ATSDR GUIDANCE FOR HEALTH ASSESSMENTS

1994

ATSDR

Agency for Toxic Substances and Disease Registry

Environmental Data Needed For Public Health Assessments

A Guidance Manual

U S DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta Georgia 30333

June 1994

Disclaimer

Use of trade names is for identification only and does not imply endorsement by the Agency for Toxic Substances and Disease Registry the Public Health Service or the U S Department of Health and Human Services

The Environmental Data Needed for Public Health Assessments is available through the U S Department of Commerce National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161 telephone (703)487 4650 The NTIS order number for this document is PB94 179827

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FOREWORD

The highest priority of the Agency for Toxic Substances and Disease Registry (ATSDR) is the protection of public health The Agency addresses that priority through specific public health activities as directed by the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and other federal statutes Although the CERCLA mandate covers a wide range of health related activities this document focuses on data needs for the specific requirement of preparing a public health assessment for each site on or pro posed for inclusion on the National Priorities List (NPL) When appropriate this may also apply to ATSDR s response to petitions requesting investigation of particular facilities or toxic substance releases

Public health assessments challenge ATSDR to integrate environmental sampling data, health outcome data and community concerns successfully in the evaluation of the health implica tions of hazardous substances released to the environment. Doing so enables ATSDR staff members to make the difficult decisions as to why where and for whom public health actions should be undertaken

ATSDR s public health activities have documented human exposure to releases from about 40 percent of the hazardous waste sites Agency scientists have e) amined potential exposure could occur at another 40 percent In fiscal year 1992 sufficient environmental data were available to indicate the need for health investigations at about 35 percent of the sites evaluated by public health assessments Included were sites where concern was for current or past exposures to hazardous substances released from the site

More important to the focus of this document, there was **insufficient** environmental data to determine whether health investigations should be conducted at approximately 40 percent of the sites evaluated Thus environmental data are critical to ATSDR s public health algorithm but only to the extent that such data can be used in a manner that contributes to and facilitates the Agency s public health practice

Recognizing that data are collected at hazardous waste sites for a variety of purposes ATSDR has focussed this guidance on the needs of the environmental public health professional This guidance is not intended to supplant the professional judgment and discretion of those responsible for sampling and monitoring the environment; instead it provides a framework for further dialogue and discussion among health assessors and environmental risk managers

The draft guidance was made available for public comment through publication in the *Federal Register* and was distributed to federal state and local entities private consultants and corporations and trade/professional organizations Comments received were considered and when appropriate incorporated into the document ATSDR is responsible for the technical

accuracy of this guidance and is committed to updating it as new information becomes available Comments from the users of this guidance document are welcome Please send comments to Robert C Williams P E DEE Director Division of Health Assessment and Consultation ATSDR E 32 1600 Clifton Road Atlanta Georgia 30333

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INTRODUCTION

This document describes the general purpose and focus of a public health assessment (PHA) and provides a list of general site information and environmental data that ATSDR usually obtains from the Environmental Protection Agency (EPA) the potentially responsible party (PRP) or other lead agencies responsible for conducting environmental investigations It is intended for use by EPA Remedial Project Managers (RPMs) Federal Facility Installation Restoration Program Managers ATSDR Regional Representatives PRPs and other parties involved in the public health assessment process

A PHA is the evaluation of data and information on the release of hazardous substances into the environment in order to assess any past current, or future impact on public health to develop health advisories or other recommendations and to identify studies or actions needed to evaluate and mitigate or prevent human health effects For further information on the PHA process and ATSDR s methodologies for evaluating public health effects see *ATSDR Public Health Assessment Guidance Manual* March 1992 The PHA evaluates three primary types of information environmental data community health concerns and health outcome data This data needs document addresses only environmental data needs

During analysis of human exposure pathways environmental data are used to determine how human exposure may have occurred may be occurring or may occur An exposure pathway consists of five elements

1 source (landfill spill etc)
2 transport media (groundwater air etc)
3 exposure point (drinking water well food source shower etc)
4 route of exposure (ingestion inhalation etc) and
5 receptor population (families schoolchildren etc)

During preparation of a public health assessment ATSDR must evaluate specific data that address pathways especially at potential exposure points Much of that needed information is available in reports of remedial investigations (RIs) and other environmental studies conduct ed by EPA federal facilities state agencies and PRPs Other environmental information critical to exposure pathway analysis such as contaminant concentrations at off site human exposure points is not as likely to be available at the beginning of the RI process The following sections describe specific environmental data that are needed for a thorough evaluation of potential human exposure to hazardous substances and the related health effects The availability of this information early in the remediation process could contribute to the timely identification of needed public health actions and would eliminate the need for preliminary health assessments which usually conclude that more data are needed for full evaluation of the public s exposure

ATSDR depends on other agencies or corporate PRPs to generate the environmental data necessary to determine the degree of public exposure to toxic chemicals at hazardous waste sites Most of the environmental information that ATSDR needs is the same as that routinely required by EPA at NPL/hazardous waste sites ATSDR typically requires additional information in the following categories

1 contaminant concentrations in all off site media to which the public may be exposed

2 an appropriate detection limit and level of quality assurance/quality control (QA/QC) in samples to ensure the resulting data are adequate for assessing possible human exposures

3 discrete samples that reflect the potential range of exposure of the public

4 surface soil and sediment samples not deeper than 3 inches

5 more extensive biota studies and analyses of edible portions only

6 more ambient and indoor air sampling and

7 lists of physical hazards and barriers to site access

This document is intended to provide general guidance that will help persons responsible for designing hazardous waste site characterizations include the data that ATSDR needs to develop a public health assessment of the site It is recommended that when possible ATSDR review draft environmental sampling workplans for areas at each NPL site where there is an exposure potential to provide site specific guidance on data that will be needed to address site related public health issues that may arise

SAMPLING STRATEGY

Most NPL site sampling plans start at the area or areas where the releases are thought to have occurred and work out from that point or those points in an iterative process until the full extent of contamination has been characterized This process often takes years to progress off site to collect data at the potential points of public exposure ATSDR recommends that the initial evaluation of the site include an assessment of probable routes of public exposure/contaminant migration off site and that the sampling *begin* at the public exposure points to determine if interim actions are needed to reduce or eliminate public exposure If contamination at public exposure points is determined not to be at levels of health concern then the on site sampling to characterize the site fully and determine what remedial actions may be necessary should proceed However if at any point during the site characterization a medium (such as groundwater) is found to be contaminated on site at levels of public health concern and that medium was not previously tested off site then sampling should be conducted immediately at the potential public exposure points for that medium if such points exist (e g if private or municipal wells exist near the site in the case of groundwater)

Certain information should be included in any sampling study

1 Geographic area or source the sampling plan is designed to represent

2 Intent of sampling strategy e g to define average or range of concentrations

3 Rationale or statistical method used to select sampling locations i e random grid stratified composite grab etc

4 Sampling equipment used and method(s) for decontamination between samples

5 Location and rationale for selection of background samples

DATA QUALITY INFORMATION

To determine the likelihood of human exposure health asses ors evaluate all available environmental data Different organizations collect environmental data for a variety of purposes Such data often are not of the quality necessary for use in PHAs and are not intended for use in assessments Therefore the following information should accompany data sent to ATSDR

1 Data quality objectives (DQOs) The anticipated use for which samples were taken which then determines the types of laboratory analysis used sensitivity of the analytical technique detection limits confidence limits precision accuracy representativeness completeness and comparability (PARCCs) appropriate sampling design and resulting data quality

2 QA/QC requirements The criteria by which data accuracy and precision are judged

When formulating DQOs for sampling and analysis of contaminated media at human exposure points (water supply wells playground soils etc) the level of QA/QC should not be less than that used for risk assessment data (Levels III to V) as specified in the EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355 0 7B March 1987 *Data Quality Objectives for Remedial Response Activities Development Process* and the OSWER Directive 9285 7 09A June 1992 *Final Guidance for Data Usability in Risk Assessment (Parts A & B)* or current versions of these documents These documents are available from the U S Environmental Protection Agency OSWER 401 M Street S W Washington D C 20460

The ATSDR data evaluation process is discussed in detail in Appendix C of the *ATSDR Public Health Assessment Guidance Manual* (reference *Federal Register* 57 *FR* 21987 May 26 1992)

ELECTRONIC DATA TRANSFER

Currently health assessors receive most information from EPA and other organizations in written reports e g remedial investigation/feasibility studies (RI/FSs) and data sheets with accompanying maps figures and tables A few sites are making their environmental databases available to ATSDR in machine readable formats or through communication linkages An interagency workgroup including representatives from EPA Army Air Force Department of Energy ATSDR and U S Geological Survey (USGS) is attempting to develop a standard format for transferring electronic data between agencies Site specific data transfer is ongoing at a few sites However many federal facilities have expressed interest in electronic data transfer for use in the near future

Electronic transfer greatly speeds the review and analysis process by eliminating the need for duplicative data entry and verification Also data in an electronic format can be imported to a Geographic Information System (GIS) so that disparate geographically based information such as contaminant distributions census data and land uses can be integrated and interpreted Generally the entire analytical data set should be transmitted rather than only selected or summary data However if the data set is extremely large the health assessor may request that only a subset of the data be transmitted ATSDR supports the use of electronic reporting methods and is actively pursuing their use during preparation of public health assessments

GENERAL INFORMATION NEEDS

ATSDR needs background information and analytical data for each site it evaluates

A SITE IDENTIFIERS

1. Site name and alias
2. Site address or location
3. Site type (e g mine tailings landfill surface impoundment, spill etc)
4. EPA technical contact s name and phone number (e g Remedial Project Manager On Scene Coordinator etc)
5. Descriptions of problems/concerns
6. Current owner s name

B SITE HISTORY

1. Dates of operation and significant events (e g fires changes in ownership or products etc)
2. Descriptions of previous releases and actions taken by EPA or the facility to remedy them
3. NPL listing document, i e why the site was listed on the NPL
4. Descriptions of physical barriers to prevent pollutant transport (e g liners slurry walls fences dikes)
5. Current CERCLA and Resource Conservation and Recovery Act (RCRA) status of site
6. Current structural condition of containers vessels and buildings holding substances
7. Current and past operational information regarding the treatment storage or disposal of hazardous waste at the site
8. Current use (and past uses if different) of all buildings and areas where the public or workers may be exposed to contaminants e g former pesticide formulation building and outside rinse area converted to day care center or office space

C GEOGRAPHIC AND DEMOGRAPHIC DATA

1. Plotting of the site on the USGS quadrangle map including the scale and map name if the complete map is not furnished
2. Political geography i e city/town county state
3. Distance from site to closest residence
4. Approximate population residing within 1 mile of site or within the potentially affected area whichever is greater

5 Sensitive land uses and features within 1 mile of the site or within the potentially affected area (e g schools day care facilities hospitals retirement homes streams rivers wetlands aquifer recharge zones water wells etc)
6 Copies of photographs or databases that depict past or current site conditions including aerial photographs satellite imagery and GIS coverage (databases)
7 Proposed land transfers
8 Sensitive or potentially impacted land leases on site or off site

D RELATIONSHIP TO NEARBY COMMUNITY

1 On site activities and the estimated number of people involved in each activity (e g working dirt biking camping hunting fishing etc)
2 Copy of the community relations plan
3 Types of barriers or signs used to prevent public access
4 Estimated frequency of on site activities
5 Number and types of other potential environmental contamination sources within 1 mile of the site (or within the potentially affected area) including RCRA operating industrial facilities and other NPL or CERCLA Information System (CERCLIS) sites

E SUBSTANCES IDENTIFIED

1 List of chemical names and Chemical Abstract System (CAS) numbers (if known)
2 Estimate of the quantities of contaminants released to each medium (soil air surface water and groundwater)
3 Maximum concentration range and extent of contamination in each medium (including biota)
4 Identification of waste materials and quantities
5 Documentation of any chemical mechanical meteorologic or other phenomena that might rapidly alter the current physical state of the chemicals present or the general condition of the site (e g earthquake zone flood plain etc)

F ANALYTICAL INFORMATION

1 All analytical results for each sample taken (raw data may be requested under certain circumstances) in addition to documents that summarize data
2 Detection and quantitation limits for all analytical data
3 Description of the level of QA/QC used and copies of the QA/QC results and data validation reports
4 Blank and spike sample results (specify lab or field samples)

5 Care and decontamination of tools instruments and sampling equipment in the field to prevent cross contamination of samples

6 Sample storage protocol and holding times

7 Analyses of total concentrations not only RCRA extraction analyses concentrations

8 Analyses that identify which form of a chemical is present if toxicity of the agent s various forms is significantly different (e g chromium III and chromium VI elemental mercury and methylated mercury etc)

SOIL EXPOSURE PATHWAY

Contaminated soils may expose individuals who live play or work near the site to multiple contaminants at levels of health concern Ingestion of contaminated surface soil particularly by children is a primary concern Inhalation of contaminated dusts and direct dermal contact ith contaminated soils also can lead to adverse health effects Generally the public is exposed to only the top few inches of soil therefore ATSDR has defined surface soil as the top 3 inches For its evaluation ATSDR needs concentrations of contaminants found in surface soil reported separately from those found in subsurface soil Because ATSDR considers past current and future exposure scenarios the Agency needs to know the concentrations of contaminants in the soil before and after removal or remedial actions Information relevant to ATSDR s evaluation of the soil pathway is listed below

1. Exact sample locations including descriptions and map locations and the purpose of the sampling
2. Depth of sampling points specify if sample is a vertical composite of soil between specified depth ranges (e g 0 3 inches 3 12 inches 1 3 feet)
3. Type of sample (e g grab or composite)
4. Sampling scheme for composite samples (e g composite of five grab samples from a 100 square foot grid etc)
5. Constituents analyzed for analytical methods used detection limits and concentrations detected
6. Date of sampling
7. Discrete samples (grab) as well as composite samples because composited samples may not be representative of the maximum contaminant concentration to which individuals are exposed
8. Type of soil (sandy silty clayey etc)
9. Description of vegetative cover
10. Land use or special features during sampling

SURFACE WATER EXPOSURE PATHWAY

Representative sampling of surface water upgradient and downgradient of the site is necessary to distinguish health implications associated with the site All surface water bodies on or impacted by the site should be sampled including ditches gullies arroyos and perennial and intermittent streams that could transport contaminants away from the site Samples should be taken in areas where there is potential for human exposure Information needed for evaluation of the surface water pathway is listed below

1 Indication on map(s) of site location boundaries of the 100 year flood plain location of surface waters and all surface water samples
2 Locations of all downstream surface water intakes for a distance of potential impact from the site
3 Identification and descriptions of National Pollution Discharge Elimination System (NPDES) effluents from the site and sources upstream and downstream of the site at distances potentially affecting the surrounding community (copies of NPDES permits and compliance reports may also be requested)
4 Past, current, and future uses of surface water on site and downstream (e g recreational agricultural drinking water livestock watering etc)
5 Hydrologic characteristics
6 Relationship of surface water to groundwater
7 Copies of surface water sampling record and log including sample locations and site conditions e g water flow rate and/or depth visual observations etc
8 pH and specific contaminant concentrations
9 Sampling and analytical methods used detection limits QA/QC data and concentrations detected
10 Identification and description (including a map when appropriate) of any storm water drainage system on or adjacent to the site

SEDIMENT EXPOSURE PATHWAY

Residents may be exposed to contaminated sediment either through direct dermal contact, ingestion and inhalation or through a secondary pathway ingestion of contaminated biota Sediment sampling is needed at possible human exposure points such as recreational areas or children s play areas and at locations where contaminated sediment may enter the food chain such as known fishing and hunting areas if there is the possibility of uptake of contaminated sediments by wildlife fish or shellfish that may be eaten by people later Upstream sediments may be collected to determine background concentrations of the contaminants

Sediments may also be mechanically disturbed and transported to possible human exposure points by dredging Therefore sampling and analysis of the dredged sediments as well as the stream channels and impoundments may be needed at some sites

Contaminated sediments are not always found in constantly wet drainage areas Many drainage ditches surface impoundments and ephemeral streams associated with releases of hazardous waste are dry part of the year To prevent confusion between soil and sedi ment ATSDR defines sediment to be any solid material other than waste material or waste sludge that lies below a water surface that has been naturally deposited in a waterway water body channel ditch wetland or swell or that lies on a bank a beach or floodway land where solids are deposited For best evaluation of the potential exposure of the public sediment samples like soil samples should be shallow (0 3 inches) The information listed below is needed for ATSDR s analysis of the sediment pathway

1. Descriptions and locations on map of samples obtained
2. Depths of sampling points specify if sample is a composite of soil between specified depth ranges (e g 0 3 inches 3 12 inches 1 3 feet, etc)
3. Type of sample (e g grab or composite)
4. Sampling scheme for composite samples (e g composite of five grab samples from a 100 foot length of stream whether the sampling program was designed to collect samples at regular intervals or from depositional areas etc)
5. Constituents analyzed for analytical methods used detection limits QA/QC data and concentrations detected
6. Date of sampling event and site conditions at that time

GROUNDWATER EXPOSURE PATHWAY

Human exposure to contaminated groundwater from water supply wells is a common public health problem associated with hazardous waste sites To prevent or mitigate such exposure the location and use of potentially contaminated wells or springs should be identified as soon as possible after discovery of the hazardous waste problem Characterization of the vertical and lateral extent of the groundwater contamination plume is also needed to evaluate the groundwater exposure pathway but only as it relates to past, present and future contaminant movement to human exposure points

Groundwater pathways analysis and public health recommendations can be enhanced by the following approaches to groundwater monitoring

1 Correlation of groundwater contaminants measured in site monitoring wells to contaminants measured in water supply wells can be greatly improved if some of the site monitoring wells are screened in the same groundwater zone as the water supply wells

2 Because of the heterogeneous nature of groundwater systems water supply wells and springs within or at the leading fringe of a groundwater contamina tion plume usually need more than a one time sampling to be evaluated for possible human exposure Quarterly monitoring for at least one year is preferred

3 Valid comparisons between analyses of metals from groundwater samples and EPA drinking water standards can be made only if the groundwater samples are **NOT FILTERED** during sampling EPA drinking water standards and health studies are based on total metals (**UNFILTERED** samples) Unfiltered samples should <u>always</u> be taken at points of exposure e g private wells municipal drinking water systems etc All groundwater data for filtered and unfiltered samples should be provided to ATSDR

4 A few tap water samples should be included in any sampling of contaminated municipal or community wells because concentrations of contaminants mea sured at the wellhead may vary by an order of magnitude or more from concentrations measured at the drinking water taps in the system Environmen tal samples at human exposure points (drinking water taps) provide a better data set than wellhead samples to evaluate actual human exposure

Several types of information are needed for the groundwater exposure pathway analysis

A WELL SURVEY

1. Well survey and inventory within at least 1 mile of the site or within the potentially affected area whichever is greater
2. An inventory of a larger area downgradient of any known groundwater plumes depending on site specific hydrogeology and the extent of contamination The well inventory should include the number total depth screen interval well use yield status installation date pump type and age and location of all local wells and developed springs

B WATER SOURCES

Water sources designated by the following categories

1. Monitoring wells
2. Facility water supply wells
3. Municipal/utility wells springs or reservoirs
4. Residential wells or springs or small unregulated water systems
5. Commercial/industrial production wells
6. Irrigation wells (including wells that are part of lawn watering systems)
7. Community wells such as wells serving mobile home parks
8. Piezometers
9. Livestock water wells/springs

C HYDROGEOLOGY

Descriptions of site specific and regional hydrogeology including these characteristics

1. Depth thickness extent, name and characteristics (including flow direction) of all groundwater zones and aquifers affected or potentially affected by contaminants
2. Depth thickness extent name and characteristics (including flow directions) of all local drinking water aquifers
3. Vertical and lateral extent of groundwater contamination
4. Natural geochemistry (may be the same as background) of all contaminated groundwater zones and drinking water aquifers

D GROUNDWATER MONITORING

Descriptions of past and current groundwater monitoring including the following information

1 Dates and frequency of past and current monitoring
2 List of analytes and detection limits
3 Sampling procedures
4 Water level measurement procedures
5 Dates of and procedures used for aquifer tests

E ANALYTICAL DATA

Analytical results of groundwater monitoring including the following information

1 For each sample field measurements for temperature conductivity and pH
2 Tables of analytical results listed by sample location
3 Any available summaries of analytical results in which the maximum concentrations of contaminants are identified
4 QA/QC analyses for different sampling episodes
5 Analytical results of metal contaminants derived from **unfiltered** groundwater samples
6 Water level measurements calculated gradients potentiometric contour maps and figures
7 Monitoring well construction logs boring logs and site specific cross sectional maps
8 Descriptions of past current or planned groundwater remedial actions including provision of alternative water supplies
9 Descriptions and results of any geophysical geochemical (including tracer studies) or soil gas surveys performed for the purpose of defining sources and extent of groundwater contamination
10 Descriptions and locations of all known or surmised facility or site related sources of groundwater contamination Non site related sources may also be included if pertinent to contamination of water supply wells or springs
11 Descriptions and locations of any on site or near site groundwater/surface water recharge/discharge areas such as sinkholes sinking or disappearing streams stream bank or drainage ditch seeps leachate seeps or undeveloped springs

AIR EXPOSURE PATHWAY

Adverse health effects (acute and chronic) associated with inhalation of air contaminants are a common concern of citizens living and working near hazardous waste sites Air emissions from past or current production processes as well as volatilization of organic compounds airborne particulates and acid gases from hazardous waste areas may expose residents who live or work near the sites to contaminants at levels of health concern

Hazardous waste areas from which air releases may be significant are surface impoundments where there may be leaking drums or tanks containing volatile organic compounds landfills that produce methane gas which can migrate waste piles of materials that may be easily entrained by winds or that contain volatile organic contaminants and contaminated soils that may become entrained in the air by winds or vehicular traffic Air emissions may also be generated by excavation landfarming or bioremediation air stripping pond aeration incinerator stack emissions and ash and handling of decontaminated soil

Air releases from past and/or current production processes may cause off site deposition of contaminants that may lead to soil biota and surface water contamination which in turn may result in the population near the site having secondary exposure Therefore site characterization should include an evaluation of production area air releases meteorologic data (including wind rose or wind speeds and directions) and possibly modeling of those releases to determine potential off site air-exposure points and deposition areas that may need to be sampled Grab samples are generally not very representative of the long term exposure the public may receive from a facility since air concentrations can vary widely If grab samples are taken ATSDR recommends that several samples representative of the area be taken over time to assess the areal distribution and variation in concentration of the contaminants Information relevant to the air pathway is listed below

A AMBIENT AIR DATA

1. Locations where samples were taken including descriptions and illustrations on maps
2. Meteorologic conditions temperature wind speed and wind direction when samples were taken (i e which samples were upwind and which were down wind) cloud cover (i e sunny overcast) time of year and time of day or night
3. Sampling log including descriptions of activities in the area during sampling that may have contributed to concentrations of constituents detected (e g 10 feet from busy intersection 20 feet downwind from bulldozers excavating contaminated soil etc) and descriptions of measures taken to reduce emissions if ambient air monitoring is in conjunction with remediation activities (e g dust-control measures etc)

4 Height at which samples were taken Samples should be taken in the breathing zone (4 5 feet above ground)

5 Descriptions of sampling methods used and constituents collected by each method (personal monitors fixed monitoring stations Tenax® tubes total particulate or PM10 Drager® tubes OVA® HNU® etc)

6 Sampling frequency and dates (duration of continuous or integrated composite sampling grab samples etc) If grab samples are taken samples may need to be taken both at night and during the day in case the concentrations are affected by the change in meteorologic conditions

7 Constituents analyzed for analytical methods used detection limits QA/QC and concentrations detected

8 Ambient air sampling where people may be exposed at on and off site loca tions if fugitive air emissions are the only source of potential human air exposure and if on site or fence line sampling indicates contaminants are present at levels that could cause adverse health effects

9 Ambient air data from the maximum predicted off site exposure locations to ensure that modeling predictions are accurate and to protect public health if there are current stack emissions from production areas or remedial technolo gies and if modeling of those emissions indicates a potential for people off site to be exposed to constituents at levels that may cause health effects

10 Ambient air samples even if modeling does not indicate a potential for off site exposure at levels of health concern but exposure is plausible and there is community concern about site emissions

B STACK EMISSIONS DATA

1 Detailed descriptions of the treatment technology or manufacturing process associated with each stack including design drawings raw feed materials operating temperatures and conditions produ ts and by products of the system any air pollution control equipment etc

2 All permits (state and federal Clean Air Act polychlorinated biphenyls [PCB] and hazardous waste [RCRA]) if permitted under those programs or if a CERCLA unit all documents relevant to the unit s design and operating requirements

3 All compliance reports required under any of the previously described permits and any other documents that discuss past planned and unplanned air releases

4 All stack testing or trial burn results for the units (including testing or trial burn plans sampling analytical and QA/QC reports and any written reviews of the data)

5 Identification of the closest meteorologic station and general meteorologic conditions (including wind rose prevalence of air stagnation events or other

unusual conditions for that area) and a determination that the information is representative of the meteorologic conditions at the site and surrounding areas

6 Any air modeling for the stack(s) and/or fugitive emissions at the site (including all parameters used in the modeling such as land use terrain features nearby building dimensions meteorologic conditions used or dates and source of meteorologic data used in the modeling flue gas temperature and velocity stack height contaminant emission rate etc)

C SOIL GAS DATA

1 Analytical results from any soil gas surveys and a description of the sample locations and survey methods

2 Measurements of flammable and explosive gases such as methane or ethyl benzene at landfills and other waste source areas as well as at nearby buildings where such gases may be generated migrate or accumulate

3 Descriptions of calibration gases and concentrations needed in addition to the instrument readings of a combustible gas meter or other instrument calibrated to determine concentrations at or above the lower explosive limit of gases under investigation

4 Gas pressure measurements to estimate how far soil gas contaminants may migrate from their source to human exposure points such as occupied residences

   a. Permanent gas monitoring wells should be equipped with a permanent pressure gauge that should be read before sampling

   b Vertical and lateral zones of soil gas movement can best be determined when gas monitoring wells are screened in the most likely subsurface zone of movement and not over the entire depth of the unsaturated zone

5 Investigation of buried utility lines that lie beneath or adjacent to the hazardous waste area to determine if they serve as preferential pathways for soil gas movement from the source area into occupied buildings

D INDOOR AIR QUALITY DATA

Indoor air sampling data may be needed to determine potential health effects on building occupants (workers and/or residents) if on site buildings that are occupied (or may be occupied by people in the future) are constructed of contaminated materials or the buildings became contaminated during use Indoor air sampling may also be needed if gases or volatile organic compounds are known to be migrating through the soil or if soil gas measurements around the building indicate that gases may accumulate in the building If flammable or explosive atmospheres are possible instruments capable of detecting flammable and explosive

gases at and above the lower explosive limit should be used Specific indoor air sampling data are needed

1 Type of instruments and sample collection methods used (include air volume sampled)
2 Analytical data and analytical methods used including detection limits for all contaminants calibration of equipment and QA/QC procedures and results
3 Date time and temperature when samples were taken
4 Diagram of building showing sampling locations
5 Descriptions of building construction materials and significant construction features (on concrete slab basement, number of stories below grade on stilts etc)
6 Descriptions of sampling locations including type of room (bedroom den garage basement attic process area or storage area etc) height in the room and distances from significant structures in the room such as ceilings hoods vents workbenches chemical storage or use areas doors or other large open ings etc
7 Descriptions of building air flow before and during the sampling (e g was the building unoccupied and closed with no air circulation? Was central heating or air conditioning operating for sufficient time to reach equilibrium in air quality?)
8 Descriptions of other contaminants that may be present in the air because of normal building use (especially important for residential sampling) such as chemicals or solvents used for hobbies freshly painted surfaces cleaners lawn care products tobacco smoke etc
9 Data from aggressive air sampling of buildings that are/may be contaminated with metals particulates or fibers Aggressive air sampling is any method used to agitate particulates or fibers that may have settled out of the air or that could easily become airborne because of human activity (usually the use of high powered fans or leaf blowers) The air should be agitated either during the entire time that an air sample is being collected or at regular intervals during the sampling period Aggressive air sampling gives the most conserva tive of worst case results of a given contaminant in indoor air
   a ATSDR recommends that such sampling be performed because it is difficult to interpret surface wipe sampling data for health purposes
   b Aggressive air sampling should be conducted when buildings are not occupied with the indoor air constantly stirred up to simulate worst case conditions
   c Contaminants may be in homes as a result of contaminated soil being tracked in contaminated clothing being brought home from work or air deposition through open windows vents etc

E INDOOR DUST DATA

In some cases indoor air sampling may not be appropriate or possible If sampling must be done while the building is occupied conducting aggressive air ampling for particulate and fiber contaminants may increase the exposure of occupants by making contaminants airborne If this is a concern dust sampling should be used to determine human exposure

A typical scenario for which indoor dust sampling may be appropriate would be a residential setting where soil lead contamination is at or near levels of health concern In this case lead contamination s being tracked indoors and being ingested by infants or young children would warrant indoor dust sampling Any contaminant that can be analyzed from a particulate sample can be measured via dust sampling

If indoor dust sampling is conducted the data listed below are needed

1 Surface area vacuumed (i e square feet)
2 Description of the area sampled Is activity in the area high or low? Is the area accessible (i e kitchen floor vs behind couch or a combination)? Are floors in the sampled building or area carpeted hardwood concrete linoleum etc ?
3 Description of the sampling equipment and collection media
   a High Efficiency Particulate Air (HEPA) filters are recommended
   b ATSDR recommends that samples not be taken from the resident s vacuum cleaner because the resident may use the vacuum in other areas besides the home (e g garage workplace etc) and the maller particles are not captured in a vacuum bag Some studies have shown that more contaminants are attached to small particles than to large particles
4 A copy of the indoor dust sampling plan The detection limits that will dictate how large a sample to collect must be at or below the level of health concern for the contaminants present
5 Are there any other possible contributing factors to the contamination besides surface loading (i e hobbies lead paint etc)?

If the results of indoor dust sampling indicate a health threat sampling after an indoor cleanup will be needed to verify that the threat has been eliminated In theory this should be easy If the cleaning is sufficient there should be no dust remaining to collect and therefore no contamination However this has not always been the case In some instances the contaminant concentrations appeared to have increased as a result of remediation ATSDR recommends that the same area be vacuumed before and after cleanup but acknowledges that it will sometimes be necessary to vacuum a larger area after cleanup to get enough dust to analyze If that is required in the sampling plan the plan should also include a requirement for wipe sampling a same sized area before and after cleanup Wipe sampling will document the contaminant surface loading before and after remediation

E INDOOR DUST DATA

In some cases indoor air sampling may not be appropriate or possible If sampling must be done while the building is occupied conducting aggressive air sampling for particulate and fiber contaminants may increase the exposure of occupants by making contaminants airborne If this is a concern dust sampling should be used to determine human exposure

A typical scenario for which indoor dust sampling may be appropriate would be a residential setting where soil lead contamination is at or near levels of health concern In this case lead contamination s being tracked indoors and being ingested by infants or young children would warrant indoor dust sampling Any contaminant that can be analyzed from a particulate sample can be measured via dust sampling

If indoor dust sampling is conducted the data listed below are needed

1 Surface area vacuumed (i e square feet)
2 Description of the area sampled Is activity in the area high or low? Is the area accessible (i e kitchen floor vs behind couch or a combination)? Are floors in the sampled building or area carpeted hardwood concrete linoleum etc ?
3 Description of the sampling equipment and collection media
   a High Efficiency Particulate Air (HEPA) filters are recommended
   b ATSDR recommends that samples not be taken from the resident s vacuum cleaner because the resident may use the vacuum in other areas besides the home (e g garage workplace etc) and the smaller particles are not captured in a vacuum bag Some studies have shown that more contaminants are attached to small particles than to large particles
4 A copy of the indoor dust sampling plan The detection limits that will dictate how large a sample to collect must be at or below the level of health concern for the contaminants present
5 Are there any other possible contributing factors to the contamination besides surface loading (i e hobbies lead paint etc)?

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FOOD CHAIN EXPOSURE PATHWAY

People may be exposed to site contaminants by eating plants or animals that have incorpo rated the contaminants into their bodies Both on and off site hunting fishing foraging and farming activities may bring people into contact with those contaminants Some substances particularly fat soluble substances and heavy metals may reach concentrations in animal tissues that are thousands of times higher than those found in water soil and sediment For discussion in the PHA it is important that the *edible portions* of such food items be analyzed for contaminants of concern *Edible portions* of food items needs to be determined at each site based on the eating habits of the various ethnic populations that may ingest the various food items being analyzed e g residents of one community may eat skinned fillets of fish while those in another community eat the whole fish If several ethnic groups are present in the potentially exposed community it would be desirable to have samples analyzed based on each ethnic group s eating habits however if this is not possible the worst-case eating habits should be used to determine the samples to be analyzed It is difficult to draw meaningful human food safety conclusions when the whole body of a fish is analyzed rather than fillet samples if the community typically eats only fillets of that type of fish or when a whole plant is analyzed and only the fruits are normally ingested

When planning and designing an investigation of food chain contamination it is important to have a well designed biota sampling protocol with sample size large enough to be statisti cally significant (more than 20 samples per location per sampling episode are recommended when parametric statistical methods will be used) In particular organisms of different species ages or reproductive status should not be sampled without strong justification For example when assessing the impact of contaminated sediment upon the edible fish popula tions in a stream results of analyses of tissues from bottom feeding fish should not be combined with those from water column feeders because of their different feeding habits very different effects may be expected Discrete (grab) samples are preferred because ATSDR tries to determine the maximum contamination in order to model worst case scenarios

Special handling of biologic samples needs to be considered Some analytical procedures require that live or fresh frozen fish be transported to the lab immediately for analysis the accuracy of other procedures may not be affected if formalin preserved specimens or those held frozen for weeks or months are used Such considerations along with any special problems encountered should be included in an appendix to the document for quality assurance review

When contamination of consumable plants and/or animals is suspected specific data are needed by ATSDR to evaluate the food chain pathway