



COLORADO
Department of Public
Health & Environment

Soil reuse and clean fill

Guidance for internal use

Purpose and background

This guidance seeks to clarify how disturbed or excavated soil can be classified as either environmental media, solid waste, or hazardous waste based on Colorado’s Regulations Pertaining to Solid Waste Sites and Facilities (6 CCR 1007-2, Part 1), or “the Solid Waste Regulations.”

The Solid Waste Regulations do not define clean fill. However, CDPHE considers environmental media and soil containing concentrations of constituents at or less than unrestricted land use values to be clean fill. Unrestricted land use values are discussed in the **Screening Levels** section below. The Solid Waste Regulations define environmental media as:

“Environmental Media means earth materials including soil, sand, silt, gravel, rock, stone, sediment, and other naturally occurring solids.”

Applicability

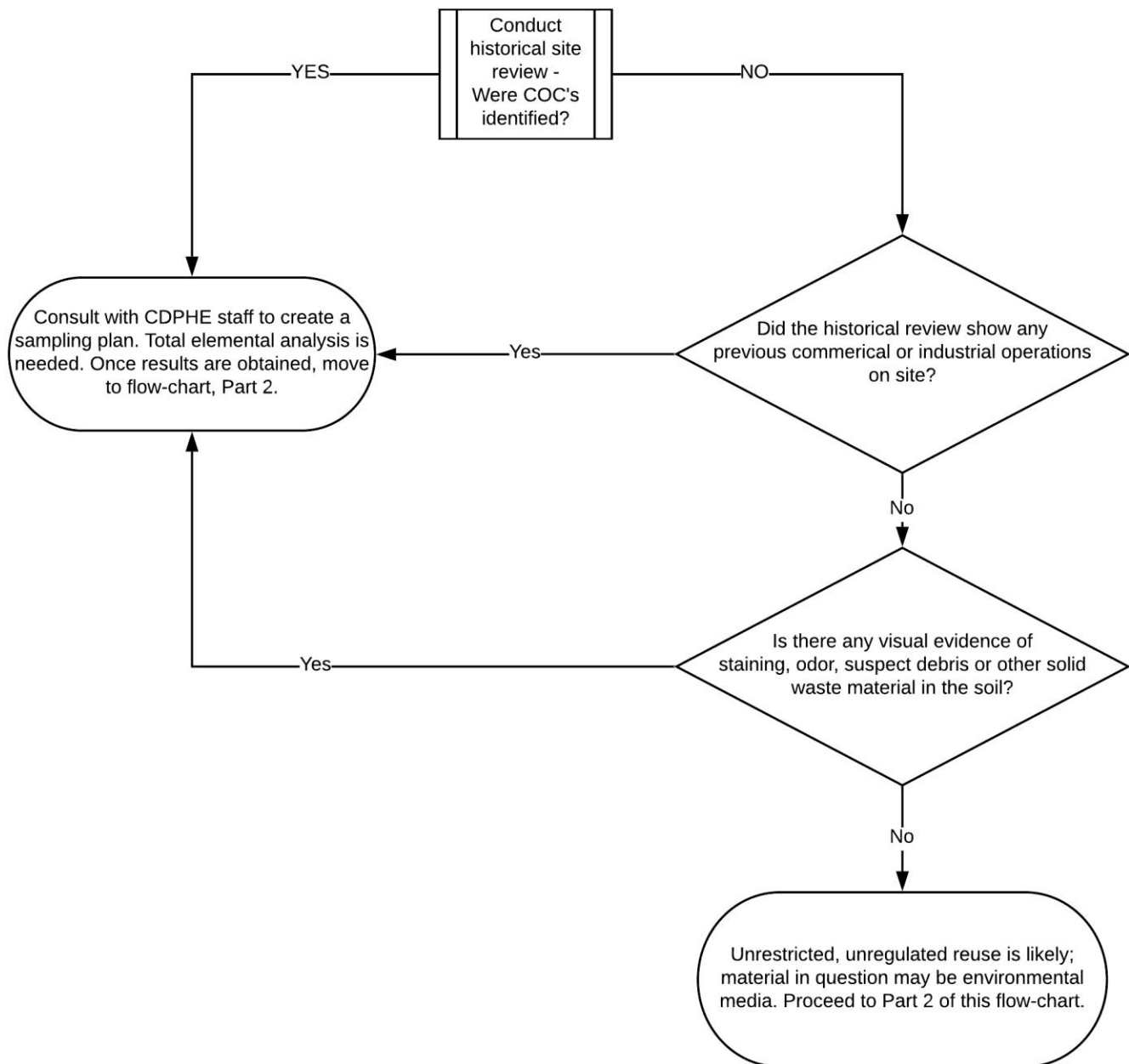
Confusion surrounding the reuse of soil excavated from construction sites is widespread. The processes outlined in this guidance will provide consistent procedures to determine whether soil can be reused or needs to be regulated and disposed of as a solid or hazardous waste. After proper characterization, the reuse of soil can reduce hauling costs, disposal fees and vehicle emissions while diverting excess soil from landfills. A condensed definition of Solid Waste, in accordance with 6 CCR 1007-2, is provided below. Please refer to the full definition to determine those items that are not considered solid waste.

“Solid Waste means any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, air pollution control facility, or other discarded material: including solid, liquid, semisolid, or contained gaseous material resulting from industrial operations, commercial operations or community activities.”

Characterization procedures

1. Before soil is disturbed, an environmental assessment of the site should be conducted to identify potential contamination based on previous site operations. Before non-residential property is acquired during a real estate transaction, an ASTM standardized Phase I Environmental Site Assessment (2014)¹ is routinely conducted. This kind of assessment may identify potential contaminants of concern (COCs) on site. For sites without a Phase 1 report, review of site conditions, historical documents and other records can be used to evaluate previous site activities (e.g., Google Earth, aerial photographs, property records, etc.). If industrial operations and some commercial operations, like dry cleaners and gas stations, were historically conducted on site, soil contamination may exist. In accordance with the Solid Waste Regulations, any site where review of historical information (including Phase I or Phase II environmental site assessments) reveals possible contamination on site, then a Beneficial Use

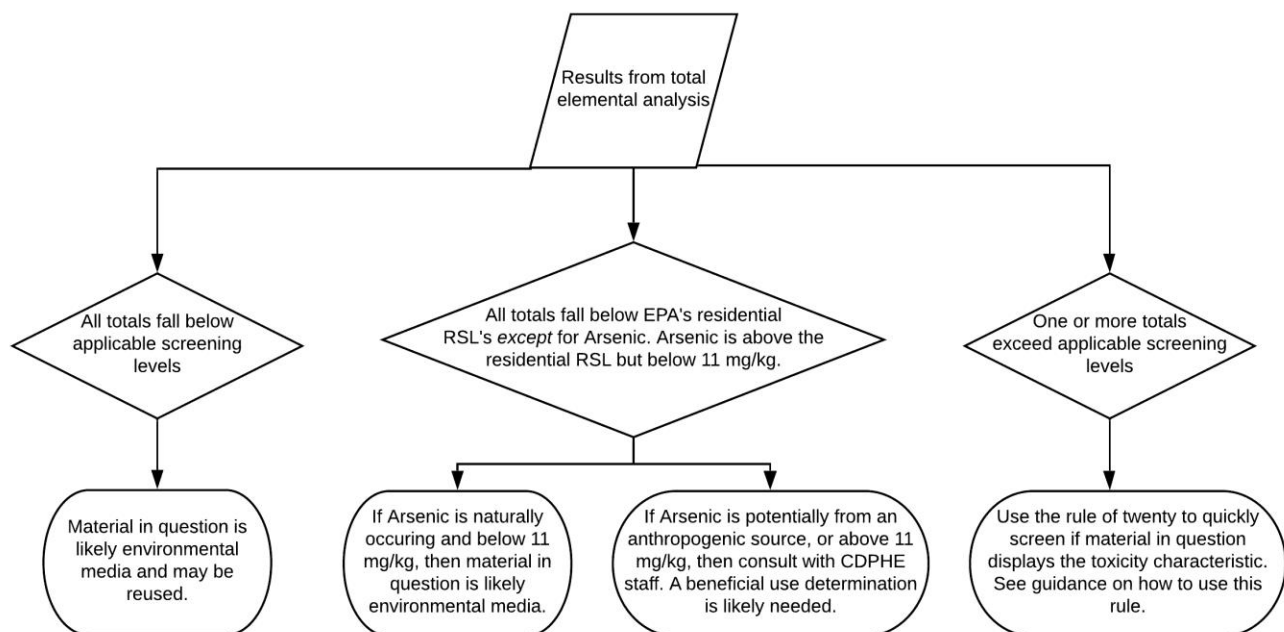
Determination may be required prior to soil reuse. Consult with staff if this situation occurs.



2. If the historical review and/or Phase I Environmental Site Assessment results show no evidence of commercial or industrial activities that may have contaminated the site, the excavated material has no visual staining or odor, and there is no suspect debris or other solid waste in the excavated material, then the material can be assumed to be clean fill and no further investigation is necessary. Proof of a completed site review should be made available if needed throughout the project. Any amount of debris in the soil qualifies the soil as solid waste, unless the debris can be removed from the

soil. Debris that is suspect / potential asbestos-containing material such as bricks with old adhesive, insulating material, insulated pipe, roofing materials, vinyl floor tiles, cement materials, plaster, drywall and associated joint compound materials, etc. may trigger Section 5.5 of the Solid Waste Regulations for the Management of Regulated Asbestos -Contaminated Soil (RACS). If there is any potential asbestos-contaminated material present on the site, then a Colorado Certified Asbestos Building Inspector (CABI) must conduct an inspection to determine if there are suspect materials in the soil that may contain asbestos, and to collect samples accordingly. Reference Section 5.5.1, Scope and Applicability, of the Solid Waste Regulations to determine specific requirements of the owner or operator.

3. If the historical review indicates previous industrial activities, or any other use that might have introduced contaminants of concern into the soil, soil characterization is necessary. CDPHE staff can assist in developing the appropriate list of chemical constituents being tested for prior to sample collection. A representative number of samples should be taken in order to accurately characterize for constituents in the soil. In addition, soil should be visually assessed for chemical staining or odors. During site visits and inspections, staff should follow, “looks bad, smells bad” characterization protocol; visual evidence of staining, presence of non-soil material, presence of odors and/or unique layering not found elsewhere should all be considered suspect, representatively sampled, and laboratory analyzed to determine reusability. Staff should ensure that samples are analyzed for the appropriate chemicals based on historical context. Sampling protocol should follow EPA guidance (2002)² and analysis should be tailored to the site’s previous use and presumed contaminants of concern. Accompanying EPA guidance, Section 4 of the Corrective Action Guidance (2002)³ provides specific information regarding site characterization investigations and details CDPHE accepted protocol and methodology. Generally, a total elemental analysis should be performed first on solid samples and compared to values described in the **Screening Levels** section, below. Use the following decision matrix based on the total elemental analysis.



4. If all constituent concentrations are at or below the screening levels indicated in the following section and there is no visual evidence of debris, soil can be deemed clean fill and would be available for unrestricted land reuse. Consult with CDPHE staff if soil meets constituent criteria yet has visual evidence of impact. If arsenic is the only constituent in exceedance, contractors should consult with CDPHE staff. If one or more constituents exceeds the unrestricted use values, soil cannot be reused in a residential exposure scenario (i.e., unrestricted land use) and must be managed in accordance with the Solid Waste Regulations. When constituents in soil exceed the unrestricted use concentrations but are below the industrial values on the RSL's, such soil may be available for reuse in a restricted use scenario with an approved Beneficial Use Determination and possible environmental covenant or restrictive notice on the property seeking to reuse the impacted soil. Beneficial Use Determinations (BUDs) are subject to separate regulations (6 CCR 1007-2 C.R.S., Section 8.6) and the application for a BUD can be found on CDPHE's website at the following link: <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/417423> More information on environmental covenants is available here: <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/428827>
5. If the material in question exceeds screening levels and cannot be reused as clean fill then it should be determined if the material in question is considered a hazardous waste. Generally, the rule of twenty can be used to quickly screen if total elemental concentrations fall within solid waste or hazardous waste determination levels. The rule of 20 should not be solely used when making a hazardous waste determination. Rather, use the rule of 20 for a quick evaluation of whether the material in question is considered a solid or hazardous waste. For an example of using the rule of 20 please see the corresponding section below.
6. In order to dispose of soil that is solid waste, most landfills require Toxicity characteristic leaching procedure (TCLP) results before accepting the waste. TCLP results must be used to ultimately make a hazardous waste determination. Again, the rule of 20 should only be used as a quick screening tool. Once TCLP results are obtained to make a hazardous waste determination, compare the TCLP results to the maximum concentrations listed in Table 1 (Maximum Concentrations of Contaminants for the Toxicity Characteristic), found in Section 261.24 of Colorado's Hazardous Waste Regulations (6 CCR 1007-3), "the Hazardous Waste regulations." If the excavated material contains COCs that exceed maximum thresholds then the material in question exhibits the toxicity characteristic and must be handled and disposed of in accordance with the Hazardous Waste Regulations. Any questions regarding hazardous waste management may be provided to the Hazardous Waste Corrective Action Unit of the Hazardous Materials and Waste Management Division.

Screening levels

When characterizing soil, constituents included on CDPHE's Groundwater Protection Values⁴ (GPVs) should be the starting point for the analytical list. Constituents not on the GPV list but are suspect based on site / process knowledge, should be included on the analytical list for laboratory analysis.

Laboratory data should be compared or screened against the lowest value from either the GPVs or from the most recent EPA Regional Screening Level Summary Table⁵ (RSLs, TR=1E-06, THQ=1.0). If constituent concentrations are below corresponding screening values, then the soil in question can be classified as clean fill and approved for unrestricted use. Links to the GPVs, RSLs, and EPA's Maximum Contaminant Levels are provided below.

- [CDPHE Groundwater Protection Values:](https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/413311)
<https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/413311>
- [EPA Regional Screening Level Summary Table - see values in "Resident Soil" column:](https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables)
<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>
- [Table 1 \(Section 261.24\)- Maximum Concentrations of Contaminants for the Toxicity Characteristic:](https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables#Table1)
- https://drive.google.com/file/d/1zlW-gCfyMbb8JPB_fPIIfBtQ4Ukvf0aZ/view

Rule of 20

Total elemental analysis is typically performed on 100 mg subsample of material. Because of this, during the TCLP procedure the sample is diluted with a volume of extraction fluid that equals 20 times the weight of the sample. If all constituents in the sample completely dissolve, then the constituent concentrations in the extraction fluid will always be 20 times less than its original concentration in the total elemental sample. Because of this 20:1 dilution ratio, the rule of 20 can be used to quickly determine whether a waste is hazardous or not based on the total elemental analysis. Here's how the Rule of 20 can be used:

- Take the current TCLP screening level (in mg/L) for a given constituent and multiply that value by 20.
- If the total elemental analysis in (mg/kg) is equal to or more than the associated screening level then the waste may be hazardous and should be handled as such until TCLP analysis can be completed.

For example:

- Current TCLP screening level for Benzene = 0.5 mg/L
- $20 \times \text{TCLP limit or } 20 \times 0.5 = 10$
- If the total elemental analysis for Benzene is equal to or more than 10 mg/kg then the waste may be hazardous and should be handled as such until TCLP analysis can be completed.

It is worth noting that just because total results come back below residential RSL's that does not mean TCLP testing is not necessary. It is possible to have low totals for certain constituents but those constituents may still leach above the TCLP limits.

TPHs, Petroleum sites, Arsenic and other considerations

- Concentrations for Total Petroleum Hydrocarbons (TPHs) are not always representative of other chemical compounds encompassing TPH. Because of this, TPH concentrations should only be used as a screening tool; if TPHs are present then analysis for VOCs and/or SVOCs will be required. Otherwise, TPH should not be used when characterizing soil for reuse potential. Instead polycyclic aromatic hydrocarbon (PAH) concentrations should be tested, analyzed, and the results compared to the residential RSLs and the GPVs. This will ensure accurate characterization of PAHs.

- For sites with confirmed petroleum based releases, procedures outlined in the Emergency Petroleum Spill Waste Management Guidance⁶ should be followed.
- Due to weathering of bedrock, elevated background concentrations for Arsenic are commonly found in Colorado. CDPHE guidance (2014)⁷ specifically addresses background arsenic in soils and established Colorado specific arsenic screening values. These values may be used instead of the EPA's RSLs. If arsenic is a constituent of concern on the site, consult with CDPHE staff prior to reuse of any soils with arsenic elevated beyond the EPA residential RSLs.
- This guidance only applies to the terrestrial excavation and application of soil.
- Make every attempt to have laboratory detection limits lower than the applicable screening table values.

References

- ¹ ASTM, 2014. Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, E1527-13. <https://www.astm.org/Standards/E1527.htm>
- ² EPA, 2002. Guidance on Choosing a Sampling Design for Environmental Data Collection, EPA QA/G-5s. <https://www.epa.gov/sites/production/files/2015-06/documents/g5s-final.pdf>
- ³ CDPHE, 2002. Corrective Action Guidance Document. <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/189097>
- ⁴ CDPHE, 2014. Groundwater Protection Values Soil Cleanup Table. <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/413311>
- ⁵ EPA, 2016. Regional Screening Levels-Generic Tables (May 2016). <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016>
- ⁶ CDPHE, 2014. Emergency Petroleum Spill Waste Management Guidance. <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/Recordview/403428>
- ⁷ CDPHE, 2014. Arsenic Concentrations in Soil, Risk Management Guidance for Evaluating. <https://environmentalrecords.colorado.gov/HPRMWebDrawerHM/RecordView/403417>