# DRAFT

## RESPONSE PLAN FOR ELEVATED H2S LEVELS

The response tiers established below would be triggered by readings on the Jerome H2S analyzer that surpass the indicated concentration for the specified length of time in areas where human exposure to these concentrations is likely (e.g., residential/retail areas). The indicated response would only occur if these levels are likely to continue for at least one additional hour based upon the time-frame for mitigative measures. Tiers 2 and 3 involve public alerts that advise the public in the area to alter their behavior, on a voluntary basis, to avoid landfill-related odors. While a GasTech analyzer will also be in use for H2S monitoring, this is a screening type device and will be confirmed with the Jerome analyzer before response actions are initiated.

**Tier 1 H2S Level**: ≥ 0.1 ppm for 2 hours or 0.5 ppm for 15 minutes (up toTier 2 levels)

Tier 1 Response: The Danbury Health Director alters the telephone message for medical/emergency response personnel to indicate that H2S concentrations in the community, while below a toxic effects level, are elevated to a range where strong odors may affect sensitive individuals (e.g., transient nausea, headache). In addition, it would be noted that strong odors of any kind may prompt increased symptoms in some asthmatics.

**Tier 2 H2S Level**: ≥ 0.5 ppm average for 2 hours or 2 ppm for 15 minutes (up to Tier 3 levels)

Tier 2 Response: The Local Health Directors will alert the public in the exceedance area (areas delineated by monitoring that have the exceedance) that sensitive individuals (e.g., asthmatics, young children) stay indoors and cease performing work or physical exercise; alternatively, such individuals may want to temporarily leave the area surrounding the landfill where the odors are strongest. If the exceedance area includes the Bethel school complex, and if it occurs during school hours, the Local Health Director will notify school officials. The Danbury Health Director will also change the phone message for medical personnel to indicate an increase in H2S to a level that, while below a toxic effect level for the general public, may possibly produce reversible effects in sensitive individuals (increased airway resistance, irritation).

**Tier 3 H2S Level**: ≥ 5 ppm average for 30 minutes

Tier 3 Response: The Local Health Directors will alert the public in the exceedance area (areas delineated by monitoring that have the exceedance) that all individuals may consider temporarily leaving the area. The Danbury Health Director will also change the phone message for medical personnel to indicate that H2S concentrations are in a range where reversible irritative and biochemical effects are possible in exposed individuals.

Notes: For Tiers 1 thru 3 the Local Health Directors will notify all parties that the exceedance has ended once verification of this has been obtained. The exact trigger points for these tiers may shift if it is found that the community has a more pronounced response to a given H2S concentration than what is expected based upon the literature.

# SUPPORTING INFORMATION

DPH has reviewed the H2S toxicology and epidemiology literature, as well as H2S exposure guidelines developed by other states, by the World Health Organization, and by OSHA/NIOSH. DPH's assessment factored in the animal and human H2S database but relies more heavily upon the human studies (occupational studies, controlled exposure chamber studies, epidemiology studies) than upon animal studies. The available evidence suggests that H2S effects begin to occur at concentrations as low as 5 ppm in healthy subjects (irritation, elevated blood lactate levels) and as low as 2 ppm in asthmatics (increased airway resistance and decreased conductance in 2 of 10 subjects). NIOSH has a workplace ceiling of 10 ppm meaning that workers should not be exposed to this level for more than occacional, brief periods.

To our knowledge, the only state that has produced a risk assessment addressing emergency response actions is Hawaii. Based upon the human data, the Hawaii Health Environmental Management Division recommended three tiers: 0.1 ppm as a public alert level; 1 ppm as a public warning level; 10 ppm as a public emergency level. Based upon the H2S animal toxicology literature, their recommendations were approximately 10 fold more conservative (lower H2S levels needed to trigger action). The state of Nebraska just completed a risk assessment to establish an H2S health-based (as opposed to odor-based) ambient standard. Their assessment developed a standard of 0.1 ppm as a 30 minute average, above which the source must be controlled (this proposed standard has recently been released for public review). The World Health Organization developed an ambient guideline for Europe of 0.1 ppm H2S (24 hour average concentration) based upon ocular irritation effects and a 100 fold safety factor. Additionally, ATSDR's draft Toxicological Profile for Hydrogen Sulfide is supportive of limiting exposures to the general public in the concentration ranges outlined in DPH's 3 tiers.

Review of these data sources suggests that an average H2S concentration of 0.5 ppm for 2 hours or a 15 minute peak of 2 ppm would be sufficient to put sensitive subjects at risk for health effects. The first level of public notification (Tier 2) is intended to avoid these risks. The 2nd level of public notification (Tier 3) is intended to also avoid health effects in the general population which may begin as low as 5 ppm. Tier 1 would be established to notify medical and emergency response personnel that H2S concentrations are elevated into a range where certain members of the community may be in distress (due to strong odors) and may report with readily reversible symptoms.