DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION
RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: **Bell Laboratories – Alcatel-Lucent Murray Hill Facility**
Facility Address: **600 Mountain Avenue, Murray Hill, New Jersey 07974**
Facility EPA ID#: **NJD006980924**

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

El Determination status codes should remain in the RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

Alcatel-Lucent USA, Inc. (Alcatel-Lucent), formerly known as Lucent Technologies Inc., or its predecessors in interest, including AT&T Bell Laboratories (Bell Labs), has occupied the Site since the 1940s. Alcatel-Lucent assumed responsibility for clean-up of the Site in 1996 pursuant to the requirements of the New Jersey Department of Environmental Protection (NJDEP) enforced Industrial Site Recovery Act (ISRA), which was triggered as a result of AT&T's transfer of the property to Lucent Technologies Inc.

The Site consists of approximately 200 acres at 600 Mountain Avenue, Murray Hill, New Jersey in Union County (see Drawing 2). The majority of the Site is located in Berkeley Heights Township with the northern portion of the Site in the Borough of New Providence. The Site is comprised of laboratories, office space (for administrative and software development), and computer facilities. Support buildings (e.g., treatment and steam plants) are located throughout the Site to provide services for the daily operation of the facility. Land use within 200 feet of the Site is primarily zoned as residential to the south and east and office and research to the north and west. Sensitive property uses, as defined by NJDEP, within 200 feet of the Site consist of residential properties, typically single family homes. According to the Township of Berkeley Heights and the Borough of New Providence, there are no proposed changes to land use at or within 200 feet of the Site.

As part of a New Jersey Pollutant Discharge Elimination System (NJPDES), groundwater investigations were completed in 1982 and monitoring well sampling results at the Site indicated the presence of VOCs (more specifically, chlorinated aliphatic hydrocarbons [CAHs] and predominantly trichloroethene [TCE]) at concentrations above NJDEP Standards. Because TCE was, and is, the primary constituent of concern, the groundwater contamination is referred to as the "TCE groundwater plume." Since 1982, Alcatel-Lucent has implemented numerous groundwater and soil investigations aimed at defining the extent of the TCE groundwater plume, identifying the source of the dissolved TCE in groundwater and evaluating risk to human and ecological receptors. Investigations conducted by Geraghty & Miller, Inc. (Refs. 1-4) and Eckenfelder (Ref. 5) were successful in identifying the plume and developing a preliminary conceptual model of the physical and geologic setting of the Site. A comprehensive groundwater Remedial Investigation (RI) was performed at the Site under the requirements of the ISRA and the NJDEP Technical Requirements for Site Remediation (TRSR) (Ref. 6).

The following activities were implemented to evaluate potential receptors to contamination originating from the Site:

- Baseline Ecological Evaluation (BEE) to evaluate risks to ecological receptors,
- Soil gas survey along the eastern boundary of the Site to evaluate potential risks caused by VOC vapor migration,
- Vapor intrusion investigation of all buildings (where access was granted) within 100 feet of the TCE groundwater plume,
- Surface water sampling at Salt Brook, located northeast of the Site,
- Sediment and surface water sampling at the stormwater detention basin and Blue Brook tributary, located southwest of the Site,
- Well search to evaluate drinking water receptors.

The following remedial actions have been implemented at the Site:

- Excavation and off-site disposal of 267 tons of ripable saprolite from the TCE groundwater plume source zone,
- Excavation and off-site disposal of impacted soil from a total of 31 AOCs to mitigate soils that had constituents above the applicable NJDEP soil cleanup criteria,
- Connection of seven homes to the public water supply in 1998,
- Installation of a sub-slab mitigation system in one home in 2003,
- Dredging of sediments at the detention basin in 2000 and 2010,
- Source zone pilot study testing soil vapor extraction (SVE) and *in-situ* chemical oxidation (ISCO) technologies, and
- ISCO interim remedial action (IRM) by injection of 27,367 pounds of potassium permanganate into blast fracture trenches for remediation of the source of the TCE groundwater plume.
- Supplemental ISCO injection of 9,151 pounds of potassium permanganate into blast fracture trenches at the former source area.

Remedial activities, pursuant to an NJDEP-approved work plan, are on-going at the Site to reduce contamination and mitigate risks to human health. Specifically, supplemental ISCO injections were performed in the former source zones in October and November 2011 and periodic dredging of sediments at the detention basin will be conducted to continue to address contaminant concentrations in groundwater, sediment and surface water.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   X If yes - check here and continue with #2 below.

   If no - re-evaluate existing data, or

   If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Summary of Areas of Concern (AOCs):

A total of 215 AOCs have been identified at the Site (Ref. 7). Since 1996, most environmental AOCs identified at the Site have been addressed to the satisfaction of the NJDEP by various methods including excavation and off-site disposal of contaminated soil and sediment, connection of homes with domestic water wells to the public supply system and installation of a sub-slab depressurization system in a nearby residence. A Case Inventory Document summarizing each AOC status (i.e., investigation, remediation, and/or no further action [NFA] determination status) and a Site map showing the locations of all AOCs are provided in Attachment A in support of this EI determination. Some of the recent correspondence from NJDEP pertinent to the 'NFA determination' of select AOCs has been included on a CD attached in support of the EI determination (Refs. 16, 17, 18). A table summarizing all remaining media impacts at the Site is provided as Attachment B.

Of the 215 AOCs, six AOCs are still active (Ref. 8, 9). Of these six AOCs, NFA determinations have been requested at the following three AOCs and are pending NJDEP approval:

- MH-173 (2500 gallon Fuel Oil UST – Building 5)
- MH-174 (Diesel Spill), and
- MH-175 (Hydraulic Lift – Building 14).

Remedial activities at the remaining three AOCs below are on-going at the Site:

- MH-2B (TCE Groundwater Plume)
- MH-2D (Stormwater Drainage Ditch Sediment), and
- MH-2J (Surface Water).

AOCs MH-2B (TCE Groundwater Plume) and MH-2J (Surface Water) address the impacts of contaminated groundwater originating from the Site. The extent of the TCE groundwater plume is shown in the TCE Isoconcentration Maps from December 2009 (Attachment C). The horizontal extent of contamination extends north from the southeast corner of the Alcatel-Lucent property (the source area) to approximately 350 feet south of the intersection of South Street and Candlewood Drive in New Providence with a maximum width of 1,400 feet along Mountain Avenue. The contaminated groundwater plume is approximately 3,100 feet in length. The source of the groundwater contamination is believed to be from historical handling of solvents. Two former proximate areas comprised of TCE with concentrations greater than 10,000 micrograms per liter (µg/L), designated as dense non-aqueous phase liquid (DNAPL) Source Zone "A" (10,450 square ft [ft^2] and DNAPL Source Zone "B" (8,950 ft^2), were delineated during the remedial investigations. The former DNAPL Source Zones were located in the southeast corner of the Site and extend partially onto the NJDOT right of way and have undergone significant remediation.

An ISCO IRM was conducted from June 2006 to October 2009 to remediate the DNAPL Source Zones. The ISCO IRM successfully eliminated the source of the dissolved TCE groundwater plume, thereby ultimately attenuating the plume and its associated impact to Salt Brook, a stream located to the northeast of the property (Refs. 10, 12). On August 15, 2011, NJDEP approved a Remedial Action Work Plan for groundwater that included evaluation of remedial options whereby monitored natural attenuation (MNA) with supplemental oxidant injections was selected as the remedy for groundwater (Ref. 10). The approved work plan included a Technical Impracticability (TI) waiver request for remediation of TCE to below 1 µg/L standard (Ref. 12). Using the existing injection well network, supplemental ISCO injections were performed at the Site in October and November 2011 to mitigate TCE concentrations in the former source zones where concentrations exceed 1,000 µg/L in groundwater. The supplemental ISCO injections performed at the Site in 2011 are anticipated to further reduce TCE concentrations and promote conditions for natural attenuation of the dissolved TCE groundwater plume. If TCE concentrations do not further decrease, or if concentration spikes in the groundwater and/or surface water, then Alcatel-Lucent will need to reevaluate the remedy (Ref. 13).

Salt Brook is impacted to approximately 2,000 feet north of the culvert at Mountain Avenue with TCE from the groundwater baseflow (groundwater contributions to surface water) [see Attachment C]. Since the source of the Salt Brook impacts is Site groundwater, the surface water at Salt Brook will be indirectly treated through the remedy for MH-2B (TCE Groundwater Plume).

References:

1. Geraghty & Miller, Inc., Hydrogeologic Data and Groundwater Monitoring Plan for a NJPDES Permit Application AT&T Bell Laboratories Murray Hill, New Jersey, October 1982.

2. Geraghty & Miller, Inc., Results for the First Phase (Phase I) Compliance Monitoring Program AT&T Bell Laboratories Murray Hill, New Jersey, April 1987.

3. Geraghty & Miller, Inc., Results of the Soil Gas Survey at the AT&T Bell Laboratories, Murray Hill, New Jersey Site, April 1988.

4. Geraghty & Miller, Inc., Results of the Soil Boring and Sampling Program at the AT&T Bell Laboratories, Murray Hill, New Jersey Site, July 1989.

5. Eckenfelder, Inc., Final Report Hydrogeologic Investigations AT&T Bell Laboratories Murray Hill, New Jersey, May 30, 1991.

6. McLaren/Hart, Inc., Groundwater Remedial Investigation Report, AT&T Bell Laboratories – Murray Hill Facility, July 1998.

7. Bell Laboratories, Division of Lucent Technologies Inc., Industrial Site Recovery Act (ISRA) Preliminary Assessment Report for AT&T Bell Laboratories 600 Mountain Avenue, Murray Hill, New Jersey 07974, ISRA Case Number 95514, Books 1-7, May 15, 1996.

8. Langan Engineering and Environmental Services, Inc., Initial Receptor Evaluation Report, February 2011.

9. Email from Andy Dillman, NJDEP, to Sam Abdellatif, EPA, re: Alcatel-Lucent, Murray Hill. Dated November 15, 2011.

10. New Jersey Department of Environmental Protection, Letter of Approval for Proposed Remedial Actions for MH-2B. August 15, 2011.

11. Langan Engineering and Environmental Services, Inc., IRM Completion Report. July 2010.

12. Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.

13. Email from Andy Dillman, NJDEP, to Sam Abdellatif, EPA, re: Alcatel-Lucent, Murray Hill. Dated November 10, 2011.

14. New Jersey Department of Environmental Protection, Comment Letter for Remedial Investigation Report (RIR) dated October 5, 2004 – Pilot Test Report. May 5, 2005.

15. New Jersey Department of Environmental Protection, Letter of Approval for Remedial Investigation Report (RIR) dated November 2, 2006. June 20, 2007.

16. New Jersey Department of Environmental Protection, Comment Letter for Various Remedial Investigation Reports (RIR). May 7, 2003.

17. New Jersey Department of Environmental Protection, Letter of Approval for Remedial Investigation Workplan (RIW) dated July 7, 2003. January 29, 2004.

18. New Jersey Department of Environmental Protection, Notice of Deficiency for Remedial Investigation Report (RIR) dated November 18, 2004. September 10, 2007.

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

X If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

___ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

If unknown - skip to #8 and enter "IN" status code.

Rationale:

TCE Groundwater Plume:

A 3,100 feet long TCE groundwater plume exists along the eastern portion of the Site, extending north from the former DNAPL Source Zones located at the southeast corner of the Site (see Attachment C). The horizontal extent of the plume extends to approximately 350 feet south of the intersection of South Street and Candlewood Drive in New Providence with a maximum width of 1,400 feet along Mountain Avenue. The groundwater plume extends to the upstream portion of Salt Brook (AOC MH-2J).

The Site is underlain by four stratigraphic units: glacial till, saprolite, Preakness Basalt and the Feltville Formation. Site monitoring wells are screened across five saturated zones: the shallow zone (S) within the unconsolidated deposits (till and saprolite), the intermediate zone (I) within the upper Preakness Basalt, the deep 1 and deep 2 zones (D1, D2) within the lower Preakness Basalt, and the sedimentary zone (F) within the Feltville Formation. A Site conceptual model and a Site map are provided as Attachments D and E, respectively. A cross-section of the site from south to north showing TCE concentrations from the December 2009 sampling event is provided as Attachment F. The vertical extent of the TCE groundwater plume is limited to the unconsolidated material and the Preakness Basalt.

An ISCO IRM was implemented in the former DNAPL Source Zones "A" and "B" from June 2006 to October 2009, which successfully mitigated the source of the TCE groundwater plume (i.e., the area where concentrations in groundwater were greater than 10,000 µg/L). A total of approximately 27,367 pounds of potassium permanganate ($KMnO_4$), equivalent to approximately 55,019 gallons of 2.5% $KMnO_4$ solution, was injected in the subsurface as part of the ISCO IRM. Two years of quarterly post-ISCO injection monitoring results has demonstrated that there has been minimal rebound of TCE levels in those wells that contained the highest concentrations of TCE. The IRM Completion Report (Ref. 1) that

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

presented the post-ISCO injection monitoring results was approved by the NJDEP in a letter dated February 22, 2011 (Ref. 2).

The contaminants present in groundwater above the NJDEP Ground Water Quality Standards (GWQS) and their maximum concentrations in micrograms per liter (µg/L) from the December 2009 sampling event following the IRM are provided below. Three recent groundwater sampling events were conducted at the Site in September 2011 (baseline round), December 2011 (post-injection round one), and May 2012 (post-injection round two) as part of the supplemental ISCO injections. The results from the September and December 2011 groundwater sampling events were included and submitted to NJDEP and EPA in the Remedial Action Progress Report, dated March 1, 2012 [Ref. 8]. The results from the May 2012 groundwater sampling event will be included in a remedial action completion report that is tentatively scheduled to be submitted to NJDEP and EPA in August 2012.

Constituent	Maximum Concentration	GWQS	Well Location
Benzene	83.8 µg/L	1 µg/L	MW-46D1
Bromodichloromethane	1.4 µg/L	1 µg/L	MW-45I
Carbon Tetrachloride	9.4 µg/L	1 µg/L	MW-2
Chloroform	112 µg/L	70 µg/L	MW-46I
1,1,-Dichloroethane	63.8 µg/L	50 µg/L	MW-46I
1,1-Dichloroethene	42.9 µg/L	1 µg/L	MW-46I
1,2-Dichloroethane	15.6 µg/L	2 µg/L	MW-46I
cis-1,2-Dichloroethene	3610 µg/L	70 µg/L	MW-46I
Methylene Chloride	168 µg/L	3 µg/L	MW-46D1
1,1,1-Trichloroethane	218 µg/L	30 µg/L	MW-36IR
1,1,2-Trichloroethane	20.6 µg/L	1 µg/L	MW-46I
Tetrachloroethene	17.7 µg/L	1 µg/L	MW-46D1
Trichloroethene	7825 µg/L	1 µg/L	MW-35D2
Vinyl Chloride	11.4 µg/L	1 µg/L	MW-46I

While the TCE levels in the former DNAPL Source Zones "A" and "B" have been significantly remediated (*i.e.*, TCE concentrations in the source area have been reduced by 94%), the groundwater concentrations present at the Site continue to exceed the NJDEP GWQS of 1 µg/L. The TCE groundwater plume occupies an area of approximately 3 million square feet, which is about 73 times greater in aerial extent than the former DNAPL Source Zones. Due to the large area of the TCE plume and the complex and heterogeneous nature of the subsurface geologic substrate, a remedial alternative that will result in the restoration of groundwater to meet the NJDEP GWQS is not technically or economically feasible (Refs. 3, 4).

To address the TCE groundwater plume, supplemental ISCO injections were performed at the Site in 2011 and monitored natural attenuation and institutional controls are planned to be implemented at the Site. These plans are discussed in detail in the Remedial Action Selection Report and Remedial Action Work Plan (RASR/RAWP) dated May 2011 (Ref. 3) that was approved by the NJDEP in a letter dated August 15, 2011 (Ref. 4). Supplemental injections of potassium permanganate ($KMnO_4$) were performed in the former DNAPL Source Zones where residual source area TCE impacts were greater than 1,000 µg/L. A total of approximately 9,151 pounds of $KMnO_4$, equivalent to approximately 43,000 gallons of 2.5% $KMnO_4$ solution, were injected into the subsurface in October and November 2011 as part of the

supplemental injection program (Refs. 4, 6, 8). Monitored natural attenuation will be used to demonstrate the reduction in mass of organic contaminants and institutional controls (i.e., a Classification Exception Area [CEA] and Well Restriction Area [WRA]) have been established over the "footprint" of the plume to restrict groundwater use within the area of groundwater contamination, thereby preventing direct contact with groundwater contaminants. The establishment of a CEA/WRA is a public notification mechanism indicating that an aquifer does not satisfy water quality standards and restricting aquifer use until standards are achieved. Formal public notification relating to the CEA/WRA was sent to 46 individual recipients whose property overlies the "footprint" of the TCE groundwater plume (Refs. 5, 7).

References:

1. Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
2. New Jersey Department of Environmental Protection, Letter of Approval for IRM Completion Report. February 22, 2011.
3. Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.
4. New Jersey Department of Environmental Protection, Letter of Approval for Proposed Remedial Actions for MH-2B. August 15, 2011.
5. Langan Engineering and Environmental Services, Inc., Notification of Ongoing Environmental Activities at the Alcatel-Lucent USA Inc. – Murray Hill Facility, August 26, 2011.
6. New Jersey Department of Environmental Protection, Letter of Approval for Additional Oxidant Injections and Modification of NJPDES Discharge to Groundwater Permit by Rule. November 2, 2011.
7. New Jersey Department of Environmental Protection, Remedial Investigation Work Plan (RIW) Approval. June 3, 2008.
8. Langan Engineering and Environmental Services, Inc., Remedial Action Progress Report AOC MH-2B (TCE Groundwater Plume), March 1, 2012.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

_X_ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

The migration of the TCE groundwater plume has stabilized, as indicated by the historical plume delineation maps and the trend analysis plots for TCE groundwater concentrations at individual monitoring wells.

To evaluate changes in the extent of the TCE groundwater plume over time, TCE isoconcentration maps for each stratigraphic zone were compared over two sampling events. The following TCE isoconcentrations maps are presented in Attachment C:

- Figure 12 – TCE Concentration in the Deep 2 Zone, October 2003 vs. April 2004
- Figures D-1 to D-3 – TCE Isoconcentration Maps of the Shallow, Intermediate and Deep 1 Zones, November 2005
- Figures D-1 to D-4 – TCE isoconcentrations Maps of the Shallow, Intermediate, Deep 1 and Deep 2 Zones, December 2009

As discussed in response to Question No. 2, the Site stratigraphic zones are characterized as shallow, intermediate, deep 1, deep 2 and sedimentary. TCE isoconcentration maps from the sedimentary zone were not prepared because TCE results have been below the GWQS. A Site conceptual model in Attachment D illustrates the stratigraphic zones, Site well designations and the vertical extent of TCE migration. A comparison of the TCE isoconcentration contour maps from 2004 through 2009 indicate that the TCE groundwater plume in the shallow, intermediate, deep 1 and deep 2 zones have remained relatively stable or decreased in extent over time. As shown in the 2009 contours, the source area has been significantly remediated by the ISCO IRM, which targeted all TCE concentrations greater than 10,000 µg/L.

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[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

TCE trend (TCE concentrations versus time) plots showing historical TCE concentrations since 1997 were presented in Appendix L of the IRM Completion Report (Ref. 1). A site-wide monitoring well trend plot and select monitoring well trend plots discussed below are included in Attachment G. The majority of on-site and off-site monitoring wells show a decreasing to stable trend that is likely a result of the remedial actions implemented at the source area to date. TCE concentrations in the source area wells decreased 94% as a direct result of the ISCO IRM completed in 2009 (Ref. 1). Further downgradient at the Site boundary, trend plots at the monitoring well clusters MW-20 and MW-22 show that TCE concentrations have been decreasing in all stratigraphic saturated zones (shallow, intermediate and deep zones) (Attachment G).

To evaluate plume migration off-site, the concentration trends at the off-site downgradient monitoring wells MW-21S, MW-21I, MW-21D, and MW-43I are analyzed. The trend plots for MW-21I and MW-21D show a decreasing trend over time while the plot for MW-21S shows a slightly increasing trend, which could possibly be a result of one anomalous detection of 50 µg/L of TCE in November 1999. Excluding that data point, TCE concentrations were detected between 160.5 and 216 µg/L in ten sampling events since 1997. As shown in the MW-21S trend plot, TCE concentrations have remained relatively stable since 2003 with no strong increasing or decreasing trends. The plot for intermediate well MW-43I indicate low levels of TCE at this well, with concentrations ranging from 0.5 to 1.8 µg/L in 11 sampling events since July 2005, which are less than or slightly above the NJDEP GWQS of 1 µg/L (Attachment G). Overall, these TCE trend plots demonstrate that TCE groundwater concentrations have stabilized in the shallow, intermediate and deep zones from the source area to the downgradient plume extents as a result of remedial activities implemented at the Site to date.

Additionally, an NJDEP-approved plume extent has been defined through an NJDEP fate and transport spreadsheet-based analytical model for the establishment of the Classification Exception Area /Well Restriction Area (CEA/WRA) on February 22, 2011 to restrict groundwater use (Refs. 2 and 3). The extent of this plume is provided in Figure C-1 (Attachment H) with an anticipated duration of 35 years. The downgradient and vertical extents of contamination are delineated by monitoring wells MW-52I and MW-16F, respectively. These wells are sampled biennially pursuant to the CEA reporting requirements to verify the extent of groundwater contamination.

As indicated by the above analyses of historical TCE plume delineation maps (isoconcentration contour maps) and the TCE concentration trend plots, the migration of the TCE groundwater plume has stabilized. The source area TCE concentrations have been significantly reduced as a result of the ISCO IRM. The downgradient concentrations have stabilized due to natural attenuation and as a result of source area remediation. With the supplemental ISCO injections performed at the Site in October and November 2011, the concentrations at the downgradient plume boundary are expected to further decrease over time.

References:

1. Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
2. Langan Engineering and Environmental Services, Inc., CEA/WRA Permit Fact Sheet, July 2010.
3. Langan Engineering and Environmental Services, Inc., Notification of Ongoing Environmental Activities at the Alcatel-Lucent USA Inc. Murray Hill Facility, August 26, 2011.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

   X If yes - continue after identifying potentially affected surface water bodies.

   ___ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination"does not enter surface water bodies.

   ___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Salt Brook, a stream to the northeast of the property, is impacted by the TCE groundwater plume (Ref. 1). The stream is approximately 5,000 feet long prior to its confluence with the Passaic River (Ref. 2). Approximately 390 feet of Salt Brook runs within the delineated extent of the shallow groundwater plume; therefore, it is believed that the source of the surface water TCE impacts is the baseflow contribution of TCE-impacted groundwater (see Attachment C). Surface water sampling was conducted from 1997 to 1999 as part of the ecological and human health evaluations (Refs. 2, 3) and again from 2005 to 2009 to evaluate the effect of the ISCO IRM on surface water concentrations (Ref. 1). During the most recent surface water sampling event conducted in December 2009, TCE concentrations ranged from non-detect to 21.3 µg/L in Salt Brook, exceeding the NJDEP Surface Water Quality Criteria (SWQC) of 1 µg/L and impacts extend approximately 2,000 feet downstream of the culvert.

References:

1. Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
2. McLaren/Hart, Inc., Baseline Ecological Evaluation (BEE) (Appendix D of the Site Investigation/Remedial Investigation Report for Soils, AT&T Bell Laboratories – Murray Hill Facility), June 1998.
3. AMEC Earth & Environmental, Inc., Human Health Risk Assessment for Lucent Technologies Murray Hill Facility, 600 Mountain Avenue, Murray Hill, New Jersey, November 2001.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations)?

___ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

_X_ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

___ If unknown - enter "IN" status code in #8.

Rationale:

The discharge of impacted groundwater into Salt Brook is not likely to be "insignificant," because TCE is present at concentrations greater than 10 times its NJDEP GWQS in groundwater adjacent to the stream. The groundwater concentration at monitoring well MW-21S is believed to be most representative of the baseflow contribution to Salt Brook because it is the closest well to Salt Brook and is screened in the shallow unconfined saturated zone from 36 to 56 feet below ground surface (ft bgs). In the sampling event conducted in December 2009, carbon tetrachloride, TCE and tetrachloroethene (PCE) were detected in MW-21S at concentrations of 4.7, 203 and 2.8 µg/L, respectively. Drawing 15 provided in Attachment I shows the surface water sampling locations at Salt Brook from December 2009. These concentrations exceed the NJDEP GWQS of 1 µg/L for each compound; however, only TCE concentrations exceed the NJDEP GWQS by greater than 10 times. As discussed in response to Question No. 3, TCE concentrations at MW-21S have been relatively stable since 2003 with no significant increasing or decreasing trends.

TCE is the only contaminant present in MW-21S at a concentration greater than 100 times its NJDEP GWQS. Assuming a conservative level of TCE in groundwater at 203 µg/L discharging into Salt Brook

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

throughout the 390-foot length of the stream intersecting the shallow groundwater plume, the amount of TCE being discharged into surface water is estimated to be approximately 0.12 kg/year (Attachment J). Because the groundwater TCE concentrations are relatively stable from a release to the environment that occurred over approximately 40 years ago and has since been mitigated and the baseflow contribution to Salt Brook is not expected to increase in volume, the amount of TCE being discharged into surface water is not expected to increase over time.

Furthermore, as discussed in response to Question No. 3, groundwater concentrations at the downgradient plume boundary are expected to eventually decrease over time as a result of the source area ISCO IRM implemented from 2006 through 2009 and the supplemental ISCO injections performed at the Site in October and November 2011. The anticipated reductions in TCE concentrations in groundwater discharge will further mitigate impacts to the surface water at Salt Brook (Ref. 2)

References:

1. Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
2. Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_X_ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

___ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

___ If unknown - skip to 8 and enter "IN" status code.

Rationale:

As discussed in response to Question No. 4, surface water sampling was performed in Salt Brook from 1997 to 1999 as part of the ecological and human health evaluations (Refs. 1, 2) and again from 2005 to 2009 to evaluate the effect of the ISCO IRM on surface water concentrations (Ref. 3). The figures provided in Attachment I show the surface water sampling locations from 1998 through 2009. During the sampling event conducted in December 2009, TCE concentrations ranged from non-detect to 21.3 µg/L in Salt Brook, which are significantly lower than the historical TCE levels detected in surface water (ranging from non-detect to 120 µg/L). It is believed that the observed decrease in surface water concentrations has been a result of the ISCO IRM implemented between 2006 and 2009.

Although the concentrations of TCE in surface water detected at Salt Brook are still higher than the NJDEP SWQC of 1 µg/L, site-specific ecological evaluations have demonstrated that the detected TCE

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

levels in surface water are acceptable. A Screening Risk Evaluation of Salt Brook was completed by McLaren/Hart, Inc. in 1997 that characterized the surface water flow, identified vegetation and wildlife habitat, and assessed the potential effects on ecological receptors (Ref. 3, 4). TCE concentrations was the driver for the risk assessment and calculations were performed for a maximum TCE concentration of 29 µg/L, as measured in surface water in July 1997. The TCE level used in the risk assessment was higher than the current TCE concentrations in surface water (i.e., 21.3 µg/L). The risk assessment concluded that the detected levels of TCE at Salt Brook would not adversely impact the aquatic biota inhabiting the area or the surrogate wildlife species (e.g., whitetail deer and eastern cottontail) through ingestion of VOCs in surface water.

The potential for sediment impacts in Salt Brook was also evaluated in the risk assessment (Ref. 3, 4). The water in the brook is shallow (3-4 inches), flowing rapidly over exposed bedrock, cobbles, and pebbles with little silt. The potential for TCE to be present in surface sediments within the brook is limited. The chemical characteristics of TCE and the physical characteristics of sediments at the Site suggest that the potential for sorption of TCE is low. Although TCE may be detected in the sediments, it is likely to be present at levels that will not pose a significant risk (Ref. 6). No sediment samples could be collected in Salt Brook because the streambed mainly consists of exposed bedrock, cobbles, and pebbles with little, if any, sediment present.

Given the results of the 1997 Screening Risk Evaluation of Salt Brook and the observed decrease in TCE concentrations in surface water over the past ten years, the current discharge of impacted groundwater in surface water is not an imminent concern and is considered to be within acceptable limits. Furthermore, as previously discussed, Alcatel-Lucent has implemented supplemental ISCO injections in October and November 2011 to further reduce source area TCE concentrations, thereby promoting attenuation of the groundwater plume and its associated impacts to the surface water in Salt Brook (Ref. 5).

References:

1. McLaren/Hart, Inc., Baseline Ecological Evaluation (BEE) (Appendix D of the Site Investigation/Remedial Investigation Report for Soils, AT&T Bell Laboratories – Murray Hill Facility), June 1998.
2. AMEC Earth & Environmental, Inc., Human Health Risk Assessment for Lucent Technologies Murray Hill Facility, 600 Mountain Avenue, Murray Hill, New Jersey, November 2001.
3. Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
4. McLaren/Hart, Inc., Screening Risk Evaluation of Salt Brook (Attachment 1 of the BEE dated June 1998), October 1997.
5. Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.
6. Email from Andy Dillman, NJDEP, to Sam Abdellatif, EPA, re: Alcatel-Lucent, Murray Hill. Dated November 10, 2011.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

_X_ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

___ If no - enter "NO" status code in #8.

___ If unknown - enter "IN" status code in #8.

Rationale:

Pursuant to ISRA and the requirements for Engineering and Institutional Controls under the TRSR (N.J.S.A. 58:10B-13.1 and N.J.A.C. 7:26E-8), monitoring will be conducted every two years for 35 years to verify the compliance and effectiveness of the institutional controls in effect [Classification Exception Area/Well Restriction Area (CEA/WRA)]. A total of 17 on-site and off-site monitoring wells and two Salt Brook locations will be sampled biennially to monitor the extent of the groundwater plume (Ref. 1). A summary table identifying all on-site and off-site monitoring wells in the sampling program is provided in Attachment K. Monitoring wells MW-52I and MW-16F, defining the downgradient and vertical extents of the plume, will be sampled to verify that the plume is not migrating beyond the established plume extents. Written certification will be submitted to NJDEP every two years describing the sampling results and confirming that the delineated CEA plume continues to be protective of public health and the environment.

Reference:

1. Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

   _X_ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the Bell Laboratories – Alcatel-Lucent Murray Hill Facility site, EPA ID# NJD006980924, located at 600 Mountain Avenue in Murray Hill, New Jersey. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater." This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

   ___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

   ___ IN - More information is needed to make a determination.

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Date: 8/1/12

Approved by: Adolph Everett
Adolph Everett, P.E., Chief
Haz. Waste ~~RCRA~~ Programs Branch
EPA Region 2
Date: 8/3/12

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

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Attachments

The following attachments have been provided to support this EI determination.

- Attachment A – Area of Concern Summary Documentation
  - NJDEP Case Inventory Document
  - Figure 1: Case Inventory Document
- Attachment B – Summary of Media Impacts Table
- Attachment C – Historical TCE Isoconcentration Maps
  - Figure 12 – October 2003 vs. April 2004
  - Drawings D-1 to D-3 – November 2005
  - Drawings D-1 to D-4 – December 2009
- Attachment D – Drawing 4: Site Conceptual Model
- Attachment E – Drawing 2: Site Plan and Groundwater Monitoring Well Locations
- Attachment F – Drawing D-1: Cross Section A-A'
- Attachment G – Select Monitoring Well Trend Plots
  - Drawing 15: Average TCE Concentrations (Site Wide)
  - MW-20(S, I, D), MW-21(S, I, D), MW-22(S, I, D), MW-43I
- Attachment H – Exhibit C: Proposed Limits of CEA
- Attachment I – Surface Water Sample Location Maps
  - Figure 6: Salt Brook Sample Location Map
  - Drawing 15: Summary of Salt Brook Surface Water Monitoring Results
- Attachment J – Estimate of TCE Loading into Salt Brook
- Attachment K – Table 3: Sampling Plan

The following references are provided on a CD attached in support of the EI determination:

- Langan Engineering and Environmental Services, Inc., IRM Completion Report, July 2010.
- Langan Engineering and Environmental Services, Inc., Remedial Action Selection Report and Remedial Action Work Plan AOC MH-2B (TCE Groundwater Plume), May 2011.
- New Jersey Department of Environmental Protection, Letter of Approval for Proposed Remedial Actions for MH-2B. August 15, 2011.
- Langan Engineering and Environmental Services, Inc., Notification of Ongoing Environmental Activities at the Alcatel-Lucent USA Inc. – Murray Hill Facility, August 26, 2011.
- McLaren/Hart, Inc., Baseline Ecological Evaluation (BEE), June 1998.
  (Appendix 1: McLaren/Hart, Inc., Screening Risk Evaluation of Salt Brook, October 1997.)

- New Jersey Department of Environmental Protection, Comment Letter for Various Remedial Investigation Reports (RIR). May 7, 2003.
- New Jersey Department of Environmental Protection, Letter of Approval for Remedial Investigation Workplan (RIW) dated July 7, 2003. January 29, 2004.
- New Jersey Department of Environmental Protection, Notice of Deficiency for Remedial Investigation Report (RIR) dated November 18, 2004. September 10, 2007.

Attachment B: Summary of Media Impacts Table

AOC or SWMU	GW	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
AOC MH-2B (TCE Groundwater Plume)	Y	Y	N	Y	N	N	N	TCE Groundwater Plume: In-situ chemical oxidation by injection of approximately 27,367 pounds of potassium permanganate ($KMnO_4$) through blast fracture trenches in the two source zones from June 2006 to October 2009. Supplemental injections of approximately 9,151 pounds of $KMnO_4$ performed in the two former source zones in October and November 2011. Indoor air at 130 Roland Road: Sub slab mitigation system installed on January 8. 2003 and was approved by NJDEP. Drinking Water: Seven off-site residences connected to the public water supply (New Jersey American Water) in October 1998.	TCE
AOC MH-2D (Stormwater Drainage Ditch Sediment)	N	N	N	Y	Y	N	N	Dredging of approximately 145 tons of sediment in 2000 and approximately 150 tons of sediment in 2010 from the detention basin. Planned periodic sampling and dredging of sediment at the drainage ditch and stormwater detention basin. Planned use of limestone as a pH buffering technique in order to precipitate Copper from surface water and prevent off-site migration of contaminants.	Copper
AOC MH-2J (Surface Water)	N	N	N	Y	N	N	N	The stormwater detention Basin and Blue Brook Tributary will be mitigated through sediment dredging and pH buffering activities discussed under the MH-2D corrective action measures section above. Salt Brook will be mitigated over time as the TCE groundwater plume attenuates following source reduction using supplemental ISCO injections (MH-2B).	TCE, Copper