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National Grid
Syracuse, New York

Human Health Risk Assessment

Niagara Mohawk Power Corporation
Saratoga Springs Former
Manufactured Gas Plant Site

Old Red Spring Subarea

EPA ID#: NYD980664361

Saratoga Springs, New York

January 2013

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Prepared for:
National Grid

Prepared by:
ARCADIS of New York, Inc.
6723 Towpath Road
P.O. Box 66
Syracuse
New York 13214-0066
Tel 315.446.9120
Fax 315.449.0017

Our Ref.:
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1. Introduction

On behalf of National Grid (formerly the Niagara Mohawk Power Corporation), ARCADIS of New York, Inc. (ARCADIS) has prepared this Human Health Risk Assessment (HHRA) for the Saratoga Springs Former Manufactured Gas Plant (MGP) Site located in Saratoga, New York (Figure 1). Specifically, this HHRA addresses the Old Red Spring subarea that encompasses approximately 0.5 acres at the intersection of Excelsior Avenue, Warren Street, and High Rock Avenue, as well as a portion of Excelsior Avenue and the Old Red Spring; this area is referred to herein as the Project Area. This HHRA has been prepared at the request of the U.S. Environmental Protection Agency's (USEPA's) May 11, 2012 e-mail and builds upon the Pathways Analysis Report (PAR) (ARCADIS, March 2011), including USEPA's comments on the PAR (USEPA, December 2011). Consistent with the USEPA's request and the PAR, this HHRA focuses on potential residential use of Project Area groundwater (i.e., drinking water exposures via ingestion, dermal contact, and inhalation of volatiles). In doing so, this HHRA evaluates potential current and future health risks to people who may be exposed to overburden and bedrock groundwater as a potable water source within the Project Area, assuming no additional remedial actions are undertaken and that land use changes in the future. In addition, at the request of USEPA, the vapor intrusion pathway from groundwater to indoor air is also evaluated in this HHRA. This HHRA presents a baseline evaluation of potential human health risks in the absence of institutional controls or remedial measures.

This HHRA has been conducted in accordance with USEPA (1989; 2004) guidance and involves the following four steps: 1) data evaluation, to identify site-related constituents of interest; 2) exposure assessment, to determine potential exposure pathways and quantify the magnitude of potential exposure; 3) toxicity assessment, to determine types of effects associated with exposures; and 4) risk characterization, to quantify potential excess lifetime cancer risks and non-cancer health hazards associated with potential exposures at the Project Area.

1.1 Summary of Previous Remedial Actions

Remedial actions have been performed at the former MGP site and the former Spa Steel Products Company, Inc. (Spa Steel) property in accordance with the USEPA Record of Decision (ROD), issued September 29, 1995 (USEPA, 1995). Remedial actions at the former MGP site were conducted between May 2001 and September 2002 and generally consisted of the following:

- Installing a sub-grade sheet pile barrier wall around the perimeter of the National Grid property

- Excavating and transporting MGP-source material and select surface soils off-site for treatment/disposal
- Installing a perimeter stormwater diversion/management system
- Constructing a permanent groundwater management/treatment system
- Installing an asphaltic cap across the former MGP site

Remedial actions at the Spa Steel property were conducted in 2008 as an extension of remedial actions completed at the adjacent former MGP site. Remedial actions included the installation of a sub-grade sheet pile barrier wall and an impermeable cap within a portion of the Spa Steel property.

1.2 Site Setting

The Project Area occupies approximately 0.5 acres near the intersection of Excelsior Avenue, Warren Street, and High Rock Avenue (Figure 2). The Project Area is essentially comprised of the land south of the sheet piling installed during the remediation of the former MGP site and the Spa Steel property. This area consists of parcels owned by the City of Saratoga Springs and Mill LLC (a former New York State Department of Environmental Conservation [NYSDEC] inactive hazardous waste site, known as the Van Raalte Knitting Mill Site). The western portion of the Project Area consists of a paved parking lot for the fitness gym located west of the Old Red Spring. The Project Area is bounded to the north by the Spa Steel property and former MGP site, to the south by High Rock Avenue, and to the east by Warren Street. An active groundwater spring and an associated pavilion (referred to as Old Red Spring) are located in the eastern portion of the Project Area, within a small "green space" area. This spring is located within the deep bedrock groundwater zone (deeper than 150 feet below grade), which is separated from the overburden groundwater zone by thick clay and till confining layers. Depth to overburden groundwater at the Project Area ranges between 5 and 10 feet below ground surface (bgs). The horizontal hydraulic gradient in the Project Area is generally in the southeast direction and the vertical hydraulic gradient is upward through the confining units. Surrounding land use in the vicinity of the Project Area is a mixture of commercial and residential properties.

Groundwater at the site is classified as Class GA, fresh groundwater. The best usage of Class GA waters as defined in the New York Code of Rules and Regulations (NYCRR) is as a source of potable water supply (NYCRR, 1991). According to 6 NYCRR §701.18, all freshwater groundwater in New York State is classified as Class GA. Currently, the City of Saratoga Springs receives its drinking water from three sources including surface water from the Loughberry Lake Watershed and groundwater from the Geyser Crest and

Interlaken well systems (SSCPW, 2012); these sources are not hydraulically connected to the Project Area. Although site groundwater is not used as a potable source and there are city requirements for use of municipal water supplies, this baseline HHRA was conducted in the absence of institutional controls consistent with USEPA (1989) guidance. The Project Area is currently zoned as Transect Zone 5 (T-5) Neighborhood Center. The intent of this district is a mixed-use neighborhood center meant to accommodate a variety of non-residential and residential uses, building types and lot sizes, and the district is meant to provide linkages to adjacent neighborhoods conducive to pedestrian activity (City of Saratoga, 2007).

Table 1 identifies receptor populations and potentially complete exposure pathways that were quantitatively evaluated in this HHRA. Generally, the selection of receptor populations and exposure pathways uses site-specific information based on current and reasonably anticipated future land use to identify potentially complete exposure pathways. Future land use at the site is expected to be consistent with current land use (i.e., no potable use of Project Area groundwater). However, at the request of USEPA, this HHRA evaluates hypothetical future residential use of Project Area groundwater. The exposure assessment, which discusses the selection of potential receptors and exposure pathways, is presented in Section 3 of this report. Both a Reasonable Maximum Exposure (RME) and a Central Tendency Exposure (CTE) scenario are evaluated in this HHRA for groundwater-related exposures.

1.3 Report Organization

The following table identifies the step-wise HHRA process conducted for the Project Area and associated report organization:

Report Section	Description
Section 2	Data Evaluation – Discusses the analytical data used in the HHRA, identification of constituents of potential concern, and calculation of exposure point concentrations.
Section 3	Exposure Assessment – Identifies the receptors and exposure pathways evaluated in the HHRA.

Report Section	Description
Section 4	Toxicity Assessment – Discusses the toxicity data used to determine the types of effects associated with exposures.
Section 5	Risk Characterization – Uses the information presented in the data evaluation, exposure assessment, and toxicity assessment to quantify potential human health risks and hazards.
Section 6	Uncertainty Analysis – Identifies the key assumptions used in the HHRA that lend uncertainty to the HHRA process.
Section 7	Summary and Conclusions – Presents a concise summation of the HHRA results.
Section 8	References – Lists the reference materials cited in this report.

2. Data Evaluation

2.1 Summary of Previous Investigations

A number of investigations and remedial actions of the former MGP site and surrounding properties have been conducted since Niagara Mohawk Power Corporation (now National Grid) entered into a Consent Decree with the USEPA in September 1989. Potential MGP-related impacts were evaluated within the Project Area (i.e., in the Excelsior Avenue/Old Red Spring area) as part of the following investigations.

2.1.1 Site Investigation – July 2006

The July 2006 investigation was conducted by the USEPA to assess the presence and extent of MGP-related residuals within subsurface soils in the area south of the former Spa Steel property. Activities included:

- Drilling 18 soil borings and installing 10 monitoring wells at select boring locations;
- Measuring water levels at existing and new monitoring wells; and
- Collecting and submitting soil and groundwater samples for laboratory analysis of Target Compound List (TCL) volatile organic compounds (VOCs) and TCL semi-volatile organic compounds (SVOCs).

2.1.2 Supplemental Site Investigation – February/March 2008

The February/March 2008 Supplemental Site Investigation (SSI) was conducted by National Grid to further define the nature and extent of MGP-related impacts to the south and southwest of the former MGP site. Activities included:

- Drilling 16 soil borings and installing two monitoring wells at select boring locations;
- Measuring water levels at existing and new monitoring wells; and
- Collecting and submitting soil and groundwater samples for laboratory analysis of TCL VOCs and TCL SVOCs.

2.1.3 Monitored Natural Attenuation Evaluation – May 2009

The May 2009 groundwater investigations were conducted by National Grid to support an evaluation of monitored natural attenuation (MNA) as a potential remedial alternative to address MGP-related impacts to groundwater at the Project Area. Investigation activities included the collection of groundwater samples from accessible monitoring wells within the Project Area and submitting the samples for laboratory analysis of VOCs, polycyclic aromatic hydrocarbons (PAHs), and various attenuation parameters.

2.1.4 Additional Site Investigation – October 2009

The October/November 2009 Site Investigation was conducted by National Grid to further define the nature and extent of MGP-related impacts to the south and southwest of the former MGP site. Activities included:

- Drilling five soil borings and installing two monitoring wells at select locations;
- Measuring water levels at existing and new monitoring wells; and
- Collecting and submitting soil and groundwater samples for laboratory analysis of TCL VOCs and TCL SVOCs.

2.1.5 Additional Soil Borings – January 2012

The January 2012 collection of additional soil borings was completed by National Grid to characterize soil below Excelsior Avenue and confirm the quantity of visual impacts previously observed in the Old Red Spring Area. No analytical data were collected as part of this effort. This investigation did not include the collection of any groundwater data.

All of the information obtained from the above-described investigations has been previously provided to USEPA.

2.2 Analytical Data

Analytical data are available for both the shallow overburden groundwater zone and the bedrock groundwater zone. The Old Red Spring is located within the deep bedrock groundwater zone (deeper than 150 feet below grade), which is separated from the overburden groundwater zone by thick clay and till confining layers. These groundwater zones are evaluated separately in this HHRA.

As approved by USEPA (2011), this HHRA focuses on shallow overburden groundwater in the Excelsior Avenue Area and bedrock groundwater in the Old Red Spring Area. Groundwater samples from the shallow overburden in the Project Area were collected in 2006, 2008, and 2009. Samples were analyzed for VOCs, SVOCs, inorganics (iron and manganese), and miscellaneous parameters (e.g., nitrate, nitrite, sulfate). A total of 32 groundwater samples were collected from 16 monitoring wells in the shallow overburden in the Project Area during three years of sampling (2006, 2008, and 2009). An evaluation of data usability was conducted to determine if analytical data were suitable for use in this HHRA. A data usability worksheet is included as Appendix A. It was concluded that the analytical groundwater data are suitable for risk assessment purposes.

Twenty groundwater samples were collected from the Old Red Spring between January 2006 and January 2011. These samples were analyzed for VOCs and PAHs. All groundwater concentrations from the bedrock zone were non-detect, with the exception of naphthalene, which was detected at 1 microgram per liter (µg/L) in July 2006. This isolated concentration of naphthalene was well below the NYSDEC (1998) Class GA groundwater standard and this constituent was not detected in any other groundwater samples from the bedrock zone.

Figure 3 presents the groundwater monitoring well locations.

2.3 Identification of Constituents of Potential Concern

As a first step in the HHRA process, analytical data for the Project Area are compared to appropriate screening criteria to identify constituents of potential concern (COPCs) for the Project Area. The data evaluation uses the available groundwater data for the Project Area, including data for the shallow overburden and the lower bedrock zone. The following describes the COPC screening process used to evaluate potential direct contact exposures.

As requested by USEPA (2011), COPCs for Project Area groundwater (direct contact) were identified by screening maximum groundwater concentrations against USEPA (2012b) Regional Screening Levels (RSLs) for tap water. RSLs based on a non-cancer endpoint were adjusted to reflect a hazard quotient (HQ) of 0.1 to account for potential additive effects. NYSDEC Class GA Groundwater Standards and Guidance Values from Technical and Operational Guidance Series (TOGS) 1.1.1 (NYSDEC, 1998) and USEPA (2012c) Maximum Contaminant Levels (MCLs) are presented in the COPC tables as Applicable or Relevant and Appropriate Requirements (ARARs), but are not used for COPC screening purposes. As requested by USEPA (2011), the vapor intrusion pathway was also evaluated by comparing groundwater data to USEPA (2002a) generic screening criteria (i.e., target groundwater concentrations corresponding to target indoor air concentrations at a risk level

of 1 x 10^{-6}). However, it should be noted that in a letter to National Grid on January 29, 2010, the USEPA and NYSDEC concluded that, based on the site investigation data, soil vapor intrusion south of Excelsior Avenue is not a current exposure concern (USEPA, 2010a).

Tables 2.1 and 2.2 present the COPC screening for the shallow overburden and bedrock groundwater zones, respectively. Several VOCs (benzene, ethylbenzene, toluene, and xylenes), SVOCs (1,1-biphenyl, 2-methylnaphthalene, acenaphthene, anthracene, dibenzofuran, fluorene, naphthalene, and pyrene), and inorganics (iron and manganese) were identified as COPCs for the shallow overburden groundwater zone in the Project Area. Groundwater concentrations in the Old Red Spring (bedrock groundwater zone) were all non-detect (with the exception of naphthalene discussed above) and therefore, no COPCs were identified for the bedrock groundwater zone.

Table 2.3 presents the COPC screening for vapor intrusion using all Project Area groundwater data. Maximum concentrations of benzene, ethylbenzene, 2-methylnaphthalene, and naphthalene exceeded the USEPA (2002a) generic screening criteria for the vapor intrusion pathway. However, USEPA (2002a) guidance indicates that the vapor intrusion investigation should focus on those wells that are within 100 feet horizontally or vertically of a structure (e.g., occupied building). Therefore, Table 2.4 compares groundwater data for those wells within 100 feet of the fitness gym (MW-EPA-06, MW-SS-09-06, MW-SS-09-07, and MW-EPA-03). Concentrations in these monitoring wells are below the USEPA (2002a) screening criteria, and as such, no COPCs were identified for the vapor intrusion pathway based on current land use.

3. Exposure Assessment

3.1 Conceptual Site Model

Current land use at the Project Area is commercial. Specifically, the Project Area encompasses property located adjacent to and south of the former Spa Steel property and former MGP site. The Project Area consists of a paved parking lot, a fitness center, and a small green space that includes the Old Red Spring and associated pavilion. Surrounding land use is a mixture of commercial (e.g., office building, car dealership, hotel) and residential (e.g., apartments, condominiums) properties. Future land use at the Project Area is expected to remain the same.

Groundwater in the Project Area is divided into two zones: overburden and bedrock. The overburden geologic units in the Project Area consist of 15 to 25 feet thick sequence of fill, peat/clayey silt, and fine to coarse sand underlain by approximately 50 feet low permeability lacustrine silty clay and 50 feet of low permeability glacial till. The glacial till lies on the Canajoharie Shale bedrock. Groundwater from the Old Red Spring well apparently originates from the Canajoharie Shale. At one time this well flowed under natural artesian pressure; however, due to the extensive regional groundwater usage in the Canajoharie Shale the artesian pressure is much less. As such, the City of Saratoga apparently installed a pump within the well to deliver water via mechanical means.

The water table is encountered between 5 to 10 feet bgs and occurs in the fine to coarse sand and gravel materials above the silty clay. Groundwater flow in these shallow overburden materials is generally to the southeast. Given the artesian conditions that once existed in the bedrock, an upward vertical hydraulic gradient is expected across the silty clay and till units. However, based on the relatively low permeability of the silty clay and till, the amount of groundwater flowing upward from these units into the overlying shallow overburden materials is expected to be negligible.

Sparse quantities of dense non-aqueous phase liquid (DNAPL) (i.e., coal tar) has been sporadically observed in some subsurface soil samples collected from the Project Area. The DNAPL in the Project Area is interpreted to have migrated from the Saratoga Springs former MGP site. At the MGP site, the DNAPL pooled on the silty clay at several locations and migrated in a general southerly direction along the top of the silty clay and in the direction of the Project Area. In the Project Area, DNAPL has been observed at approximately 15 to 20 feet bgs. The surface topography of the silty clay, heterogeneity of the overburden materials, and the hydraulic gradients are the mechanisms that have shaped the distribution of DNAPL observed in the Project Area.

Although groundwater associated with the Project Area is classified by NYSDEC as Class GA, indicating that it's a designated drinking water source, this groundwater is not used for potable purposes. Additionally, it's also important to note that all freshwater groundwater within the State of New York is considered to be Class GA according to New York State regulations (6 NYCRR §701.18; NYCRR, 1991). Primary drinking water is currently supplied to residents in Saratoga Springs from Loughberry Lake, which is located approximately 2,000 feet upgradient of the former MGP site. Additionally, some residents in the vicinity of the former MGP site obtain their drinking water from private wells (USEPA, 2010b), but these wells are not hydraulically connected to the overburden materials at the Site. The Old Red Spring represents one of Saratoga Springs' mineral springs that is available for consumption to local residents and tourists via a fountain located within the pavilion. As previously mentioned, the Old Red Spring represents a previous artesian source that is now pumped from the bedrock groundwater zone, i.e., below the clay and till confining units. Current zoning at the Project Area restricts the use of groundwater from the overburden as a potable source. Additionally, based on telephone conversations with the City of Saratoga Springs Senior Engineer in February and September 2011, the City of Saratoga Springs Building Code requires any new building to be connected to the public water supply if constructed in the city limits and within 100 feet of a public water supply.

As requested by USEPA, this HHRA focuses solely on potential risks and hazards associated with the current and future use of Project Area groundwater from the shallow overburden (above the silty clay) and the bedrock aquifer (i.e., Old Red Spring). Table 1 (Selection of Exposure Pathways) identifies the selection of receptors and exposure pathways on which this HHRA is based.

3.2 Receptors

Potential receptors are assumed to include individuals that may be exposed to drinking water from the Project Area via consumption, dermal contact, and inhalation of vapors (i.e., during showering and/or bathing). Because there is no current potable use of Project Area groundwater from the shallow overburden, the overburden groundwater does not currently pose an unacceptable risk to human health. Based on this and consistent with the USEPA's request, the remainder of this HHRA evaluates potential risks associated with hypothetical future residential groundwater use (i.e., assuming that the shallow overburden groundwater may be used in the future as a source of water for residential purposes).

As requested by USEPA, the vapor intrusion pathway from groundwater to indoor air is also evaluated as part of this HHRA. Specifically, commercial workers employed at the on-site fitness gym (as well as members of the gym) may be exposed to vapors emanating from groundwater to indoor air.

3.3 Exposure Pathways and Exposure Routes

The Project Area groundwater in the overburden materials (above the silty clay) is not currently used as a potable source (or for any other purposes). In addition, current zoning at the Project Area precludes the installation of private wells due to proximate municipal water availability. However, if deed restrictions are not implemented, future exposures could hypothetically occur if the current zoning restriction on groundwater usage was changed and if residents were to install private drinking water wells (a violation of existing building code) rather than utilize municipal water supplies. Under this hypothetical future scenario, such residents may be exposed to constituents in shallow overburden groundwater via direct ingestion of drinking water, dermal contact, and/or inhalation of volatilized constituents during showering and other household activities. However, it should be noted that this hypothetical scenario is highly unlikely in the foreseeable future given the size of the Project Area, it's location within the City of Saratoga limits, the current land use zoning, the presence of a readily available municipal water supply, and the City of Saratoga zoning and Building Code requirements regarding the municipal water supply.

Because COPCs have not been detected in groundwater from the Old Red Spring, groundwater from the Old Red Spring does not pose a human health risk. Additionally, the New York State Department of Health (NYSDOH) conducts sampling of the Old Red Spring on an on-going basis. Therefore, no further evaluation of groundwater exposures for Old Red Spring is warranted. Likewise, because groundwater concentrations in those monitoring wells located within 100 feet of the on-site fitness gym are less than USEPA (2002a) screening criteria, it is assumed that the vapor intrusion pathway does not pose a human health risk based on current land use and no further evaluation of this pathway is warranted.

3.4 Exposure Factors

This HHRA uses exposure and toxicity factors that represent site-specific conditions and reflect current scientific and regulatory policy. The RME scenario is evaluated in this HHRA and is intended to represent the "highest exposure that is reasonably expected to occur at a site" (USEPA, 1989). Likewise, a CTE scenario is also evaluated in this HHRA, which is intended to use less conservative exposure factors to reflect more typical (or realistic) exposures at the site. The exposure assumptions that will be used to evaluate potential exposure of future residents to groundwater via ingestion, dermal contact, and inhalation are presented in Tables 4.1.RME (ingestion and dermal contact), 4.1.CTE (ingestion and dermal contact), 4.2.RME (inhalation), and 4.2.CTE (inhalation). The following briefly discusses the exposure factors used to quantify potential risks and hazards for hypothetical future exposure of residents to potable groundwater from the overburden zone.

The groundwater ingestion rates used to quantify potential risks and hazards for future adult and child residents (2 liters per day [L/day] and 1 L/day, respectively) under an RME scenario reflect USEPA default values from the USEPA (1997) *Exposure Factors Handbook* (EFH), USEPA (1991a) OSWER Directive 9285.6-03 "Standard Default Exposure Factors", and USEPA (2002b) Supplemental Guidance for Development of Soil Screening Levels for Superfund Sites. CTE values for groundwater ingestion (0.5 and 1 L/day, respectively for the child and adult resident, respectively) represent one-half of the RME values. The exposure frequency used to evaluate ingestion and dermal exposures (350 days per year) represents the USEPA (2004) default for residential receptors; this value was used for both RME and CTE scenarios. The RME exposure durations used for the adult and child resident (24 and 6 years, respectively) represent USEPA (2004) default values. For the CTE scenario, an exposure duration of 9 years was used for the adult resident, which is also a USEPA (2004) default value.

To evaluate the dermal contact exposure route, the RME exposure time was assumed to be 0.25 hours per event (15 minutes), which is intended to represent the amount of a time a resident spends in the shower (USEPA, 1997). A value of 0.17 hours per event (10 minutes) was used to evaluate dermal exposures under a CTE scenario (USEPA, 1997). An event frequency of 1 was used for both the RME and CTE scenarios, which assumes one showering event per day for an individual. The exposed skin surface areas used to evaluate dermal exposures for a child and adult resident were 6,600 square centimeters (cm^2) and 18,000 cm^2, respectively; these values represent USEPA (2004) default values for a showering/bathing scenario. Table 4.3 presents the chemical-specific factors used to quantify potential dermal absorbed doses.

The Andelman (1990) exposure model, as modified by Schaum et al. (1994), was used to quantify potential inhalation exposures to volatiles emanating from potable groundwater during showering and/or bathing. The exposure times used to quantify inhalation exposures (i.e., during showering/bathing) were the same as those used to quantify dermal exposures (0.25 and 0.17 hours per event for RME and CTE scenarios, respectively). Inhalation exposures also consider the time spent in the bathroom following showering/bathing events. The values used to account for these additional exposure times under an RME scenario were 0.33 hours (20 minutes) for a child and 0.5 hours (30 minutes) for an adult. For the CTE scenario, a value of 0.08 hours (5 minutes) was used for both the child and adult. Exposure factors used to quantify inhalation exposures were taken from USEPA's (1997) EFH and USEPA's (2004) Dermal Risk Assessment guidance.

3.5 Determination of Exposure Point Concentrations

The exposure point concentrations (EPCs) that were used to evaluate potential groundwater exposures for the overburden materials (above the silty clay) at the Project Area are based on the analytical groundwater data collected in 2006, 2008, and 2009. USEPA's ProUCL software (version 4.1.00; USEPA, 2010c) was used to derive EPCs. Specifically, the 95th percentile upper confidence limits (UCLs) on the arithmetic mean have been selected as EPCs except when the UCL exceeded the maximum concentration detected or there are insufficient data to calculate a UCL (i.e., less than 8 samples or 5 detections). In those cases, the maximum concentration was selected as the EPC.

Not all shallow overburden wells were sampled during each sampling year (i.e., 2006, 2008, and 2009), which made the dataset somewhat skewed towards those wells with more samples. Because some wells showed high variability in groundwater concentrations, to be conservative, it was assumed that all individual data points reflect concentrations in the overburden zone to which a hypothetical future receptor could be exposed. Therefore, concentrations in each well were treated as individual data points in the calculation of EPCs (rather than calculate average concentrations in each well prior to the calculation of EPCs). The exception to this was the analytical data for polycyclic aromatic hydrocarbons (PAHs), which were analyzed using two different analytical methods (USEPA Method 8270C and 8310) as requested by USEPA. Therefore, for some wells, there were two data points for the same PAH from that sampling event. The following hierarchy was used to determine the average PAH concentrations for each well prior to the calculation of EPCs:

(1) For samples with two detectable PAH concentrations, the average of the two data points was used to represent the chemical concentration for that sampling event.

(2) For samples with non-detectable PAH concentrations for both methods, the lowest detection limit was used to represent the well concentration for that sampling event.

Table 3.1 presents the EPCs for shallow overburden groundwater (above the silty clay) in the Project Area. Due to the high variability in COPC concentrations, the resulting EPCs are likely conservative.

3.6 Estimation of Chemical Intake

The Chronic Daily Intake (CDI) was calculated to estimate a receptor's potential daily intake from exposure to constituents in groundwater. Exposure to groundwater (i.e., drinking water) was assumed to occur via ingestion, dermal contact and inhalation of volatiles. The equations used to estimate CDIs are presented below. The human exposure parameters

used for the RME and CTE ingestion and dermal contact exposure routes are presented in Tables 4.1.RME and 4.1.CTE, respectively. The exposure parameters used for the RME and CTE inhalation exposure route are presented in Tables 4.2.RME and 4.2.CTE, respectively.

CDIs for groundwater ingestion were calculated consistent with USEPA's (1989) Risk Assessment Guidance for Superfund (RAGS) Part A as follows:

$$CDI = \frac{C_{GW} \times IR \times EF \times ED \times CF}{AT \times BW}$$

where:

CDI	=	Chronic Daily Intake due to Ingestion (mg/kg-day)
C_{GW}	=	Chemical Concentration in Groundwater (µg/L)
IR	=	Ingestion Rate of Groundwater (L/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
CF	=	Conversion Factor (10^{-3} mg/µg)
BW	=	Body Weight (kg)
AT	=	Averaging Time (days)

CDIs for dermal absorption of groundwater were calculated consistent with USEPA's (2004) RAGS Part E as follows:

$$CDI = \frac{DA_{event} \times EV \times ED \times EF \times SA}{AT \times BW}$$

where:

CDI	=	Chronic Daily Intake Due to Dermal Contact (mg/kg-day)
DA_{event}	=	Absorbed Dose (mg/cm^2-event)
EV	=	Event Frequency (events/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
SA	=	Skin Surface Area Available for Contact (cm^2)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

If $t_{event} \leq t^*$, then:

$$DA_{event} = 2FA \times K_p \times C_{GW} \times CF \times \sqrt{\frac{6T \times t_{event}}{\Pi}}$$

If $t_{event} > t^*$, then:

$$DA_{event} = FA \times K_p \times C_{GW} \times CF \times \left[\frac{t_{event}}{1+B} + 2T_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

where:

DA_{event}	=	Absorbed Dose (mg/cm^2-event)
FA	=	Fraction Absorbed of Water (unitless)
K_p	=	Dermal Permeability Coefficient of Compound in Water (cm/hour)
C_{GW}	=	Chemical Concentration in Groundwater (µg/L)
CF	=	Conversion Factor (1000 L/cm^3 x 10^{-3} mg/µg)
T_{event}	=	Lag Time per Event (hours/event)
t_{event}	=	Event Duration (hours/event)
t^*	=	Time to Reach Steady-State (hours) = 2.4 T_{event}
B	=	Dimensionless Ratio of the Permeability Coefficient of a Compound through the Stratum Corneum Relative to its Permeability Coefficient Across the Epidermis (unitless)

To evaluate the inhalation of groundwater volatiles while showering, the air concentration was calculated using the Andelman (1990) model (as modified by Schaum et al. [1994]) and intakes were calculated consistent with USEPA's (2009) RAGS Part F:

$$CDI = \frac{CA \times ET \times EF \times ED}{AT}$$

where:

CDI	=	Chronic Daily Intake due to Ingestion (mg/m^3)
CA	=	Chemical Concentration in Air (mg/m^3)
ET	=	Exposure Time (hours/day)
EF	=	Exposure Frequency (days/year)
ED	=	Exposure Duration (years)
AT	=	Averaging Time (hours)

$$CA = \frac{(CA_{max}/2)t_1 + (CA_{max} \times t_2)}{t_1 + t_2}$$

where:

CA	=	Concentration of Constituent in Air (mg/m^3)
CA_{max}	=	Maximum Concentration of Constituent in Air (mg/m^3)
t_1	=	Time of Shower (hours)
t_2	=	Time After Shower (hours)

$$CA_{max} = \frac{CW \times f \times Fw \times t_1}{V_a}$$

where:

CA_{max}	=	Maximum Concentration of Constituent in Air (mg/m^3)
CW	=	Groundwater Concentration (mg/L)
f	=	Fraction Volatilized (unitless)
Fw	=	Water Flow Rate (L/h)
t_1	=	Time of Shower (hours)
V_a	=	Bathroom Volume (m^3)

4. Toxicity Assessment

The toxicity assessment identifies the potential effects that are generally associated with exposure to a given constituent. Specifically, the toxicity assessment step involves quantifying the relationship between the magnitude of potential exposure to COPCs via a particular exposure pathway and the likelihood of an adverse health effect. USEPA typically evaluates two types of toxic effects: carcinogenic effects and non-carcinogenic effects. The results of the toxicity assessment, when combined with the dose estimated in the exposure assessment, are used to estimate potential health risks.

To quantify non-carcinogenic effects, USEPA has derived reference doses (RfDs) that represent a threshold of toxicity. RfDs are expressed in units of mg/kg-day and represent "an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (USEPA, 1989). Oral/dermal RfDs and inhalation reference concentrations (RfCs) used in this HHRA are presented in Tables 5.1 and 5.2, respectively.

To quantify carcinogenic effects, the USEPA has derived slope factors (SFs) for those constituents found to cause a dose-related, statistically significant increase in tumor incidence in an exposed population relative to the incidence of tumors observed in an unexposed population. These dose-related incidence rates are usually determined in a laboratory study. SFs are typically developed based on oral toxicity studies and are reported as risk per dose in units of inverse milligrams per kilogram body weight per day ($[mg/kg\text{-}day]^{-1}$). The SFs are used to quantify the potential risk of cancer associated with a given exposure. Oral/dermal SFs and inhalation unit risk factors (URFs) used in this HHRA are presented in Tables 6.1 and 6.2, respectively.

Toxicity values are developed by USEPA, state regulatory agencies and other entities after a comprehensive scientific review of all available toxicological literature and dose-response information for a constituent. The hierarchy used to select toxicity values that were used in this HHRA was consistent with USEPA (2003a) guidance. Specifically, toxicity values were obtained from the following sources, in order of priority:

- USEPA's Integrated Risk Information System (IRIS) (USEPA, 2012d);
- USEPA's Provisional Peer-Reviewed Toxicity Values (PPRTVs) (USEPA, 2012e); and

- California Environmental Protection Agency (CalEPA, 2012), Office of Environmental Health Hazard Assessment (OEHHA), toxicity criteria database.

The oral SFs and RfDs described above are used to evaluate both ingestion and dermal contact exposure routes. Because most oral toxicity values are based on an administered dose, these toxicity values are sometimes adjusted (expressed as an absorbed dose) when evaluating dermal exposure scenarios. This adjustment is applied only when the gastrointestinal absorption of a compound is less than 50% (USEPA, 2004).

5. Risk Characterization

The risk characterization combines the results of the exposure assessment and the toxicity assessment to provide a quantitative estimate of the potential for carcinogenic and non-carcinogenic human health effects due to exposure to COPCs. This HHRA develops conservative estimates of cancer and non-cancer risks and hazards for residential receptors that may potentially be exposed to groundwater (drinking water) COPCs under a hypothetical future scenario.

Consistent with USEPA (1989) guidance, the potential for carcinogenic and non-carcinogenic effects are evaluated separately. Tables 7.1.RME through 7.2.CTE present the calculation of constituent-specific excess lifetime cancer risks and non-cancer hazard indices (HIs) for future adult and child residential receptors exposed to potable groundwater. Tables 9.1.RME through 9.2.CTE present cancer risks and non-cancer hazards for each receptor across all exposure routes (i.e., ingestion, dermal contact, and inhalation of volatiles while showering) as well as target-organ specific hazard quotients (HQs). Tables 9.3.RME and 9.3.CTE present cumulative cancer risks for the aggregate (child + adult) residential receptor.

5.1 Non-Carcinogenic Health Hazards

The HI is used to characterize potential non-carcinogenic health effects associated with exposure to multiple constituents. This approach assumes that sub-threshold chronic exposures to multiple constituents are additive. The hazard index for ingestion and dermal exposure routes is calculated as follows:

$$HI = E1/RfD1 + E2/RfD2 + \ldots + Ei/RfDi$$

Where:

HI = Hazard Index

E/RfD = Hazard Quotient

Ei = Exposure intake for the i^{th} constituent (mg/kg-day)

RfDi = Reference dose for the i^{th} constituent

The hazard index for the inhalation exposure route is calculated as follows:

$HI = E1/RfC1 + E2/RfC2 + \ldots + Ei/RfCi$

Where:

HI = Hazard Index

E/RfC = Hazard Quotient

Ei = Exposure intake for the i^{th} constituent (mg/m^3)

RfCi = Reference concentration for the i^{th} constituent

A HQ value greater than 1 indicates that a calculated exposure is greater than the RfD or RfC for a given constituent and that there may be some potential for health concerns. Similarly, a HI greater than 1 indicates that overall exposure to all constituents of interest may present a concern (USEPA, 1989). Target-organ-specific HIs above the USEPA threshold of 1 can indicate potential effects on individual organs or systems. Target-organ-specific HIs are presented in Tables 9.1.RME through 9.2.CTE.

The non-cancer hazards for future adult and child residents exposed to potable groundwater from the overburden zone at Excelsior Avenue under an RME scenario are 91 and 94, respectively, which are above USEPA's threshold of 1; target-organ HIs for the adult range from 0.7 (gastrointestinal) to 41 (body weight and respiratory), and target-organ HIs for the child range from 0.2 (development) to 27 (whole body). CTE hazards for future adult and child residents are 37 and 65, respectively; target-organ HIs for the adult range from 0.05 (development) to 9 (whole body), and target-organ HIs for the child range from 0.1 (development) to 18 (whole body). Inhalation of naphthalene is the primary hazard driver for adults under an RME scenario and dermal contact with dibenzofuran is the primary hazard driver for adults under a CTE scenario. For children, ingestion of dibenzofuran and benzene in potable groundwater are the primary hazard drivers under an RME scenario. For the CTE scenario, ingestion of dibenzofuran and benzene and dermal contact with dibenzofuran in potable groundwater are the primary hazard drivers.

Naphthalene was detected in approximately 50% of the groundwater samples from the overburden zone, with detected concentrations ranging from 0.12 to 9,600 micrograms per liter (µg/L). The highest naphthalene concentrations were observed in wells MW-EPA-05 and MW-EPA-08 from 2009, which are located within 40 feet of the Old Red Spring (Figure 3). Dibenzofuran was only detected in 2 of 31 overburden groundwater samples, with a maximum concentration of 230 µg/L in well MW-EPA-05. Benzene was detected in 13 of 31 samples with concentrations ranging from 0.32 to 5,800 µg/L. The maximum benzene

concentration was observed in well MW-SS-05-01, which is located north of Excelsior Avenue (Figure 3). The occurrence of high COPC concentrations is correlated with the presence of DNAPL (ARCADIS, 2011). Based on this information, it appears that only a few constituents in a few wells are driving the non-cancer hazards. Due to the high variability in COPC concentrations, the resulting EPCs are likely conservative, which results in conservative estimates of non-cancer hazards.

5.2 Carcinogenic Risks

Excess lifetime carcinogenic risk is expressed as a probability of developing cancer over the course of a lifetime as a result of a given level of exposure (USEPA, 1989). For the ingestion and dermal contact exposure routes, carcinogenic risk is calculated as follows:

Risk = E x SF

Where:

E = Exposure Intake (mg/kg-day)

SF = Slope Factor $(mg/kg\text{-}day)^{-1}$

For the inhalation exposure route, carcinogenic risk is calculated as follows:

Risk = E x URF

Where:

E = Exposure Intake (mg/m^3)

URF = Unit Risk Factor $(mg/m^3)^{-1}$

USEPA uses a range of cancer risks of 1×10^{-4} to 1×10^{-6} as a "target range within which the Agency strives to manage risks as part of a Superfund cleanup" (USEPA, 1991b). The National Contingency Plan (NCP) states that "for known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 1×10^{-4} to 1×10^{-6}" (USEPA, 2003b).

Excess lifetime cancer risks for a hypothetical future resident (child + adult) exposed to potable groundwater via ingestion, dermal contact, and inhalation of volatiles while

showering are 3 x 10^{-3} under an RME scenario and 4 x 10^{-4} under a CTE scenario, both of which are above USEPA's target risk range. The inhalation of naphthalene vapors while showering is the primary risk driver for the hypothetical future resident and accounts for approximately 60% of the total excess lifetime cancer risk under an RME scenario. Risks attributable to ingestion and inhalation of benzene are also above USEPA's target risk range under an RME scenario. For the CTE scenario, inhalation of naphthalene and ingestion of benzene are the primary risk drivers. Similar to the non-cancer hazards, it appears that only a few constituents in a few wells are driving carcinogenic risks. Due to the high variability in COPC concentrations, the resulting EPCs are likely conservative, which results in conservative estimates of cancer risks.

6. Uncertainty Analysis

There are various sources of uncertainty inherent in the risk assessment process. These generally include uncertainties associated with exposure parameters and toxicity factors for which conservative assumptions are typically used so as not to underestimate risk. The objective of an uncertainty analysis is to present key information regarding assumptions and uncertainties in the risk assessment process to place the quantitative risk estimates in proper perspective (USEPA, 1989). The key sources of uncertainty in this HHRA include hypothetical future land use, the development of EPCs, and the use of standard toxicity values that are typically derived from animal studies.

6.1 Future Land Use

As stated previously, the anticipated future land use is expected to remain consistent with current land use (i.e., non-residential) and current restrictions regarding the use of the groundwater as a potable water supply also remaining in place. It's important to note that this HHRA evaluates the use of site groundwater in the absence of institutional controls. According to USEPA's (1989) Risk Assessment Guidance for Superfund (RAGS) Part A, the determination of potential future land use should be based on available information and professional judgment, and should consider reasonably anticipated future land use. An assumption of future residential land use may not be justifiable if the probability that the site will support residential land use in the future is exceedingly small (USEPA, 1989; 1991c). USEPA guidance also indicates that the assumption of residential land use is not a requirement of the Superfund program, but rather is an assumption that can be made based on conservative, but realistic exposures, to ensure that remedies that are ultimately selected for the site will be protective (USEPA, 1991c). USEPA's (1995) *Land Use in the CERCLA Remedy Selection Process* indicates that current land use and zoning laws (among other types of information) may be used to identify reasonably anticipated future land use. Based on these guidance documents, it is clear that an assumption of future residential land use is not appropriate for all sites and may not be a suitable assumption for the Project Area based on its small size, current non-residential land use, zoning laws, and the City of Saratoga requirements regarding municipal water supply. It should also be noted, that NYSDEC's 6NYCRR Part 375-1.8(g)(2) allows restrictions on the use of groundwater to be placed on "residential use" properties. This approach is consistent with the approach taken at other MGP sites in New York.

6.2 Analytical Data

The analytical groundwater data that form the basis of this HHRA were collected from various wells in the overburden zone across the Project Area at different sampling intervals

(i.e., 2006, 2008, and/or 2009). Because some of these wells were not sampled each year, the dataset for overburden groundwater is biased towards those wells with more data, especially since average concentrations for each well were not calculated prior to the calculation of EPCs. The highest concentrations of risk and hazard drivers (i.e., naphthalene, dibenzofuran, and benzene) were primarily observed in wells MW-EPA-05 and MW-SS-05-01. Well MW-EPA-05 was sampled in 2008 and 2009 and concentrations of dibenzofuran and naphthalene were significantly lower in 2008 than 2009 (based on Method 8270C). DNAPL has been observed in a few areas of the Project Area, including near well MW-EPA-05 (ARCADIS, 2009), which may explain the isolated, high concentrations of COPCs. Well MW-SS-05-01 was only sampled in 2006 for a subset of analytes, but contained the highest concentration of benzene.

EPCs based on these analytical data may overestimate the "true mean" of the data because there was such a wide variance in observed concentrations. In the case of 1,1'-biphenyl, anthracene, dibenzofuran, fluorene, and pyrene, maximum concentrations were used as EPCs due to the low frequency of detection, which precluded the calculation of UCLs. Use of maximum concentrations as EPCs in this HHRA most likely overestimates cancer risks and non-cancer hazards.

6.3 Toxicity Factors

The toxicity factors used in the quantitative evaluation of potential risks and hazards (e.g., RfDs, SFs) were primarily selected from IRIS. Secondary sources included PPRTVs and CalEPA values. For many chemicals, there is a lack of appropriate information on effects in humans (i.e., epidemiologic studies). Therefore, animal studies are generally used to develop toxicity values used in HHRAs.

Specifically, for non-cancer effects, toxicity values based on laboratory animal data are extrapolated with the use of uncertainty factors to account for factors such as: (1) variation in sensitivity among members of the human population (i.e., intraspecies variability), (2) the uncertainty in extrapolating animal data to humans (i.e., interspecies variability), (3) the uncertainty in extrapolating from less-than-lifetime data to lifetime exposure, (4) the uncertainty in extrapolating from a Lowest-Observed-Adverse-Effect-Level (LOAEL) rather than a No-Observed-Adverse-Effect-Level (NOAEL), and (5) the uncertainty associated with extrapolation from animal data when the database is incomplete (USEPA, 2002c).

A similar "margin of safety" is built into toxicity values for carcinogenic effects. The evaluation of the carcinogenicity of chemicals in this HHRA follows the USEPA (2005) Guidelines for Carcinogen Risk Assessment. SFs are based on dose-response curves and their derivation includes the use of mathematical models to extrapolate from observed high

dose data to the desired (but unmeasurable) slope at low dose (USEPA, 2012f). In order to account for the uncertainty in this extrapolation process, USEPA typically chooses to employ the upper 95th confidence limit of the slope as the SF; therefore, there is a 95 percent probability that the true cancer potency is lower than the value chosen for the SF (USEPA, 2012f). Based on the above information, the toxicity values used in this HHRA are considered to be conservative and may overestimate potential risks and hazards.

Because some chemicals do not have associated toxicity values, the potential for risks and hazards may be underestimated for some COPCs. However, it is not expected that these COPCs would add significantly to overall risks and hazards.

7. Summary and Conclusions

Media of interest associated with the Project Area include overburden groundwater in the Excelsior Avenue Area and bedrock groundwater in the Old Red Spring Area; these media were the focus of this HHRA. The following presents a summary of the findings for the exposure pathways that were evaluated in this HHRA:

- Bedrock Groundwater: Water quality of the Old Red Spring has been continuously analyzed since the beginning of Superfund investigations starting as far back as 1990, and the NYSDOH continues to monitor the Old Red Spring on an on-going basis. To date, there have been no exceedances of NYSDOH drinking water standards or NYSDEC groundwater standards from water taken from the Old Red Spring. The Old Red Spring is supplied by water pumped from an artesian bedrock aquifer below the approximately 100 foot thick lacustrine clay layer underlying the Project Area. DNAPL, which has likely been present for over 100 years, has not migrated downward through the 100 feet of clay. Based on this information, there are no unacceptable human health risks from exposure to bedrock groundwater.

- Overburden Groundwater (Current Condition): There is no current direct contact exposure pathway for residents to overburden groundwater in the Excelsior Avenue Area because there is no potable use of groundwater in the vicinity of the Project Area. Current zoning at the Project Area restricts the use of groundwater from the overburden as a potable source and requires use of the municipal water supply (i.e., prohibits the installation of new private wells within 100 feet of a municipal water supply). Therefore, overburden groundwater does not present a current complete exposure pathway for residents.

- Overburden Groundwater (Hypothetical Future Condition): Overburden groundwater in the Project Area represents a potential exposure medium for a hypothetical future scenario if residents in the Excelsior Avenue Area were allowed to use groundwater as a potable source. However, it is important to note that city requirements for the use of municipal water supplies preclude the use of site groundwater as a potable source. The hypothetical future residential scenario assumes the absence of institutional controls. Based on a hypothetical future residential scenario, potable use of overburden groundwater may present unacceptable risks to human health (i.e., estimated risks and hazards were above USEPA targets which include a cancer risk range of $1x10^{-4}$ to $1x10^{-6}$ and a hazard index of 1). However, this hypothetical future scenario is highly unlikely within the lifecycle of any remedy presented in the Feasibility Study (i.e., 30 years) based on the current site usage (non-residential) and zoning restrictions (which prohibits the installation of new private wells and requires new structures to utilize the municipal

water supply within the City limits if the water lines are within 100 feet). Since municipal water supply pipes are located in the streets on both sides of the site, this zoning restriction would preclude the installation of new private wells. In addition, NYSDEC's 6NYCRR Part 375-1.8(g)(2) allows restrictions on the use of groundwater to be placed on "residential use" properties. Restrictions could be placed on the groundwater as additional protection against current City zoning restrictions were to be removed. The placement of restrictions on groundwater in this type of setting is consistent with the approach taken at other MGP sites in New York.

- As requested by USEPA, this HHRA only evaluates a hypothetical future groundwater exposure scenario for a resident. Under future conditions, potential risks and hazards for an industrial scenario involving groundwater may equate to approximately one-half of that for the adult resident; however, quantification of potential industrial risks and hazards would depend on the type of worker evaluated (e.g., utility worker, construction worker), the exact use of groundwater (e.g., potable source, strict industrial use), potential exposure routes, and associated exposure factors used in the quantification of risk estimates.

- Vapor Intrusion: The vapor intrusion pathway does not currently pose an unacceptable risk to human health. This pathway was evaluated relative to on-site receptors such as commercial workers and members at the fitness gym. Based on a screening evaluation of groundwater data collected within 100 feet of the building, concentrations are below USEPA (2002a) target groundwater concentrations. Should the site usage change in the future, measures could be taken to mitigate this pathway if necessary. The need or scope of any potential mitigation methods would need to be evaluated once the nature of the future use was identified.

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ARCADIS

Tables

Table 0

Site Risk Assessment Identification Information

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Site Name/OU:	Saratoga Springs, NY
Region:	2
EPA ID Number:	NYD980664361
State:	New York
Status:	
Federal Facility (Y/N):	Y
EPA Project Manager:	Maria Jon
EPA Risk Assessor:	
Prepared by (Organization):	ARCADIS
Prepared for (Organization):	National Grid (formerly the Niagara Mohawk Power Corporation)
Document Title:	Human Health Risk Assessment for Niagara Mohawk Power Corporation Saratoga Springs Plant
Document Date:	July 2012
Probabilistic Risk Assessment (Y/N):	N
Comments:	

Table 1

Selection of Exposure Pathways

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Groundwater	Tap Water	Old Red Spring (bedrock groundwater zone)	Resident	Adult	Ingestion	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
						Dermal	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
					Child	Ingestion	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
						Dermal	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
			Excelsior Avenue (overburden groundwater zone)	Resident	Adult	Ingestion	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
						Dermal	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
						Inhalation (showering)	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
					Child	Ingestion	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
						Dermal	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
						Inhalation (showering)	Qualitative	Site groundwater is not currently used as a potable source. There are currently no residences on the Site. Exposure pathway is incomplete.
				Commercial Worker	Adult	Inhalation (vapor intrusion)	Quantitative	Commercial workers at the fitness gym may be exposed to vapors in indoor air emanating from overburden groundwater. Monitoring wells within 100 feet of the building represent potential exposure points.

Table 1

Selection of Exposure Pathways

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Tap Water	Old Red Spring (bedrock groundwater zone)	Resident	Adult	Ingestion	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
						Dermal	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
					Child	Ingestion	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
						Dermal	Quantitative	Bedrock groundwater (i.e., beneath the confining clay layer) is currently available as a potable source at the Old Red Spring.
			Excelsior Avenue (overburden groundwater zone)	Resident	Adult	Ingestion	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
						Dermal	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
						Inhalation (showering)	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
					Child	Ingestion	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
						Dermal	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
						Inhalation (showering)	Quantitative	Exposure pathway may be potentially complete if residential development were to occur onsite in the future and such residences installed a private drinking water well.
				Commercial Worker	Adult	Inhalation (vapor intrusion)	Quantitative	Commercial workers at the fitness gym may be exposed to vapors in indoor air emanating from overburden groundwater. Monitoring wells within 100 feet of the building represent potential exposure points.

Table 2.1
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration used for Screening [1]	Screening Toxicity Value [2]	Potential ARAR/TBC Value 1	Potential ARAR/TBC Source 1	Potential ARAR/TBC Value 2	Potential ARAR/TBC Source 2	COPC Flag (Y/N)	Rationale for Selection or Deletion [3]
	VOCs by USEPA Method 8260B															
71432	Benzene	ug/L	0.32	5800	13/31	MW-SS-05-01	1	1	5800	0.39	5	MCL	1	NYSDEC Class GA	Y	ASTV
56235	Carbon tetrachloride	ug/L	2.9	2.9	1/31	MW-EPA-07	1	250	2.9	0.39	5	MCL	5	NYSDEC Class GA	N	FOD
67663	Chloroform	ug/L	0.2	0.2	1/31	MW-EPA-06	1	250	0.2	0.19	NA	MCL	7	NYSDEC Class GA	N	FOD
100414	Ethylbenzene	ug/L	1.7	920	11/31	MW-EPA-08	1	4	920	1.3	700	MCL	5	NYSDEC Class GA	Y	ASTV
75092	Methylene chloride	ug/L	28	28	1/31	MW-EPA-04	1	340	28	9.9	5	MCL	5	NYSDEC Class GA	N	FOD
108883	Toluene	ug/L	0.16	460	9/31	MW-EPA-08	1	50	460	86	1,000	MCL	5	NYSDEC Class GA	Y	ASTV
1330207	Xylenes (total)	ug/L	1.4	1100	11/31	MW-EPA-08	3	5	1100	19	10,000	MCL	5	NYSDEC Class GA	Y	ASTV
	SVOCs by USEPA Method 8270C															
92524	1,1'-Biphenyl	ug/L	19	19	1/9	MW-SS-05-01	9.4	9.6	19	0.083	NA	NA	5	NYSDEC Class GA	Y	ASTV
91576	2-Methylnaphthalene	ug/L	1	6700	8/22	MW-EPA-05	10	100	6700	2.7	NA	NA	NA	NYSDEC Class GA	Y	ASTV
83329	Acenaphthene	ug/L	0.3	3000	7/23	MW-EPA-05	9.5	100	3000	40	NA	NA	20	NYSDEC Class GA	Y	ASTV
120127	Anthracene	ug/L	2.7	1500	2/22	MW-EPA-05	10	200	1500	130	NA	NA	50	NYSDEC Class GA	Y	ASTV
56553	Benzo(a)anthracene	ug/L	690	690	1/22	MW-EPA-05	1	20	690	0.029	NA	NA	0.002	NYSDEC Class GA	N	FOD
50328	Benzo(a)pyrene	ug/L	460	460	1/22	MW-EPA-05	1	20	460	0.0029	0.2	MCL	0	NYSDEC Class GA	N	FOD
205992	Benzo(b)fluoranthene	ug/L	220	220	1/22	MW-EPA-05	1	20	220	0.029	NA	NA	0.002	NYSDEC Class GA	N	FOD
207089	Benzo(k)fluoranthene	ug/L	300	300	1/22	MW-EPA-05	1	20	300	0.29	NA	NA	0.002	NYSDEC Class GA	N	FOD
218019	Chrysene	ug/L	740	740	1/22	MW-EPA-05	10	200	740	2.9	NA	NA	0.002	NYSDEC Class GA	N	FOD
132649	Dibenzofuran	ug/L	1.6	230	2/31	MW-EPA-05	9.4	200	230	0.58	NA	NA	NA	NYSDEC Class GA	Y	ASTV
206440	Fluoranthene	ug/L	1400	1400	1/22	MW-EPA-05	10	200	1400	63	NA	NA	50	NYSDEC Class GA	N	FOD
86737	Fluorene	ug/L	12	2200	3/22	MW-EPA-05	10	100	2200	22	NA	NA	50	NYSDEC Class GA	Y	ASTV
193395	Indeno(1,2,3-cd)pyrene	ug/L	130	130	1/22	MW-EPA-05	1	20	130	0.029	NA	NA	0.002	NYSDEC Class GA	N	FOD
91203	Naphthalene	ug/L	130	9600	8/23	MW-EPA-05	9.5	10	9600	0.14	NA	NA	10	NYSDEC Class GA	Y	ASTV
85018	Phenanthrene	ug/L	10	4800	2/22	MW-EPA-05	10	200	4800	NA	NA	NA	50	NYSDEC Class GA	N	NSTV
108952	Phenol	ug/L	4	20	3/31	MW-SS-05-01	9.4	500	20	450	NA	NA	1	NYSDEC Class GA	N	BSTV
129000	Pyrene	ug/L	1.4	2000	2/23	MW-EPA-05	9.5	200	2000	8.7	NA	NA	50	NYSDEC Class GA	Y	ASTV
	PAHs by USEPA Method 8310															
91576	2-Methylnaphthalene	ug/L	16	310	2/9	MW-SS-05-01	0.95	1.2	310	2.7	NA	NA	NA	NYSDEC Class GA	Y	ASTV
83329	Acenaphthene	ug/L	1	46	3/19	MW-EPA-05	0.94	95	46	40	NA	NA	20	NYSDEC Class GA	Y	ASTV
218019	Chrysene	ug/L	0.03	0.03	1/19	MW-EPA-10	0.19	19	0.03	2.9	NA	NA	0.002	NYSDEC Class GA	N	BSTV
91203	Naphthalene	ug/L	0.12	2500	9/19	MW-SS-05-01	0.94	0.97	2500	0.14	NA	NA	10	NYSDEC Class GA	Y	ASTV
	Miscellaneous															
14808798	Sulfate	ug/L	8400	310000	7/12	MW-EPA-01	5000	5000	310000	NA	NA	NA	250000	NYSDEC Class GA	N	NSTV
	Inorganics - Total															
7439896	Iron	ug/L	99.6	27700	12/12	MW-EPA-02	NA	NA	27700	1100	NA	NA	300	NYSDEC Class GA	Y	ASTV
7439965	Manganese	ug/L	77.1	2490	12/12	LTMW-12	NA	NA	2490	32	NA	NA	300	NYSDEC Class GA	Y	ASTV
	Inorganics-Filtered															
7439896	Iron (filtered)	ug/L	89	5240	7/12	LTMW-12	150	150	5240	1100	NA	NA	300	NYSDEC Class GA	N	BSTV
7439965	Manganese (filtered)	ug/L	66.8	2520	12/12	LTMW-12	NA	NA	2520	32	NA	NA	300	NYSDEC Class GA	Y	ASTV

Notes:
[1] Maximum concentration was used as the screening concentration.
[2] Screening Toxicity Value represents USEPA Regional Screening Levels (RSLs) for tap water dated May 2012. RSLs based on a non-cancer endpoint were adjusted to reflect a hazard quotient of 0.1.
[3] Rationale codes:
ASTV = Retained because screening concentration is above screening toxicity value.
BSTV = Excluded because screening concentration is below screening toxicity value.
NSTV = No screening toxicity value. Constituent has no associated toxicity value that would allow quantitative evaluation; therefore, this constituent is not retained as a COPC
FOD = Frequency of detection is less than 5 percent.
Table contains detected constituents only.
ARAR/TBC = Applicable or Relevant and Appropriate Requirement / To Be Considered
COPC = Chemical of Potential Concern
MCL = Maximum Contaminant Level
NA = Not available
ug/L = micrograms per liter

Table 2.2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Old Red Spring Area

Scenario Timeframe: Current/Future
Medium: Bedrock Groundwater
Exposure Medium: Bedrock Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration used for Screening [1]	Screening Toxicity Value [2]	Potential ARAR/TBC Value 1	Potential ARAR/TBC Source 1	Potential ARAR/TBC Value 2	Potential ARAR/TBC Source 2	COPC Flag (Y/N)	Rationale for Selection or Deletion [3]
	VOCs by USEPA Method 8260B															
71432	Benzene	ug/L	--	--	0/20	--	NA	NA	ND	0.39	5	MCL	1	NYSDEC Class GA	N	ND
100414	Ethylbenzene	ug/L	--	--	0/20	--	NA	NA	ND	1.3	700	MCL	5	NYSDEC Class GA	N	ND
108883	Toluene	ug/L	--	--	0/20	--	NA	NA	ND	86	1000	MCL	5	NYSDEC Class GA	N	ND
1330207	Xylenes (total)	ug/L	--	--	0/20	--	NA	NA	ND	19	10000	MCL	5	NYSDEC Class GA	N	ND
	SVOCs by USEPA Method 8270C															
91576	2-Methylnaphthalene	ug/L	--	--	0/20	--	NA	NA	ND	2.7	NA	NA	NA	NYSDEC Class GA	N	ND
83329	Acenaphthene	ug/L	--	--	0/20	--	NA	NA	ND	40	NA	NA	20	NYSDEC Class GA	N	ND
208968	Acenaphthylene	ug/L	--	--	0/20	--	NA	NA	ND	NA	NA	NA	NA	NYSDEC Class GA	N	ND
120127	Anthracene	ug/L	--	--	0/20	--	NA	NA	ND	130	NA	NA	50	NYSDEC Class GA	N	ND
56553	Benzo(a)anthracene	ug/L	--	--	0/20	--	NA	NA	ND	0.029	NA	NA	0.002	NYSDEC Class GA	N	ND
50328	Benzo(a)pyrene	ug/L	--	--	0/20	--	NA	NA	ND	0.0029	0.2	MCL	0	NYSDEC Class GA	N	ND
205992	Benzo(b)fluoranthene	ug/L	--	--	0/20	--	NA	NA	ND	0.029	NA	NA	0.002	NYSDEC Class GA	N	ND
191242	Benzo(ghi)perylene	ug/L	--	--	0/20	--	NA	NA	ND	NA	NA	NA	NA	NYSDEC Class GA	N	ND
207089	Benzo(k)fluoranthene	ug/L	--	--	0/20	--	NA	NA	ND	0.29	NA	NA	0.002	NYSDEC Class GA	N	ND
218019	Chrysene	ug/L	--	--	0/20	--	NA	NA	ND	2.9	NA	NA	0.002	NYSDEC Class GA	N	ND
53703	Dibenzo(a,h)anthracene	ug/L	--	--	0/20	--	NA	NA	ND	0.0029	NA	NA	NA	NYSDEC Class GA	N	ND
206440	Fluoranthene	ug/L	--	--	0/20	--	NA	NA	ND	63	NA	NA	50	NYSDEC Class GA	N	ND
86737	Fluorene	ug/L	--	--	0/20	--	NA	NA	ND	22	NA	NA	50	NYSDEC Class GA	N	ND
193395	Indeno(1,2,3-cd)pyrene	ug/L	--	--	0/20	--	NA	NA	ND	0.029	NA	NA	0.002	NYSDEC Class GA	N	ND
91203	Naphthalene	ug/L	--	--	1/20	7/17/06	NA	NA	1	0.14	NA	NA	10	NYSDEC Class GA	N	ND [a]
85018	Phenanthrene	ug/L	--	--	0/20	--	NA	NA	ND	NA	NA	NA	50	NYSDEC Class GA	N	ND
129000	Pyrene	ug/L	--	--	0/20	--	NA	NA	ND	8.7	NA	NA	50	NYSDEC Class GA	N	ND

Notes:
[1] Maximum concentration was used as the screening concentration.
[2] Screening Toxicity Value represents USEPA Regional Screening Levels (RSLs) for tap water dated May 2012. RSLs based on a non-cancer endpoint were adjusted to reflect a hazard quotient of 0.1.
[3] Rationale codes:
ND = Constituent was not detected.
[a] The only detected concentration of naphthalene was in July 2006; all other concentrations were non-detect. Because naphthalene was not detected in recent sampling events (i.e., 2010 and 2011), this constituent was not retained as a COPC.
ARAR/TBC = Applicable or Relevant and Appropriate Requirement / To Be Considered
COPC = Chemical of Potential Concern
MCL = Maximum Contaminant Level
ND = Non-detect
NA = Not available
ug/L = micrograms per liter

Table 2.3
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Site-Wide)

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration used for Screening [1]	Toxic and Volitale [2]	Screening Toxicity Value [3]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [4]
	VOCs by USEPA Method 8260B														
71432	Benzene	ug/L	0.32	5800	13/31	MW-SS-05-01	1	1	5800	YES	5	NA	NA	Y	ASTV
56235	Carbon tetrachloride	ug/L	2.9	2.9	1/31	MW-EPA-07	1	250	2.9	YES	5	NA	NA	N	BSTV
67663	Chloroform	ug/L	0.2	0.2	1/31	MW-EPA-06	1	250	0.2	YES	80	NA	NA	N	BSTV
100414	Ethylbenzene	ug/L	1.7	920	11/31	MW-EPA-08	1	4	920	YES	700	NA	NA	Y	ASTV
75092	Methylene chloride	ug/L	28	28	1/31	MW-EPA-04	1	340	28	YES	58	NA	NA	N	BSTV
108883	Toluene	ug/L	0.16	460	9/31	MW-EPA-08	1	50	460	YES	1500	NA	NA	N	BSTV
1330207	Xylenes (total)	ug/L	1.4	1100	11/31	MW-EPA-08	3	5	1100	NA	NA	NA	NA	N	NSTV
NA	Total BTEX	ug/L	0.32	7700	13/31	MW-SS-05-01	NA	NA	7700	NA	NA	NA	NA	N	NSTV
	SVOCs by USEPA Method 8270C														
92524	1,1'-Biphenyl	ug/L	19	19	1/9	MW-SS-05-01	9.4	9.6	19	NA	NA	NA	NA	N	NSTV
91576	2-Methylnaphthalene	ug/L	1	6700	8/22	MW-EPA-05	10	100	6700	YES	3300	NA	NA	Y	ASTV
95487	2-Methylphenol	ug/L	0.4	0.4	1/31	MW-EPA-07	9.4	500	0.4	NO	NA	NA	NA	N	NSTV
106445	4-Methylphenol	ug/L	1.2	1.2	1/31	MW-EPA-07	9.4	500	1.2	NA	NA	NA	NA	N	NSTV
83329	Acenaphthene	ug/L	0.3	3000	7/23	MW-EPA-05	9.5	100	3000	YES	NA	NA	NA	N	NSTV
208968	Acenaphthylene	ug/L	20	1300	3/22	MW-EPA-05	10	100	1300	NA	NA	NA	NA	N	NSTV
120127	Anthracene	ug/L	2.7	1500	2/22	MW-EPA-05	10	200	1500	NO	NA	NA	NA	N	NSTV
56553	Benzo(a)anthracene	ug/L	690	690	1/22	MW-EPA-05	1	20	690	NO	NA	NA	NA	N	NSTV
50328	Benzo(a)pyrene	ug/L	460	460	1/22	MW-EPA-05	1	20	460	NO	NA	NA	NA	N	NSTV
205992	Benzo(b)fluoranthene	ug/L	220	220	1/22	MW-EPA-05	1	20	220	YES	NA	NA	NA	N	NSTV
191242	Benzo(ghi)perylene	ug/L	150	150	1/22	MW-EPA-05	10	200	150	NA	NA	NA	NA	N	NSTV
207089	Benzo(k)fluoranthene	ug/L	300	300	1/22	MW-EPA-05	1	20	300	NO	NA	NA	NA	N	NSTV
86748	Carbazole	ug/L	3.7	13	2/31	MW-SS-05-01	9.4	500	13	NO	NA	NA	NA	N	NSTV
218019	Chrysene	ug/L	740	740	1/22	MW-EPA-05	10	200	740	YES	NA	NA	NA	N	NSTV
132649	Dibenzofuran	ug/L	1.6	230	2/31	MW-EPA-05	9.4	200	230	YES	NA	NA	NA	N	NSTV
206440	Fluoranthene	ug/L	1400	1400	1/22	MW-EPA-05	10	200	1400	NO	NA	NA	NA	N	NSTV
86737	Fluorene	ug/L	12	2200	3/22	MW-EPA-05	10	100	2200	YES	NA	NA	NA	N	NSTV
193395	Indeno(1,2,3-cd)pyrene	ug/L	130	130	1/22	MW-EPA-05	1	20	130	NO	NA	NA	NA	N	NSTV
91203	Naphthalene	ug/L	130	9600	8/23	MW-EPA-05	9.5	10	9600	YES	150	NA	NA	Y	ASTV
85018	Phenanthrene	ug/L	10	4800	2/22	MW-EPA-05	10	200	4800	NA	NA	NA	NA	N	NSTV
108952	Phenol	ug/L	4	20	3/31	MW-SS-05-01	9.4	500	20	NO	NA	NA	NA	N	NSTV
129000	Pyrene	ug/L	1.4	2000	2/23	MW-EPA-05	9.5	200	2000	YES	NA	NA	NA	N	NSTV
NA	Total PAHs2	ug/L	130	35000	8/23	MW-EPA-05	NA	NA	35000	NA	NA	NA	NA	N	NSTV
	PAHs by USEPA Method 8310														
91576	2-Methylnaphthalene	ug/L	16	310	2/9	MW-SS-05-01	0.95	1.2	310	YES	3300	NA	NA	N	BSTV
83329	Acenaphthene	ug/L	1	46	3/19	MW-EPA-05	0.94	95	46	YES	NA	NA	NA	N	NSTV
208968	Acenaphthylene	ug/L	0.87	470	2/19	MW-SS-05-01	0.94	9.5	470	NA	NA	NA	NA	N	NSTV
120127	Anthracene	ug/L	0.026	4.2	4/19	MW-SS-05-01	0.19	1.9	4.2	NO	NA	NA	NA	N	NSTV
191242	Benzo(ghi)perylene	ug/L	0.03	0.03	1/19	MW-EPA-10	0.19	19	0.03	NA	NA	NA	NA	N	NSTV
218019	Chrysene	ug/L	0.03	0.03	1/19	MW-EPA-10	0.19	19	0.03	YES	NA	NA	NA	N	NSTV
206440	Fluoranthene	ug/L	0.034	0.25	2/19	MW-EPA-04	0.19	19	0.25	NO	NA	NA	NA	N	NSTV
86737	Fluorene	ug/L	1.2	10	2/19	MW-EPA-05	0.19	19	10	YES	NA	NA	NA	N	NSTV

Table 2.3
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Site-Wide)

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration used for Screening [1]	Toxic and Volitale [2]	Screening Toxicity Value [3]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [4]
91203	Naphthalene	ug/L	0.12	2500	9/19	MW-SS-05-01	0.94	0.97	2500	YES	150	NA	NA	Y	ASTV
85018	Phenanthrene	ug/L	0.042	9.1	8/19	MW-EPA-05	0.19	24	9.1	NA	NA	NA	NA	N	NSTV
129000	Pyrene	ug/L	0.046	0.046	1/19	MW-08-08	0.19	19	0.046	YES	NA	NA	NA	N	NSTV
NA	Total PAHs	ug/L	0.034	3300	16/19	MW-SS-05-01	NA	NA	3300	NA	NA	NA	NA	N	NSTV
	Miscellaneous														
NA	Alkalinity	ug/L	263000	827000	12/12	MW-EPA-07	NA	NA	827000	NA	NA	NA	NA	N	NSTV
7664417	Ammonia	ug/L	140	3800	12/12	MW-EPA-08	NA	NA	3800	NA	NA	NA	NA	N	NSTV
124389	Carbon dioxide	ug/L	55000	430000	13/13	MW-EPA-07	NA	NA	430000	NA	NA	NA	NA	N	NSTV
74828	Methane	ug/L	2.9	9800	13/13	MW-EPA-07	NA	NA	9800	NA	NA	NA	NA	N	NSTV
14797558	Nitrate as N	ug/L	100	950	6/12	MW-EPA-06	100	100	950	NA	NA	NA	NA	N	NSTV
7727379	Nitrogen, Total Kjeldahl	ug/L	160	5400	12/12	MW-EPA-08	NA	NA	5400	NA	NA	NA	NA	N	NSTV
14265442A	Orthophosphate as P	ug/L	35	350	9/12	LTMW-12,MW-EPA-08	30	30	350	NA	NA	NA	NA	N	NSTV
7782447	Oxygen	ug/L	1900	8500	13/13	MW-EPA-01	NA	NA	8500	NA	NA	NA	NA	N	NSTV
14808798	Sulfate	ug/L	8400	310000	7/12	MW-EPA-01	5000	5000	310000	NA	NA	NA	NA	N	NSTV
	Inorganics														
7439896	Iron	ug/L	99.6	27700	12/12	MW-EPA-02	NA	NA	27700	NA	NA	NA	NA	N	NSTV
7439965	Manganese	ug/L	77.1	2490	12/12	LTMW-12	NA	NA	2490	NA	NA	NA	NA	N	NSTV
	Inorganics-Filtered														
7439896	Iron (filtered)	ug/L	89	5240	7/12	LTMW-12	150	150	5240	NA	NA	NA	NA	N	NSTV
7439965	Manganese (filtered)	ug/L	66.8	2520	12/12	LTMW-12	NA	NA	2520	NA	NA	NA	NA	N	NSTV

Notes:
[1] Maximum concentration was used as the screening concentration.
[2] Considered toxic and volatile according to USEPA (2002) Subsurface Vapor Intrusion Guidance.
[3] Screening Toxicity Value represents the target groundwater concentration corresponding to target indoor air concentration where soil gas to indoor air attenuation factor = 0.001 and partitioning across water table obeys Henry's Law. Based on risk of 1E-06.
Source: USEPA (2002) OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). EPA530-D-02-004. November.
[4] Rationale codes:
ASTV = Retained because screening concentration is above Screening Toxicity Value.
BSTV = Excluded because screening concentration is below both Screening Toxicity Value.
NSTV = No screening toxicity value. Constituent has no associated toxicity value that would allow quantitative evaluation; therefore, this constituent is not retained as a COPC
Table contains detected constituents only.
ARAR/TBC = Applicable or Relevant and Appropriate Requirement / To Be Considered
COPC = Chemical of Potential Concern
NA = Not available, not applicable
ug/L = micrograms per liter

Table 2.4
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Within 100 Feet of Building)[1]

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration Used for Screening [2]	Toxic and Volitale [3]	Screening Toxicity Value [4]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
	VOCs by USEPA Method 8260B														
71556	1,1,1-Trichloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	3100	NA	NA	N	ND
79345	1,1,2,2-Tetrachloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	3	NA	NA	N	ND
76131	1,1,2-Trichloro-1,2,2-trifluoroethane	ug/L	ND	ND	0/2	--	1	1	ND	YES	1500	NA	NA	N	ND
79005	1,1,2-Trichloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	5	NA	NA	N	ND
75343	1,1-Dichloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	2200	NA	NA	N	ND
75354	1,1-Dichloroethene	ug/L	ND	ND	0/5	--	1	1	ND	YES	190	NA	NA	N	ND
120821	1,2,4-Trichlorobenzene	ug/L	ND	ND	0/2	--	1	1	ND	YES	3400	NA	NA	N	ND
96128	1,2-Dibromo-3-chloropropane	ug/L	ND	ND	0/2	--	1	1	ND	YES	33	NA	NA	N	ND
106934	1,2-Dibromoethane	ug/L	ND	ND	0/2	--	1	1	ND	YES	0.36	NA	NA	N	ND
95501	1,2-Dichlorobenzene	ug/L	ND	ND	0/2	--	1	1	ND	YES	2600	NA	NA	N	ND
107062	1,2-Dichloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	5	NA	NA	N	ND
78875	1,2-Dichloropropane	ug/L	ND	ND	0/5	--	1	1	ND	YES	35	NA	NA	N	ND
541731	1,3-Dichlorobenzene	ug/L	ND	ND	0/2	--	1	1	ND	YES	830	NA	NA	N	ND
106467	1,4-Dichlorobenzene	ug/L	ND	ND	0/2	--	1	1	ND	YES	8200	NA	NA	N	ND
78933	2-Butanone	ug/L	ND	ND	0/5	--	5	10	ND	YES	440000	NA	NA	N	ND
591786	2-Hexanone	ug/L	ND	ND	0/5	--	5	10	ND	NA	NA	NA	NA	N	ND
108101	4-Methyl-2-pentanone	ug/L	ND	ND	0/5	--	5	10	ND	YES	14000	NA	NA	N	ND
67641	Acetone	ug/L	ND	ND	0/5	--	5	10	ND	YES	220000	NA	NA	N	ND
71432	Benzene	ug/L	ND	ND	0/5	--	1	1	ND	YES	5	NA	NA	N	ND
75274	Bromodichloromethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	2.1	NA	NA	N	ND
75252	Bromoform	ug/L	ND	ND	0/5	--	1	1	ND	YES	0.0083	NA	NA	N	ND
74839	Bromomethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	20	NA	NA	N	ND
75150	Carbon disulfide	ug/L	ND	ND	0/5	--	1	1	ND	YES	560	NA	NA	N	ND
56235	Carbon tetrachloride	ug/L	ND	ND	0/5	--	1	1	ND	YES	5	NA	NA	N	ND
108907	Chlorobenzene	ug/L	ND	ND	0/5	--	1	1	ND	YES	390	NA	NA	N	ND
75003	Chloroethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	28000	NA	NA	N	ND
67663	Chloroform	ug/L	0.2	0.2	1/5	MW-EPA-06	1	1	0.2	YES	80	NA	NA	N	BSTV
74873	Chloromethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	6.7	NA	NA	N	ND
156592	cis-1,2-Dichloroethene	ug/L	ND	ND	0/5	--	1	1	ND	YES	210	NA	NA	N	ND
542756	cis-1,3-Dichloropropene	ug/L	ND	ND	0/5	--	1	1	ND	YES	0.84	NA	NA	N	ND
110827	Cyclohexane	ug/L	ND	ND	0/2	--	1	1	ND	NA	NA	NA	NA	N	ND
124481	Dibromochloromethane	ug/L	ND	ND	0/5	--	1	1	ND	YES	3.2	NA	NA	N	ND
75718	Dichlorodifluoromethane	ug/L	ND	ND	0/2	--	1	1	ND	YES	14	NA	NA	N	ND
100414	Ethylbenzene	ug/L	ND	ND	0/5	--	1	1	ND	YES	700	NA	NA	N	ND
98828	Isopropylbenzene	ug/L	ND	ND	0/2	--	1	1	ND	YES	8.4	NA	NA	N	ND
79209	Methyl acetate	ug/L	ND	ND	0/2	--	1	1	ND	YES	720000	NA	NA	N	ND
1634044	Methyl tert-butyl ether	ug/L	ND	ND	0/2	--	1	1	ND	YES	120000	NA	NA	N	ND
108872	Methylcyclohexane	ug/L	ND	ND	0/2	--	1	1	ND	YES	710	NA	NA	N	ND
75092	Methylene chloride	ug/L	ND	ND	0/5	--	1	1	ND	YES	58	NA	NA	N	ND
100425	Styrene	ug/L	ND	ND	0/5	--	1	1	ND	YES	8900	NA	NA	N	ND
127184	Tetrachloroethene	ug/L	ND	ND	0/5	--	1	1	ND	YES	5	NA	NA	N	ND
108883	Toluene	ug/L	ND	ND	0/5	--	1	1	ND	YES	1500	NA	NA	N	ND
156605	trans-1,2-Dichloroethene	ug/L	ND	ND	0/5	--	1	1	ND	YES	180	NA	NA	N	ND
542756	trans-1,3-Dichloropropene	ug/L	ND	ND	0/5	--	1	1	ND	YES	0.84	NA	NA	N	ND

Table 2.4
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Within 100 Feet of Building)[1]

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration Used for Screening [2]	Toxic and Volitale [3]	Screening Toxicity Value [4]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
79016	Trichloroethene	ug/L	ND	ND	0/5	--	1	1	ND	YES	NA	NA	NA	N	ND
75694	Trichlorofluoromethane	ug/L	ND	ND	0/2	--	1	1	ND	YES	180	NA	NA	N	ND
75014	Vinyl chloride	ug/L	ND	ND	0/5	--	1	1	ND	YES	2	NA	NA	N	ND
1330207	Xylenes (total)	ug/L	ND	ND	0/5	--	3	3	ND	NA	NA	NA	NA	N	ND
NA	Total BTEX	ug/L	ND	ND	0/5	--	N/A	N/A	ND	NA	NA	NA	NA	N	ND
	SVOCs by USEPA Method 8270C														
92524	1,1'-Biphenyl	ug/L	ND	ND	0/2	--	9.4	9.5	ND	NA	NA	NA	NA	N	ND
120821	1,2,4-Trichlorobenzene	ug/L	ND	ND	0/3	--	1	1	ND	YES	3400	NA	NA	N	ND
95501	1,2-Dichlorobenzene	ug/L	ND	ND	0/3	--	10	10	ND	YES	2600	NA	NA	N	ND
541731	1,3-Dichlorobenzene	ug/L	ND	ND	0/3	--	10	10	ND	YES	830	NA	NA	N	ND
106467	1,4-Dichlorobenzene	ug/L	ND	ND	0/3	--	10	10	ND	YES	8200	NA	NA	N	ND
540545	2,2'-oxybis(1-Chloropropane)	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
95954	2,4,5-Trichlorophenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
88062	2,4,6-Trichlorophenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
120832	2,4-Dichlorophenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
105679	2,4-Dimethylphenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
51285	2,4-Dinitrophenol	ug/L	ND	ND	0/5	--	30	48	ND	NO	NA	NA	NA	N	ND
121142	2,4-Dinitrotoluene	ug/L	ND	ND	0/5	--	2	9.5	ND	NO	NA	NA	NA	N	ND
606202	2,6-Dinitrotoluene	ug/L	ND	ND	0/5	--	2	9.5	ND	NO	NA	NA	NA	N	ND
91587	2-Chloronaphthalene	ug/L	ND	ND	0/5	--	9.4	10	ND	YES	NA	NA	NA	N	ND
95578	2-Chlorophenol	ug/L	ND	ND	0/5	--	9.4	10	ND	YES	1100	NA	NA	N	ND
91576	2-Methylnaphthalene	ug/L	ND	ND	0/3	--	10	10	ND	YES	3300	NA	NA	N	ND
95487	2-Methylphenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
88744	2-Nitroaniline	ug/L	ND	ND	0/5	--	20	48	ND	NA	NA	NA	NA	N	ND
88755	2-Nitrophenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
91941	3,3'-Dichlorobenzidine	ug/L	ND	ND	0/5	--	20	48	ND	NO	NA	NA	NA	N	ND
99092	3-Nitroaniline	ug/L	ND	ND	0/5	--	20	48	ND	NA	NA	NA	NA	N	ND
534521	4,6-Dinitro-2-methylphenol	ug/L	ND	ND	0/5	--	30	48	ND	NO	NA	NA	NA	N	ND
101553	4-Bromophenyl phenyl ether	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
59507	4-Chloro-3-methylphenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
106478	4-Chloroaniline	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
7005723	4-Chlorophenyl phenyl ether	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
106445	4-Methylphenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
100016	4-Nitroaniline	ug/L	ND	ND	0/5	--	20	48	ND	NA	NA	NA	NA	N	ND
100027	4-Nitrophenol	ug/L	ND	ND	0/5	--	30	48	ND	NO	NA	NA	NA	N	ND
83329	Acenaphthene	ug/L	ND	ND	0/3	--	10	10	ND	YES	NA	NA	NA	N	ND
208968	Acenaphthylene	ug/L	ND	ND	0/3	--	10	10	ND	NA	NA	NA	NA	N	ND
98862	Acetophenone	ug/L	ND	ND	0/2	--	9.4	9.5	ND	YES	800000	NA	NA	N	ND
120127	Anthracene	ug/L	ND	ND	0/3	--	10	10	ND	NO	NA	NA	NA	N	ND
1912249	Atrazine	ug/L	ND	ND	0/2	--	9.4	9.5	ND	NA	NA	NA	NA	N	ND
100527	Benzaldehyde	ug/L	ND	ND	0/2	--	9.4	9.5	ND	YES	360000	NA	NA	N	ND
56553	Benzo(a)anthracene	ug/L	ND	ND	0/3	--	1	1	ND	NO	NA	NA	NA	N	ND
50328	Benzo(a)pyrene	ug/L	ND	ND	0/3	--	1	1	ND	NO	NA	NA	NA	N	ND
205992	Benzo(b)fluoranthene	ug/L	ND	ND	0/3	--	1	1	ND	YES	NA	NA	NA	N	ND
191242	Benzo(ghi)perylene	ug/L	ND	ND	0/3	--	10	10	ND	NA	NA	NA	NA	N	ND

Table 2.4
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Within 100 Feet of Building)[1]

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration Used for Screening [2]	Toxic and Volitale [3]	Screening Toxicity Value [4]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
207089	Benzo(k)fluoranthene	ug/L	ND	ND	0/3	--	1	1	ND	NO	NA	NA	NA	N	ND
11911	bis(2-Chloroethoxy)methane	ug/L	ND	ND	0/5	--	9.4	10	ND	NA	NA	NA	NA	N	ND
111444	bis(2-Chloroethyl) ether	ug/L	ND	ND	0/5	--	1	9.5	ND	YES	10	NA	NA	N	ND
117817	bis(2-Ethylhexyl) phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
85687	Butyl benzyl phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
105602	Caprolactam	ug/L	ND	ND	0/2	--	9.4	9.5	ND	NA	NA	NA	NA	N	ND
86748	Carbazole	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
218019	Chrysene	ug/L	ND	ND	0/3	--	10	10	ND	YES	NA	NA	NA	N	ND
53703	Dibenzo(a,h)anthracene	ug/L	ND	ND	0/3	--	1	1	ND	NO	NA	NA	NA	N	ND
132649	Dibenzofuran	ug/L	ND	ND	0/5	--	9.4	10	ND	YES	NA	NA	NA	N	ND
84662	Diethyl phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
131113	Dimethyl phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
84742	Di-n-butyl phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
117840	Di-n-octyl phthalate	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
206440	Fluoranthene	ug/L	ND	ND	0/3	--	10	10	ND	NO	NA	NA	NA	N	ND
86737	Fluorene	ug/L	ND	ND	0/3	--	10	10	ND	YES	NA	NA	NA	N	ND
118741	Hexachlorobenzene	ug/L	ND	ND	0/5	--	1	9.5	ND	YES	1	NA	NA	N	ND
87683	Hexachlorobutadiene	ug/L	ND	ND	0/5	--	2	9.5	ND	YES	0.33	NA	NA	N	ND
77474	Hexachlorocyclopentadiene	ug/L	ND	ND	0/5	--	10	48	ND	YES	50	NA	NA	N	ND
67721	Hexachloroethane	ug/L	ND	ND	0/5	--	1	9.5	ND	YES	3.8	NA	NA	N	ND
193395	Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	0/3	--	1	1	ND	NO	NA	NA	NA	N	ND
78591	Isophorone	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
91203	Naphthalene	ug/L	ND	ND	0/3	--	10	10	ND	YES	150	NA	NA	N	ND
98953	Nitrobenzene	ug/L	ND	ND	0/5	--	1	9.5	ND	YES	2000	NA	NA	N	ND
621647	N-Nitrosodi-n-propylamine	ug/L	ND	ND	0/5	--	1	9.5	ND	NO	NA	NA	NA	N	ND
86306	N-Nitrosodiphenylamine	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
87865	Pentachlorophenol	ug/L	ND	ND	0/5	--	30	48	ND	NO	NA	NA	NA	N	ND
85018	Phenanthrene	ug/L	ND	ND	0/3	--	10	10	ND	NA	NA	NA	NA	N	ND
108952	Phenol	ug/L	ND	ND	0/5	--	9.4	10	ND	NO	NA	NA	NA	N	ND
129000	Pyrene	ug/L	ND	ND	0/3	--	10	10	ND	YES	NA	NA	NA	N	ND
NA	Total PAHs2	ug/L	ND	ND	0/3	--	N/A	N/A	ND	NA	NA	NA	NA	N	ND
	PAHs by USEPA Method 8310														
91576	2-Methylnaphthalene	ug/L	ND	ND	0/2	--	0.95	0.95	ND	YES	3300	NA	NA	N	ND
83329	Acenaphthene	ug/L	ND	ND	0/4	--	0.94	0.95	ND	YES	NA	NA	NA	N	ND
208968	Acenaphthylene	ug/L	ND	ND	0/4	--	0.94	0.95	ND	NA	NA	NA	NA	N	ND
120127	Anthracene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
56553	Benzo(a)anthracene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
50328	Benzo(a)pyrene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
205992	Benzo(b)fluoranthene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	YES	NA	NA	NA	N	ND
191242	Benzo(ghi)perylene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NA	NA	NA	NA	N	ND
207089	Benzo(k)fluoranthene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
218019	Chrysene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	YES	NA	NA	NA	N	ND
53703	Dibenzo(a,h)anthracene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
206440	Fluoranthene	ug/L	0.034	0.034	1/4	MW-EPA-03	0.19	0.19	0.034	NO	NA	NA	NA	N	NSTV
86737	Fluorene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	YES	NA	NA	NA	N	ND

Table 2.4
Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area - Vapor Intrusion Pathway (Within 100 Feet of Building)[1]

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

CAS Number	Location ID: / Date Collected:	Units	Minimum Detect	Maximum Detect	Detection Frequency	Max Detect Location	Minimum Non-Detect	Maximum Non-Detect	Concentration Used for Screening [2]	Toxic and Volitale [3]	Screening Toxicity Value [4]	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion [5]
193395	Indeno(1,2,3-cd)pyrene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	NO	NA	NA	NA	N	ND
91203	Naphthalene	ug/L	ND	ND	0/4	--	0.94	0.95	ND	YES	150	NA	NA	N	ND
85018	Phenanthrene	ug/L	0.042	0.044	1/4	MW-SS-09-07	0.19	0.19	0.044	NA	NA	NA	NA	N	NSTV
129000	Pyrene	ug/L	ND	ND	0/4	--	0.19	0.19	ND	YES	NA	NA	NA	N	ND
NA	Total PAHs	ug/L	0.034	0.044	2/4	MW-SS-09-07	N/A	N/A	0.044	NA	NA	NA	NA	N	NSTV
	Miscellaneous														
NA	Alkalinity	ug/L	320000	320000	1/1	MW-EPA-06	N/A	N/A	320000	NA	NA	NA	NA	N	NSTV
7664417	Ammonia	ug/L	140	140	1/1	MW-EPA-06	N/A	N/A	140	NA	NA	NA	NA	N	NSTV
124389	Carbon dioxide	ug/L	55000	55000	1/1	MW-EPA-06	N/A	N/A	55000	NA	NA	NA	NA	N	NSTV
74828	Methane	ug/L	2.9	2.9	1/1	MW-EPA-06	N/A	N/A	2.9	NA	NA	NA	NA	N	NSTV
14797558	Nitrate as N	ug/L	950	950	1/1	MW-EPA-06	N/A	N/A	950	NA	NA	NA	NA	N	NSTV
14797650	Nitrite as N	ug/L	ND	ND	0/1	--	100	100	ND	NA	NA	NA	NA	N	ND
7727379	Nitrogen, Total Kjeldahl	ug/L	160	160	1/1	MW-EPA-06	N/A	N/A	160	NA	NA	NA	NA	N	NSTV
14265442A	Orthophosphate as P	ug/L	ND	ND	0/1	--	30	30	ND	NA	NA	NA	NA	N	ND
7782447	Oxygen	ug/L	4700	4700	1/1	MW-EPA-06	N/A	N/A	4700	NA	NA	NA	NA	N	NSTV
14808798	Sulfate	ug/L	131000	131000	1/1	MW-EPA-06	N/A	N/A	131000	NA	NA	NA	NA	N	NSTV
	Inorganics														
7439896	Iron	ug/L	99.6	99.6	1/1	MW-EPA-06	N/A	N/A	99.6	NA	NA	NA	NA	N	NSTV
7439965	Manganese	ug/L	77.1	77.1	1/1	MW-EPA-06	N/A	N/A	77.1	NA	NA	NA	NA	N	NSTV
	Inorganics (filtered)														
7439896	Iron (filtered)	ug/L	ND	ND	0/1	--	150	150	ND	NA	NA	NA	NA	N	ND
7439965	Manganese (filtered)	ug/L	66.8	66.8	1/1	MW-EPA-06	N/A	N/A	66.8	NA	NA	NA	NA	N	NSTV

Notes:
[1] Based on groundwater wells within 100 feet of on-site building (MW-EPA-06, MW-SS-09-06, MW-SS-09-07, and MW-EPA-03).
[2] Maximum concentration was used as the screening concentration.
[3] Considered toxic and volatile according to USEPA (2002) Subsurface Vapor Intrusion Guidance.
[4] Screening Toxicity Value represents the target groundwater concentration corresponding to target indoor air concentration where soil gas to indoor air attenuation factor = 0.001 and partitioning across water table obeys Henry's Law. Based on risk of 1E-06.
Source: USEPA (2002) OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). EPA530-D-02-004. November.
[5] Rationale codes:
BSTV = Excluded because screening concentration is below both Screening Toxicity Value.
NSTV = No screening toxicity value. Constituent has no associated toxicity value that would allow quantitative evaluation; therefore, this constituent is not retained as a COPC.
ARAR/TBC = Applicable or Relevant and Appropriate Requirement / To Be Considered
COPC = Chemical of Potential Concern
NA = Not available, not applicable
ND = non-detect
ug/L = micrograms per liter

Table 3.1
Exposure Point Concentration Summary [1,2]
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Excelsior Avenue Area

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Overburden Groundwater

Exposure Point	Chemical of Potential Concern	Units	No. of Detections	Arithmetic Mean (3)	95% UCL (Distribution) (4)	Maximum Concentration	Exposure Point Concentration		
							Value	Statistic (5)	Rationale (6)
Overburden Groundwater	Benzene	ug/L	13 / 31	408	759.9 (NP)	5800	759.9	95% KM (t) UCL	W-Test (2)
	Ethylbenzene	ug/L	11 / 31	127	215.2 (NP)	920	215.2	95% KM (t) UCL	W-Test (2)
	Toluene	ug/L	9 / 31	44.7	79.46 (NP)	460	79.46	95% KM (t) UCL	W-Test (2)
	Xylenes (total)	ug/L	11 / 31	115	199.9 (NP)	1100	199.9	95% KM (t) UCL	W-Test (2)
	1,1'-Biphenyl	ug/L	1 / 9	6.35	NA	19	19	Maximum	Less than 8 detects
	2-Methylnaphthalene	ug/L	10 / 31	268	646.8 (NP)	6700	646.8	95% KM (t) UCL	W-Test (2)
	Acenaphthene	ug/L	8 / 31	110	278.2 (NP)	3000	278.2	95% KM (t) UCL	W-Test (2)
	Anthracene	ug/L	2 / 22	79.8	NA	1500	1500	Maximum	Less than 8 detects
	Dibenzofuran	ug/L	2 / 31	17	NA	230	230	Maximum	Less than 8 detects
	Fluorene	ug/L	3 / 22	110	NA	2200	2200	Maximum	Less than 8 detects
	Naphthalene	ug/L	14 / 31	623	1194 (NP)	9600	1194	95% KM (t) UCL	W-Test (2)
	Pyrene	ug/L	2 / 23	98.2	NA	2000	2000	Maximum	Less than 8 detects
	Iron	ug/L	12 / 12	7380	17061 (G)	27700	17061	95% Approximate Gamma UCL	AD/KS-Test
	Manganese	ug/L	12 / 12	693	1680 (NP)	2490	1680	95% Chebyshev (Mean, Sd) UCL	W-Test (2)

Notes:

(1) Exposure point concentrations are based on all available groundwater data collected in 2006, 2008, and 2009. Concentrations in each well are treated as separate data points and are not averaged across sampling years.

(2) PAH statistics are based on the combined (averaged) data for Methods 8270C and 8310.

(3) Arithmetic means represent averages for all individual wells and use 1/2 detection limit for non-detects.

(4) Upper Confidence Level (UCL) calculations were performed using ProUCL version 4.1 (May 2010), developed by Lockheed-Martin for USEPA.

NA - not available, NP - Nonparametric, G - Gamma, LN - Lognormal, N - Normal

(5) Exposure Point Concentration calculation statistics abbreviated following ProUCL output.

(6) Shapiro-Wilk W Test used to test the normality or lognormality of the data distribution. Anderson-Darling and Kolmogorov-Smirnov Test statistics used for gamma distributions.

W - Test (1) = Shapiro-Wilk W Test indicates data are either normally or log-normally distributed.

W - Test (2) = Shapiro-Wilk W Test indicates data do not follow a discernable distribution.

AD/KS - Test = Anderson-Darling and Kolmogorov-Smirnov Test indicates data are gamma distributed.

UCL is the calculated upper confidence limit. UCLs are calculated for constituents with sample sizes of at least 8, with at least 5 detections.

The same exposure point concentration was used for both Reasonable Maximum Exposure and Central Tendency Exposure scenarios.

ug/L = micrograms per liter

NA = Not available

Table 4.1.RME

Values Used for Daily Intake Calculations

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF	Conversion Factor	1.00E-03	mg/ug	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IRg	Groundwater Ingestion Rate	1	L/day	USEPA 1997	CW x CF x IRg x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	6	years	USEPA 2004	
				BW	Body Weight	15	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	
				ATnc	Averaging Time - Noncancer	2,190	days	USEPA 2004	
		Adult	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF	Conversion Factor	1.00E-03	mg/ug	--	CDI (mg/kg-day) =
				IRg	Groundwater Ingestion Rate	2	L/day	USEPA 1997; 2002	CW x CF x IRg x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	24	years	USEPA 2004	
				BW	Body Weight	70	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	
				ATnc	Averaging Time - Noncancer	8,760	days	USEPA 2004	
Dermal	Resident	Child	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF1	Conversion Factor	1.00E-03	mg/ug		Dermal Absorbed Dose (DAD) (mg/kg-day) =
				CF2	Conversion Factor	1.00E-03	L/cm^3		DAevent x EVg x EF x ED x SAg x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical Specific	unitless	USEPA 2004	
				Kp	Permeability Coefficient	Chemical Specific	cm/hour	USEPA 2004	DAevent (mg/cm^2-event) =
				B	Permeability Ratio	Chemical Specific	unitless	USEPA 2004	For organics (t-event ≤ t*):
				t*	Time to Reach Steady State	2.4 x tau-event	hours	USEPA 2004	2 FA x Kp x CW x CF1 x CF2 x SQRT(6 x tau-event x t-event x 1/pi)
				tau-event	Lag Time per Event	Chemical Specific	hr/event	USEPA 2004	For organics (t-event > t*):
				ETg	Exposure Time/Event Duration	0.25	hr/event	USEPA 1997	FA x Kp x CW x CF1 x CF2 x {(t-event/(1 + B)) +
				EVg	Event Frequency	1	events/day	USEPA 2004	2 x tau-event x ((1 + (3 x B) + (3 B^2)) / (1 + B)^2 }
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	6	years	USEPA 2004	For inorganics:
				SAg	Exposed Skin Surface Area	6,600	cm^2	USEPA 2004	Kp x CW x CF1 x CF2 x t-event
				BW	Body Weight	15	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	and where t-event = ETg
				ATnc	Averaging Time - Noncancer	2,190	days	USEPA 2004	

Table 4.1.RME

Values Used for Daily Intake Calculations

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Adult	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF1	Conversion Factor	1.00E-03	mg/ug		DAD (mg/kg-day) =
				CF2	Conversion Factor	1.00E-03	L/cm^3		DAevent x EVgx EF x ED x SAg x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical Specific	unitless	USEPA 2004	
				Kp	Permeability Coefficient	Chemical Specific	cm/hour	USEPA 2004	DAevent (mg/cm^2-event) =
				B	Permeability Ratio	Chemical Specific	unitless	USEPA 2004	For organics (t-event ≤ t*):
				t*	Time to Reach Steady State	2.4 x tau-event	hours	USEPA 2004	2 FA x Kp x CW x CF1 x CF2 x SQRT(6 x tau-event x t-event x 1/pi)
				tau-event	Lag Time per Event	Chemical Specific	hr/event	USEPA 2004	
				ETg	Exposure Time/Event Duration	0.25	hr/event	USEPA 1997	For organics (t-event > t*):
				EVg	Event Frequency	1	events/day	USEPA 2004	FA x Kp x CW x CF1 x CF2 x {(t-event/(1 + B)) +
				EF	Exposure Frequency	350	days/year	USEPA 2004	2 x tau-event x ((1 + (3 x B) + ($3 B^2$)) / $(1 + B)^2$ }
				ED	Exposure Duration	24	years	USEPA 2004	
				SAg	Exposed Skin Surface Area	18,000	cm^2	USEPA 2004	For inorganics:
				BW	Body Weight	70	kg	USEPA 1997	Kp x CW x CF1 x CF2 x t-event
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	and where t-event = ETg
				ATnc	Averaging Time - Noncancer	8,760	days	USEPA 2004	

Notes:

USEPA. 1989. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part A. EPA/540/1-89/002. December 1989.

USEPA. 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. August 1997.

USEPA. 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. December 2002.

USEPA. 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R-99/005. July 2004.

Table 4.1.CTE
Values Used for Daily Intake Calculations
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York
Central Tendency Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Child	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF	Conversion Factor	1.00E-03	mg/ug	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IRg	Groundwater Ingestion Rate	0.5	L/day	USEPA 1997	CW x CF x IRg x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	6	years	USEPA 2004	
				BW	Body Weight	15	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	
				ATnc	Averaging Time - Noncancer	2,190	days	USEPA 2004	
		Adult	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF	Conversion Factor	1.00E-03	mg/ug	--	CDI (mg/kg-day) =
				IRg	Groundwater Ingestion Rate	1	L/day	USEPA 1997	CW x CF x IRg x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	9	years	USEPA 2004	
				BW	Body Weight	70	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	
				ATnc	Averaging Time - Noncancer	3,285	days	USEPA 2004	
Dermal	Resident	Child	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF1	Conversion Factor	1.00E-03	mg/ug		Dermal Absorbed Dose (DAD) (mg/kg-day) =
				CF2	Conversion Factor	1.00E-03	L/cm^3		DAevent x EVg x EF x ED x SAg x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical Specific	unitless	USEPA 2004	
				Kp	Permeability Coefficient	Chemical Specific	cm/hour	USEPA 2004	DAevent (mg/cm^2-event) =
				B	Permeability Ratio	Chemical Specific	unitless	USEPA 2004	For organics (t-event ≤ t*):
				t*	Time to Reach Steady State	2.4 x tau-event	hours	USEPA 2004	2 FA x Kp x CW x CF1 x CF2 x SQRT(6 x tau-event x t-event x 1/pi)
				tau-event	Lag Time per Event	Chemical Specific	hr/event	USEPA 2004	For organics (t-event > t*):
				ETg	Exposure Time/Event Duration	0.17	hr/event	USEPA 1997	FA x Kp x CW x CF1 x CF2 x {(t-event/(1 + B)) +
				EVg	Event Frequency	1	events/day	USEPA 2004	2 x tau-event x ((1 + (3 x B) + ($3 B^2$)) / $(1 + B)^2$ }
				EF	Exposure Frequency	350	days/year	USEPA 2004	
				ED	Exposure Duration	6	years	USEPA 2004	For inorganics:
				SAg	Exposed Skin Surface Area	6,600	cm^2	USEPA 2004	Kp x CW x CF1 x CF2 x t-event
				BW	Body Weight	15	kg	USEPA 1997	
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	and where t-event = ETg
				ATnc	Averaging Time - Noncancer	2,190	days	USEPA 2004	

Table 4.1.CTE

Values Used for Daily Intake Calculations

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
		Adult	Old Red Spring/ Excelsior Avenue	CW	Chemical Concentration in Groundwater	Chemical Specific	ug/L	See Table 3	
				CF1	Conversion Factor	1.00E-03	mg/ug		DAD (mg/kg-day) =
				CF2	Conversion Factor	1.00E-03	L/cm^3		DAevent x EVgx EF x ED x SAg x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical Specific	unitless	USEPA 2004	
				Kp	Permeability Coefficient	Chemical Specific	cm/hour	USEPA 2004	DAevent (mg/cm^2-event) =
				B	Permeability Ratio	Chemical Specific	unitless	USEPA 2004	For organics (t-event ≤ t*):
				t*	Time to Reach Steady State	2.4 x tau-event	hours	USEPA 2004	2 FA x Kp x CW x CF1 x CF2 x SQRT(6 x tau-event x t-event x 1/pi)
				tau-event	Lag Time per Event	Chemical Specific	hr/event	USEPA 2004	
				ETg	Exposure Time/Event Duration	0.17	hr/event	USEPA 1997	For organics (t-event > t*):
				EVg	Event Frequency	1	events/day	USEPA 2004	FA x Kp x CW x CF1 x CF2 x {(t-event/(1 + B)) +
				EF	Exposure Frequency	350	days/year	USEPA 2004	2 x tau-event x ((1 + (3 x B) + (3 B^2)) / $(1 + B)^2$ }
				ED	Exposure Duration	9	years	USEPA 2004	
				SAg	Exposed Skin Surface Area	18,000	cm^2	USEPA 2004	For inorganics:
				BW	Body Weight	70	kg	USEPA 1997	Kp x CW x CF1 x CF2 x t-event
				ATc	Averaging Time - Cancer	25,550	days	USEPA 1989; 2004	and where t-event = ETg
				ATnc	Averaging Time - Noncancer	3,285	days	USEPA 2004	

Notes:

USEPA. 1989. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part A. EPA/540/1-89/002. December 1989.

USEPA. 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. August 1997.

USEPA. 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R-99/005. July 2004.

Table 4.2.RME

Values Used for Daily Intake Calculations

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water Vapors

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Resident	Child	Tap Water Vapors	CA	Chemical concentration in Air	Site-specific	mg/m^3	Calculated	
				CAmax	Maximum concentration of chemical in air	Site-specific	mg/m^3	Calculated	Chronic Daily Intake (CDI) (mg/m^3) =
				t1	Time of shower/bath	0.25	hours	USEPA 1997	CA x ET x EF x ED x 1/AT
				t2	Time after shower/bath	0.33	hours	USEPA 1997	where:
				CW	Chemical concentration in groundwater	Site-specific	mg/L	--	CA = [(CAmax/2) x t1) + (CAmax x t2)] x 1/(t1 + t2)
				f	Fraction volatilized	0.5	unitless	Schaum et al. (1994)	and
				Fw	Water flow rate	500	L/hr	Schaum et al. (1994)	CAmax = (CW x f x Fw x t1)/Va
				Va	Bathroom volume	16	m^3	Schaum et al. (1994)	
				ET	Exposure time	0.58	hours/day	USEPA 1997	
				EF	Exposure frequency	350	days/year	USEPA 2004	
				ED	Exposure duration	6	years	USEPA 2004	
				ATc	Averaging time, cancer	613200	hours	70 yrs x 365 d/yr x 24 hr/d	
				ATnc	Averaging time, non-cancer	52560	hours	6 yrs x 365 d/yr x 24 hr/d	
		Adult	Tap Water Vapors	CA	Chemical concentration in Air	Site-specific	mg/m^3	Calculated	
				CAmax	Maximum concentration of chemical in air	Site-specific	mg/m^3	Calculated	Chronic Daily Intake (CDI) (mg/m^3) =
				t1	Time of shower/bath	0.25	hours	USEPA 1997	CA x ET x EF x ED x 1/AT
				t2	Time after shower/bath	0.5	hours	USEPA 1997	where:
				CW	Chemical concentration in groundwater	Site-specific	mg/L	--	CA = [(CAmax/2) x t1) + (CAmax x t2)] x 1/(t1 + t2)
				f	Fraction volatilized	0.5	unitless	Schaum et al. (1994)	and
				Fw	Water flow rate	500	L/hr	Schaum et al. (1994)	CAmax = (CW x f x Fw x t1)/Va
				Va	Bathroom volume	16	m^3	Schaum et al. (1994)	
				ET	Exposure time	0.75	hours/day	USEPA 1997	
				EF	Exposure frequency	350	days/year	USEPA 2004	
				ED	Exposure duration	24	years	USEPA 2004	
				ATc	Averaging time, cancer	613200	hours	70 yrs x 365 d/yr x 24 hr/d	
				ATnc	Averaging time, non-cancer	210240	hours	24 yrs x 365 d/yr x 24 hr/d	

Notes:

(1) Chemical concentrations in residences resulting from volatilization from tap water during bathing or showering will be estimated using the Andelman (1990) exposure model, as modified by Schaum et al. (1994), for inhalation during bathing or showering.

Andelman, J.B. 1990. Total exposure to volatile organic compounds in potable water. Significance and Treatment of Volatile Organic Compounds in Water Supplies. N.M. Ram, R.F. Christman, K.P. Cantor, eds. Lewis, Chelsea, MI, pp. 485-504.

Schaum, J., et al. 1994. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. Water Contamination and Health. R.G.M. Wang, ed. Marcel Dekker, New York, pp. 305-321.

USEPA. 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. August 1997.

USEPA. 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R-99/005. July 2004.

Table 4.2.CTE

Values Used for Daily Intake Calculations

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water Vapors

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Resident	Child	Tap Water Vapors	CA	Chemical concentration in Air	Site-specific	mg/m^3	Calculated	
				CAmax	Maximum concentration of chemical in air	Site-specific	mg/m^3	Calculated	Chronic Daily Intake (CDI) (mg/m^3) =
				t1	Time of shower/bath	0.17	hours	USEPA 1997	CA x ET x EF x ED x 1/AT
				t2	Time after shower/bath	0.08	hours	USEPA 1997	where:
				CW	Chemical concentration in groundwater	Site-specific	mg/L	--	CA = [(CAmax/2) x t1) + (CAmax x t2)] x 1/(t1 + t2)
				f	Fraction volatilized	0.5	unitless	Schaum et al. (1994)	and
				Fw	Water flow rate	500	L/hr	Schaum et al. (1994)	CAmax = (CW x f x Fw x t1)/Va
				Va	Bathroom volume	16	m^3	Schaum et al. (1994)	
				ET	Exposure time	0.25	hours/day	USEPA 1997	
				EF	Exposure frequency	350	days/year	USEPA 2004	
				ED	Exposure duration	6	years	USEPA 2004	
				ATc	Averaging time, cancer	613200	hours	70 yrs x 365 d/yr x 24 hr/d	
				ATnc	Averaging time, non-cancer	52560	hours	6 yrs x 365 d/yr x 24 hr/d	
		Adult	Tap Water Vapors	CA	Chemical concentration in Air	Site-specific	mg/m^3	Calculated	
				CAmax	Maximum concentration of chemical in air	Site-specific	mg/m^3	Calculated	Chronic Daily Intake (CDI) (mg/m^3) =
				t1	Time of shower/bath	0.17	hours	USEPA 1997	CA x ET x EF x ED x 1/AT
				t2	Time after shower/bath	0.08	hours	USEPA 1997	where:
				CW	Chemical concentration in groundwater	Site-specific	mg/L	--	CA = [(CAmax/2) x t1) + (CAmax x t2)] x 1/(t1 + t2)
				f	Fraction volatilized	0.5	unitless	Schaum et al. (1994)	and
				Fw	Water flow rate	500	L/hr	Schaum et al. (1994)	CAmax = (CW x f x Fw x t1)/Va
				Va	Bathroom volume	16	m^3	Schaum et al. (1994)	
				ET	Exposure time	0.25	hours/day	USEPA 1997	
				EF	Exposure frequency	350	days/year	USEPA 2004	
				ED	Exposure duration	9	years	USEPA 2004	
				ATc	Averaging time, cancer	613200	hours	70 yrs x 365 d/yr x 24 hr/d	
				ATnc	Averaging time, non-cancer	78840	hours	9 yrs x 365 d/yr x 24 hr/d	

Notes:

(1) Chemical concentrations in residences resulting from volatilization from tap water during bathing or showering will be estimated using the Andelman (1990) exposure model, as modified by Schaum et al. (1994), for inhalation during bathing or showering.

Andelman, J.B. 1990. Total exposure to volatile organic compounds in potable water. Significance and Treatment of Volatile Organic Compounds in Water Supplies. N.M. Ram, R.F. Christman, K.P. Cantor, eds. Lewis, Chelsea, MI, pp. 485-504.

Schaum, J., et al. 1994. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. Water Contamination and Health. R.G.M. Wang, ed. Marcel Dekker, New York, pp. 305-321.

USEPA. 1997. Exposure Factors Handbook. EPA/600/P-95/002Fa. August 1997.

USEPA. 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I, Human Health Evaluation Manual, Part E, Supplemental Guidance for Dermal Risk Assessment. EPA/540/R-99/005. July 2004.

Table 4.3
Chemical Specific Factors - Dermal Groundwater Exposure
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

RME DA-event for Resident, adult:

COPC	EPC (ug/L)	t-event (hours/event)	t* (hours)	is t-event < t*?	FA	Kp (cm/hr)	CF1 (mg/ug)	CF2 (L/cm^3)	tau-event (hours)	B	Pi (π)	DA-event (mg/cm^2-event)
Benzene	759.9	0.25	0.696	Y	1	0.015	1.00E-03	1.00E-03	0.29	0.1	3.142	8.5E-06
Ethylbenzene	215.2	0.25	1.008	Y	1	0.049	1.00E-03	1.00E-03	0.42	0.2	3.142	9.4E-06
Toluene	79.46	0.25	0.84	Y	1	0.031	1.00E-03	1.00E-03	0.35	0.1	3.142	2.0E-06
Xylenes (total)	199.9	0.25	1.008	Y	1	0.053	1.00E-03	1.00E-03	0.42	0.2	3.142	9.5E-06
1,1'-Biphenyl	19	0.25	1.873	Y	1	0.099	1.00E-03	1.00E-03	0.78	0.5	3.142	2.3E-06
2-Methylnaphthalene	646.8	0.25	1.604	Y	1	0.092	1.00E-03	1.00E-03	0.67	0.4	3.142	6.7E-05
Acenaphthene	278.2	0.25	1.873	Y	1	0.086	1.00E-03	1.00E-03	0.78	0.4	3.142	2.9E-05
Anthracene	1500	0.25	2.555	Y	1	0.142	1.00E-03	1.00E-03	1.06	0.7	3.142	3.0E-04
Dibenzofuran	230	0.25	2.244	Y	1	0.098	1.00E-03	1.00E-03	0.94	0.5	3.142	3.0E-05
Fluorene	2200	0.25	2.187	Y	1	0.110	1.00E-03	1.00E-03	0.91	0.5	3.142	3.2E-04
Naphthalene	1194	0.25	1.344	Y	1	0.047	1.00E-03	1.00E-03	0.56	0.2	3.142	5.8E-05
Pyrene	2000	0.25	3.485	Y	1	0.201	1.00E-03	1.00E-03	1.45	1.1	3.142	6.7E-04
Iron	17061	0.25	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	4.3E-06
Manganese	1680	0.25	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	4.2E-07

CTE DA-event for Resident, adult::

COPC	EPC (ug/L)	t-event (hours/event)	t* (hours)	is t-event < t*?	FA	Kp (cm/hr)	CF1 (mg/ug)	CF2 (L/cm^3)	tau-event (hours)	B	Pi (π)	DA-event (mg/cm^2-event)
Benzene	759.9	0.17	0.696	Y	1	0.015	1.00E-03	1.00E-03	0.29	0.1	3.142	7.0E-06
Ethylbenzene	215.2	0.17	1.008	Y	1	0.049	1.00E-03	1.00E-03	0.42	0.2	3.142	7.8E-06
Toluene	79.46	0.17	0.84	Y	1	0.031	1.00E-03	1.00E-03	0.35	0.1	3.142	1.7E-06
Xylenes (total)	199.9	0.17	1.008	Y	1	0.053	1.00E-03	1.00E-03	0.42	0.2	3.142	7.8E-06
1,1'-Biphenyl	19	0.17	1.873	Y	1	0.099	1.00E-03	1.00E-03	0.78	0.5	3.142	1.9E-06
2-Methylnaphthalene	646.8	0.17	1.604	Y	1	0.092	1.00E-03	1.00E-03	0.67	0.4	3.142	5.5E-05
Acenaphthene	278.2	0.17	1.873	Y	1	0.086	1.00E-03	1.00E-03	0.78	0.4	3.142	2.4E-05
Anthracene	1500	0.17	2.555	Y	1	0.142	1.00E-03	1.00E-03	1.06	0.7	3.142	2.5E-04
Dibenzofuran	230	0.17	2.244	Y	1	0.098	1.00E-03	1.00E-03	0.94	0.5	3.142	2.5E-05
Fluorene	2200	0.17	2.187	Y	1	0.110	1.00E-03	1.00E-03	0.91	0.5	3.142	2.6E-04
Naphthalene	1194	0.17	1.344	Y	1	0.047	1.00E-03	1.00E-03	0.56	0.2	3.142	4.8E-05
Pyrene	2000	0.17	3.485	Y	1	0.201	1.00E-03	1.00E-03	1.45	1.1	3.142	5.5E-04
Iron	17061	0.17	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	2.9E-06
Manganese	1680	0.17	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	2.9E-07

Table 4.3
Chemical Specific Factors - Dermal Groundwater Exposure
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

RME DA-event for Resident, child:

COPC	EPC (ug/L)	t-event (hours/event)	t* (hours)	is t-event < t*?	FA	Kp (cm/hr)	CF1 (mg/ug)	CF2 (L/cm^3)	tau-event (hours)	B	Pi (π)	DA-event (mg/cm^2-event)
Benzene	759.9	0.25	0.696	Y	1	0.015	1.00E-03	1.00E-03	0.29	0.1	3.142	8.5E-06
Ethylbenzene	215.2	0.25	1.008	Y	1	0.049	1.00E-03	1.00E-03	0.42	0.2	3.142	9.4E-06
Toluene	79.46	0.25	0.84	Y	1	0.031	1.00E-03	1.00E-03	0.35	0.1	3.142	2.0E-06
Xylenes (total)	199.9	0.25	1.008	Y	1	0.053	1.00E-03	1.00E-03	0.42	0.2	3.142	9.5E-06
1,1'-Biphenyl	19	0.25	1.873	Y	1	0.099	1.00E-03	1.00E-03	0.78	0.5	3.142	2.3E-06
2-Methylnaphthalene	646.8	0.25	1.604	Y	1	0.092	1.00E-03	1.00E-03	0.67	0.4	3.142	6.7E-05
Acenaphthene	278.2	0.25	1.873	Y	1	0.086	1.00E-03	1.00E-03	0.78	0.4	3.142	2.9E-05
Anthracene	1500	0.25	2.555	Y	1	0.142	1.00E-03	1.00E-03	1.06	0.7	3.142	3.0E-04
Dibenzofuran	230	0.25	2.244	Y	1	0.098	1.00E-03	1.00E-03	0.94	0.5	3.142	3.0E-05
Fluorene	2200	0.25	2.187	Y	1	0.110	1.00E-03	1.00E-03	0.91	0.5	3.142	3.2E-04
Naphthalene	1194	0.25	1.344	Y	1	0.047	1.00E-03	1.00E-03	0.56	0.2	3.142	5.8E-05
Pyrene	2000	0.25	3.485	Y	1	0.201	1.00E-03	1.00E-03	1.45	1.1	3.142	6.7E-04
Iron	17061	0.25	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	4.3E-06
Manganese	1680	0.25	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	4.2E-07

CTE DA-event for Resident, child:

COPC	EPC (ug/L)	t-event (hours/event)	t* (hours)	is t-event < t*?	FA	Kp (cm/hr)	CF1 (mg/ug)	CF2 (L/cm^3)	tau-event (hours)	B	Pi (π)	DA-event (mg/cm^2-event)
Benzene	759.9	0.17	0.696	Y	1	0.015	1.00E-03	1.00E-03	0.29	0.1	3.142	7.0E-06
Ethylbenzene	215.2	0.17	1.008	Y	1	0.049	1.00E-03	1.00E-03	0.42	0.2	3.142	7.8E-06
Toluene	79.46	0.17	0.84	Y	1	0.031	1.00E-03	1.00E-03	0.35	0.1	3.142	1.7E-06
Xylenes (total)	199.9	0.17	1.008	Y	1	0.053	1.00E-03	1.00E-03	0.42	0.2	3.142	7.8E-06
1,1'-Biphenyl	19	0.17	1.873	Y	1	0.099	1.00E-03	1.00E-03	0.78	0.5	3.142	1.9E-06
2-Methylnaphthalene	646.8	0.17	1.604	Y	1	0.092	1.00E-03	1.00E-03	0.67	0.4	3.142	5.5E-05
Acenaphthene	278.2	0.17	1.873	Y	1	0.086	1.00E-03	1.00E-03	0.78	0.4	3.142	2.4E-05
Anthracene	1500	0.17	2.555	Y	1	0.142	1.00E-03	1.00E-03	1.06	0.7	3.142	2.5E-04
Dibenzofuran	230	0.17	2.244	Y	1	0.098	1.00E-03	1.00E-03	0.94	0.5	3.142	2.5E-05
Fluorene	2200	0.17	2.187	Y	1	0.110	1.00E-03	1.00E-03	0.91	0.5	3.142	2.6E-04
Naphthalene	1194	0.17	1.344	Y	1	0.047	1.00E-03	1.00E-03	0.56	0.2	3.142	4.8E-05
Pyrene	2000	0.17	3.485	Y	1	0.201	1.00E-03	1.00E-03	1.45	1.1	3.142	5.5E-04
Iron	17061	0.17	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	2.9E-06
Manganese	1680	0.17	--	--	--	0.001	1.00E-03	1.00E-03	--	--	3.142	2.9E-07

Source:

USEPA. 2004. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005 July 2004

Kp displayed in RAGS Part E Appendix B are calculated from the spreadsheet ORG04_01.xls available under Part E Spreadsheets at:

http://www.epa.gov/oswer/riskassessment/ragse/index.htm

Table 5.1
Non-Cancer Toxicity Data -- Oral/Dermal
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (1)	Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Benzene	Chronic	4.0E-03	mg/kg-day	> 0.5	4.0E-03	mg/kg-day	Blood	300	IRIS	4/17/2003
Ethylbenzene	Chronic	1.0E-01	mg/kg-day	> 0.5	1.0E-01	mg/kg-day	Liver, Kidney	1000	IRIS	6/1/1991
Toluene	Chronic	8.0E-02	mg/kg-day	> 0.5	8.0E-02	mg/kg-day	Kidney	3000	IRIS	9/23/2005
Xylenes (total)	Chronic	2.0E-01	mg/kg-day	> 0.5	2.0E-01	mg/kg-day	Body weight	1000	IRIS	2/21/2003
1,1'-Biphenyl	Chronic	5.0E-02	mg/kg-day	> 0.5	5.0E-02	mg/kg-day	Kidney	100	IRIS	8/1/1989
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg-day	0.89	4.0E-03	mg/kg-day	heart	1000	IRIS	12/22/2003
Acenaphthene	Chronic	6.0E-02	mg/kg-day	0.89	6.0E-02	mg/kg-day	Liver	3000	IRIS	4/1/1994
Anthracene	Chronic	3.0E-01	mg/kg-day	0.89	3.0E-01	mg/kg-day	None	3000	IRIS	7/1/1993
Dibenzofuran	Chronic	1.0E-03	mg/kg-day	> 0.5	1.0E-03	mg/kg-day	Whole body	10000	PPRTV	6/11/2007
Fluorene	Chronic	4.0E-02	mg/kg-day	0.89	4.0E-02	mg/kg-day	Blood	3000	IRIS	11/1/1990
Naphthalene	Chronic	2.0E-02	mg/kg-day	0.89	2.0E-02	mg/kg-day	Body weight	3000	IRIS	9/17/1998
Pyrene	Chronic	3.0E-02	mg/kg-day	0.89	3.0E-02	mg/kg-day	Kidney	3000	IRIS	7/1/1993
Iron	Chronic	7.0E-01	mg/kg-day	> 0.5	7.0E-01	mg/kg-day	GI	1.5	PPRTV	11/2010
Manganese (non-diet)	Chronic	2.4E-02	mg/kg-day	0.04	9.6E-04	mg/kg-day	CNS	3	IRIS	5/1/1996

Notes:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health E valuation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Section 4.2 and Exhibit 4-1. As indicated in RAGS Part E, only chemicals with an oral absorption factor <50% were adjusted to account for absorbed dose in the dermal exposure pathway.

CNS = Central nervous system

GI = Gastrointestinal effects

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer Reviewed Toxicity Value as cited in USEPA (November 2010) Regional Screening Levels. PPRTVs are developed by EPA's Office of Solid Waste and Emergency Response.

RfD = oral reference dose

mg/kg-day = millgrams per kilogram of body weight per day

NA = Not Available

Table 5.2
Non-Cancer Toxicity Data -- Inhalation
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Extrapolated RfD [1]		Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Benzene	Chronic	3.0E-02	mg/m^3	8.6E-03	mg/kg-day	Blood	300	IRIS	4/17/2003
Ethylbenzene	Chronic	1.0E+00	mg/m^3	2.9E-01	mg/kg-day	Development	300	IRIS	1/1/1991
Toluene	Chronic	5.0E+00	mg/m^3	1.4E+00	mg/kg-day	Neurological	10	IRIS	9/23/2005
Xylenes (total)	Chronic	1.0E-01	mg/m^3	2.9E-02	mg/kg-day	CNS	300	IRIS	2/21/2003
1,1'-Biphenyl	Chronic	4.0E-04	mg/m^3	1.1E-04	mg/kg-day	Liver, Kidney	3000	PPRTV	4/4/2011
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Chronic	3.0E-03	mg/m^3	8.6E-04	mg/kg-day	Respiratory	3000	IRIS	9/17/1998
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (non-diet)	Chronic	5.0E-05	mg/m^3	1.4E-05	mg/kg-day	Neurological	1000	IRIS	12/1/1993

Notes:
[1] The inhalation RfC is used in the calculation of inhalation hazards. Extrapolated RfDs are simply shown for sake of completeness.
IRIS = Integrated Risk Information System
PPRTV = Provisional Peer-Reviewed Toxicity Value
RfD = oral reference dose
RfC = inhalation reference concentration
CNS = central nervous system
mg/m^3 = milligrams per cubic meter
NA = Not available

Table 6.1
Cancer Toxicity Data -- Oral/Dermal
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Benzene	5.5E-02	$(mg/kg\text{-}day)^{-1}$	> 0.5	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	1/9/2000
Ethylbenzene	1.1E-02	$(mg/kg\text{-}day)^{-1}$	> 0.5	1.1E-02	$(mg/kg\text{-}day)^{-1}$	D	CalEPA	7/21/2009
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	8.0E-03	$(mg/kg\text{-}day)^{-1}$	> 0.5	8.0E-03	$(mg/kg\text{-}day)^{-1}$	C	PPRTV	4/4/2011
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (diet)	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). Section 4.2 and Exhibit 4-1. As indicated in RAGS Part E, only chemicals with an oral absorption factor <50% were adjusted to account for absorbed dose in the dermal exposure pathway.

A - Human Carcinogen

C - Possible Human Carcinogen

D - Not classifiable as to human carcinogenicity.

CSF = cancer slope factor

CalEPA = California EPA

IRIS = Integrated Risk Information System

PPRTV = Provisional Peer-Reviewed Toxicity Value

mg/kg-day = milligrams per kilogram of body weight per day

NA = Not Available

Table 6.2
Cancer Toxicity Data -- Inhalation
Human Health Risk Assessment
Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Chemical of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor [1]		Weight of Evidence/ Cancer Guideline Description	URF : Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Date(s) (MM/DD/YYYY)
Benzene	7.8E-03	$(mg/m^3)^{-1}$	2.7E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	1/9/2000
Ethylbenzene	2.5E-03	$(mg/m^3)^{-1}$	8.8E+00	$(mg/kg\text{-}day)^{-1}$	D	CalEPA	2003
Toluene	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)	NA	NA	NA	NA	NA	NA	NA
1,1'-Biphenyl	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA
Naphthalene	3.4E-02	$(mg/m^3)^{-1}$	1.2E+02	$(mg/kg\text{-}day)^{-1}$	C	CalEPA	7/21/2009
Pyrene	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA

Notes:
[1] The unit risk factor is used to calculate inhalation risks. The inhalation CSF is simply shown for sake of completeness.
A - Known Human Carcinogen
C - Possible Human Carcinogen
D - Not classifiable as to human carcinogenicity.
URF = unit risk factor
CSF = cancer slope factor
IRIS = Integrated Risk Information System
CalEPA = California Environmental Protection Agency
mg/m^3 = milligrams per cubic meter
mg/kg-day = milligrams per kilogram of body weight per day
NA = Not Available

Table 7.1.RME

Calculation of Chemical Cancer Risks and Non-Cancer Hazards

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Percent of Total Risk per Route	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	Percent of Total Hazard per Route
							Value	Units	Value	Units			Value	Units	Value	Units		
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Ingestion	Benzene	7.6E+02	ug/L	7.1E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	4.E-04	94%	2.1E-02	mg/kg-day	4.0E-03	mg/kg-day	5.2E+00	22%
				Ethylbenzene	2.2E+02	ug/L	2.0E-03	mg/kg-day	1.1E-02	(mg/kg-day)-1	2.E-05	5%	5.9E-03	mg/kg-day	1.0E-01	mg/kg-day	5.9E-02	0.2%
				Toluene	7.9E+01	ug/L	7.5E-04	mg/kg-day	NA	NA	NA	NA	2.2E-03	mg/kg-day	8.0E-02	mg/kg-day	2.7E-02	0.1%
				Xylenes (total)	2.0E+02	ug/L	1.9E-03	mg/kg-day	NA	NA	NA	NA	5.5E-03	mg/kg-day	2.0E-01	mg/kg-day	2.7E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	1.8E-04	mg/kg-day	8.0E-03	(mg/kg-day)-1	1.E-06	0.3%	5.2E-04	mg/kg-day	5.0E-02	mg/kg-day	1.0E-02	0.04%
				2-Methylnaphthalene	6.5E+02	ug/L	6.1E-03	mg/kg-day	NA	NA	NA	NA	1.8E-02	mg/kg-day	4.0E-03	mg/kg-day	4.4E+00	19%
				Acenaphthene	2.8E+02	ug/L	2.6E-03	mg/kg-day	NA	NA	NA	NA	7.6E-03	mg/kg-day	6.0E-02	mg/kg-day	1.3E-01	1%
				Anthracene	1.5E+03	ug/L	1.4E-02	mg/kg-day	NA	NA	NA	NA	4.1E-02	mg/kg-day	3.0E-01	mg/kg-day	1.4E-01	1%
				Dibenzofuran	2.3E+02	ug/L	2.2E-03	mg/kg-day	NA	NA	NA	NA	6.3E-03	mg/kg-day	1.0E-03	mg/kg-day	6.3E+00	26%
				Fluorene	2.2E+03	ug/L	2.1E-02	mg/kg-day	NA	NA	NA	NA	6.0E-02	mg/kg-day	4.0E-02	mg/kg-day	1.5E+00	6%
				Naphthalene	1.2E+03	ug/L	1.1E-02	mg/kg-day	NA	NA	NA	NA	3.3E-02	mg/kg-day	2.0E-02	mg/kg-day	1.6E+00	7%
				Pyrene	2.0E+03	ug/L	1.9E-02	mg/kg-day	NA	NA	NA	NA	5.5E-02	mg/kg-day	3.0E-02	mg/kg-day	1.8E+00	8%
				Iron	1.7E+04	ug/L	1.6E-01	mg/kg-day	NA	NA	NA	NA	4.7E-01	mg/kg-day	7.0E-01	mg/kg-day	6.7E-01	3%
				Manganese	1.7E+03	ug/L	1.6E-02	mg/kg-day	NA	NA	NA	NA	4.6E-02	mg/kg-day	2.4E-02	mg/kg-day	1.9E+00	8%
			Exp. Route Total								4.E-04	100%					2.4E+01	100%
			Dermal	Benzene	7.6E+02	ug/L	7.2E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	4.E-05	79%	2.1E-03	mg/kg-day	4.0E-03	mg/kg-day	5.2E-01	3%
				Ethylbenzene	2.2E+02	ug/L	8.0E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	9.E-06	18%	2.3E-03	mg/kg-day	1.0E-01	mg/kg-day	2.3E-02	0.1%
				Toluene	7.9E+01	ug/L	1.7E-04	mg/kg-day	NA	NA	NA	NA	5.0E-04	mg/kg-day	8.0E-02	mg/kg-day	6.2E-03	0.03%
				Xylenes (total)	2.0E+02	ug/L	8.0E-04	mg/kg-day	NA	NA	NA	NA	2.3E-03	mg/kg-day	2.0E-01	mg/kg-day	1.2E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	1.9E-04	mg/kg-day	8.0E-03	(mg/kg-day)-1	2.E-06	3%	5.6E-04	mg/kg-day	5.0E-02	mg/kg-day	1.1E-02	0.1%
				2-Methylnaphthalene	6.5E+02	ug/L	5.7E-03	mg/kg-day	NA	NA	NA	NA	1.7E-02	mg/kg-day	4.0E-03	mg/kg-day	4.1E+00	20%
				Acenaphthene	2.8E+02	ug/L	2.5E-03	mg/kg-day	NA	NA	NA	NA	7.2E-03	mg/kg-day	6.0E-02	mg/kg-day	1.2E-01	1%
				Anthracene	1.5E+03	ug/L	2.6E-02	mg/kg-day	NA	NA	NA	NA	7.5E-02	mg/kg-day	3.0E-01	mg/kg-day	2.5E-01	1%
				Dibenzofuran	2.3E+02	ug/L	2.5E-03	mg/kg-day	NA	NA	NA	NA	7.4E-03	mg/kg-day	1.0E-03	mg/kg-day	7.4E+00	36%
				Fluorene	2.2E+03	ug/L	2.7E-02	mg/kg-day	NA	NA	NA	NA	7.8E-02	mg/kg-day	4.0E-02	mg/kg-day	2.0E+00	9%
				Naphthalene	1.2E+03	ug/L	4.9E-03	mg/kg-day	NA	NA	NA	NA	1.4E-02	mg/kg-day	2.0E-02	mg/kg-day	7.2E-01	3%
				Pyrene	2.0E+03	ug/L	5.7E-02	mg/kg-day	NA	NA	NA	NA	1.7E-01	mg/kg-day	3.0E-02	mg/kg-day	5.5E+00	27%
				Iron	1.7E+04	ug/L	3.6E-04	mg/kg-day	NA	NA	NA	NA	1.1E-03	mg/kg-day	7.0E-01	mg/kg-day	1.5E-03	0.01%
				Manganese	1.7E+03	ug/L	3.6E-05	mg/kg-day	NA	NA	NA	NA	1.0E-04	mg/kg-day	9.6E-04	mg/kg-day	1.1E-01	0.5%
			Exp. Route Total								5.E-05	100%					2.1E+01	100%
			Inhalation (showering)	Benzene	2.5E+00	mg/m^3	2.5E-02	mg/m3	7.8E-03	(mg/m3)-1	2.E-04	13%	7.4E-02	mg/m3	3.0E-02	mg/m3	2.5E+00	5%
				Ethylbenzene	7.0E-01	mg/m^3	7.2E-03	mg/m3	2.5E-03	(mg/m3)-1	2.E-05	1%	2.1E-02	mg/m3	1.0E+00	mg/m3	2.1E-02	0.05%
				Toluene	2.6E-01	mg/m^3	2.7E-03	mg/m3	NA	NA	NA	NA	7.8E-03	mg/m3	5.0E+00	mg/m3	1.6E-03	0.003%
				Xylenes (total)	6.5E-01	mg/m^3	6.7E-03	mg/m3	NA	NA	NA	NA	1.9E-02	mg/m3	1.0E-01	mg/m3	1.9E-01	0.4%
				1,1'-Biphenyl	6.2E-02	mg/m^3	6.4E-04	mg/m3	NA	NA	NA	NA	1.9E-03	mg/m3	4.0E-04	mg/m3	4.6E+00	10%
				2-Methylnaphthalene	2.1E+00	mg/m^3	2.2E-02	mg/m3	NA	NA	NA	NA	6.3E-02	mg/m3	NA	NA	NA	NA
				Acenaphthene	9.1E-01	mg/m^3	9.3E-03	mg/m3	NA	NA	NA	NA	2.7E-02	mg/m3	NA	NA	NA	NA
				Anthracene	4.9E+00	mg/m^3	5.0E-02	mg/m3	NA	NA	NA	NA	1.5E-01	mg/m3	NA	NA	NA	NA
				Dibenzofuran	7.5E-01	mg/m^3	7.7E-03	mg/m3	NA	NA	NA	NA	2.2E-02	mg/m3	NA	NA	NA	NA
				Fluorene	7.2E+00	mg/m^3	7.4E-02	mg/m3	NA	NA	NA	NA	2.1E-01	mg/m3	NA	NA	NA	NA
				Naphthalene	3.9E+00	mg/m^3	4.0E-02	mg/m3	3.4E-02	(mg/m3)-1	1.E-03	86%	1.2E-01	mg/m3	3.0E-03	mg/m3	3.9E+01	84%
				Pyrene	6.5E+00	mg/m^3	6.7E-02	mg/m3	NA	NA	NA	NA	2.0E-01	mg/m3	NA	NA	NA	NA
			Exp. Route Total								2.E-03	100%					4.6E+01	100%
		Exposure Point Total									2.E-03	--					9.1E+01	--
	Exposure Medium Total										2.E-03	--					9.1E+01	--
Medium Total											2.E-03	--					9.1E+01	--
Total of Receptor Risks/Hazards Across All Media										Total of Receptor Risks Across All Media	2.E-03	--				Total of Receptor Hazards Across All Media	9.1E+01	--
										Percent Contribution from Ingestion		20%				Percent Contribution from Ingestion		26%
										Percent Contribution from Dermal		2%				Percent Contribution from Dermal		23%
										Percent Contribution from Inhalation		77%				Percent Contribution from Inhalation		51%

Table 7.1.CTE

Calculation of Chemical Cancer Risks and Non-Cancer Hazards

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Percent of Total Risk per Route	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	Percent of Total Hazard per Route
							Value	Units	Value	Units			Value	Units	Value	Units		
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Ingestion	Benzene	7.6E+02	ug/L	1.3E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	7.E-05	94%	1.0E-02	mg/kg-day	4.0E-03	mg/kg-day	2.6E+00	22%
				Ethylbenzene	2.2E+02	ug/L	3.8E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	4.E-06	5%	2.9E-03	mg/kg-day	1.0E-01	mg/kg-day	2.9E-02	0.2%
				Toluene	7.9E+01	ug/L	1.4E-04	mg/kg-day	NA	NA	NA	NA	1.1E-03	mg/kg-day	8.0E-02	mg/kg-day	1.4E-02	0.1%
				Xylenes (total)	2.0E+02	ug/L	3.5E-04	mg/kg-day	NA	NA	NA	NA	2.7E-03	mg/kg-day	2.0E-01	mg/kg-day	1.4E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	3.3E-05	mg/kg-day	8.0E-03	(mg/kg-day)-1	3.E-07	0.3%	2.6E-04	mg/kg-day	5.0E-02	mg/kg-day	5.2E-03	0.04%
				2-Methylnaphthalene	6.5E+02	ug/L	1.1E-03	mg/kg-day	NA	NA	NA	NA	8.9E-03	mg/kg-day	4.0E-03	mg/kg-day	2.2E+00	19%
				Acenaphthene	2.8E+02	ug/L	4.9E-04	mg/kg-day	NA	NA	NA	NA	3.8E-03	mg/kg-day	6.0E-02	mg/kg-day	6.4E-02	1%
				Anthracene	1.5E+03	ug/L	2.6E-03	mg/kg-day	NA	NA	NA	NA	2.1E-02	mg/kg-day	3.0E-01	mg/kg-day	6.8E-02	1%
				Dibenzofuran	2.3E+02	ug/L	4.1E-04	mg/kg-day	NA	NA	NA	NA	3.2E-03	mg/kg-day	1.0E-03	mg/kg-day	3.2E+00	26%
				Fluorene	2.2E+03	ug/L	3.9E-03	mg/kg-day	NA	NA	NA	NA	3.0E-02	mg/kg-day	4.0E-02	mg/kg-day	7.5E-01	6%
				Naphthalene	1.2E+03	ug/L	2.1E-03	mg/kg-day	NA	NA	NA	NA	1.6E-02	mg/kg-day	2.0E-02	mg/kg-day	8.2E-01	7%
				Pyrene	2.0E+03	ug/L	3.5E-03	mg/kg-day	NA	NA	NA	NA	2.7E-02	mg/kg-day	3.0E-02	mg/kg-day	9.1E-01	8%
				Iron	1.7E+04	ug/L	3.0E-02	mg/kg-day	NA	NA	NA	NA	2.3E-01	mg/kg-day	7.0E-01	mg/kg-day	3.3E-01	3%
				Manganese	1.7E+03	ug/L	3.0E-03	mg/kg-day	NA	NA	NA	NA	2.3E-02	mg/kg-day	2.4E-02	mg/kg-day	9.6E-01	8%
			Exp. Route Total								8.E-05	100%					1.2E+01	100%
			Dermal	Benzene	7.6E+02	ug/L	2.2E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	1.E-05	79%	1.7E-03	mg/kg-day	4.0E-03	mg/kg-day	4.3E-01	3%
				Ethylbenzene	2.2E+02	ug/L	2.5E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	3.E-06	18%	1.9E-03	mg/kg-day	1.0E-01	mg/kg-day	1.9E-02	0.1%
				Toluene	7.9E+01	ug/L	5.3E-05	mg/kg-day	NA	NA	NA	NA	4.1E-04	mg/kg-day	8.0E-02	mg/kg-day	5.1E-03	0.03%
				Xylenes (total)	2.0E+02	ug/L	2.5E-04	mg/kg-day	NA	NA	NA	NA	1.9E-03	mg/kg-day	2.0E-01	mg/kg-day	9.6E-03	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	6.0E-05	mg/kg-day	8.0E-03	(mg/kg-day)-1	5.E-07	3%	4.7E-04	mg/kg-day	5.0E-02	mg/kg-day	9.3E-03	0.1%
				2-Methylnaphthalene	6.5E+02	ug/L	1.8E-03	mg/kg-day	NA	NA	NA	NA	1.4E-02	mg/kg-day	4.0E-03	mg/kg-day	3.4E+00	20%
				Acenaphthene	2.8E+02	ug/L	7.6E-04	mg/kg-day	NA	NA	NA	NA	5.9E-03	mg/kg-day	6.0E-02	mg/kg-day	9.9E-02	1%
				Anthracene	1.5E+03	ug/L	7.9E-03	mg/kg-day	NA	NA	NA	NA	6.2E-02	mg/kg-day	3.0E-01	mg/kg-day	2.1E-01	1%
				Dibenzofuran	2.3E+02	ug/L	7.8E-04	mg/kg-day	NA	NA	NA	NA	6.1E-03	mg/kg-day	1.0E-03	mg/kg-day	6.1E+00	36%
				Fluorene	2.2E+03	ug/L	8.3E-03	mg/kg-day	NA	NA	NA	NA	6.5E-02	mg/kg-day	4.0E-02	mg/kg-day	1.6E+00	9%
				Naphthalene	1.2E+03	ug/L	1.5E-03	mg/kg-day	NA	NA	NA	NA	1.2E-02	mg/kg-day	2.0E-02	mg/kg-day	5.9E-01	3%
				Pyrene	2.0E+03	ug/L	1.7E-02	mg/kg-day	NA	NA	NA	NA	1.4E-01	mg/kg-day	3.0E-02	mg/kg-day	4.5E+00	27%
				Iron	1.7E+04	ug/L	9.2E-05	mg/kg-day	NA	NA	NA	NA	7.2E-04	mg/kg-day	7.0E-01	mg/kg-day	1.0E-03	0.01%
				Manganese	1.7E+03	ug/L	9.1E-06	mg/kg-day	NA	NA	NA	NA	7.0E-05	mg/kg-day	9.6E-04	mg/kg-day	7.3E-02	0.4%
			Exp. Route Total								2.E-05	100%					1.7E+01	100%
			Inhalation (showering)	Benzene	1.3E+00	mg/m^3	1.7E-03	mg/m3	7.8E-03	(mg/m3)-1	1.E-05	13%	1.3E-02	mg/m3	3.0E-02	mg/m3	4.4E-01	5%
				Ethylbenzene	3.8E-01	mg/m^3	4.8E-04	mg/m3	2.5E-03	(mg/m3)-1	1.E-06	1%	3.8E-03	mg/m3	1.0E+00	mg/m3	3.8E-03	0.05%
				Toluene	1.4E-01	mg/m^3	1.8E-04	mg/m3	NA	NA	NA	NA	1.4E-03	mg/m3	5.0E+00	mg/m3	2.8E-04	0.003%
				Xylenes (total)	3.5E-01	mg/m^3	4.5E-04	mg/m3	NA	NA	NA	NA	3.5E-03	mg/m3	1.0E-01	mg/m3	3.5E-02	0.4%
				1,1'-Biphenyl	3.3E-02	mg/m^3	4.3E-05	mg/m3	NA	NA	NA	NA	3.3E-04	mg/m3	4.0E-04	mg/m3	8.3E-01	10%
				2-Methylnaphthalene	1.1E+00	mg/m^3	1.5E-03	mg/m3	NA	NA	NA	NA	1.1E-02	mg/m3	NA	NA	NA	NA
				Acenaphthene	4.9E-01	mg/m^3	6.3E-04	mg/m3	NA	NA	NA	NA	4.9E-03	mg/m3	NA	NA	NA	NA
				Anthracene	2.6E+00	mg/m^3	3.4E-03	mg/m3	NA	NA	NA	NA	2.6E-02	mg/m3	NA	NA	NA	NA
				Dibenzofuran	4.0E-01	mg/m^3	5.2E-04	mg/m3	NA	NA	NA	NA	4.0E-03	mg/m3	NA	NA	NA	NA
				Fluorene	3.9E+00	mg/m^3	5.0E-03	mg/m3	NA	NA	NA	NA	3.9E-02	mg/m3	NA	NA	NA	NA
				Naphthalene	2.1E+00	mg/m^3	2.7E-03	mg/m3	3.4E-02	(mg/m3)-1	9.E-05	86%	2.1E-02	mg/m3	3.0E-03	mg/m3	7.0E+00	84%
				Pyrene	3.5E+00	mg/m^3	4.5E-03	mg/m3	NA	NA	NA	NA	3.5E-02	mg/m3	NA	NA	NA	NA
			Exp. Route Total								1.E-04	100%					8.3E+00	100%
		Exposure Point Total									2.E-04	--					3.7E+01	--
	Exposure Medium Total										2.E-04	--					3.7E+01	--
Medium Total											2.E-04	--					3.7E+01	--
Total of Receptor Risks/Hazards Across All Media									Total of Receptor Risks Across All Media		2.E-04	--				Total of Receptor Hazards Across All Media	3.7E+01	--
									Percent Contribution from Ingestion			39%				Percent Contribution from Ingestion		32%
									Percent Contribution from Dermal			8%				Percent Contribution from Dermal		46%
									Percent Contribution from Inhalation			53%				Percent Contribution from Inhalation		22%

Table 7.2.RME

Calculation of Chemical Cancer Risks and Non-Cancer Hazards

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Percent of Total Risk per Route	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	Percent of Total Hazard per Route
							Value	Units	Value	Units			Value	Units	Value	Units		
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Ingestion	Benzene	7.6E+02	ug/L	4.2E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	2.E-04	94%	4.9E-02	mg/kg-day	4.0E-03	mg/kg-day	1.2E+01	22%
				Ethylbenzene	2.2E+02	ug/L	1.2E-03	mg/kg-day	1.1E-02	(mg/kg-day)-1	1.E-05	5%	1.4E-02	mg/kg-day	1.0E-01	mg/kg-day	1.4E-01	0.2%
				Toluene	7.9E+01	ug/L	4.4E-04	mg/kg-day	NA	NA	NA	NA	5.1E-03	mg/kg-day	8.0E-02	mg/kg-day	6.3E-02	0.1%
				Xylenes (total)	2.0E+02	ug/L	1.1E-03	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	2.0E-01	mg/kg-day	6.4E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	1.0E-04	mg/kg-day	8.0E-03	(mg/kg-day)-1	8.E-07	0.3%	1.2E-03	mg/kg-day	5.0E-02	mg/kg-day	2.4E-02	0.04%
				2-Methylnaphthalene	6.5E+02	ug/L	3.5E-03	mg/kg-day	NA	NA	NA	NA	4.1E-02	mg/kg-day	4.0E-03	mg/kg-day	1.0E+01	19%
				Acenaphthene	2.8E+02	ug/L	1.5E-03	mg/kg-day	NA	NA	NA	NA	1.8E-02	mg/kg-day	6.0E-02	mg/kg-day	3.0E-01	1%
				Anthracene	1.5E+03	ug/L	8.2E-03	mg/kg-day	NA	NA	NA	NA	9.6E-02	mg/kg-day	3.0E-01	mg/kg-day	3.2E-01	1%
				Dibenzofuran	2.3E+02	ug/L	1.3E-03	mg/kg-day	NA	NA	NA	NA	1.5E-02	mg/kg-day	1.0E-03	mg/kg-day	1.5E+01	26%
				Fluorene	2.2E+03	ug/L	1.2E-02	mg/kg-day	NA	NA	NA	NA	1.4E-01	mg/kg-day	4.0E-02	mg/kg-day	3.5E+00	6%
				Naphthalene	1.2E+03	ug/L	6.5E-03	mg/kg-day	NA	NA	NA	NA	7.6E-02	mg/kg-day	2.0E-02	mg/kg-day	3.8E+00	7%
				Pyrene	2.0E+03	ug/L	1.1E-02	mg/kg-day	NA	NA	NA	NA	1.3E-01	mg/kg-day	3.0E-02	mg/kg-day	4.3E+00	8%
				Iron	1.7E+04	ug/L	9.3E-02	mg/kg-day	NA	NA	NA	NA	1.1E+00	mg/kg-day	7.0E-01	mg/kg-day	1.6E+00	3%
				Manganese	1.7E+03	ug/L	9.2E-03	mg/kg-day	NA	NA	NA	NA	1.1E-01	mg/kg-day	2.4E-02	mg/kg-day	4.5E+00	8%
			Exp. Route Total								2.E-04	100%					5.6E+01	100%
			Dermal	Benzene	7.6E+02	ug/L	3.1E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	2.E-05	79%	3.6E-03	mg/kg-day	4.0E-03	mg/kg-day	8.9E-01	3%
				Ethylbenzene	2.2E+02	ug/L	3.4E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	4.E-06	18%	4.0E-03	mg/kg-day	1.0E-01	mg/kg-day	4.0E-02	0.1%
				Toluene	7.9E+01	ug/L	7.3E-05	mg/kg-day	NA	NA	NA	NA	8.5E-04	mg/kg-day	8.0E-02	mg/kg-day	1.1E-02	0.03%
				Xylenes (total)	2.0E+02	ug/L	3.4E-04	mg/kg-day	NA	NA	NA	NA	4.0E-03	mg/kg-day	2.0E-01	mg/kg-day	2.0E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	8.3E-05	mg/kg-day	8.0E-03	(mg/kg-day)-1	7.E-07	3.1E-02	9.7E-04	mg/kg-day	5.0E-02	mg/kg-day	1.9E-02	0.1%
				2-Methylnaphthalene	6.5E+02	ug/L	2.4E-03	mg/kg-day	NA	NA	NA	NA	2.8E-02	mg/kg-day	4.0E-03	mg/kg-day	7.1E+00	20%
				Acenaphthene	2.8E+02	ug/L	1.1E-03	mg/kg-day	NA	NA	NA	NA	1.2E-02	mg/kg-day	6.0E-02	mg/kg-day	2.1E-01	1%
				Anthracene	1.5E+03	ug/L	1.1E-02	mg/kg-day	NA	NA	NA	NA	1.3E-01	mg/kg-day	3.0E-01	mg/kg-day	4.3E-01	1%
				Dibenzofuran	2.3E+02	ug/L	1.1E-03	mg/kg-day	NA	NA	NA	NA	1.3E-02	mg/kg-day	1.0E-03	mg/kg-day	1.3E+01	36%
				Fluorene	2.2E+03	ug/L	1.2E-02	mg/kg-day	NA	NA	NA	NA	1.3E-01	mg/kg-day	4.0E-02	mg/kg-day	3.4E+00	9%
				Naphthalene	1.2E+03	ug/L	2.1E-03	mg/kg-day	NA	NA	NA	NA	2.4E-02	mg/kg-day	2.0E-02	mg/kg-day	1.2E+00	3%
				Pyrene	2.0E+03	ug/L	2.4E-02	mg/kg-day	NA	NA	NA	NA	2.8E-01	mg/kg-day	3.0E-02	mg/kg-day	9.4E+00	27%
				Iron	1.7E+04	ug/L	1.5E-04	mg/kg-day	NA	NA	NA	NA	1.8E-03	mg/kg-day	7.0E-01	mg/kg-day	2.6E-03	0.01%
				Manganese	1.7E+03	ug/L	1.5E-05	mg/kg-day	NA	NA	NA	NA	1.8E-04	mg/kg-day	9.6E-04	mg/kg-day	1.8E-01	0.5%
			Exp. Route Total								2.E-05	100%					3.6E+01	100%
			Inhalation (showering)	Benzene	2.3E+00	mg/m^3	4.6E-03	mg/m3	7.8E-03	(mg/m3)-1	4.E-05	13%	4.6E-03	mg/m3	3.0E-02	mg/m3	1.5E-01	5%
				Ethylbenzene	6.6E-01	mg/m^3	1.3E-03	mg/m3	2.5E-03	(mg/m3)-1	3.E-06	1%	1.3E-03	mg/m3	1.0E+00	mg/m3	1.3E-03	0.05%
				Toluene	2.4E-01	mg/m^3	4.8E-04	mg/m3	NA	NA	NA	NA	4.8E-04	mg/m3	5.0E+00	mg/m3	9.7E-05	0.003%
				Xylenes (total)	6.1E-01	mg/m^3	1.2E-03	mg/m3	NA	NA	NA	NA	1.2E-03	mg/m3	1.0E-01	mg/m3	1.2E-02	0.4%
				1,1'-Biphenyl	5.8E-02	mg/m^3	1.2E-04	mg/m3	NA	NA	NA	NA	1.2E-04	mg/m3	4.0E-04	mg/m3	2.9E-01	10%
				2-Methylnaphthalene	2.0E+00	mg/m^3	3.9E-03	mg/m3	NA	NA	NA	NA	3.9E-03	mg/m3	NA	NA	NA	NA
				Acenaphthene	8.5E-01	mg/m^3	1.7E-03	mg/m3	NA	NA	NA	NA	1.7E-03	mg/m3	NA	NA	NA	NA
				Anthracene	4.6E+00	mg/m^3	9.1E-03	mg/m3	NA	NA	NA	NA	9.1E-03	mg/m3	NA	NA	NA	NA
				Dibenzofuran	7.0E-01	mg/m^3	1.4E-03	mg/m3	NA	NA	NA	NA	1.4E-03	mg/m3	NA	NA	NA	NA
				Fluorene	6.7E+00	mg/m^3	1.3E-02	mg/m3	NA	NA	NA	NA	1.3E-02	mg/m3	NA	NA	NA	NA
				Naphthalene	3.7E+00	mg/m^3	7.3E-03	mg/m3	3.4E-02	(mg/m3)-1	2.E-04	86%	7.3E-03	mg/m3	3.0E-03	mg/m3	2.4E+00	84%
				Pyrene	6.1E+00	mg/m^3	1.2E-02	mg/m3	NA	NA	NA	NA	1.2E-02	mg/m3	NA	NA	NA	NA
			Exp. Route Total								3.E-04	100%					2.9E+00	100%
		Exposure Point Total									6.E-04	--					9.4E+01	--
	Exposure Medium Total										6.E-04	--					9.4E+01	--
Medium Total											6.E-04	--					9.4E+01	--
Total of Receptor Risks/Hazards Across All Media										Total of Receptor Risks Across All Media	6.E-04	--				Total of Receptor Hazards Across All Media	9.4E+01	--
										Percent Contribution from Ingestion		44%				Percent Contribution from Ingestion		59%
										Percent Contribution from Dermal		4%				Percent Contribution from Dermal		38%
										Percent Contribution from Inhalation		52%				Percent Contribution from Inhalation		3%

Table 7.2.CTE

Calculation of Chemical Cancer Risks and Non-Cancer Hazards

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations						Non-Cancer Hazard Calculations					
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Percent of Total Risk per Route	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient	Percent of Total Hazard per Route
							Value	Units	Value	Units			Value	Units	Value	Units		
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Ingestion	Benzene	7.6E+02	ug/L	2.1E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	1.E-04	94%	2.4E-02	mg/kg-day	4.0E-03	mg/kg-day	6.1E+00	22%
				Ethylbenzene	2.2E+02	ug/L	5.9E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	6.E-06	5%	6.9E-03	mg/kg-day	1.0E-01	mg/kg-day	6.9E-02	0.2%
				Toluene	7.9E+01	ug/L	2.2E-04	mg/kg-day	NA	NA	NA	NA	2.5E-03	mg/kg-day	8.0E-02	mg/kg-day	3.2E-02	0.1%
				Xylenes (total)	2.0E+02	ug/L	5.5E-04	mg/kg-day	NA	NA	NA	NA	6.4E-03	mg/kg-day	2.0E-01	mg/kg-day	3.2E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	5.2E-05	mg/kg-day	8.0E-03	(mg/kg-day)-1	4.E-07	0.3%	6.1E-04	mg/kg-day	5.0E-02	mg/kg-day	1.2E-02	0.04%
				2-Methylnaphthalene	6.5E+02	ug/L	1.8E-03	mg/kg-day	NA	NA	NA	NA	2.1E-02	mg/kg-day	4.0E-03	mg/kg-day	5.2E+00	19%
				Acenaphthene	2.8E+02	ug/L	7.6E-04	mg/kg-day	NA	NA	NA	NA	8.9E-03	mg/kg-day	6.0E-02	mg/kg-day	1.5E-01	1%
				Anthracene	1.5E+03	ug/L	4.1E-03	mg/kg-day	NA	NA	NA	NA	4.8E-02	mg/kg-day	3.0E-01	mg/kg-day	1.6E-01	1%
				Dibenzofuran	2.3E+02	ug/L	6.3E-04	mg/kg-day	NA	NA	NA	NA	7.4E-03	mg/kg-day	1.0E-03	mg/kg-day	7.4E+00	26%
				Fluorene	2.2E+03	ug/L	6.0E-03	mg/kg-day	NA	NA	NA	NA	7.0E-02	mg/kg-day	4.0E-02	mg/kg-day	1.8E+00	6%
				Naphthalene	1.2E+03	ug/L	3.3E-03	mg/kg-day	NA	NA	NA	NA	3.8E-02	mg/kg-day	2.0E-02	mg/kg-day	1.9E+00	7%
				Pyrene	2.0E+03	ug/L	5.5E-03	mg/kg-day	NA	NA	NA	NA	6.4E-02	mg/kg-day	3.0E-02	mg/kg-day	2.1E+00	8%
				Iron	1.7E+04	ug/L	4.7E-02	mg/kg-day	NA	NA	NA	NA	5.5E-01	mg/kg-day	7.0E-01	mg/kg-day	7.8E-01	3%
				Manganese	1.7E+03	ug/L	4.6E-03	mg/kg-day	NA	NA	NA	NA	5.4E-02	mg/kg-day	2.4E-02	mg/kg-day	2.2E+00	8%
			Exp. Route Total								1.E-04	100%					2.8E+01	100%
			Dermal	Benzene	7.6E+02	ug/L	2.5E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	1.E-05	79%	3.0E-03	mg/kg-day	4.0E-03	mg/kg-day	7.4E-01	3%
				Ethylbenzene	2.2E+02	ug/L	2.8E-04	mg/kg-day	1.1E-02	(mg/kg-day)-1	3.E-06	18%	3.3E-03	mg/kg-day	1.0E-01	mg/kg-day	3.3E-02	0.1%
				Toluene	7.9E+01	ug/L	6.0E-05	mg/kg-day	NA	NA	NA	NA	7.0E-04	mg/kg-day	8.0E-02	mg/kg-day	8.8E-03	0.03%
				Xylenes (total)	2.0E+02	ug/L	2.8E-04	mg/kg-day	NA	NA	NA	NA	3.3E-03	mg/kg-day	2.0E-01	mg/kg-day	1.7E-02	0.1%
				1,1'-Biphenyl	1.9E+01	ug/L	6.8E-05	mg/kg-day	8.0E-03	(mg/kg-day)-1	5.E-07	3.1E-02	8.0E-04	mg/kg-day	5.0E-02	mg/kg-day	1.6E-02	0.1%
				2-Methylnaphthalene	6.5E+02	ug/L	2.0E-03	mg/kg-day	NA	NA	NA	NA	2.3E-02	mg/kg-day	4.0E-03	mg/kg-day	5.8E+00	20%
				Acenaphthene	2.8E+02	ug/L	8.7E-04	mg/kg-day	NA	NA	NA	NA	1.0E-02	mg/kg-day	6.0E-02	mg/kg-day	1.7E-01	1%
				Anthracene	1.5E+03	ug/L	9.1E-03	mg/kg-day	NA	NA	NA	NA	1.1E-01	mg/kg-day	3.0E-01	mg/kg-day	3.5E-01	1%
				Dibenzofuran	2.3E+02	ug/L	8.9E-04	mg/kg-day	NA	NA	NA	NA	1.0E-02	mg/kg-day	1.0E-03	mg/kg-day	1.0E+01	36%
				Fluorene	2.2E+03	ug/L	9.5E-03	mg/kg-day	NA	NA	NA	NA	1.1E-01	mg/kg-day	4.0E-02	mg/kg-day	2.8E+00	9%
				Naphthalene	1.2E+03	ug/L	1.7E-03	mg/kg-day	NA	NA	NA	NA	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	1.0E+00	3%
				Pyrene	2.0E+03	ug/L	2.0E-02	mg/kg-day	NA	NA	NA	NA	2.3E-01	mg/kg-day	3.0E-02	mg/kg-day	7.8E+00	27%
				Iron	1.7E+04	ug/L	1.0E-04	mg/kg-day	NA	NA	NA	NA	1.2E-03	mg/kg-day	7.0E-01	mg/kg-day	1.7E-03	0.01%
				Manganese	1.7E+03	ug/L	1.0E-05	mg/kg-day	NA	NA	NA	NA	1.2E-04	mg/kg-day	9.6E-04	mg/kg-day	1.3E-01	0.4%
			Exp. Route Total								2.E-05	100%					2.9E+01	100%
			Inhalation (showering)	Benzene	1.3E+00	mg/m^3	1.1E-03	mg/m3	7.8E-03	(mg/m3)-1	9.E-06	13%	1.3E-02	mg/m3	3.0E-02	mg/m3	4.4E-01	5%
				Ethylbenzene	3.8E-01	mg/m^3	3.2E-04	mg/m3	2.5E-03	(mg/m3)-1	8.E-07	1%	3.8E-03	mg/m3	1.0E+00	mg/m3	3.8E-03	0.05%
				Toluene	1.4E-01	mg/m^3	1.2E-04	mg/m3	NA	NA	NA	NA	1.4E-03	mg/m3	5.0E+00	mg/m3	2.8E-04	0.003%
				Xylenes (total)	3.5E-01	mg/m^3	3.0E-04	mg/m3	NA	NA	NA	NA	3.5E-03	mg/m3	1.0E-01	mg/m3	3.5E-02	0.4%
				1,1'-Biphenyl	3.3E-02	mg/m^3	2.9E-05	mg/m3	NA	NA	NA	NA	3.3E-04	mg/m3	4.0E-04	mg/m3	8.3E-01	10%
				2-Methylnaphthalene	1.1E+00	mg/m^3	9.7E-04	mg/m3	NA	NA	NA	NA	1.1E-02	mg/m3	NA	NA	NA	NA
				Acenaphthene	4.9E-01	mg/m^3	4.2E-04	mg/m3	NA	NA	NA	NA	4.9E-03	mg/m3	NA	NA	NA	NA
				Anthracene	2.6E+00	mg/m^3	2.3E-03	mg/m3	NA	NA	NA	NA	2.6E-02	mg/m3	NA	NA	NA	NA
				Dibenzofuran	4.0E-01	mg/m^3	3.5E-04	mg/m3	NA	NA	NA	NA	4.0E-03	mg/m3	NA	NA	NA	NA
				Fluorene	3.9E+00	mg/m^3	3.3E-03	mg/m3	NA	NA	NA	NA	3.9E-02	mg/m3	NA	NA	NA	NA
				Naphthalene	2.1E+00	mg/m^3	1.8E-03	mg/m3	3.4E-02	(mg/m3)-1	6.E-05	86%	2.1E-02	mg/m3	3.0E-03	mg/m3	7.0E+00	84%
				Pyrene	3.5E+00	mg/m^3	3.0E-03	mg/m3	NA	NA	NA	NA	3.5E-02	mg/m3	NA	NA	NA	NA
			Exp. Route Total								7.E-05	100%					8.3E+00	100%
		Exposure Point Total									2.E-04	--					6.5E+01	--
	Exposure Medium Total										2.E-04	--					6.5E+01	--
Medium Total											2.E-04	--					6.5E+01	--
Total of Receptor Risks/Hazards Across All Media										Total of Receptor Risks Across All Media	2.E-04	--				Total of Receptor Hazards Across All Media	6.5E+01	--
										Percent Contribution from Ingestion		58%				Percent Contribution from Ingestion		43%
										Percent Contribution from Dermal		8%				Percent Contribution from Dermal		45%
										Percent Contribution from Inhalation		34%				Percent Contribution from Inhalation		13%

Table 9.1.RME

Summary of Receptor Risks and Hazards for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	4.E-04	2.E-04	4.E-05	--	6.E-04	31%	Blood	Blood	5.2E+00	2.5E+00	5.2E-01	8.2E+00	9%
			Ethylbenzene	2.E-05	2.E-05	9.E-06	--	5.E-05	2%	Liver, Kidney	Development	5.9E-02	2.1E-02	2.3E-02	1.0E-01	0.1%
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	2.7E-02	1.6E-03	6.2E-03	3.5E-02	0.04%
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	2.7E-02	1.9E-01	1.2E-02	2.3E-01	0.3%
			1,1'-Biphenyl	1.E-06	NA	2.E-06	--	3.E-06	0.1%	Kidney	Liver, Kidney	1.0E-02	4.6E+00	1.1E-02	4.7E+00	5%
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	4.4E+00	NA	4.1E+00	8.6E+00	9%
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	1.3E-01	NA	1.2E-01	2.5E-01	0.3%
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	1.4E-01	NA	2.5E-01	3.9E-01	0.4%
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	6.3E+00	NA	7.4E+00	1.4E+01	15%
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	1.5E+00	NA	2.0E+00	3.5E+00	4%
			Naphthalene	NA	1.E-03	NA	--	1.E-03	67%	Body weight	Respiratory	1.6E+00	3.9E+01	7.2E-01	4.1E+01	45%
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	1.8E+00	NA	5.5E+00	7.3E+00	8%
			Iron	NA	--	NA	--	NA	NA	GI	NA	6.7E-01	--	1.5E-03	6.7E-01	1%
			Manganese	NA	--	NA	--	NA	NA	CNS	Neurological	1.9E+00	--	1.1E-01	2.0E+00	2.2%
			Chemical Total	4.E-04	2.E-03	5.E-05	--	2.E-03	--			2.4E+01	4.6E+01	2.1E+01	9.1E+01	--
		Exposure Point Total						2.E-03	--						9.1E+01	--
	Exposure Medium Total							2.E-03	--						9.1E+01	--
Medium Total								2.E-03	--						9.1E+01	--
Receptor Total							Receptor Risk Total	2.E-03	--					Receptor HI Total	9.1E+01	--

Total Blood HI Across All Media =	1.2E+01
Total Liver HI Across All Media =	5.0E+00
Total Kidney HI Across All Media =	1.2E+01
Total Development HI Across All Media =	1.0E-01
Total Neurological HI Across All Media =	2.1E+00
Total Whole Body HI Across All Media =	1.4E+01
Total Heart HI Across All Media =	8.6E+00
Total Body Weight HI Across All Media =	4.1E+01
Total Gastrointestinal HI Across All Media =	6.7E-01
Total CNS HI Across All Media =	2.3E+00
Total Respiratory HI Across All Media =	4.1E+01

Table 9.1.CTE

Summary of Receptor Risks and Hazards for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	7.E-05	1.E-05	1.E-05	--	1.E-04	50%	Blood	Blood	2.6E+00	4.4E-01	4.3E-01	3.5E+00	9%
			Ethylbenzene	4.E-06	1.E-06	3.E-06	--	8.E-06	4%	Liver, Kidney	Development	2.9E-02	3.8E-03	1.9E-02	5.2E-02	0.1%
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	1.4E-02	2.8E-04	5.1E-03	1.9E-02	0.05%
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	1.4E-02	3.5E-02	9.6E-03	5.8E-02	0.2%
			1,1'-Biphenyl	3.E-07	NA	5.E-07	--	7.E-07	0.4%	Kidney	Liver, Kidney	5.2E-03	8.3E-01	9.3E-03	8.5E-01	2%
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	2.2E+00	NA	3.4E+00	5.6E+00	15%
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	6.4E-02	NA	9.9E-02	1.6E-01	0.4%
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	6.8E-02	NA	2.1E-01	2.7E-01	0.7%
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	3.2E+00	NA	6.1E+00	9.2E+00	25%
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	7.5E-01	NA	1.6E+00	2.4E+00	6%
			Naphthalene	NA	9.E-05	NA	--	9.E-05	46%	Body weight	Respiratory	8.2E-01	7.0E+00	5.9E-01	8.4E+00	22%
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	9.1E-01	NA	4.5E+00	5.4E+00	15%
			Iron	NA	--	NA	--	NA	NA	GI	NA	3.3E-01	--	1.0E-03	3.3E-01	1%
			Manganese	NA	--	NA	--	NA	NA	CNS	Neurological	9.6E-01	--	7.3E-02	1.0E+00	2.8%
			Chemical Total	8.E-05	1.E-04	2.E-05	--	2.E-04	--			1.2E+01	8.3E+00	1.7E+01	3.7E+01	--
		Exposure Point Total						2.E-04	--						3.7E+01	--
	Exposure Medium Total							2.E-04	--						3.7E+01	--
Medium Total								2.E-04	--						3.7E+01	--
Receptor Total							Receptor Risk Total	2.E-04	--					Receptor HI Total	3.7E+01	--

Total Blood HI Across All Media =	5.8E+00
Total Liver HI Across All Media =	1.1E+00
Total Kidney HI Across All Media =	6.4E+00
Total Development HI Across All Media =	5.2E-02
Total Neurological HI Across All Media =	1.1E+00
Total Whole Body HI Across All Media =	9.2E+00
Total Heart HI Across All Media =	5.6E+00
Total Body Weight HI Across All Media =	8.4E+00
Total Gastrointestinal HI Across All Media =	3.3E-01
Total CNS HI Across All Media =	1.1E+00
Total Respiratory HI Across All Media =	8.4E+00

Table 9.2.RME

Summary of Receptor Risks and Hazards for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: , Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	2.E-04	4.E-05	2.E-05	--	3.E-04	51%	Blood	Blood	1.2E+01	1.5E-01	8.9E-01	1.3E+01	14%
			Ethylbenzene	1.E-05	3.E-06	4.E-06	--	2.E-05	4%	Liver, Kidney	Development	1.4E-01	1.3E-03	4.0E-02	1.8E-01	0.2%
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	6.3E-02	9.7E-05	1.1E-02	7.4E-02	0.08%
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	6.4E-02	1.2E-02	2.0E-02	9.6E-02	0.1%
			1,1'-Biphenyl	8.E-07	NA	7.E-07	--	1.E-06	0.3%	Kidney	Liver, Kidney	2.4E-02	2.9E-01	1.9E-02	3.3E-01	0%
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	1.0E+01	NA	7.1E+00	1.7E+01	18%
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	3.0E-01	NA	2.1E-01	5.0E-01	0.5%
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	3.2E-01	NA	4.3E-01	7.5E-01	0.8%
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	1.5E+01	NA	1.3E+01	2.7E+01	29%
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	3.5E+00	NA	3.4E+00	6.9E+00	7%
			Naphthalene	NA	2.E-04	NA	--	2.E-04	45%	Body weight	Respiratory	3.8E+00	2.4E+00	1.2E+00	7.5E+00	8%
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	4.3E+00	NA	9.4E+00	1.4E+01	15%
			Iron	NA	--	NA	--	NA	NA	GI	NA	1.6E+00	--	2.6E-03	1.6E+00	2%
			Manganese	NA	--	NA	--	NA	NA	CNS	Neurological	4.5E+00	--	1.8E-01	4.7E+00	5.0%
			Chemical Total	2.E-04	3.E-04	2.E-05	--	6.E-04	--			5.6E+01	2.9E+00	3.6E+01	9.4E+01	--
		Exposure Point Total						6.E-04	--						9.4E+01	--
	Exposure Medium Total							6.E-04	--						9.4E+01	--
Medium Total								6.E-04	--						9.4E+01	--
Receptor Total							Receptor Risk Total	6.E-04	--					Receptor HI Total	9.4E+01	--

Total Blood HI Across All Media =	2.0E+01
Total Liver HI Across All Media =	1.0E+00
Total Kidney HI Across All Media =	1.4E+01
Total Development HI Across All Media =	1.8E-01
Total Neurological HI Across All Media =	4.7E+00
Total Whole Body HI Across All Media =	2.7E+01
Total Heart HI Across All Media =	1.7E+01
Total Body Weight HI Across All Media =	7.6E+00
Total Gastrointestinal HI Across All Media =	1.6E+00
Total CNS HI Across All Media =	4.8E+00
Total Respiratory HI Across All Media =	7.5E+00

Table 9.2.CTE

Summary of Receptor Risks and Hazards for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: , Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	1.E-04	9.E-06	1.E-05	--	1.E-04	66%	Blood	Blood	6.1E+00	4.4E-01	7.4E-01	7.3E+00	11%
			Ethylbenzene	6.E-06	8.E-07	3.E-06	--	1.E-05	5%	Liver, Kidney	Development	6.9E-02	3.8E-03	3.3E-02	1.1E-01	0.2%
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	3.2E-02	2.8E-04	8.8E-03	4.1E-02	0.1%
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	3.2E-02	3.5E-02	1.7E-02	8.3E-02	0.1%
			1,1'-Biphenyl	4.E-07	NA	5.E-07	--	1.E-06	0.5%	Kidney	Liver, Kidney	1.2E-02	8.3E-01	1.6E-02	8.6E-01	1%
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	5.2E+00	NA	5.8E+00	1.1E+01	17%
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	1.5E-01	NA	1.7E-01	3.2E-01	0.5%
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	1.6E-01	NA	3.5E-01	5.1E-01	0.8%
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	7.4E+00	NA	1.0E+01	1.8E+01	27%
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	1.8E+00	NA	2.8E+00	4.5E+00	7%
			Naphthalene	NA	6.E-05	NA	--	6.E-05	29%	Body weight	Respiratory	1.9E+00	7.0E+00	1.0E+00	9.9E+00	15%
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	2.1E+00	NA	7.8E+00	9.9E+00	15%
			Iron	NA	--	NA	--	NA	NA	GI	NA	7.8E-01	--	1.7E-03	7.8E-01	1%
			Manganese	NA	--	NA	--	NA	NA	CNS	Neurological	2.2E+00	--	1.3E-01	2.4E+00	4%
			Chemical Total	1.E-04	7.E-05	2.E-05	--	2.E-04	--			2.8E+01	8.3E+00	2.9E+01	6.5E+01	--
		Exposure Point Total						2.E-04	--						6.5E+01	--
	Exposure Medium Total							2.E-04	--						6.5E+01	--
Medium Total								2.E-04	--						6.5E+01	--
Receptor Total							Receptor Risk Total	2.E-04	--					Receptor HI Total	6.5E+01	--

Total Blood HI Across All Media =	1.2E+01
Total Liver HI Across All Media =	1.3E+00
Total Kidney HI Across All Media =	1.1E+01
Total Development HI Across All Media =	1.1E-01
Total Neurological HI Across All Media =	2.4E+00
Total Whole Body HI Across All Media =	1.8E+01
Total Heart HI Across All Media =	1.1E+01
Total Body Weight HI Across All Media =	1.0E+01
Total Gastrointestinal HI Across All Media =	7.8E-01
Total CNS HI Across All Media =	2.4E+00
Total Respiratory HI Across All Media =	9.9E+00

Table 9.3.RME

Summary of Aggregate Receptor Risks for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Reasonable Maximum Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient [1]						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	6.E-04	2.E-04	6.E-05	--	9.E-04	35%	Blood	Blood	--	--	--	--	--
			Ethylbenzene	4.E-05	2.E-05	1.E-05	--	7.E-05	3%	Liver, Kidney	Development	--	--	--	--	--
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	--	--	--	--	--
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	--	--	--	--	--
			1,1'-Biphenyl	2.E-06	NA	2.E-06	--	4.E-06	0.2%	Kidney	Liver, Kidney	--	--	--	--	--
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	--	--	--	--	--
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	--	--	--	--	--
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	--	--	--	--	--
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	--	--	--	--	--
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	--	--	--	--	--
			Naphthalene	NA	2.E-03	NA	--	2.E-03	62%	Body weight	Respiratory	--	--	--	--	--
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	--	--	--	--	--
			Iron	NA	--	NA	--	NA	NA	GI	NA	--	--	--	--	--
			Manganese	NA	--	NA	--	NA	NA	CNS	Neurological	--	--	--	--	--
			Chemical Total	7.E-04	2.E-03	7.E-05	--	3.E-03	--			--	--	--	--	--
		Exposure Point Total						3.E-03	--						--	--
	Exposure Medium Total							3.E-03	--						--	--
Medium Total								3.E-03	--						--	--
Receptor Total							Receptor Risk Total	3.E-03	--					Receptor HI Total	--	--

Note:

[1] Consistent with USEPA guidance, non-carcinogenic hazards are presented separately for the adult and child in Tables 9.1 and 9.2, respectively.

Table 9.3.CTE

Summary of Aggregate Receptor Risks for COPCs

Human Health Risk Assessment

Niagara Mohawk Power Corporation - Saratoga Springs Former Manufactured Gas Plant Site - Saratoga Springs, New York

Central Tendency Exposure

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult + Child

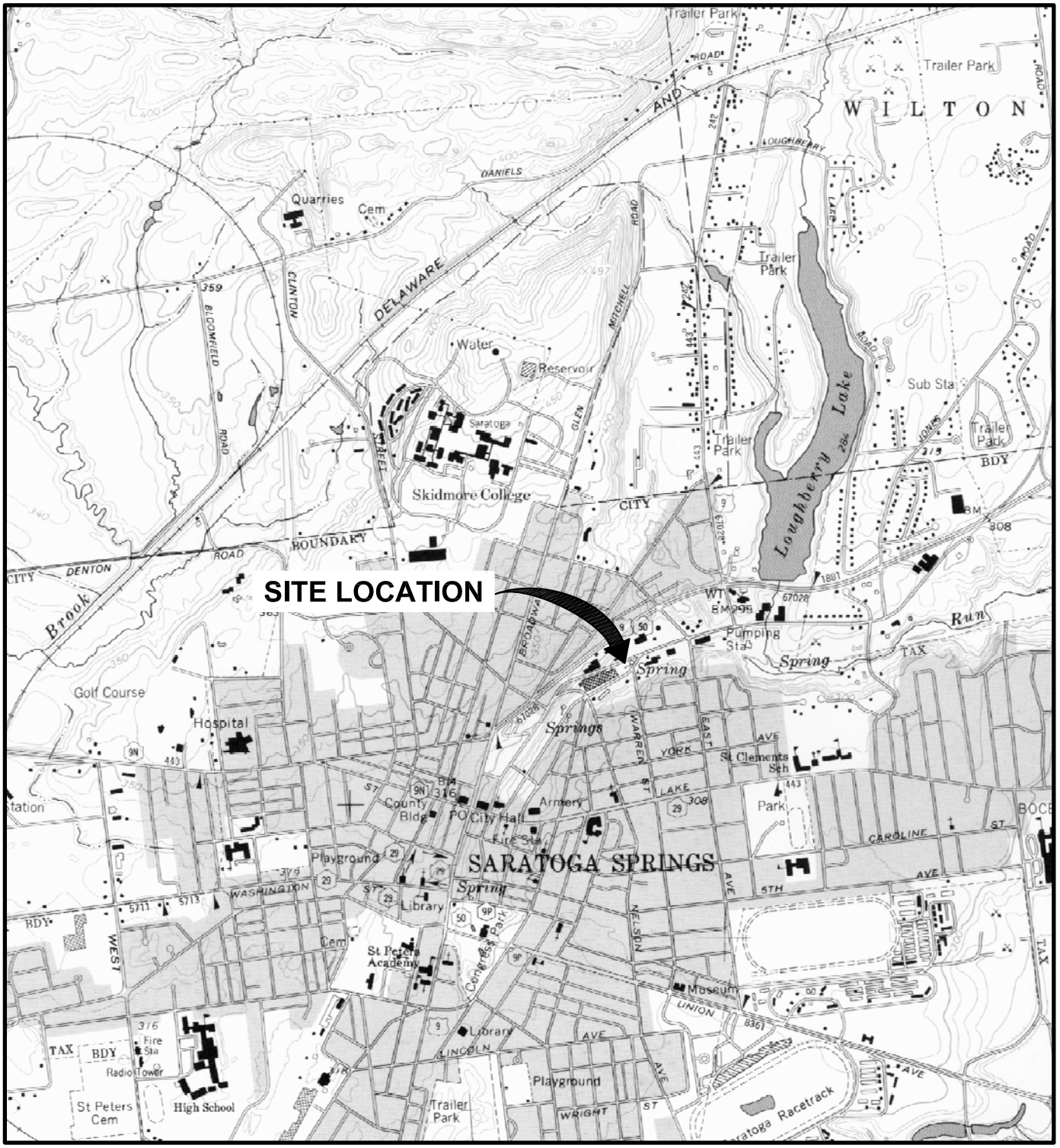
Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk						Non-Carcinogenic Hazard Quotient [1]						
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total	Percent Contribution to Total Risk	Primary Target Organ(s), RfD	Primary Target Organ(s), RfC	Ingestion	Inhalation	Dermal	Exposure Routes Total	Percent Contribution to Total Hazard
Groundwater	Overburden Groundwater	Excelsior Avenue Area	Benzene	2.E-04	2.E-05	3.E-05	--	2.E-04	58%	Blood	Blood	--	--	--	--	--
			Ethylbenzene	1.E-05	2.E-06	6.E-06	--	2.E-05	5%	Liver, Kidney	Development	--	--	--	--	--
			Toluene	NA	NA	NA	--	NA	NA	Kidney	Neurological	--	--	--	--	--
			Xylenes (total)	NA	NA	NA	--	NA	NA	Body weight	CNS	--	--	--	--	--
			1,1'-Biphenyl	7.E-07	NA	1.E-06	--	2.E-06	0.4%	Kidney	Liver, Kidney	--	--	--	--	--
			2-Methylnaphthalene	NA	NA	NA	--	NA	NA	heart	NA	--	--	--	--	--
			Acenaphthene	NA	NA	NA	--	NA	NA	Liver	NA	--	--	--	--	--
			Anthracene	NA	NA	NA	--	NA	NA	None	NA	--	--	--	--	--
			Dibenzofuran	NA	NA	NA	--	NA	NA	Whole body	NA	--	--	--	--	--
			Fluorene	NA	NA	NA	--	NA	NA	Blood	NA	--	--	--	--	--
			Naphthalene	NA	2.E-04	NA	--	2.E-04	37%	Body weight	Respiratory	--	--	--	--	--
			Pyrene	NA	NA	NA	--	NA	NA	Kidney	NA	--	--	--	--	--
			Iron	NA	NA	NA	--	NA	NA	GI	NA	--	--	--	--	--
			Manganese	NA	NA	NA	--	NA	NA	CNS	Neurological	--	--	--	--	--
			Chemical Total	2.E-04	2.E-04	3.E-05	--	4.E-04	--			--	--	--	--	--
		Exposure Point Total						4.E-04	--						--	--
	Exposure Medium Total							4.E-04	--						--	--
Medium Total								4.E-04	--						--	--
Receptor Total							Receptor Risk Total	4.E-04	--					Receptor HI Total	--	--

Note:

[1] Consistent with USEPA guidance, non-carcinogenic hazards are presented separately for the adult and child in Tables 9.1 and 9.2, respectively.

ARCADIS

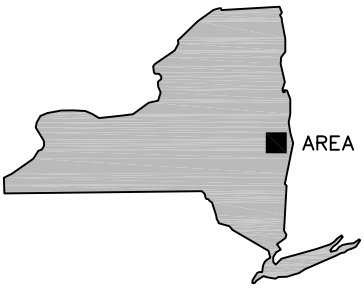
Figures



NEW YORK: BASE MAP SOURCE USGS 7.5 MIN. TOPO. QUADS., SARATOGA SPRINGS, NY, 1983.

0 2000' 4000'

GRAPHIC SCALE



NIAGARA MOHAWK POWER CORPORATION
SARATOGA SPRINGS FORMER MANUFACTURED GAS PLANT SITE
OLD RED SPRING SUBAREA
HUMAN HEALTH RISK ASSESSMENT

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY: SYRACUSE DIV/GROUP: ENVCAD DB: N. SMITHGALL K. WOOD L. FORAKER LD: PIC: J. NUSS PM: K. CROWLEY TM: K. CROWLEY LYR: ON=*;OFF=*REF*
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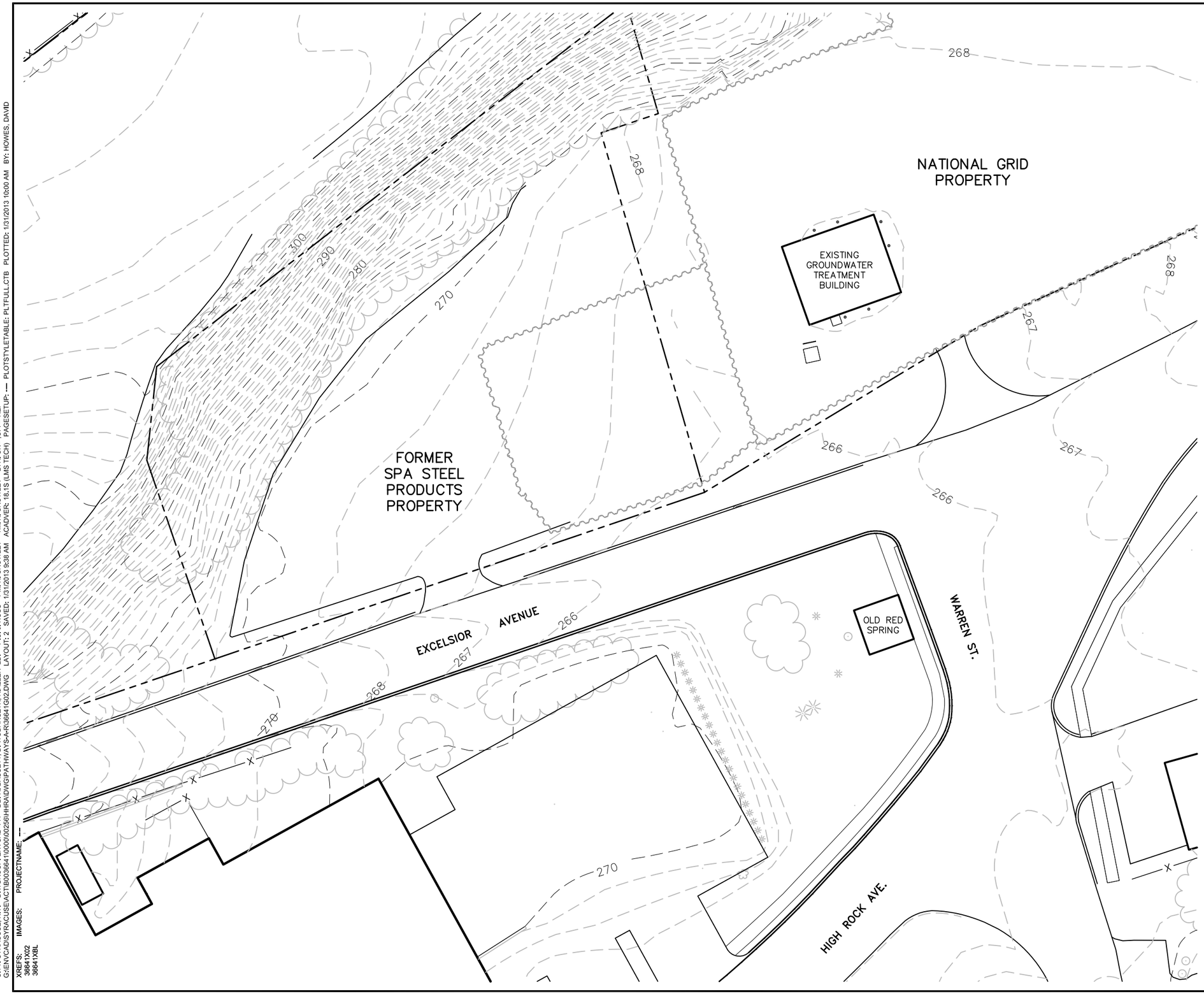
XREFS: IMAGES: PROJECTNAME: ---
36641X01.TIF



LEGEND:

- PROPERTY LINE (APPROXIMATE)
- CHAINLINK FENCE
- GROUND SURFACE CONTOUR (ONE-FOOT INTERVAL)
- EXISTING SUBGRADE SHEET PILE BARRIER WALL
- TREE/BRUSH LINE
- TREE/BUSH
- BUILDING/STRUCTURE

NOTES:

1. BASE MAPPING WAS COMPILED FROM A COMBINATION OF STEREOPHOTOGRAMMETRIC METHODS; AERIAL PHOTOGRAPHY FLOWN ON 8/96 AND 11/98 BY LOCKWOOD MAPPING COMPANY; AS-BUILT RECORD DRAWINGS FOR COMPLETED REMEDIATION ACTIVITIES AT THE SPA STEEL PRODUCTS PROPERTY; AND FIELD SURVEY METHODS ON 5/96, PROVIDED BY NIAGARA MOHAWK, SURVEY REFERENCE FILE NO. 3435, FILE INDEX 21.0-S2.18-M49, AND A NEW SURVEY FILE NO. 01135-1.DWG RECEIVED 8/19/02.
2. PROPERTY INFORMATION TAKEN FROM "CITY OF SARATOGA SPRINGS, SARATOGA COUNTY, N.Y. TAX MAPS" NUMBERED 153.00(OD), 166.00(OD), 165.36(ID), 166.00(ID), 166.05(ID), 166.11(ID), 166.21(ID), 166.29(ID), 166.30(ID), 166.31(ID), 166.37(ID), 166.38(ID), AND 166.39(ID).
3. ELEVATIONS ARE BASED ON NAVD 88 USING STATION G396, ELEVATION 306.010 FEET.

0 40' 80'

GRAPHIC SCALE

NIAGARA MOHAWK POWER CORPORATION
SARATOGA SPRINGS FORMER MANUFACTURED GAS PLANT SITE
OLD RED SPRING SUBAREA
HUMAN HEALTH RISK ASSESSMENT

SITE AND SURROUNDING AREAS

ARCADIS

FIGURE
2

CITY: SYRACUSE, N.Y. DIV/GROUP: ENVCAD-141 DB: R. BASSETT, D. WODARCZYK, R.ALLEN LD: PIC: J. NUSS PM: K. CROWLEY TM: K. CROWLEY LYR: ON="*";OFF="*REF*"
G:\ENVCAD\SYRACUSE\ACTIB\003664\10000\002560\IHRA\DWG\PATHWAYS-A-R\36641G02.DWG LAYOUT: 2 SAVED: 1/31/2013 9:38 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/31/2013 10:00 AM BY: HOWES, DAVID
XREFS: IMAGES: PROJECTNAME: --
36641X02
36641XBL

SPA STEEL WAREHOUSE

METAL SHED

SHEETPILE

NATIONAL GRID PROPERTY

GROUNDWATER TREATMENT BUILDING

FORMER SPA STEEL PRODUCTS PROPERTY

LTMW-12 (267.73)

(261.1) SS-06-01(MW-EPA-01)

(261.6) SS-06-03(MW-EPA-02)

SS-06-04(MW-EPA-03)

SS-06-07(MW-EPA-04) (258.8)

MW-ORS-01

OLD RED SPRING

WARREN ST.

(258.4) MW-SS-08-05

(258.3) SS-06-14(MW-EPA-08)

SS-06-08(MW-EPA-05) (258.6)

SS-06-12(MW-EPA-07) (258.1)

MW-SS-08-08 (257.9)

(263.4) SS-06-09(MW-EPA-06)

MW-SS-09-07 (259.1)

(255.4) SS-06-18(MW-EPA-10)

(255.4) SS-06-16(MW-EPA-09)

(256.7) MW-SS-09-06

EXCELSIOR AVENUE

ROCK AVE.

300 290 280 270 268 267 266 261 260 259 258 257 256 263 262

LEGEND:

- MONITORING WELL LOCATION (ARCADIS 2008)
- USEPA INSTALLED MONITORING WELL LOCATION (JULY 2006)
- SS-06-18(MW-EPA-10) SOIL BORING ID (MONITORING WELL ID)
- BBL MONITORING WELL LOCATION (JANUARY 2005)
- MONITORING WELL LOCATION (ARCADIS NOVEMBER 2009)
- CHAIN LINK FENCE
- TAX MAP PROPERTY LINE
- (258.4) NOVEMBER 2009 WATERTABLE ELEVATION
- 259 NOVEMBER 2009 WATERTABLE ELEVATION CONTOUR

NOTES:

1. BASE MAPPING WAS COMPILED BY A COMBINATION OF STEREOPHOTOGRAMMETRIC METHODS, FROM AERIAL PHOTOGRAPHY FLOWN ON 8/96 AND 11/98 BY LOCKWOOD MAPPING COMPANY, AND FIELD SURVEY METHODS ON 5/96, PROVIDED BY NIAGARA MOHAWK, SURVEY REFERENCE FILE NO. 3435, FILE INDEX 21.0-S2.18-M49 AND A NEW SURVEY FILE NO. 01135-1.DWG RECEIVED 8/19/02.
2. PROPERTY INFORMATION TAKEN FROM "CITY OF SARATOGA SPRINGS, SARATOGA COUNTY, N.Y. TAX MAPS" NUMBERED 153.00(OD), 166.00(OD), 165.36(ID), 166.00(ID), 166.05(ID), 166.11(ID), 166.21(ID), 166.29(ID), 166.30(ID), 166.31(ID), 166.37(ID), 166.38(ID), 166.39(ID).
3. COORDINATES SHOWN ON THIS MAP REFER TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, EASTERN ZONE, BASED ON CONTROL ESTABLISHED BY G.P.S. AND ADJUSTED TO THE PUBLISHED COORDINATES FOR N.G.S. HORIZONTAL CONTROL STATIONS GEYSER, MILTEN 2 RESET, AXC, AND AUD. NAD 83, FEET.
4. ELEVATIONS ARE BASED ON NAVD 88 USING STATION G396, ELEVATION 306.010 FEET.
5. EXISTING UTILITY INFORMATION PROVIDED BY NIAGARA MOHAWK POWER CORPORATION, TAKEN FROM MAPPING DEVELOPED BY S.Y. KIM LAND SURVEYOR, P.C. PROJECT NO. 730135, JOB NO. 43-219-97, DATED JANUARY 12, 1998.

0 40' 80'

GRAPHIC SCALE

NIAGARA MOHAWK POWER CORPORATION
SARATOGA SPRINGS FORMER MANUFACTURED GAS PLANT SITE
OLD RED SPRING SUBAREA
HUMAN HEALTH RISK ASSESSMENT

MONITORING WELL LOCATIONS

ARCADIS

FIGURE 3

CITY: SYRACUSE, N.Y. GROUP: ENVCAD-141 DB: KMD, KLS, R.ALLEN PM: K. MURRAY TM: S.POWLIN LYR: ON=*;OFF=REF (FRZ)
G:\ENVCAD\SYRACUSE\ACTIVE\B0036641\0000\00256\HHRA\DWG\PATHWAYS-A-R36641W01.DWG LAYOUT: 3 SAVED: 1/31/2013 9:39 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 1/31/2013 10:02 AM BY: HOWES, DAVID
XREFS: IMAGES: PROJECTNAME: ---
36641X02
36641X01
36641XBL

Appendix A

Data Usability Worksheet

APPENDIX A
DATA USABILITY WORKSHEET
Site: National Grid - Saratoga Springs Former MGP Site, Saratoga, New York
Medium: Groundwater

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data usability.	Not all shallow overburden wells were sampled during each sampling event (2006, 2008, and 2009). This does not necessarily affect data usability, but does affect the methodology used to calculate exposure point concentrations (EPCs) in the risk assessment.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs composite, filtered vs unfiltered, low flow, etc.)?	Yes, the medium of interest at the site is groundwater, specifically potential future exposure to potable groundwater from wells associated with Excelsior Avenue and Old Red Spring.
Assess the effect of field QC results on data usability.	Field duplicate samples were collected with this data set. Several compounds associated with the parent sample and field duplicate exhibited relative percent difference (RPD) results greater than the control limit resulting in qualification of estimates (J/UJ flags).
Summarize the effect of field sampling issues on the risk assessment, if applicable.	None. Analytical data collected as part of field sampling activities are deemed appropriate for use in the risk assessment.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	The analytical program used procedures consistent with EPA-approved analytical methodology.
Were detection limits adequate?	Yes.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	No issues related to analyses of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, inorganics, or miscellaneous parameters. As requested by USEPA, polycyclic aromatic hydrocarbons (PAHs) were analyzed using both Methods 8270C and 8310, which resulted in two PAH results for some samples. For these cases, the groundwater PAH data were averaged to represent a single data point for each monitoring well.

December 2001

APPENDIX A
DATA USABILITY WORKSHEET
Site: National Grid - Saratoga Springs Former MGP Site, Saratoga, New York
Medium: Groundwater

Activity	Comment
Data Quality Objectives	
Precision - How were duplicates handled?	Precision was measured through the use of field duplicates, laboratory duplicates, matrix spike/matrix spike duplicate (MS/MSD) samples, and laboratory control sample/laboratory control sample duplicate (LCS/LCSD) samples. The sample results for benzene, toluene, ethylbenzene, and total xylenes associated with sample locations MW-EPA-07 and BD-052209 exhibited a field duplicate RPD greater than the control limit resulting in qualification of associated sample results as estimated (J/UJ). Several sample locations used in the analysis of MS/MSDs exhibited RPD results between the MS /MSD percent (%) recoveries greater than the control limit for acetone and/or phenanthrene resulting in qualification of associated sample results as estimated (J/UJ). The compounds 1,1-dichloroethene and/or 4-Nitrophenol exhibited RPD results between the LCS/LCSD % recoveries greater than the control limits resulting in qualification of associated sample results as estimated (J/UJ). Dual column analysis associated with the analysis of SW-846 Method 8310 exhibited percent difference (%D) greater than the control limit for several compounds. These exceedances resulted in qualification of associated compounds as estimated (J/UJ).
Accuracy - How were split samples handled?	Accuracy measures the bias in an analytical system or the degree of agreement of a measurement with a known reference value. For this investigation, accuracy was defined as the percent recovery of QA/QC samples that were spiked with a known concentration of an analyte or compound of interest. The QA/QC samples used to evaluate analytical accuracy included instrument calibration, LCS/LCSDs, MS/MSD samples, and surrogate compound recoveries.

APPENDIX A
DATA USABILITY WORKSHEET
Site: National Grid - Saratoga Springs Former MGP Site, Saratoga, New York
Medium: Groundwater

Activity	Comment
Data Quality Objectives	
Accuracy - How were split samples handled?	Several compounds exhibited LCS and/or LCSD % recovery greater than the control limits for various compounds resulting in qualification of associated sample results as estimated (J/UJ). Several compounds associated with sample locations used for the analysis of MS/MSD exhibited MS and/or MSD percent (%) recovery greater than the control limit. For various compounds exhibiting percent recovery greater than the control limit it resulted in qualification of associated sample results as estimated (J/UJ).
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	A QA/QC parameter that is an indicator of the representativeness of a sample is holding time. Holding time criteria are established to maintain the samples in a state that is representative of the in-situ field conditions before analysis. Sample locations MW-EPA-09, MW-EPA-10, MW-EPA-02 and MW-EPA-01 for SVOC analysis were extracted outside the method required holdtime resulting in qualification as estimated (J/UJ). Sample locations MW-EPA-01, MW-EPA-10, MW-EPA-09 for nitrite and/or nitrate were analyzed outside the method required holdtime resulting in qualification as estimated (J/UJ). Quality assurance (QA) blanks (i.e., trip blanks, rinse blanks) were included within this data set and exhibited detections greater than the method detection limit (MDL) resulting in qualification due to blank contamination (B flag).
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	Completeness is defined as the percentage of measurements that are judged to be valid or usable to meet the prescribed DQOs. The completeness criterion is essentially the same for all data uses -- the generation of a sufficient amount of valid data. This analytical data set had an overall usability of 100%.

APPENDIX A
DATA USABILITY WORKSHEET
Site: National Grid - Saratoga Springs Former MGP Site, Saratoga, New York
Medium: Groundwater

Activity	Comment
Data Quality Objectives	
Comparability - Indicate any problems associated with data comparability.	Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. This goal was achieved through the use of the standardized techniques for sample collection and analysis presented in the QAPP.
Were the DQOs specified in the QAPP satisfied?	Yes. Data that did not meet the DQOs were flagged appropriately (e.g., J-qualified).
Summarize the effect of DQO issues on the risk assessment, if applicable.	The analytical data are deemed appropriate for use in the risk assessment.
Data Validation and Interpretation	
What are the data validation requirements?	As stated in the QAPP, analytical results and QC documentation go through a systematic review. Data usability summary reports (DUSRs) were produced.
What method or guidance was used to validate the data?	Organics: USEPA National Functional Guidelines of October 1999; USEPA Region II SOPs associated with USEPA SW-846 Volatile Organic Compounds by SW-846 Method 8260B(SOP HW-24 Revision 2, October 2006); Validating Semivolatile Organic Compounds by SW-846 Method 8270 (SOP HW-22 Revision 3, October 2006) Inorganics: USEPA National Functional Guidelines of July 2002
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes
Were all data qualifiers defined? Discuss those which were not.	Yes
Which qualifiers represent useable data?	J, UJ, JN, UB, and N

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APPENDIX A
DATA USABILITY WORKSHEET
Site: National Grid - Saratoga Springs Former MGP Site, Saratoga, New York
Medium: Groundwater

Activity	Comment
Data Validation and Interpretation	
Which qualifiers represent unuseable data?	R
How are tentatively identified compounds handled?	Tentatively identified compounds (TICs) were not included with the analyses by the laboratory(s).
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	Data validation did not preclude the use of any analytical data. All analytical data are deemed appropriate for use in the risk assessment.
Additional notes:	None.

Note: The purpose of this Worksheet is to succinctly summarize the data usability analysis and conclusions. Reference specific pages in the Remedial Investigation and/or the Risk Assessment text to further expand on the information presented here.