downstream of the release. An investigation by the facility showed waste kiln dust to be the original source of contamination. Since the site is in an area of karst terrain, it is both logical and reasonable to believe that the waste dust rapidly migrated through discrete channels in the bedrock, with minimal attenuation, to the point of the blowout. The fact that this occurred at the site suggests EPA's MMSOILS ground water model is not suitable for karst type terrain, since the model assumes ground water migration through bedrock that is uniformly porous, and lacks discrete channels.

Of particular concern to the Agency is the extent of documented contamination of ground water. Even though limited information exists on ground water contamination due to a lack of monitoring programs at most sites, each case with available information on ground water shows contamination at levels of concern. Only 17% of all cement manufacturing facilities have ground water monitoring systems around their dust management units. These plants are considered to be representative of the industry. Thus, the Agency considers it likely that more damages exist, even though it did not conduct a detailed investigation of ground water beneath all CKD waste management units.

Environmental damages can also be attributed to particulate emissions of CKD from quarries, haul roads, and CKD handling equipment (screws, conveyors, and trucks), and are traceable to kilns that do and do not burn hazardous waste. Several commenters on the RTC indicated that air dispersion of CKD was a significant source of pollution to local residents living around cement manufacturing facilities. In addition, the RTC identified numerous citizen complaints of excessive particulate matter from cement plant operations collecting on cars, lawns, gardens, chairs, and other personal property of area residents. While developing the RTC, the Agency reviewed numerous letters in state files from residents living near cement kilns who complained of fugitive dust emissions (which may be due to release of CKD from plant operations and/or dust disposal piles). Although the Agency recognizes that dust from mining and quarry operations could contribute to the particulate emissions from a cement plant, other evidence (i.e., damage cases) indicates that fugitive CKD emissions are a substantial contributor to environmental damages in the form of air quality degradation.

Substep 2. Does EPA's Analysis Indicate That CKD Could Pose Significant Risk to Human Health or the Environment At Any of the Sites that Generate It (or In Off-Site Use), Under Either Current Management Practices or Plausible Management Scenarios?

The Agency's analysis indicates that there are potential risks warranting concern, from both current on-site management practices and certain offsite beneficial uses. In the RTC and NODA documents, the Agency reported on plant-specific risk screening and quantitative risk modeling conducted to evaluate potential risks from current and plausible future management of CKD. As summarized in the findings above, current on-site land management practices appear generally to pose relatively low risks to human health via direct pathways of contaminant transport and exposure.

However, with respect to possible ground water contamination, a large percentage of cement plants (and CKD management units at those cement plants) are located in areas of karst terrain, many of which may be underlain by bedrock with hydrological characteristics conducive to relatively direct leachate transport to off-site locations. In karst aquifers, contaminants can potentially migrate long distances through open conduits with little of the filtration, adsorption, and dispersion that are typical of contaminant dispersal in porous bedrock.

In addition, modeling of windblown dust from CKD management areas suggests that dust piles, when uncontrolled (i.e., uncovered and dry), may typically release sufficient quantities of fine particulates to exceed health-based National Ambient Air Quality Standards (NAAQS) at plant boundaries, and sometimes as far away as nearby residences.

The Agency's quantitative modeling of "indirect" food chain pathways, both aquatic and agricultural, indicates potential human health effects, both cancer and non-cancer. A wide range of chemical constituents, including arsenic, cadmium, chromium, barium, thallium, lead, and dioxins, were indicated as constituents of concern at various plants. Because some CKD disposal units are located near, and in some instances immediately adjacent to, farm fields, rural residences with gardens, or surface waters containing fish, there is potential for indirect risk from the consumption of CKDcontaminated beef, vegetables and fish, as well as ingestion of CKD-

contaminated water during recreational swimming.

Although limited by available data and assessment methodology, the Agency's risk assessment studies also indicated potentials for adverse aquatic ecological effects due to possible chemical releases to streams and lakes adjacent to some cement plants. Aquatic ecological damages due to siltation and sedimentation were not specifically studied in the risk assessment, but were observed in field visits and reported as a problem in damage case documents and in public comments.

The Agency's risk assessment for offsite beneficial uses of CKD indicated that, except for direct application as a lime/fertilizer substitute, most off-site uses do not pose significant risks. Direct cropland application, however, occurs at a number of locations in the country and is essentially unregulated at the state and federal levels. Analysis suggests that, at plausible application rates, CKD that contain sufficiently high concentrations of arsenic or other metals or dioxins (as documented in the Agency's CKD constituent data base), could cause food chain risks of concern that may warrant some type of regulation for these off-site uses.

Substep 3. Does CKD Exhibit Any of the Characteristics of Hazardous Waste?

Although all of the toxicity characteristic (TC) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) were detected in CKD, CKD exhibits the toxicity characteristic infrequently, and only for certain metals. This is based analysis of the CKD analytical data available to the Agency. Although CKD itself is not corrosive under EPA's rules because it is a solid, water-CKD mixtures are highly alkaline. Data presented in the RTC indicate that the pH of CKD leachates (using standard EPA leach test procedures) are typically between 11 and 13 standard units. In addition, the elevated pH of a CKDwater mixture is a prominent factor in 10 out of 14 cases of damage (documented and potential) to surface water and/or ground water. In six of these cases, including the ground water damages described for the two plants listed on the NPL, CKD-water mixtures are reported to have a pH exceeding the EPA standard of 12.5 for corrosive hazardous waste (40 CFR 261.22).

The results of Step 1 of the decision process indicate that CKD has posed and may continue to pose risks to human health and the environment under plausible management scenarios. Releases have occurred and may continue to occur as a result of current