

# **Chromium Directive FAQs**

## **1. Why was the moratorium put in place in the first place?**

Former Commissioner Bradley Campbell put the moratorium in place to address Hudson County community concerns that the Department's hexavalent chromium soil clean up criteria were not protective of public health.

As a result of these concerns, NJDEP convened a workgroup to review and discuss the applicability of current and proposed cleanup criteria for chromium, specifically as they apply to chromium ore processing residue (COPR) waste sites in New Jersey. The workgroup was comprised of experts from various programs of the Department, one representative from the NJ Department of Health and Senior Services and one representative from the NJ District of the US Geological Survey.

## **2. Why is the moratorium being lifted at this time?**

The Department's Chromium Workgroup concluded that our current soil clean up criteria are protective of public health. This modification to the moratorium provides a mechanism and guidance to Responsible Parties to proceed with remediation of chromium contaminated sites under certain conditions, while protecting public health. It also allows for the clean up of sites that have been stalled, in some cases for decades. It allows for conversion of these sites to multiple uses—industrial, commercial, residential and open space which is needed for the economic vitality and quality of life for these communities.

## **3. Is the workgroup report final?**

The Workgroup report remains in draft form until the National Toxicology Program (NTP) study is complete. However, due to the fact that the risk assessment workgroup has concluded that NJDEP's current guidance and criteria are based on sound science and are protective of public health, the moratorium is being revised to allow clean-ups to proceed under certain conditions.

## **4. Why are we waiting for the NTP study to be completed before revising NJDEP's criteria and guidance?**

The NTP study will be the definitive study on the toxicological impacts of hexavalent chromium. We expect results from the NTP study to be available in June. Modifications to our criteria, if necessary, will take place following that.

**5. Is the hexavalent chromium soil criterion of 20 ppm (mg/kg) protective of public health?**

The 20 ppm hexavalent chromium soil criterion is the most stringent in the Nation. It is the lowest value of NJ’s current soil cleanup criteria for hexavalent chromium. While we wait for the NTP study to be completed, we are using the most conservative value available in order to protect public health.

**Table 1.1. Soil Cleanup Criteria for Trivalent and Hexavalent Chromium (as recommended by the Chromium Workgroup)**

Exposure Pathway	Trivalent Chromium (ppm)		Hexavalent Chromium (ppm)	
	Residential	Nonresidential	Residential	Nonresidential
Allergic contact dermatitis	None <sup>1</sup>	None <sup>1</sup>	Site specific, but not to exceed 400 <sup>4</sup>	Site specific, but not to exceed 400 <sup>4</sup>
Inhalation	None <sup>2</sup>	None <sup>2</sup>	270 <sup>5</sup>	20 <sup>5</sup>
Ingestion	120,000 ppm <sup>3</sup>	NR <sup>3</sup>	240	3,000
Impact to Groundwater	None <sup>1</sup>	None <sup>1</sup>	Site specific <sup>6</sup>	Site specific <sup>6</sup>

*1 – Under normal environmental conditions, trivalent chromium is insoluble in water.*

*2- Noncancer toxicological data for trivalent chromium does not exist for this exposure pathway.*

*3- For the nonresidential scenario, ingestion of trivalent chromium does not pose an unacceptable risk.*

*4- The 400 ppm maximum is a new criterion being recommended by the Chromium Workgroup.*

*5- Due to the effects of vehicular traffic, the nonresidential scenario soil cleanup criterion will be lower than the residential criterion.*

*6- The model used to develop a generic impact to ground water remediation criterion for hexavalent chromium) is not appropriate for COPR, which will require remediation in accordance with N.J.A.C. 7:26E requirements. A site-specific criterion for hexavalent chromium) in COPR-soil mixtures can be developed with Departmental review and approval.*

**6. Will the DEP adopt this new criteria as regulatory standards?**

We are not adopting these numbers as a regulation. This spring the DEP will be proposing new soil standards for many contaminants but **not** for hexavalent chromium as we are waiting on the NTP study to be completed. We will propose a new standards for trivalent and hexavalent chromium after the results of this study are out and the work group has made its recommendations to the Commissioner.

**7. Why was the depth of 20 feet selected and how does it compare to other sites?**

It is a policy decision appropriate under these circumstances. Twenty feet is double the depth of a typical basement excavation. This depth is both protective of public health and provides options for Responsible Parties wishing to finalize clean up of these sites.

**8. Is the Department going to reopen old cases that were closed with higher hexavalent chromium soil cleanup criteria?**

At this time the Department is not going to reopen closed cases. However, upon finalization of the Chromium Workgroup report and subsequent promulgation of soil remediation standards for chromium soil standards, the Department may require additional evaluation of closed cases if the promulgated standard is at least an order of magnitude lower than the criteria applied at the site. If the evaluation of such sites indicates that there is an unacceptable exposure or if any existing engineering controls are determined not to be effective, the Department has the authority to require additional remediation at the site.

**9. Will deed restrictions ensure that future owners notify the public of contamination issues?**

The Department's Technical Requirements for Site Remediation outline specific notification procedures that Responsible Parties must take when a transfer of ownership occurs. The Department must be notified of who will maintain any engineering and/or institutional controls that are in place on a site. The Department also receives reports every two years under the biennial certification program concerning these controls. Therefore, the Department can track ownership compliance with these controls and take enforcement action if they are not maintained.

**10. What are some examples of engineering controls?**

Acceptable engineering controls can be case specific and vary from site to site. Capping is an example of an acceptable engineering control. On sites where hexavalent chromium is a concern, capillary breaks are required to be part of an approved capping system to prevent upward contaminant migration. Geomembranes are one means of achieving a capillary break. Sufficient depth of soil, fill, and/or gravel is another means of achieving a capillary break. Approved capping systems must also protect receptors from direct exposure to the contamination. Semi-impervious or impervious layers such as asphalt or concrete can be used to accomplish this. Limitation of infiltration is another potentially beneficial effect of these types of materials. Sufficiently thick soil and vegetated capping systems can also provide direct exposure protection, but do not preclude infiltration. Under certain circumstances, fencing can be a component of a protective engineering control system

**11. What type of remedial action would likely be approved?**

Excavation and appropriate disposal off-site of all contaminated material above the unrestricted regulatory limit is an approvable remedial action. Treatment of all contaminated material above the unrestricted regulatory limit that leads to concentrations that are permanently below the unrestricted regulatory limit is another approvable remedial action. Capping and solidification/stabilization are other options that under certain specific conditions are viable alternatives.

**12. How are you addressing the concern that there may be additional chromate waste sites in Hudson County?**

We have sampled the soil from 120 sites throughout Jersey City. Of those sample sites only one, located just outside an existing chromate site on Halliday Avenue, had a level of hexavalent above the Department's lowest cleanup criterion. Repeat sampling was unable to confirm the detection. Four additional soil samples showed detectable levels of hexavalent chromium but these were below the lowest criterion of 20 ppb. Several follow-up soil samples collected from the same locations yielded contradictory results. We are investigating reasons for the inconsistent results. A map on our website shows the locations of the sampling program and the results. Residents who suspect a location may be contaminated should contact the DEP for possible sampling.

**13. Have citizens provided information about sites they suspect are contaminated?**

So far five of the 120 sites we have sampled have been suggested by citizens. We continue to solicit the community for additional sites to sample.

**14. How did the department respond to the recommendations associated with analytical chemistry, environmental chemistry, risk assessment and air and dust transport?**

The Chromium Workgroup determined that the cleanup criteria for trivalent chromium and hexavalent chromium initially proposed in 1998, are based on the best science currently available and will therefore remain in place until completion and review of the NTP study.

Many of the recommendations provided in the workgroup's report seek to improve the procedures and operating practices of the application of the human health-based cleanup levels for chromium. These programmatic recommendations were implemented immediately.

The group further recommended that the Department continue to support and review new and upcoming research that may improve the understanding of chromium toxicity and its fate and transport in the environment. Numerous studies and reviews of studies have been initiated and some have been completed.

Specific to the workgroups, **some** of the key recommendations and their status are:

**Major Recommendations from the Subgroups**

- **Recommendation:** The results of the Davidson et al. (2004) study of the co-carcinogenicity of UV radiation and Cr (VI) ingestion should not form the basis of a revised soil cleanup value for Cr (VI). Nonetheless, this study raises the possibility that the cancer risk posed by exposure to Cr (VI) could be larger than that currently used by the NJDEP in the derivation of its soil standards. Therefore, additional research on the oral carcinogenicity of Cr (VI) would be valuable and any additional data should be rapidly evaluated to determine whether they provide sufficient additional evidence of oral carcinogenicity for Cr (VI).

- **Status:** Members of the Chromium Workgroup agreed that the data should be reviewed and incorporated into standards development, as appropriate, immediately upon finalization of the report and corresponding data.
- **Recommendation:** The NJDEP should consider adopting an allergic contact dermatitis based soil cleanup value based on the Nethercott et al. (1994) study and USEPA's current guidance on reasonable maximum soil adherence on skin as developed in the Workgroup report. Based on the assessment of the Chromium Workgroup, a site specific derived soil clean up criterion which is not to exceed 400 ppm Cr(VI) is recommended for the allergic contact dermatitis exposure endpoint.  
**Status:** A standard to address allergic contact dermatitis will be established on a site specific basis with a value not to exceed 400 ppm Cr(VI).

### Analytical Chemistry

- **Recommendation:** Comparison of analytical methods used to detect Cr(VI) in soil samples. A research project should be designed to answer the following question: After the digestion of soil samples containing Cr(III) and Cr(VI) using USEPA Method 3060A, which of the following three analytical methods best responds to the interconversion of Cr(III) and Cr(VI) in reducing and oxidizing soils?  
Method 6800, Elemental and Speciated Isotope Dilution Mass Spectroscopy  
Method 7199, Determination of Hexavalent Chromium in Drinking Water  
Method 7196A, Chromium (Colorimetric)
- **Status:** DSRT has funded a research project with the Environmental and Occupational Health Sciences Institute (EOHSI) comparing the three analytical methods.
- **Recommendation:** Evaluation of analytical methods that can determine Cr(III) and Cr(VI) in reducing and oxidizing soils without digestion is needed. It is necessary to investigate the availability of methods that do not involve wet chemistry to address the concerns with interconversion and matrix spike recoveries. Researchers have investigated the use of a wide range of X-Ray methods for in-situ metals measurements. This research project should include use of the COPR matrix. These techniques would be able to determine worst case scenarios without first digesting the COPR waste into the aqueous phase where reduction and/or oxidation could potentially inter-convert between the species present.
- **Status:** This recommendation remains a viable research option pending funding.
- **Recommendation:** Examination of other digestion methods that will remove chromium from soil without changing the indigenous content of Cr(III) and Cr(VI). A detailed search of the literature should be conducted to identify other possible methods. If methods are found, research should be conducted to determine if these methods are improvement over USEPA Method 3060A.

- **Status:** As part of the research project DSRT has funded with EOHSI, additional extraction techniques are being investigated (e.g., microwave digestion). X-ray methods are, however, beyond the scope of the project.

## Air

- **Recommendation:** The Subgroup found that it was very difficult to compile the history of how an alternative remediation standard (ARS) was developed and the final decision-making process that led to the selection of a remedy. All information used in the decision process of accepting an ARS by the Department should be contained in a formal document and made publicly available.
  - **Status:** All new ARS will be fully documented and will be available to the public.
- **Recommendation:** It is recommended that future soil remediation standards ARSs include both traffic-generated dust and wind-blown dust in the calculation. In cases where no traffic is anticipated, an ARS should be based on exposure to windblown dust at a hypothetical residence located at property fenceline (the default being 270 mg/kg at the moment).
- **Status:** Wind and traffic components will be included in the proposed inhalation pathway based soil standards. However, hexavalent chromium is currently not one of the contaminants for which standards are being proposed. Once the Chromium Workgroup report is finalized and the soil remediation standards adopted, soil remediation standards for hexavalent chromium will be pursued.

## Environmental Chemistry

- **Recommendation:** The Department should consider defining COPR waste material and soil with larger amounts of COPR waste material as a continuing source of contamination to ground water that will require remediation in accordance with the Department's Technical Requirements for Site Remediation (N.J.A.C. 7:26E).
  - **Status:** The Department agrees that COPR and COPR/soil mixtures can be continuing sources of chromium contamination to ground water. The Department intends to address this by the use of a site specific evaluation to establish an appropriate remediation standard for impact to ground water.
- **Recommendation:** To address the question of whether or not vadose zone transport can cause blooms at low soil chromium concentrations, it is recommended that a study be conducted to investigate the potential occurrence of surface enrichment due to capillary transport of hexavalent chromium. Theoretically, enrichment on surfaces can occur at any Cr(VI) concentration, but it is not known

definitively whether or not there is a threshold concentration. Specifically, COPR material and COPR-soil mixtures containing various Cr(VI) concentrations should be studied for potential evaporative enrichment via capillary action toward the goal of determining whether there is a threshold concentration in soil where evaporative enrichment via capillary action does or does not occur. It is especially important to evaluate the possibility of capillary transport at sites so that the Department is better able to evaluate the effectiveness of remedial strategies.

- **Status:** This recommendation remains a viable research option pending funding.
- **Recommendation:** Information in the published literature (Kitsa et al., 1992 and Falerios et al., 1992) and site data (PPG) present limited data on enrichment of Cr(VI) on smaller soil particles. Research is recommended to clarify whether particle size enrichment is or is not of concern due to the limited data available to address this issue. Systematic, specific research is needed to definitely determine levels of hexavalent chromium on smaller particle in bloom areas, chromium-contaminated areas, and background areas. The mineralogy of small particles in chromium-contaminated areas needs to be determined. The design of the study should be determined by an appropriate group of people from the Department and unbiased external researchers with expertise in this research area. The study should include sample sites from several COPR sites in New Jersey. The Kitsa et al. (1992) study is the only one that approaches this need, but it is dated and limited. The work by Falerios et al. (1992) does not demonstrate that more chromium is present on the smaller particles. The data are equivocal. Therefore, it appears that further investigation of this matter, as a human health issue, is warranted. A larger and more current investigation than the two described here could illuminate the issue for the state and better inform the soil standard setting process. At the very least, measurements of Cr(VI) on small soil and bloom particles, as well as the routine measurements on bulk samples, could be considered as an important step in assessing human health risks from COPR. Mineralogical characterizations should be completed on samples used in experiments. It might be helpful to compare the concentrations resulting from such a study with those collected from a deep soil core for variation. Several sites plus a control site would need to be included in the study.
  - **Status:** DSRT has contracted with the original researcher at EOHSI to expand upon this preliminary work. Samples are being collected now.

## 15. How were research priorities determined by the Chromium Workgroup?

Research priorities were determined based on how fully developed and achievable a research idea was; the availability of researchers in New Jersey institutions to conduct studies, and by cost considerations.