CSI: Center for Sludge Information
Advocacy through Acquisition, Analysis and Articulation of Information re:
Land Application of Sewage Sludge
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to: SLO County Water Resources Advisory Committee (WRAC)

re: Scoping Period for EIR on Sewage Sludge Land Application
Ending 12-18-15

date: 11-21-15

This letter is intended to provide the WRAC with some information about the potential water quality impacts of sewage sludge land application as it considers submitting comments regarding the issues that should be analyzed in the EIR at its 12-2-15 meeting.

The information included herein is excerpted from Chapter 3 "Impacts" of a 70-page briefing book CSI wrote for local officials, organizations and individuals when SLO County was first being introduced to this topic years ago.

IMPACTS
SEWAGE SLUDGE/BIOSOLIDS

The contaminants in sewage sludge can adversely affect soil, soil microorganisms, plants, food, animals, humans, water, and air. The potential for long-term impacts results from the environmental persistence of heavy metals, synthetic chemicals and pathogens (centuries, decades, years, & months). The toxicity of individual contaminants can be enhanced, or synergistic, when combined with others. The impacts can also be additive due to exposure through multiple pathways.

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Water

Heavy metals, synthetic chemicals and pathogens can contaminate ground and surface waters. Long-term field studies demonstrate percolation of heavy metals through soil. As much as two-thirds applied to land have disappeared. A number of physical, chemical and temporal factors influence the mobility and availability of contaminants.

Groundwater

"…factors that enhance mobility could result in more plant uptake or leaching of the metals to the groundwater. These factors include the properties of the metals in question, the quantity and type of soil binding sites, pH, the concentration of complexing anions (organic and inorganic), and competing cations in soil solution." [7]

"One significant factor that may increase the leachability of metals is the decrease in pH caused by mineralization of biosolids organic matter over time." [160]

"Material balances on several sites which have received sludges show unexplained metal losses. Recent research indicates the potential for metals to leach from sludges and sludge products and the possibility of violating drinking water standards." [9]

"However, when doing a mass balance of the metals at these sites, Williams et al. (1987), and several other researchers, could not account for all the metals that had been applied. McGrath and Lane (1989) found that 68% of the metals applied to the field site they were studying could not be accounted for." [7]

"The preferential flow paths …allowed metals to bypass the soil matrix and pass through the soil profile." [7]

"Preferential flow has been shown to increase greatly the mobility and velocity of solute movement to the groundwater (Steenhuis et al. 1995). …It has been demonstrated that preferentially transported pesticides can rapidly reach groundwater, despite conventional model predictions to the contrary (Steenhuis et al. 1994). It is, therefore, conceivable that preferential transport could also increase metal movement." [7]

"Preferential flow and the presence of soluble metal-organic complexes could both contribute to the unexplained loss of metals in the field studies cited earlier (i.e., Dowdy, et al. 1991) by potentially allowing mobilized metals to move rapidly below the depth of sampling." [7]

"In some of the longer-term field experiments, however, evidence for metal percolation …has been found. In one case, downward migration was observed 7 yr after sludge application, where both organic matter and soluble Cu and Zn were higher at the 40 to 60-cm depth in the sludge-treated than in the untreated soil. In acid soils, the movement of Zn to a depth of 60 to 90 cm was observed following 6 yr of sludge application. Dowdy et al. (1993) noted that, while most of the monitored trace metals did not migrate below 30-cm depth after 19 yr of sludge application, Cr and Cu were increased in the subsoil (below 45 cm)." [4]

"Organics and viruses in sludge can also move through soil to contaminate ground water." [3]

"Microorganisms may leach from buried sludge with infiltrating water to contaminate groundwater." [5]

"Pathogens may not be significantly inactivated or removed by transport through the vadose zone. Once in groundwater, they may travel significant distances from the site." [5]

"Viruses, because of their small size, probably have the greatest potential of all pathogens for actually reaching groundwater and being transported from the site." [5]

"Shallow aquifers can become contaminated with pathogens from sludge and, depending on groundwater flow, these organisms may travel significant distances from the disposal site. Communities that rely on

groundwater for domestic use can become exposed to these pathogens, leading to a potential disease outbreak." [5]

Surfacewater

"Run-off of soil particulates from sludge-amended land into streams and other waters is also of concern." [3]

"Exposure of the sludge to the surface would result in the generation of runoff, which may transport sludge particles to nearby surface waters. It is also possible that, if the site becomes saturated with water, surface leachate contamination will occur." [5]

"Impacts of sludge application on surface water streams and lakes depend on the percentage of the watershed land that receives sludge." [9]

"Generally, if sludge is used as the sole source of N for crops, over a number of years excess P will build up in the soil, a possible concern for contamination of surface waters." [1]

"Animals may also acquire pollutants from ephemeral streams and standing water from vernal pools on sludge amended ground…." [17. a]

"This last consideration may be of considerable importance to California and other Western states where winter and spring wet seasons produce ephemeral streams and vernal pools on grazing land." [17. a]

References:

1. "Land Application of Sewage Sludges" 1998 CU Recommends From:1998 Cornell Recommends for Integrated Field Crop management; A Cornell Cooperative Extension Publication, C.U.N.Y.
3. "The Issue of Sewage Sludge Application to Land" Dr. D.J.Lisk, Toxic Chemicals Lab, NYS College of Agriculture & Life Sciences, C.U.N.Y. 7-10-93.
4. "Toxic Metal Accumulation from Agricultural Use of Sludge: Are USEPS Regulations Protective?" M.B. McBride, Dep't. of Soil, Crop & Atmospheric Sciences, C.U. N.Y. Journal of Environmental Quality, vol 24, #1, 1-2-95, pgs 5-18
5. "Hazards from Pathogenic Microorganisms in Land-Disposed Sewage Sludge" T.M. Straub, I.L. Pepper & C.P. Gerba, Dep't. of Soil & Water Science, U. of Ariz.: Reviews of Environmental Contamination & Toxicology, vol 132, 1993, pgs 55-91
7. "Movement of Heavy Metals Through Undisturbed & Homogenized Soil Columns" V.J. Camobreco, B.K. Richards, T.S. Steenhuis: Dep't of Agricultural & Biological Engineering; J. H. Peverly & M.B. McBride, Dep't of Soil, Crop & Atmospheric Sciences, C.U. N.Y., Soil Science, vol 161, #11, 11-96 pgs 740-750 (11 pgs)
9. "The Case For Caution: Recommendations for Land Application of Sewage Sludges & an Appraisal of the US EPA's Part 503 Sludge Rules" E.Z.

Harrison: Cornell Waste Management Inst., M.B. McBride & D.R. Bouldin: Dep't of Soil, Crop & Atmospheric Sciences, C.U. N.Y. Working Paper 8-97.

17. Panel Presentation at the Amer. Assoc. for the Adv. of Sci.: "Science & the Unpleasant: Risk Assessment & Urban Sewage Sludge" 2-14-98. Sponsored by AAAS Section on Agriculture, Food, & Renewable Resources. Summary & Presentation Abstracts (summary + abstracts)
    a. "Sludge, Sludge on the Range: Unresolved Science in the 503 Regulations" A. Medvitz, Rio Vista, Calif., rancher, farmer, Co. Farm Bureau & CFBF Board of Directors, formerly of U. of Boston.

160. Draft EIR: State Water Resources Control Board, General Waste Discharge Requirements for Biosolids Land Application, 6-28-99.