

Risk Assessment Approach



Prepared by



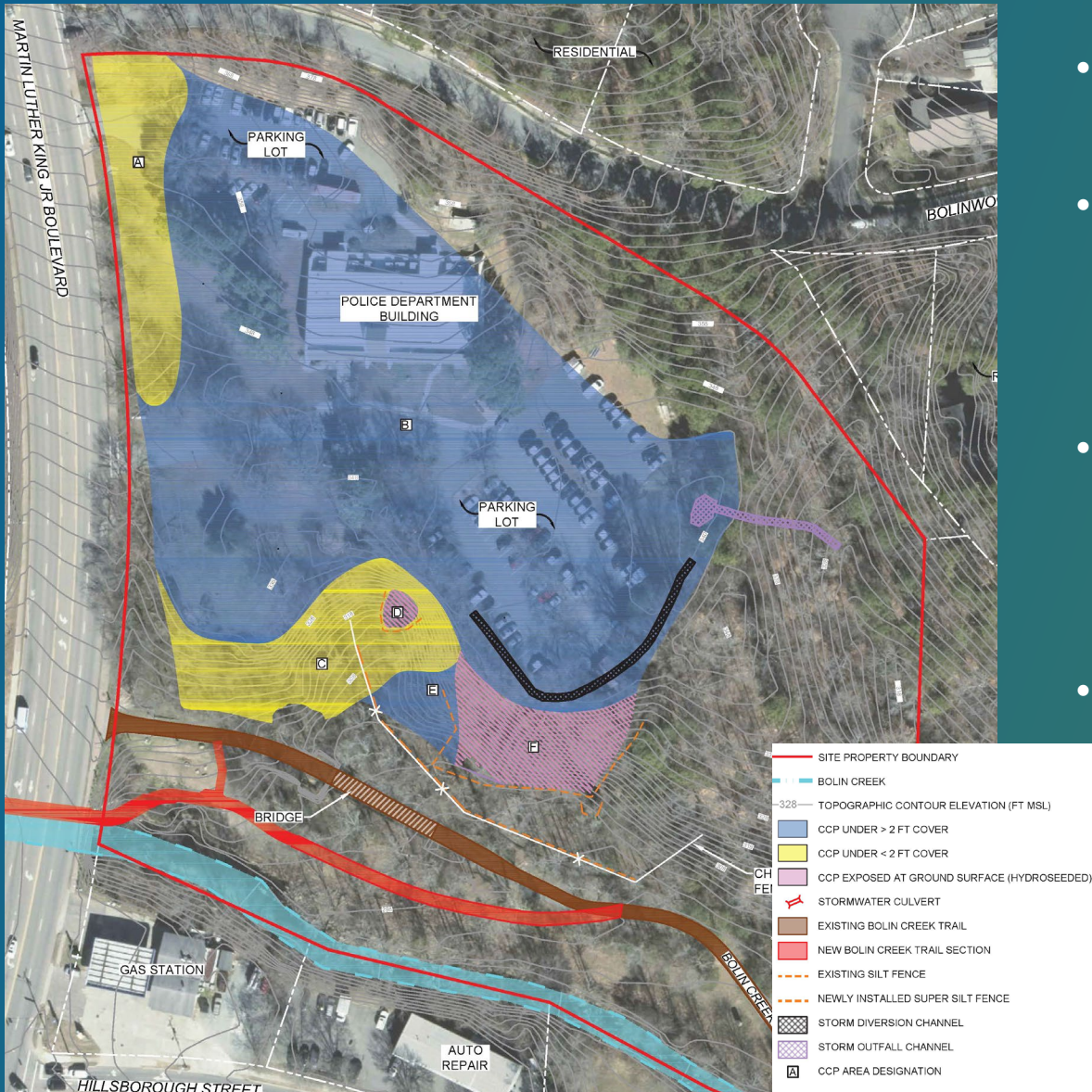
SMARTER ENVIRONMENTAL SOLUTIONS

June 23, 2021

Risk Assessment Approach

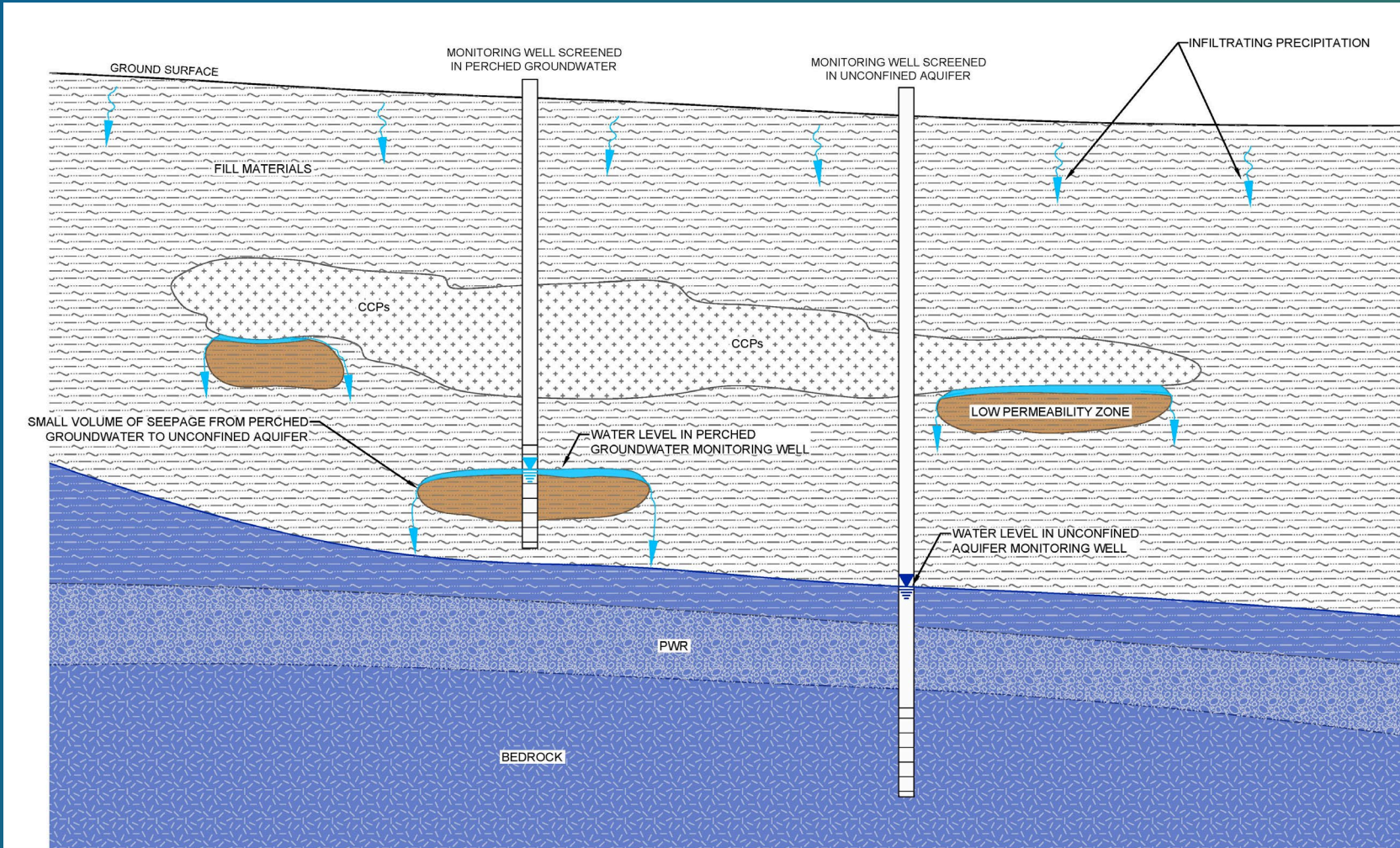
- Current status and extent of impacts
- Human–health risk assessment
- Ecological risk assessment
- Other considerations

Current Status and Extent of Impacts



- Mixture of coal combustion products (CCPs) and construction debris buried across much of the property.
- Primary compounds detected in CCPs above background levels and NCDEQ Preliminary Soil Remediation Goals are the metals arsenic, barium, manganese, mercury, and selenium.
- Interim remedial measures implemented 2020:
 - Excavation of CCPs along Bolin Creek Trail
 - Stabilization of embankment and stormwater management controls
- Interim remedial measures successfully addressed risks associated with CCPs exposed at ground surface in the vicinity of Bolin Creek Trail.

Current Status and Extent of Impacts



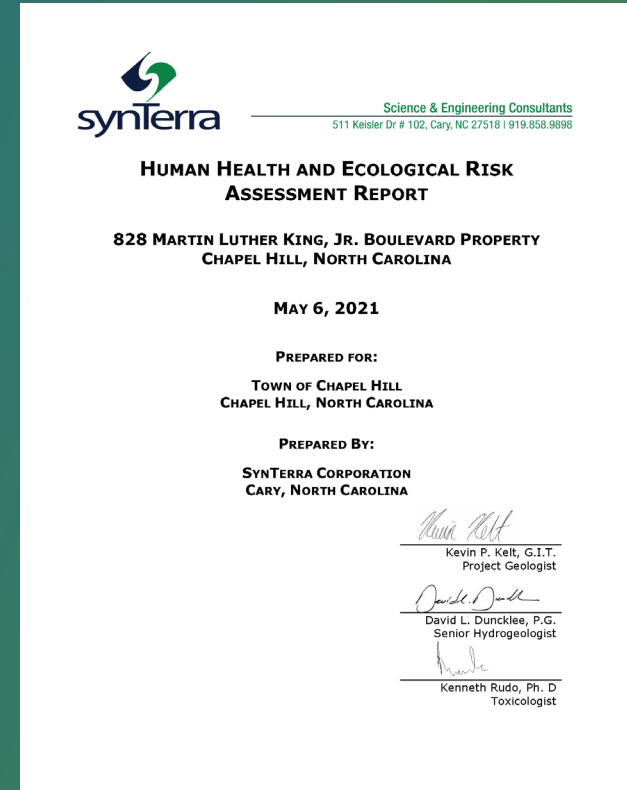
- Some elevated concentrations of metals in perched water within fill materials, but limited to no groundwater impact in monitoring wells screened in non-fill zones in the underlying aquifer.
- No significant impact to surface water in Bolin Creek.
- No groundwater users (such as water supply wells) in the area.

Current Status and Extent of Impacts

5/6/2021 Human Health and Ecological Risk Assessment Conclusions and Recommendations:

- Interim remedial measures effectively reduced risk such that greenway trail is safe for use.
- Ecological risk believed to be minimal, but additional ecological risk evaluation recommended.
- Recommend monitoring site conditions and effects from storms or potential flooding events.
- If construction activities, address potential construction worker risks.

Additional more comprehensive human-health and ecological risk assessment proposed to define final cleanup goals and permanent remedial measures.

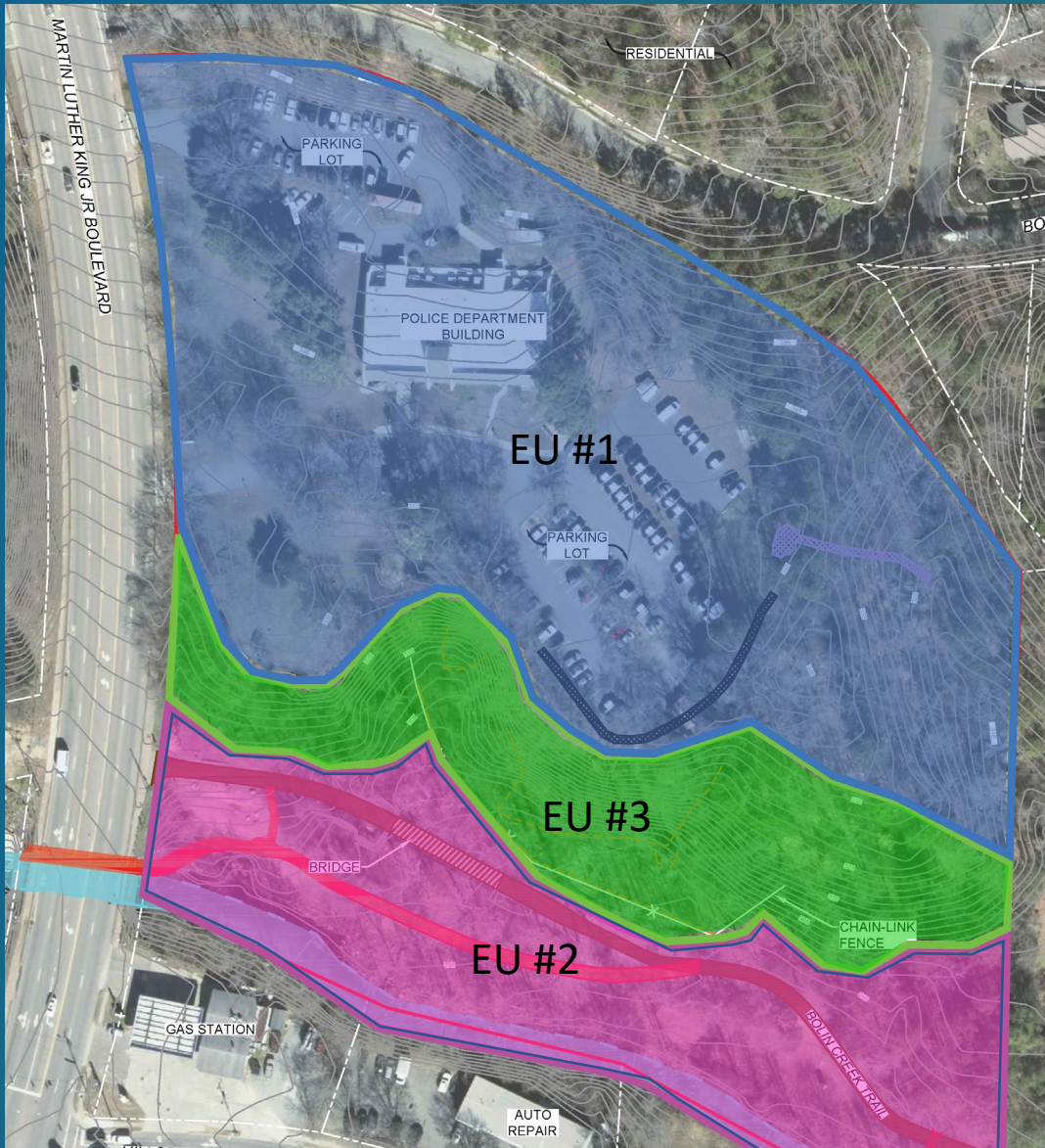


Risk Assessment Approach

- Current status and extent of impacts
- **Human–health risk assessment**
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Human Health Risk Assessment

Step 1 - Exposure Pathway Evaluation

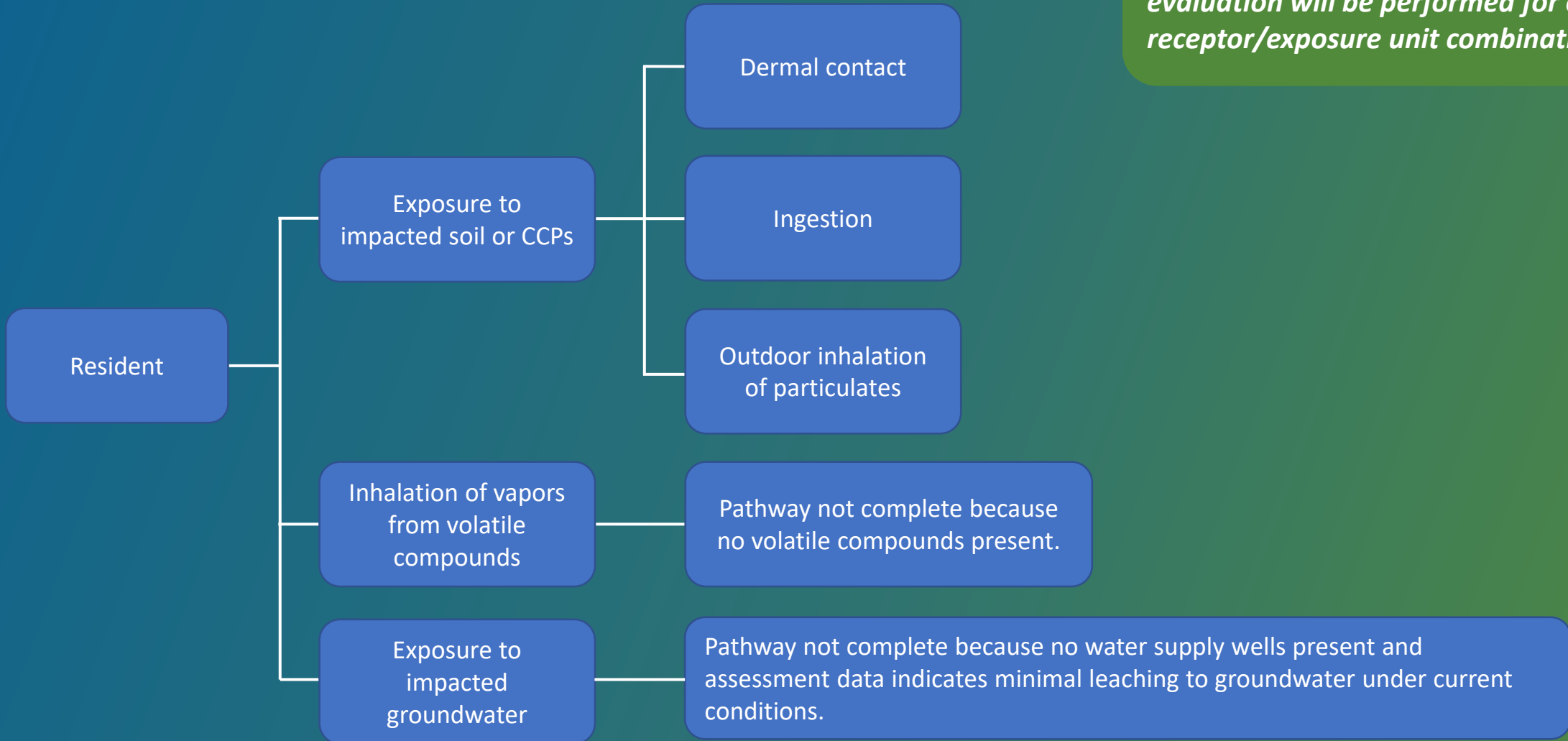


- Exposure Unit = Areas of similar land-use and exposure characteristics
- Evaluate risk for both current and possible future receptors.
- Exposure Unit #1 – Upland Area
 - Residents
 - Non-residential workers
 - Construction workers
- Exposure Unit #2 – Creek & Trail Area
 - Recreators
 - Construction workers
- Exposure Unit #3 – Embankment
 - Current exposure minimal, evaluate future risks for all receptors to identify whether additional measures needed

Human Health Risk Assessment

Exposure Unit #1 Exposure Pathways

Example exposure pathway evaluation for Exposure Unit #1 resident. Similar evaluation will be performed for other receptor/exposure unit combinations.



Human Health Risk Assessment

Step 2 – Define exposure parameters

Example exposure parameters for residential dermal contact, similarly conservative parameters apply for other exposure pathways.



Default exposure parameters incorporated into NC Risk Calculator assume reasonable maximum exposure (RME) – the highest exposure reasonably likely to occur, generally assumed to be in the range of the 90th and 99.9th percentiles.

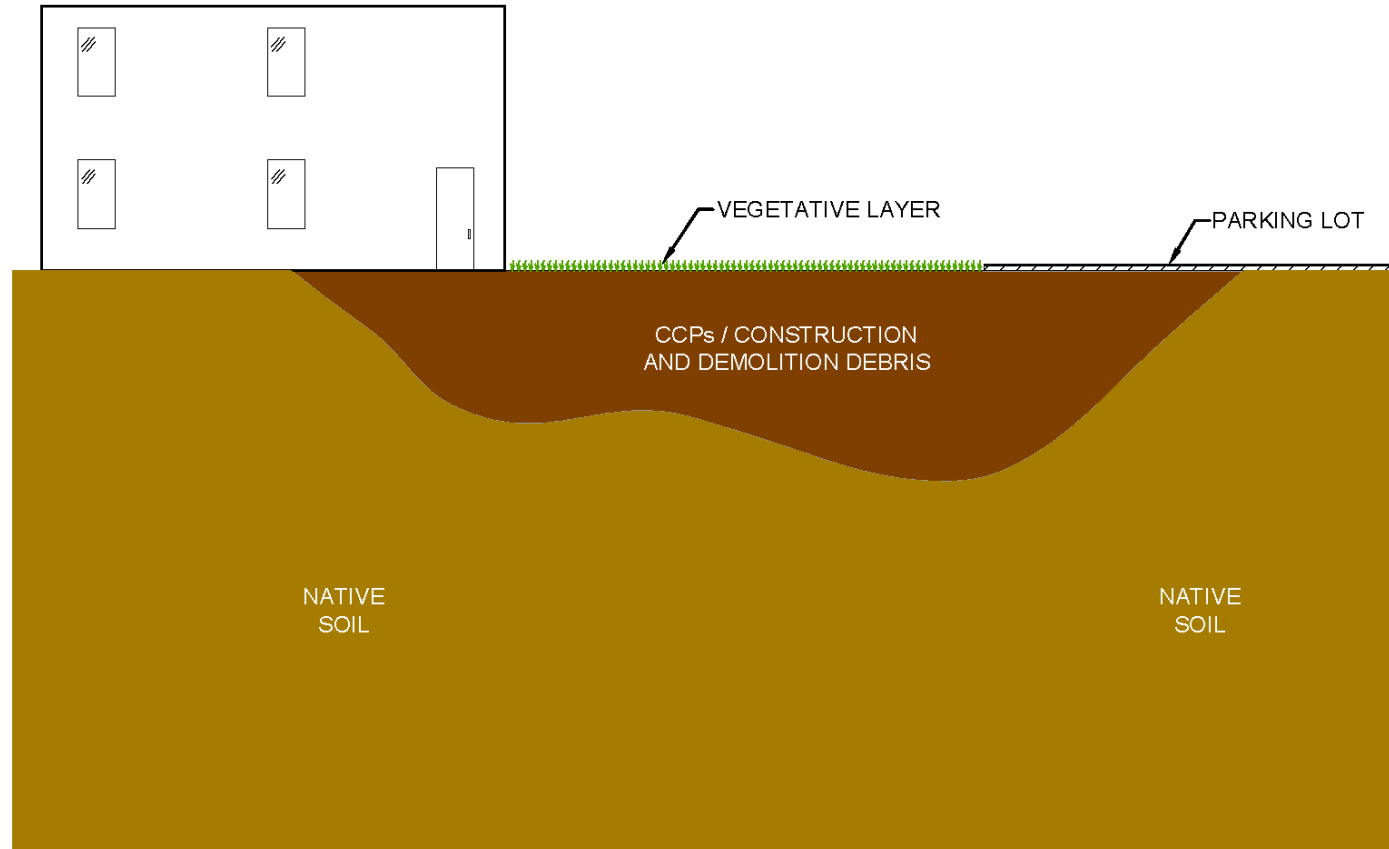
Example exposure parameters for residential dermal contact:

- Exposure of head, hands, forearms, lower legs, and feet
- 26 yrs total, including 6 yrs as a child and 20 yrs as an adult
- 350 days/yr, 24 hr/day

Toxicity values are typically based on most conservative evaluation of dose-response studies, and incorporate development effects for pregnant women.

Human Health Risk Assessment

Step 3 – Define exposure point concentrations



- Initial evaluation based on maximum concentrations at any depth.
- If initial evaluation indicates exceedances, in some cases may refine evaluation to focus on different depth zones and/or areas with no surface cover.
- Naturally occurring background metals concentrations to be excluded from evaluation.

Human Health Risk Assessment Step 4 – Calculate risk levels

- Based on EPA and NCDEQ risk assessment guidance, exceedances of the following target risk levels will be considered “triggers” for additional action:
 - Non-cancer hazard index >1
 - Cancer risk $>1/10,000$ (10^{-4})
- Per typical Brownfields redevelopment process, actions may be performed to minimize exposure even if target risk levels are not exceeded.

Non-cancer hazard index (HI) or hazard quotient (HQ)
HI > 1 = Adverse health effects possible
HI < 1 = Adverse health effects not likely

Individual Excess Lifetime Cancer Risk (CR) = Increase over background in an individual’s probability of getting cancer over a lifetime due to exposure to a chemical.

CR = 10^{-6} = 1/1,000,000 increased risk of cancer
CR = 10^{-5} = 1/100,000 increased risk of cancer
CR = 10^{-4} = 1/10,000 increased risk of cancer

Note that exceedance of these risk levels does not necessarily mean that health risks will occur, layers of conservatism incorporated into exposure parameters and toxicity values.

Human Health Risk Assessment Step 5 – Recommendations

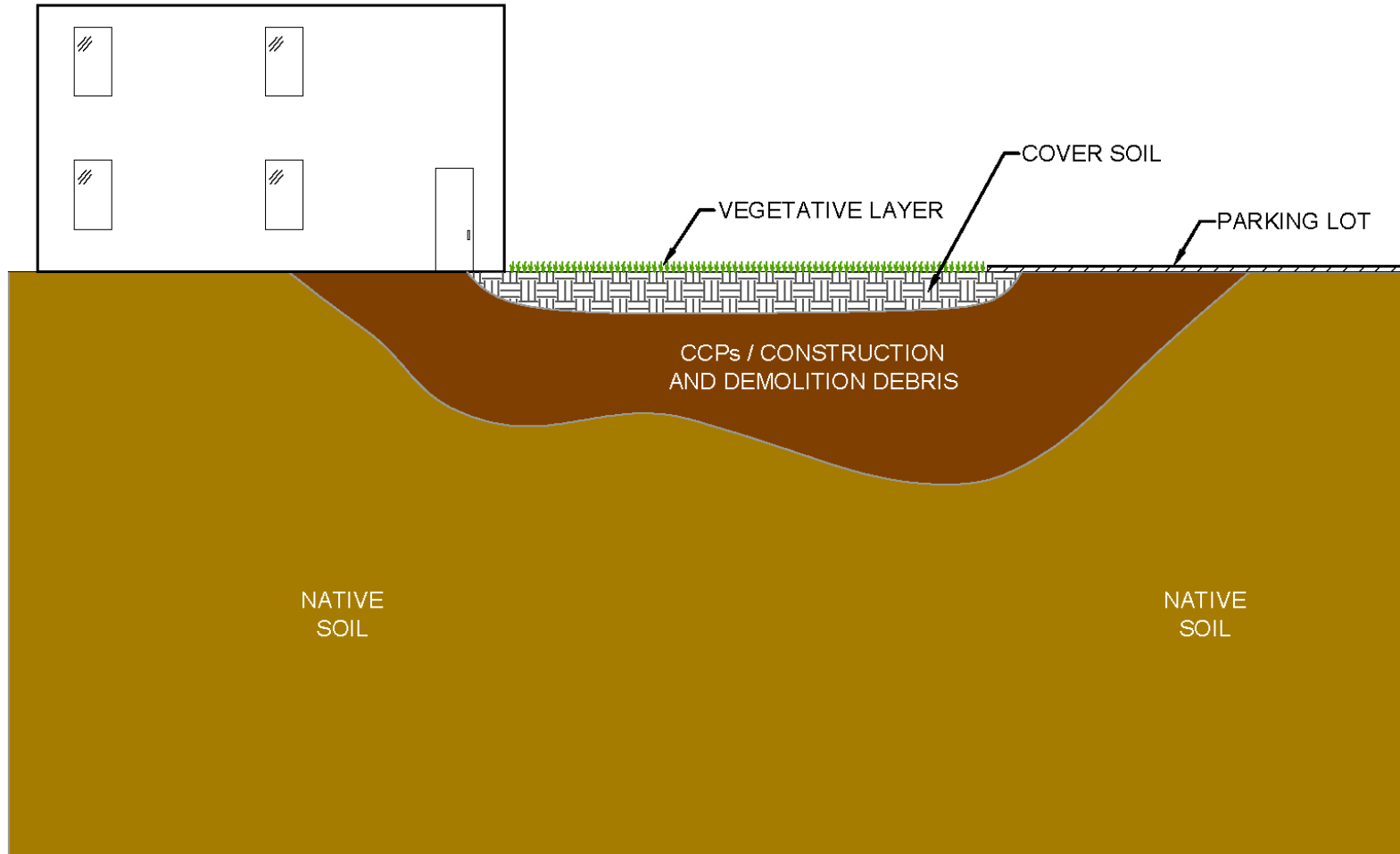
Risk assessment will detail recommendations to address risk exceedances. Expected to include one or more of the following:

- Engineering controls
- Institutional controls
- Remediation

Brownfields Agreement (BFA) to be filed on the deed for the property detailing land-use restrictions (LURs) to assure the safe use of the site. LURs are intended to ensure that risk assessment assumptions remain valid and that engineering and/or institutional controls are being complied with.

In perpetuity, BFA requires annual certification of LUR compliance.

Human Health Risk Assessment Typical Recommendations Under Brownfields Program



- Areas of impacted soil/CCPs to be covered by either building, pavement, or at least 2 ft of cover soil.
- May require discrete soil excavation, depending on redevelopment scenario.
- Eliminates the potential for exposure to impacted soil/CCPs by residents or non-residential workers.
- This action typically implemented at Brownfields Program sites even for very low levels of contamination.
- Annual certification process ensures cover soil remains in place.

Human Health Risk Assessment Typical Recommendations Under Brownfields Program



- Risk assessment typically assumes no measures will be taken to protect construction workers.
- Brownfields Program requires approved Environmental Management Plan (EMP) for any construction activities involving earth movement.
- EMP details measures to prevent construction worker exposure.
- Measures may include PPE, training, wetting, dust monitoring, etc.

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Ecological Risk Assessment



EPA
United States
Environmental Protection
Agency

Scientific Support Section
Superfund Division
EPA Region 4

Region 4 Ecological Risk Assessment Supplemental Guidance Interim Draft



EPA 2015.
Supplemental Guidance to ERAGS: Region 4, Ecological Risk Assessment.
Originally published November 1995

The EPA Region 4 environmental screening values (ESVs) found on Tables 5 through 20 of this document are outdated and should not be used. Updated values can be found in the Region 4 ecological risk guidance at:

https://www.epa.gov/sites/production/files/2015-09/documents/r4_era_guidance_document_draft_final_8-25-2015.pdf

GUIDELINES FOR PERFORMING
SCREENING LEVEL ECOLOGICAL RISK ASSESSMENTS
WITHIN THE
NORTH CAROLINA
DIVISION OF WASTE MANAGEMENT

October 2003

North Carolina Department of Environment and Natural Resources
Division of Waste Management
<http://portal.ncdenr.org/web/wm/home>

- Perform sensitive environment survey to confirm locations and types of potential ecological receptors.
- Compare maximum concentrations to EPA Ecological Screening Values (ESVs).
- If ESVs are exceeded, further evaluation may include evaluation of “average” exposure point concentrations, sample depths, specific risk drivers, and/or calculation of alternate site-specific ecological screening values.
- Risk assessment will detail recommendations to address potential ecological risks.

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Additional Considerations

- Stormwater/erosion control considerations
- Geotechnical considerations





Risk Assessment Report Goals

- Comprehensive
- Scientifically defensible
- Easy for the public and other stakeholders to understand
- Clear recommendations for next steps



Questions?

Smarter Environmental Solutions