constituents referenced above the cleanup action will continue remain protective.

3.4 Current and projected site use

The site is comprised of an operating fuel distribution facility and other commercial and light industrial land uses in keeping with Spokane County zoning. Ecology does not anticipate a change in Site use or land use in the area.

3.5 Availability and practicability of higher preference technologies

The cleanup action provided source control by removal and treatment of the contaminated shallow soil. Deeper soil contamination is addressed with a bioventing system that is designed to enhance biodegradation. Contaminated groundwater is treated with an air sparging system. The thermal treatment of shallow soil and the operation of the air sparging and bioventing systems are protective of human health and the environment. Higher preference cleanup technologies do not exist for the Site since source removal has been completed in the areas where practical and on-going treatment systems are continuing to provide high preference cleanup technologies.

3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels.

Analytical techniques have improved for TPH and associated BTEX compounds. Since cleanup levels were not set at the practical quantification limit (PQL), changes in analytical techniques will not affect compliance.

4.0 CONCLUSIONS

The North Market Street Site selected remedial action continues to be protective of human health and the environment. The shallow soil excavation and treatment has eliminated the direct contact pathway for contaminated soil. The soil removal and treatment has also removed a large groundwater contaminant source. The bioventing system continues to enhance soil vapor biodegradation. Soil vapor concentrations continue to decline across the Site. The air sparging system continues to treat

contaminated groundwater and has restored affected groundwater downgradient of the system to below cleanup levels. At this time, the efficacy of continuous sparge system operation appears diminished. With this in mind adjustment to sparge system operations including system shut down should be considered.

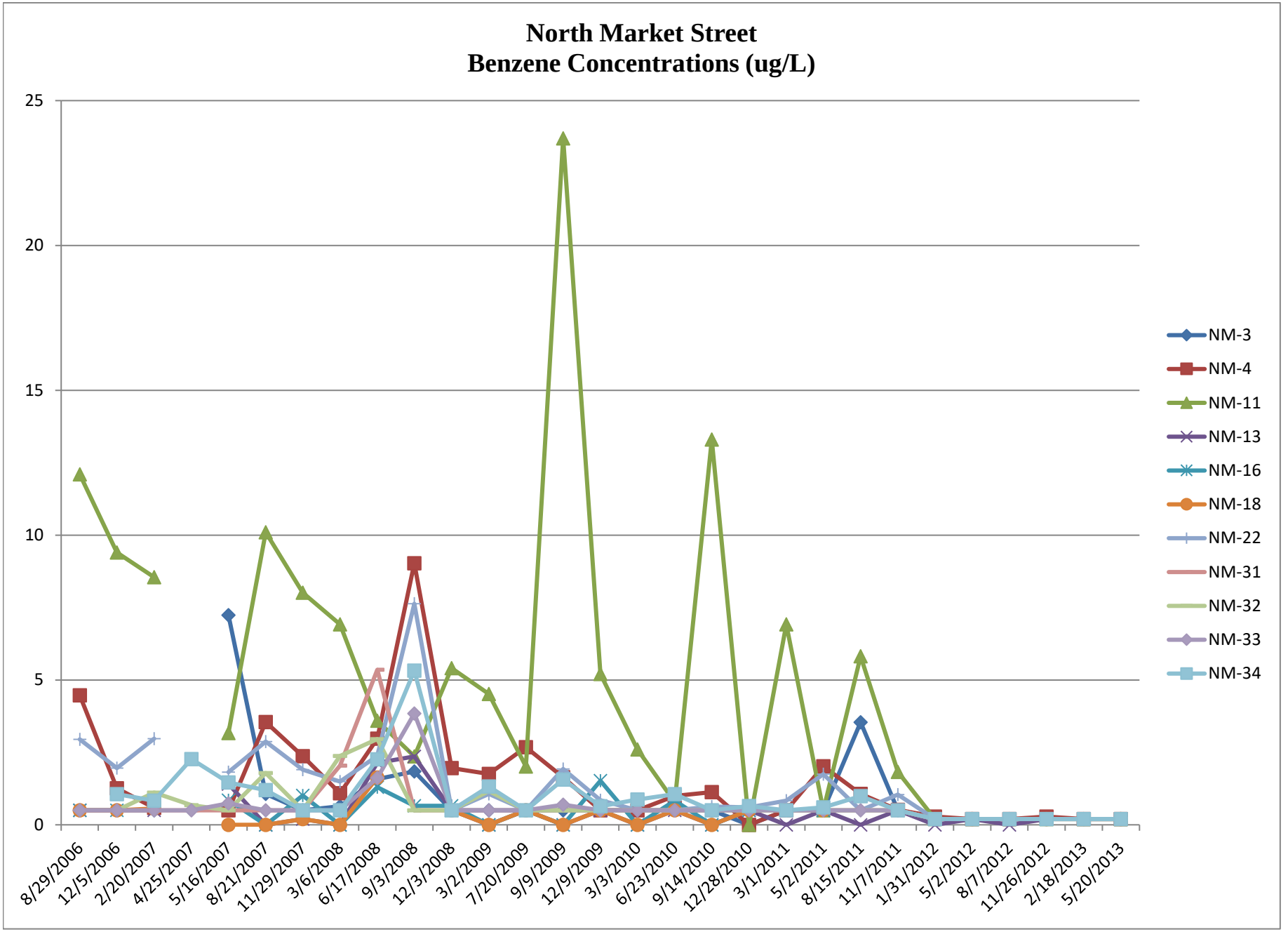
While source removal and treatment system operations have generally decreased groundwater contamination across the Site, concentrations remain above cleanup levels in a few wells. Since groundwater cleanup levels have not been met at the point of compliance, the treatment systems and institutional controls will remain in affect. The restrictive covenant placed on the Site has been recorded. The covenant will continue to be effective in protecting human health and the environment and assuring the integrity of the cleanup action.

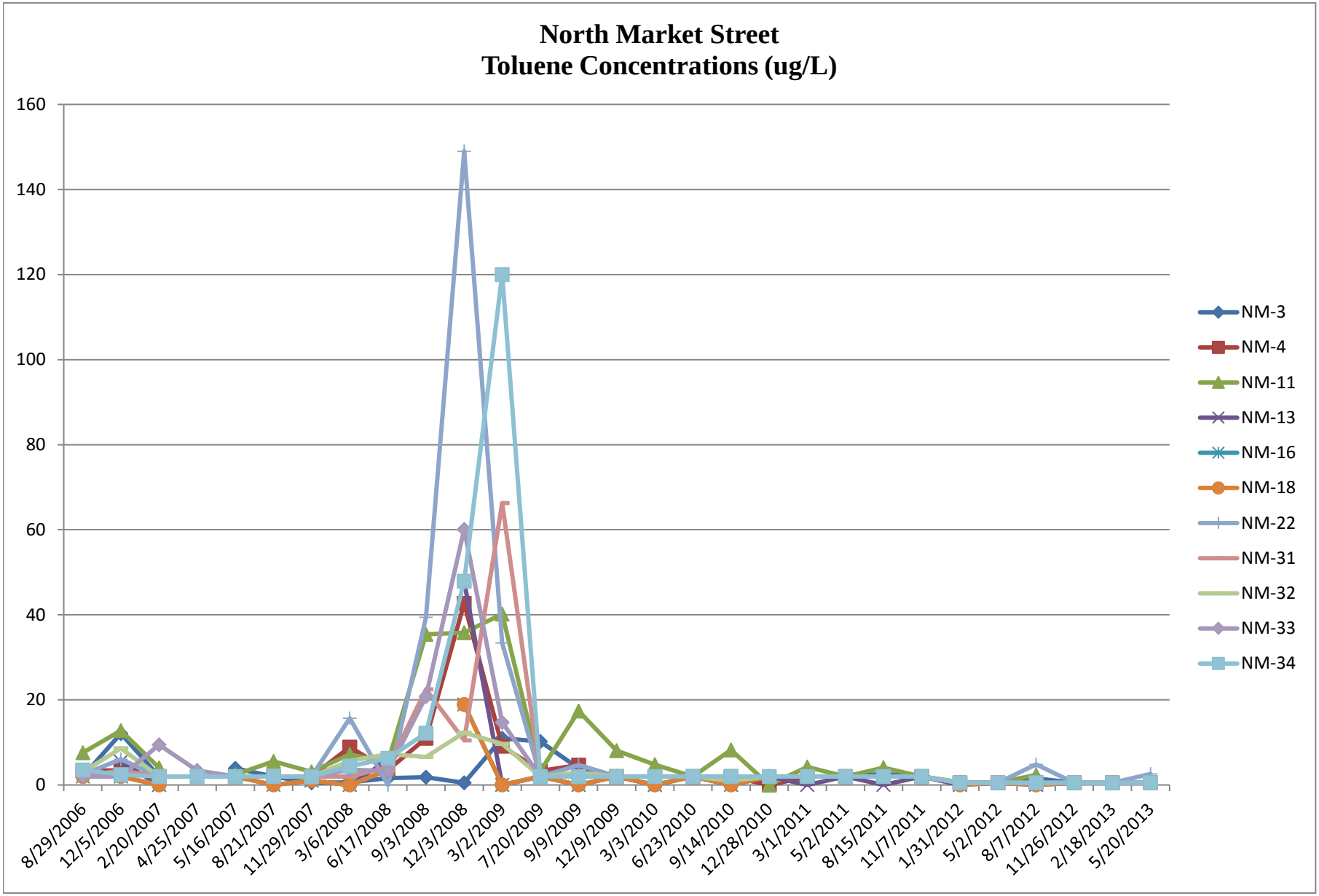
Compliance monitoring has been performed in accordance with the schedule set forth in the Consent Decree. Based on the data review, it appears to be time to adjust the compliance monitoring program. The distal monitoring wells, NM 26-30, have not detected petroleum constituents for several years. In addition, benzene has been below cleanup levels across the Site for two years.

Based on this periodic review, Ecology has determined that the remedial action has reduced the contamination at the Site and is considered protective of human health and the environment. Institutional controls remain in place on the affected properties. ConocoPhillips will continue to be responsible for operations and maintenance of the treatment systems on the Site.

APPENDIX A

MONITORING WELL CONTAMINANT GRAPHS


North Market Street
Benzene Concentrations (ug/L)
25
20
15
10
5
0
8/29/2006
12/5/2006
2/20/2007
4/25/2007
5/16/2007
8/21/2007
11/29/2007
3/6/2008
6/17/2008
9/3/2008
12/3/2008
3/2/2009
7/20/2009
9/9/2009
12/9/2009
3/3/2010
6/23/2010
9/14/2010
12/28/2010
3/1/2011
5/2/2011
8/15/2011
11/7/2011
1/31/2012
5/2/2012
8/7/2012
11/26/2012
2/18/2013
5/20/2013
NM-3
NM-4
NM-11
NM-13
NM-16
NM-18
NM-22
NM-31
NM-32
NM-33
NM-34


North Market Street
Toluene Concentrations (ug/L)
160
140
120
100
80
60
40
20
0
8/29/2006
12/5/2006
2/20/2007
4/25/2007
5/16/2007
8/21/2007
11/29/2007
3/6/2008
6/17/2008
9/3/2008
12/3/2008
3/2/2009
7/20/2009
9/9/2009
12/9/2009
3/3/2010
6/23/2010
9/14/2010
12/28/2010
3/1/2011
5/2/2011
8/15/2011
11/7/2011
1/31/2012
5/2/2012
8/7/2012
11/26/2012
2/18/2013
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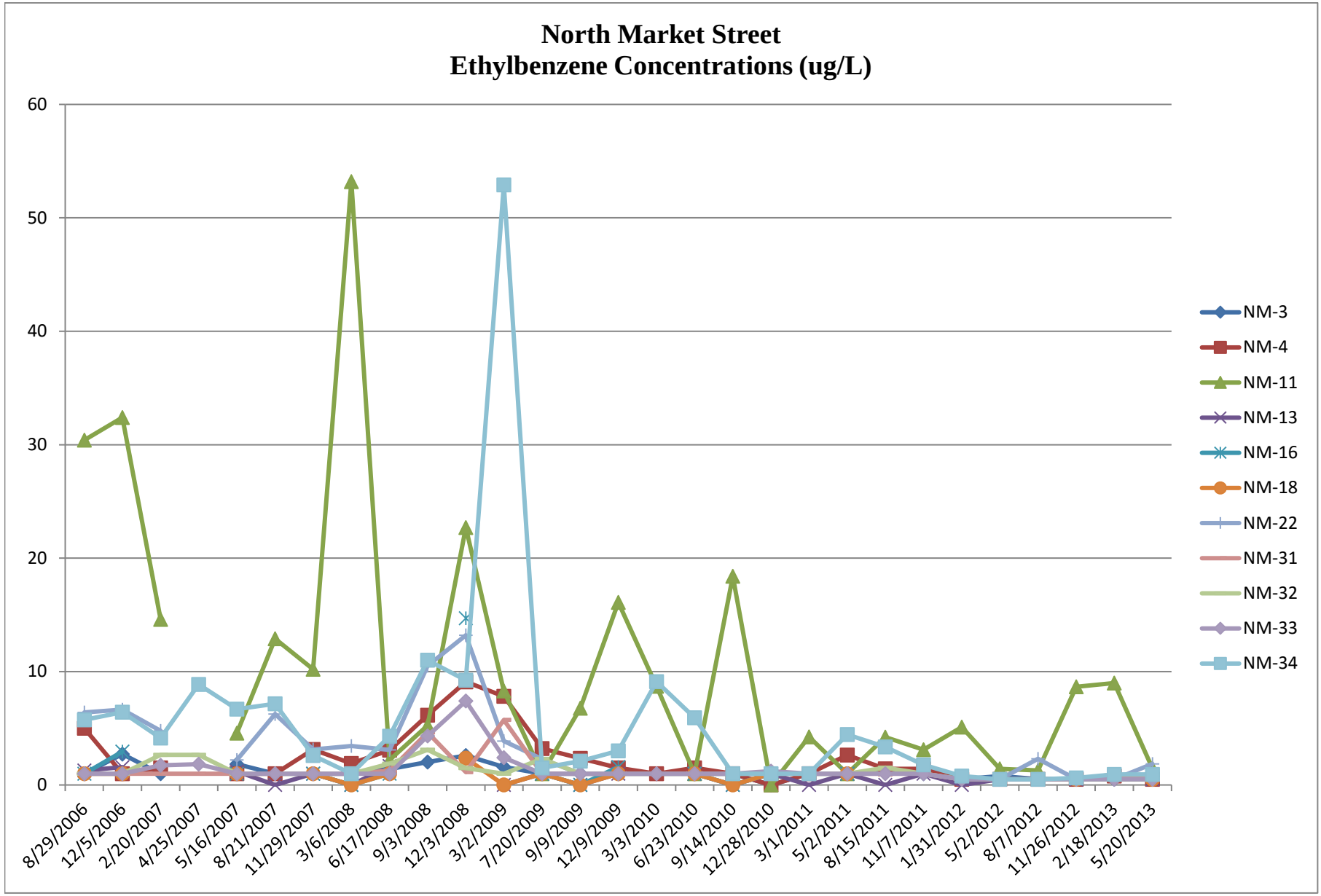
North Market Street
Ethylbenzene Concentrations (ug/L)
60
50
40
30
20
10
0
8/29/2006
12/5/2006
2/20/2007
4/25/2007
5/16/2007
8/21/2007
11/29/2007
3/6/2008
6/17/2008
9/3/2008
12/3/2008
3/2/2009
7/20/2009
9/9/2009
12/9/2009
3/3/2010
6/23/2010
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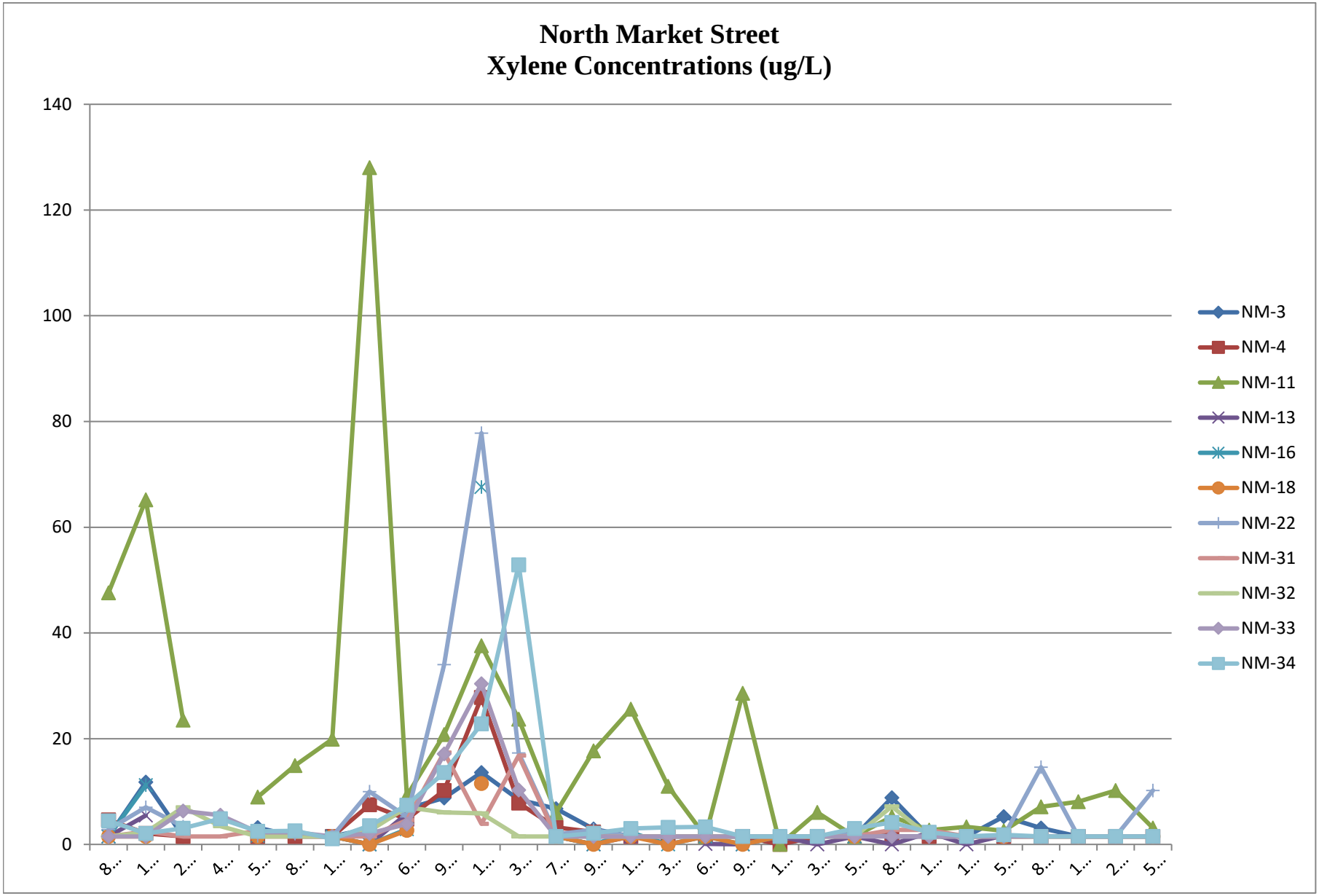
North Market Street
Xylene Concentrations (ug/L)
140
120
100
80
60
40
20
0
NM-3
NM-4
NM-11
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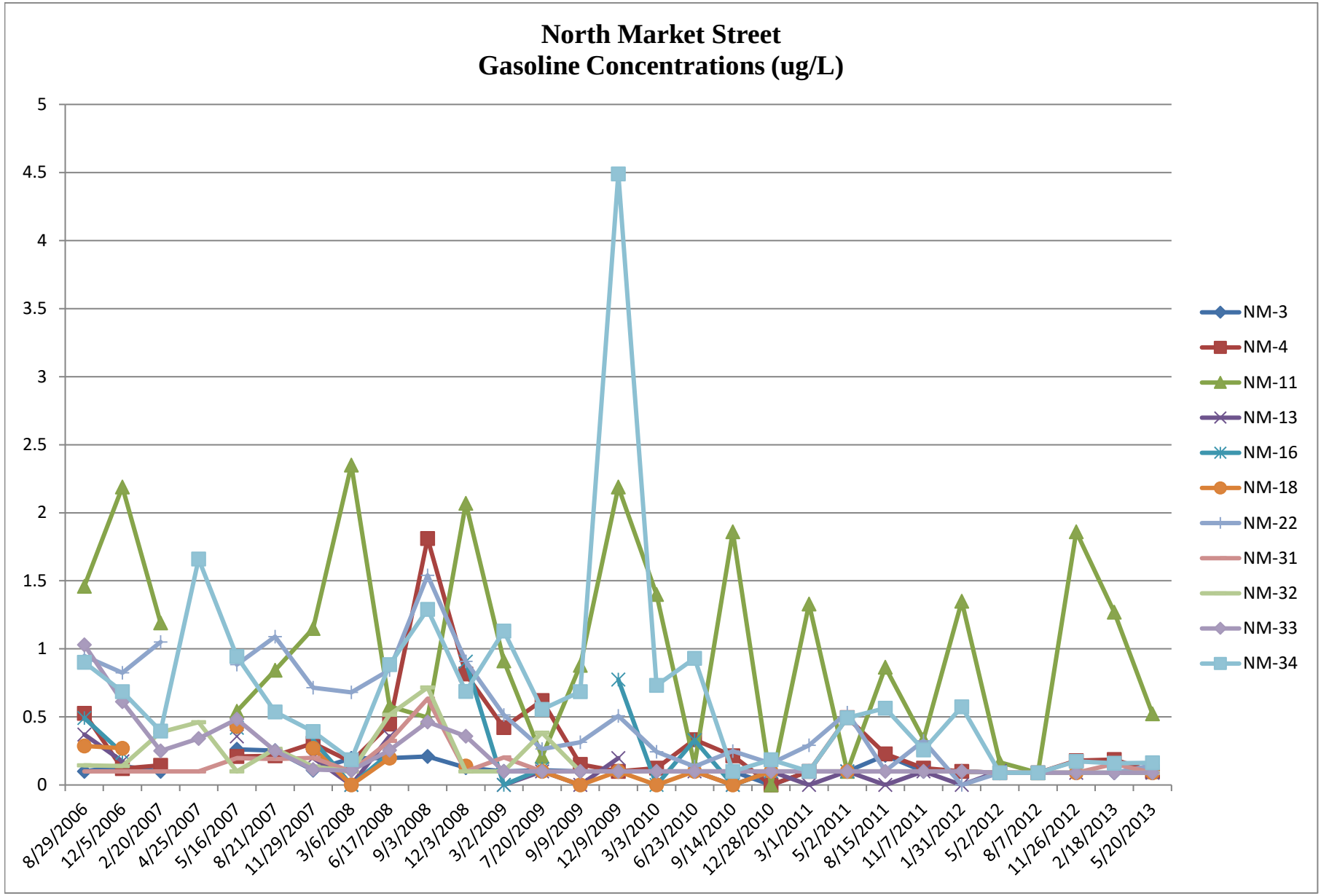
NM-18
NM-22
NM-31
NM-32
NM-33
NM-34


North Market Street
Gasoline Concentrations (ug/L)
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
8/29/2006
12/5/2006
2/20/2007
4/25/2007
5/16/2007
8/21/2007
11/29/2007
3/6/2008
6/17/2008
9/3/2008
12/3/2008
3/2/2009
7/20/2009
9/9/2009
12/9/2009
3/3/2010
6/23/2010
9/14/2010
12/28/2010
3/1/2011
5/2/2011
8/15/2011
11/7/2011
1/31/2012
5/2/2012
8/7/2012
11/26/2012
2/18/2013
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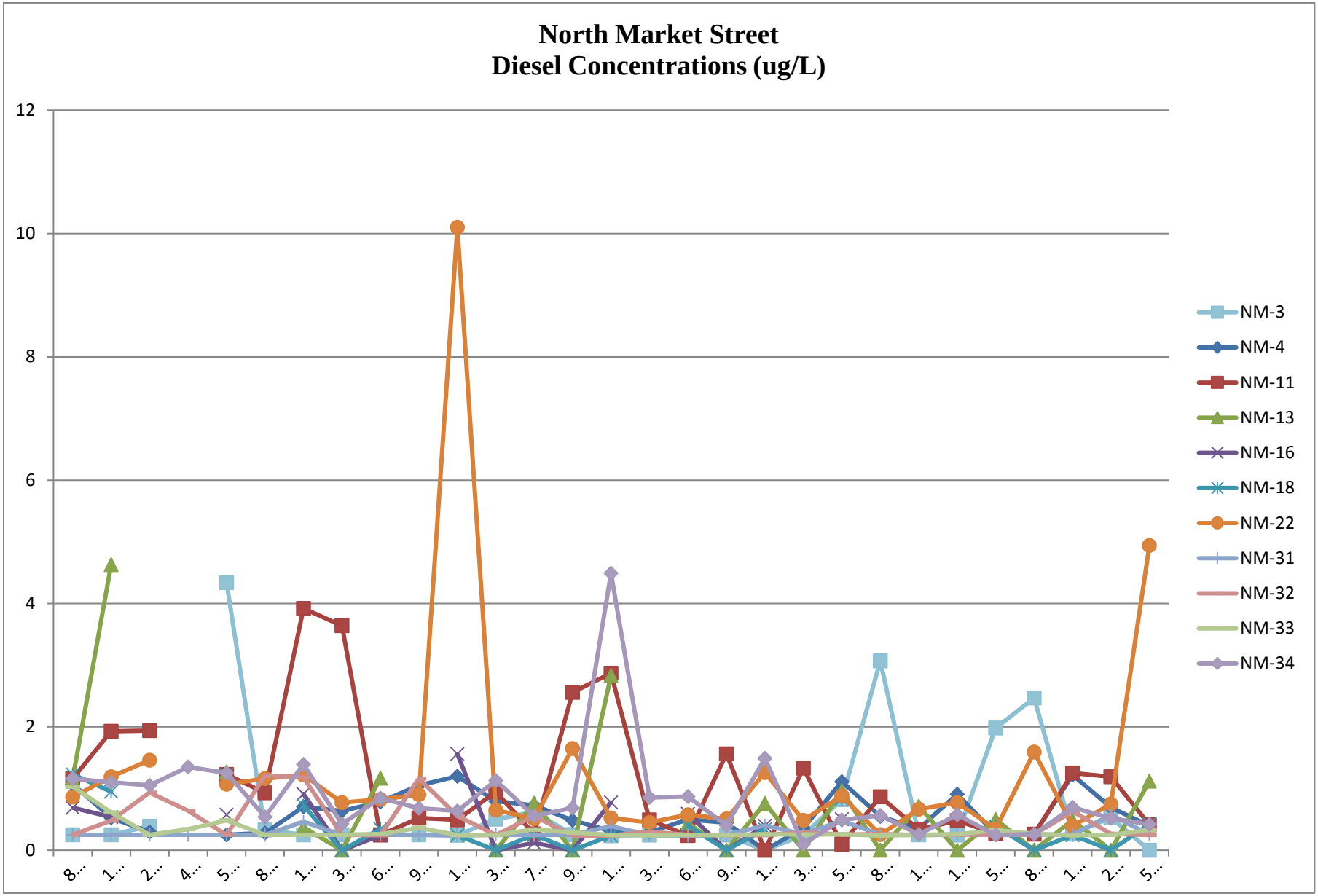
NM-34


North Market Street
Diesel Concentrations (ug/L)
12
10
8
6
4
2
0
NM-3
NM-4
NM-11
NM-13
NM-16
NM-18
NM-22
NM-31
NM-32
NM-33
NM-34