This document summarizes the final corrective measures selected for the three remaining areas of the site. The three remaining areas include – Site-wide Soil, North End Groundwater, and South End Groundwater. The final corrective measures selected for the site do not correlate to specific solid waste management units (SWMUs) and areas of concern (AOCs), but instead address the current concentrations of constituents of concern (COCs) that remain in either soil or groundwater following completion of the various clean-up activities that have already been completed.

The following information is provided in this document:

- Description of the final corrective measures for each of the remaining areas requiring further corrective measures, and
- Description of selected technologies and evaluation against performance standards set forth by United States Environmental Protection Agency's (USEPA's) *RCRA Corrective Action Plan* (USEPA, 1994).

Final Corrective Measures

The final corrective measures that have been selected for each of the three final AOCs are summarized below.

AREA OF CONCERN	FINAL CORRECTIVE MEASURES	BASIS
Site-wide Soil	▪ Maintain the cap (vegetative, asphalt, or concrete) that was placed as the final interim corrective measure (ICM) to prevent direct contact. ▪ Prevent residential development in designated areas.	▪ COCs present in soil represent a potential risk to human populations through direct contact. ▪ Change in land use creates change in exposure scenario and potential risk.
North End Groundwater	▪ Continued short-term operation of the groundwater recovery system with monitored natural attenuation (MNA) for tetrachloroethene (PCE), trichloroethene (TCE), vinyl chloride, and total petroleum hydrocarbon (TPH).	▪ Chlorinated volatile organic compounds (CVOCs) are above media protection standards (MPS) in North End Groundwater.
South End Groundwater	▪ MNA for PCE, TCE, vinyl chloride, TPH, cadmium, copper, chromium, nickel, and zinc.	▪ CVOCs are above MPS in South End Groundwater. ▪ Site specific metals are above the Massachusetts Department of Environment Protection (MA DEP) (or United States Environmental Protection Agency [USEPA]) standards in the South End Groundwater.

The following activity and use limitations (AULs; land use restrictions) are included as a part of the corrective measures for the site:

AREA OF CONCERN	ACTIVITY AND USE LIMITATIONS
Site-wide Soil	▪ Notice to deed that COCs are present beneath the soil cover at concentrations above applicable MA DEP targets. ▪ Notice to future owners that a cover (soil, asphalt, and concrete) is present in specific areas and must be maintained as a cover. ▪ Notice to deed that residential development is restricted in specific areas of the site. ▪ Notice to future construction workers to wear appropriate personal protective equipment if working in areas where affected soil may be encountered.
North End Groundwater and South End Groundwater	▪ Notice to deed that underlying groundwater is affected by COCs. ▪ Access restrictions in the form of well-casing locks on monitoring wells in the area of affected groundwater.

Corrective Measures Technology Identification and Evaluation

Early in the corrective action process, USEPA and MTD Products Inc. (MTD) met to establish short-term and long-term clean-up goals for the site and set priorities that directly tied into the overarching goals of the Resource Conservation and Recovery Act (RCRA) Corrective Action Program to be protective of human health and the environment. Following *Results-Based Approaches and Tailored Oversight Guidance*, published by the USEPA in September 2003, a "holistic" approach was adopted to set priorities and address potential risks identified at the site. This holistic approach identified MNA for the site groundwater, placement, and maintenance of a cap (vegetative cover, concrete, or asphalt) for the site soil, and AULs for both media as the final corrective measures. These final corrective measures have been achieved through completion of several ICMs to address source material and affected groundwater to the extent necessary for natural attenuation to be effective.

In following a results-based approach for the site, a formal technology screening process, where potential remedial technologies are evaluated against the performance standards outlined in the *RCRA Corrective Action Plan* (USEPA, 1994), has not been conducted for this site. Instead, the final corrective measures have been evaluated against three major performance standards as follows:

1. Protection of human health and the environment
2. Ability to attain media clean-up standards
3. Control of release sources

Other remedial technologies piloted at the site as ICMs that were effective in reducing the COCs are included as alternatives for consideration should a contingent remedy need to be applied in the future. The technologies piloted successfully at the site include *in situ* chemical oxidation (ISCO) and groundwater recovery and off-site discharge.

Evaluation of the final corrective measures alternatives included consideration of three performance standards defined in *RCRA Corrective Action Plan* (USEPA, 1994). RCRA guidance requires that corrective measures achieve the following standards:

- **Protection of Human Health and the Environment** – Involves an overall evaluation of the alternative regarding its ability to eliminate, reduce, or control exposures that pose unacceptable risks. The assessment is based on a composite of factors addressed under other evaluation criteria, including long-term effectiveness and permanence, short-term effectiveness, and compliance with institutional and legal requirements.
- **Ability to Attain MPS** – Examines the ability of the corrective measures alternative to achieve media protection standards established to meet the corrective measures objectives.
- **Control of Release Sources** – Examines the extent to which the corrective measures alternative controls or eliminates further releases that may pose a threat to human health and the environment.

Final Corrective Measures for Site-wide Soil

As discussed previously, the final corrective measure selected to address the hazardous substances found in soil is maintenance of the cap (vegetative soil cover, concrete, or asphalt) through implementation of AULs. AULs would include inspection and maintenance of the capin areas where the soil beneath the cap contains COCs above media protection goals for as long as this condition exists. The AULs include restrictions on residential development and information notices for construction workers concerning contact with soil in potentially affected areas. The corrective measures areas where the restrictions on residential development will be implemented are shown on *Corrective Measures Area for Site-wide Soil*.

Corrective Measures Area for Site-wide Soil

Although no sources to groundwater remain in the site-wide soil, alternative corrective measures may be considered should there be a future need to consider a contingent remedy. Alternative corrective measures include *in situ* stabilization and solidification, excavation and on-site treatment, and excavation and disposal.

The proposed final corrective measure for affected soil meets the three performance standards required under the RCRA Corrective Action Program as follows:

1. **Protection of human health and the environment** – AULs protect human health by preventing contact with COCs to an extent that would result in exposure exceeding the USEPA's acceptable risk range. The AULs prevent residential development of specified areas of the site and prevent unprotected exposure to construction workers. AULs also enforce monitoring and maintenance of the cap that is present at the site either as vegetative cover, asphalt, or concrete. The long-term reliability and effectiveness of the AULs depends on the level of enforcement applied to them. Institutional and legal requirements are met through proper implementation of the AULs documents. No short-term risks are associated with implementation of this alternative. The site is currently in industrial use, so implementation of this alternative will not involve any short-term changes at the facility.
2. **Ability to Attain MPS** –MPS can be met by lowering constituent concentrations at the site to below the MPS or by controlling exposure to constituent concentrations that are above the MPS. The MPS for the site are met by identifying areas with soil concentrations greater than the MPS for application of AULs. Applying AULs limit potential exposure to the COCs in soil.
3. **Control of Release Sources** – Changes in facility use over the years of operation and ICMs have addressed continuing sources of COCs to soil. Final corrective measures proposed in this CMS address residual concentrations of constituents in soil.

Final Corrective Measures for North End Groundwater

The final corrective action selected for affected groundwater located in the northern portion of the site is continued short-term groundwater recovery with MNA. The North End Groundwater corrective action area is shown on *Corrective Measures Area for North End Groundwater*. Natural attenuation is a remedy that relies on the physical, chemical, and biological processes that act without human intervention to achieve clean-up goals. Although the groundwater recovery system will continue to operate for the near-term, when groundwater at the property line (perimeter groundwater) achieves the clean-up goals the system will no longer be necessary and MNA will complete the groundwater restoration process. For North End Groundwater, site-specific MPS have been established for some constituents based on the potential for VOCs to migrate from groundwater as vapor into the indoor air. MPS for other COCs present in the groundwater are the default MA DEP groundwater targets based on potential migration of vapor to indoor air (VOCs) or on potential migration to surface water (non-volatile constituents).

Corrective Measures Area for North End Groundwater

Natural attenuation reduces consituent mass, toxicity, mobility, volume, or concentration by naturally occurring processes including biodegradation, dispersion, dilution, adsorption, volatilization, chemical or biochemical stabilization of constituents, and/or destruction of constituents. These processes occur to varying degrees depending on the types and concentrations of constituents and hydrologic and geologic characteristics of

the site. Natural attenuation processes will be documented through a coordinated groundwater monitoring program that includes compliance and detection monitoring locations. The groundwater monitoring program is described in detail in the discussion of *Operations, Maintenance, and Monitoring*.

The only potentially completed exposure pathway identified for the North End Groundwater is migration of VOCs from groundwater to vapors in the indoor air. However, in order to eliminate or control potential direct exposure to the affected groundwater in the north end, AULs will be implemented as a part of this corrective action. There is already a city restriction on the installation of drinking water wells in residential areas and city water is available. In addition, the AULs include locking the monitoring wells to prevent tampering.

As a part of the final corrective action for the North End Groundwater, the groundwater recovery system will continue to operate until the COCs detected in the recovery wells are reported at concentrations below the MPS. Once concentrations of the COCs in the groundwater at the recovery wells have achieved the MPS, the groundwater system will be discontinued and further groundwater restoration will be accomplished through MNA only.

The MNA portion of the North End Groundwater corrective action includes a contingent remedy that may be implemented if groundwater monitoring results show that natural attenuation is not achieving the remedial action objectives (*i.e.*, concentrations of COCs in the groundwater increase over time or the groundwater plume expands). The contingent alternatives that may be considered for the North End Groundwater include additional groundwater sampling, ISCO, and groundwater recovery.

As an extra margin of protection, perimeter groundwater monitoring will be conducted. Perimeter groundwater monitoring includes the recovery wells located at the property line of the site. The groundwater quality will be monitored twice a year around the perimeter of the site where groundwater exits the property. The groundwater will be analyzed for chemicals previously identified in soil and groundwater above MPS.

The selected final corrective measure for affected North End Groundwater meets the three performance standards required under the RCRA Corrective Action Program as follows:

1. **Protection of Human Health and the Environment** – Corrective measures for North End Groundwater protect human health and the environment by processes that will occur regardless of intervention under the RCRA Corrective Action Program. Although the groundwater recovery system will operate for the short-term, it will be discontinued when groundwater in the vicinity of the recovery wells has achieved the MPS. Natural attenuation reduces consituent mass, toxicity, mobility, volume, or concentration using naturally occurring processes including biodegradation, dispersion, dilution, adsorption, volatilization, chemical or biochemical stabilization of constituents, and/or destruction of constituents. These processes occur to varying degrees depending on the types and concentrations of constituents and hydrologic and geologic characteristics of the site. ICMs have already been conducted to control sources

of constituents to groundwater and to reduce concentrations of constituents that have already migrated into groundwater. Remaining concentrations of constituents in North End Groundwater will naturally attenuate over time. The monitoring program associated with MNA will ensure that the final corrective measure is effective and that COCs above the MPSs do not migrate beneath the adjacent residential neighborhood. AULs provide additional protection by ensuring that use or direct contact with affected groundwater is prohibited.

2. **Ability to Attain Media Protection Standards** – ICMs completed at the site have addressed known sources of constituents to groundwater and have reduced COC concentrations in affected groundwater near the sources. To the extent that some COCs in the North End Groundwater remain above MPS, the selected final corrective measure addresses them with AULs to prevent contact and MNA to monitor the natural decline of the remaining concentrations over time.

3. **Control of Release Sources** - Changes in facility use over the years of operation and ICMs have addressed continuing sources of COCs to groundwater. Final corrective measures discussed in this CMS address residual concentrations of constituents in affected groundwater.

Final Corrective Measures for South End Groundwater

The final corrective action selected for affected groundwater located beneath the current CMC operations and extending across South Meadow Road, beneath the tobacco fields, is MNA. The South End Groundwater corrective action area is shown on *Corrective Measures Area for South End Groundwater*. Natural attenuation relies on the physical, chemical, and biological processes that act without human intervention to meet MPS.

Corrective Measures Area for South End Groundwater

For South End Groundwater, the site-specific MPS are based on the potential for groundwater to migrate to surface water (Little River). In addition, VOCs in groundwater underlying and within 30 feet of the current facility operations must meet the MPS that are protective of potential exposure of workers to VOC vapor in the indoor air. As discussed in the *Groundwater Site Restoration Activities (ICM and Current Conditions)*, there is one well (MW-52S) located inside the existing facility building where PCE is detected at a concentration above the MPS. As an extra margin of protection, the indoor air where facility operations are conducted was sampled to confirm that there is no exposure to the facility workers.

To eliminate or control potential exposure to the affected groundwater in the south end, AULs will be implemented as a part of this corrective action. There is already a city restriction on the installation of drinking water wells in residential areas and city water is available. In addition, the AULs include locking the monitoring wells to prevent tampering.

The MNA corrective action includes a contingent remedy that may be implemented if groundwater monitoring results show that natural attenuation is not achieving the remedial action objectives (*i.e.*, increasing groundwater concentrations over time or expansion of the plume). The contingent alternatives that may be considered for the South End Groundwater include additional groundwater sampling, ISCO and groundwater recovery and treatment.

Consistent with the North End groundwater, groundwater quality in the South End Groundwater will be monitored two times each year both on the site and off the site. The groundwater will be analyzed for chemicals previously identified in soil and groundwater above clean-up goals.

The selected final corrective measure for affected South End Groundwater meets the three performance standards required under the RCRA Corrective Action Program as follows:

1. **Protection of human health and the environment** – Corrective measures for South End Groundwater protect human health and the environment by processes that will occur regardless of intervention under the RCRA Corrective Action Program. Natural attenuation reduces consituent mass, toxicity, mobility, volume, or concentration using naturally occurring processes including biodegradation, dispersion, dilution, adsorption, volatilization, chemical or biochemical stabilization of constituents, and/or destruction of constituents. These processes occur to varying degrees depending on the types and concentrations of constituents and hydrologic and geologic characteristics of the site. Other mechanisms for natural attenuation of groundwater constituents are dispersion, adsorption, and chemical stabilization. Adsorption occurs when constituents chemically affix to mineral surfaces in soil. Oxidation and reduction reactions can transform inorganic constituents into less soluble compounds rendering them less mobile. Natural attenuation processes will be documented through a coordinated groundwater monitoring program that includes compliance and detection monitoring locations. The groundwater monitoring program is described in detail in the discussion of *Operations, Maintenance, and Monitoring*.

   ICMs have already been completed to control sources of constituents to groundwater and to reduce concentrations of constituents that have already migrated into groundwater. Remaining concentrations of constituents in South End Groundwater will naturally attenuate over time. AULs provide additional protection by ensuring that use or direct contact with affected groundwater is prohibited.

2. **Ability to Attain MPS** – ICMs completed at the site have eliminated sources of constituents to groundwater and have reduced COC concentrations in affected groundwater near the sources. To the extent that some South End Groundwater continues to remain above MPS, the selected final corrective measure addresses it with AULs to prevent contact and MNA to monitor the natural attenuation of the remaining concentrations.

3. **Control of release sources** - Changes in facility use over the years of operation and ICMs have addressed continuing sources of COCs to groundwater. Final corrective measures discussed in this CMS address residual concentrations of constituents in affected groundwater.