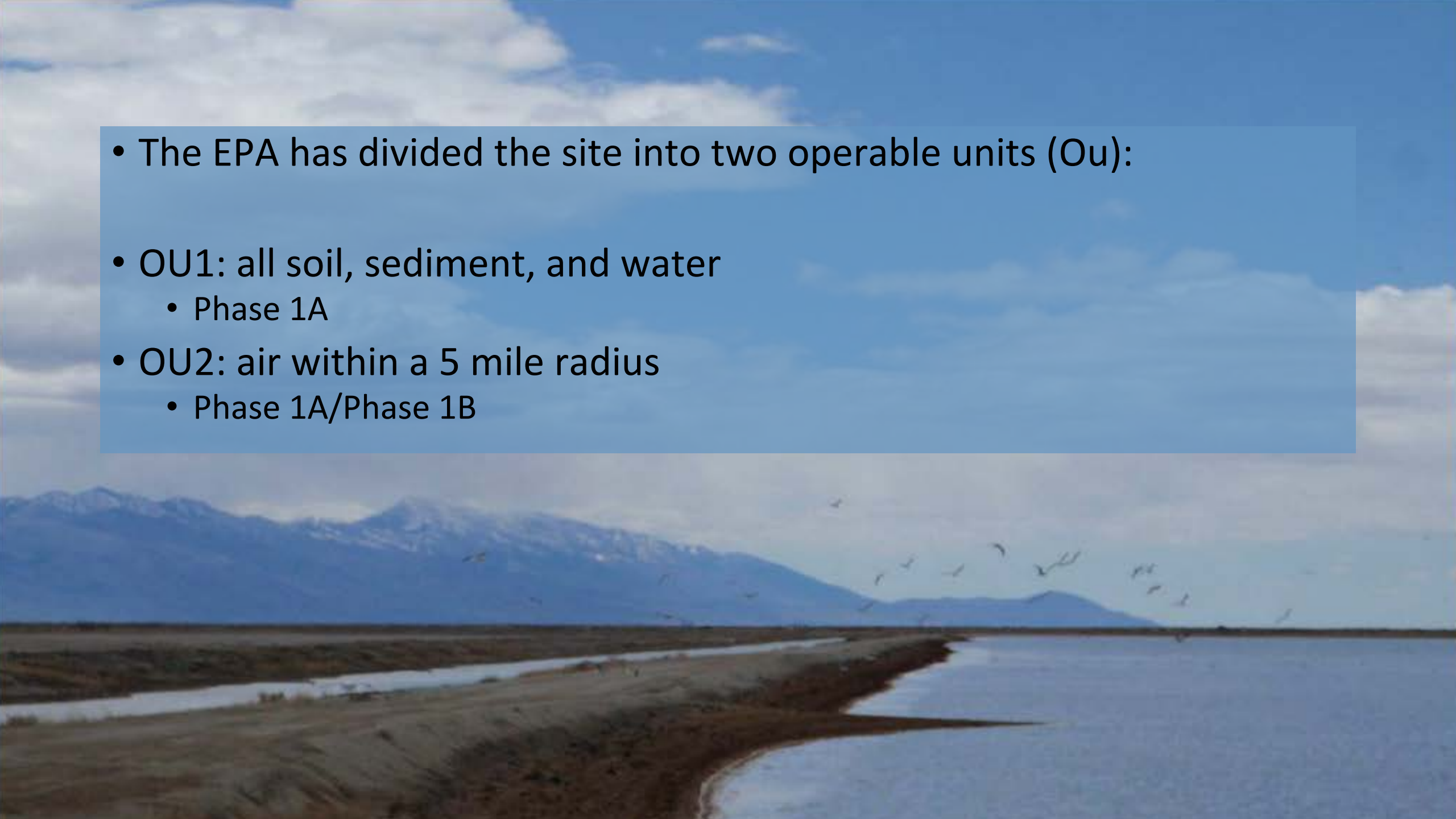
Contaminated Media at US Magnesium

Documents used:

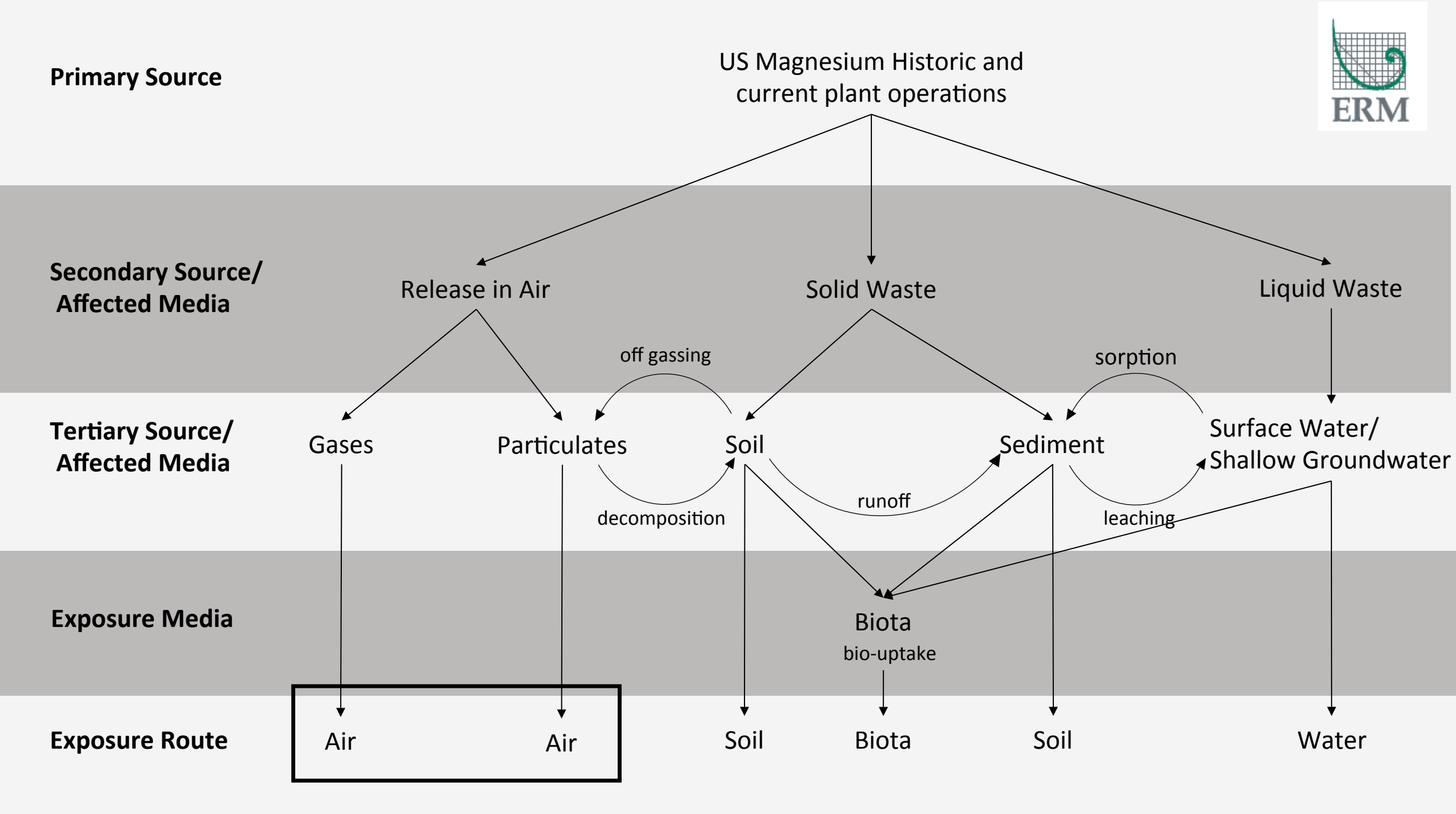
- HRS Documentation Record
- US Magnesium Remedial Investigation Activities
- Expert Rebuttal Report of Dr. Richard L. DeGrandchamp, PhD.
- US Magnesium Conceptual Site Model for Human Exposure
- Phase 1A Remedial Investigation Sampling and Analysis Plan to Identify Chemicals of Potential Concern in Soils, Sediment, Solid Waste, Water, and Air, and Receptor Surveys

Phase 1A Attachment 10B Site Photographs



- The EPA has divided the site into two operable units (Ou):

- OU1: all soil, sediment, and water
  - Phase 1A
- OU2: air within a 5 mile radius
  - Phase 1A/Phase 1B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US Magnesium Historic and current plant operations
Secondary Source/ Affected Media
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Liquid Waste
off gassing
sorption
Tertiary Source/ Affected Media
Gases
Particulates
Soil
Sediment
Surface Water/ Shallow Groundwater
runoff
decomposition
leaching
Exposure Media
Biota
bio-uptake
Exposure Route
Air
Air
Soil
Biota
Soil
Water

Air

"On two occasions during the Phase 1A activities, with a strong north wind, chlorine gas could be noted (smelled) by PWT3 personnel as far south as the Muskrat Fire Station (approximately 18 miles away)."

Phase 1A Remedial Investigation Sampling and Analysis Plane for Operable Unit 2- Ambient Air

Air

- Releases of gases, aerosol, and/or particulates from stacks, fugitive emission from process system, and fugitive dust from waste piles

Air – Stacks, Landfill and Gypsum Pile (PRIs 12 & 4)

Ancillary Worker Area (PRI 12)

Radius of Gypsum Pile (PRI 4)

Extent of Landfill (PRI 2)

Air

- Releases of gases, aerosol, and/or particulates from stacks, fugitive emission from process system, and fugitive dust from waste piles

- Previous investigations and an understanding of plant operations indicate that the following are potential COPC:
  - Cl_2

Chlorine gas: Cl_2

- Used as a weapon in WWI
- Cl_2 generated in the electrolytic refining process are captured and then recycled or sold
- BUT opportunity for fugitive emissions as well as emissions from the stack are present

Air

- Releases of gases, aerosol, and/or particulates from stacks, fugitive emission from process system, and fugitive dust from waste piles

- Previous investigations and an understanding of plant operations indicate that the following are potential COPC:
  - Cl_2
  - VOCs
  - SVOCs

Volatile organic compounds (VOCs)

- Vaporize easily→ stay in the air
- e.g. VOCs are responsible for ozone and contribute to inversion in Salt Lake

Semi-volatile organic compounds (SVOCs)

- Do not vaporize as easily, but are still found in air

Air

- Releases of gases, aerosol, and/or particulates from stacks, fugitive emission from process system, and fugitive dust from waste piles

- Previous investigations and an understanding of plant operations indicate that the following are potential COPC:
  - Cl_2
  - VOCs
  - SVOCs
  - Trace elements

Trace Elements

- Come from the Anode Dust Box
- Designed to collect off-gasses and dust by-products on site
  - All have high values of arsenic, chromium and mercury
  - Concern for gas and particulate release to air
- Dust is removed by workers with shovels with no dust collection or control procedure in place

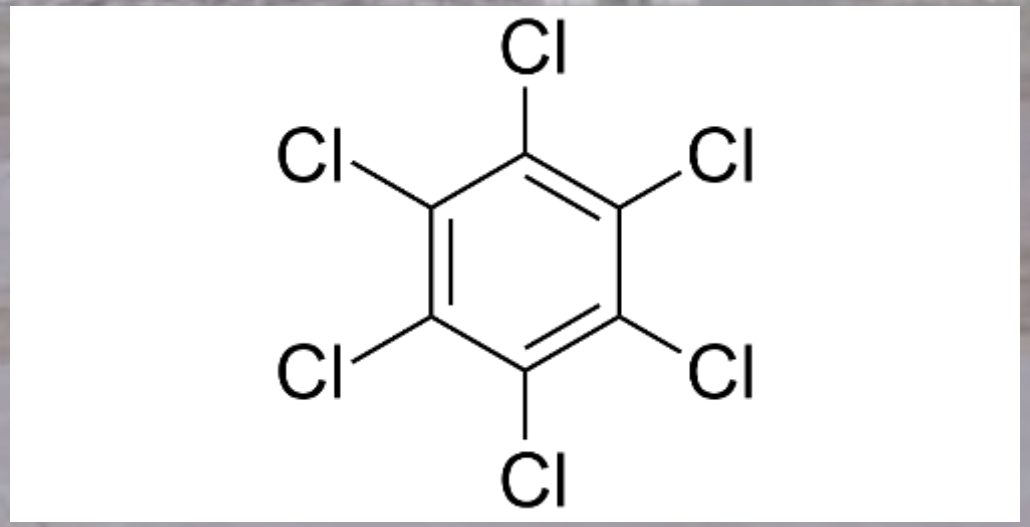
Air

- Releases of gases, aerosol, and/or particulates from stacks, fugitive emission from process system, and fugitive dust from waste piles

- Previous investigations and an understanding of plant operations indicate that the following are potential COPC:
  - Cl_2
  - VOCs
  - SVOCs
  - Trace elements
  - Non-volatile Organic Compounds
  - Other PM_{10}

Non-volatile organic compounds

- Do not readily vaporize into Air
- PCBs, Dioxins, and HCBs have all been attributed to both source and non-point source air release
- Polychlorinated biphenyls (PCBs)
- Dioxin and dioxin like compounds
- Hexachlorobenzene (HCB)



Air: Stack Emissions

There are 6 stacks:

3 Spray Dryer Systems

- PM10, PM2.5, HCl, natural gas combustion products, steam

1 melt reactor/chorine-plant tail-gas

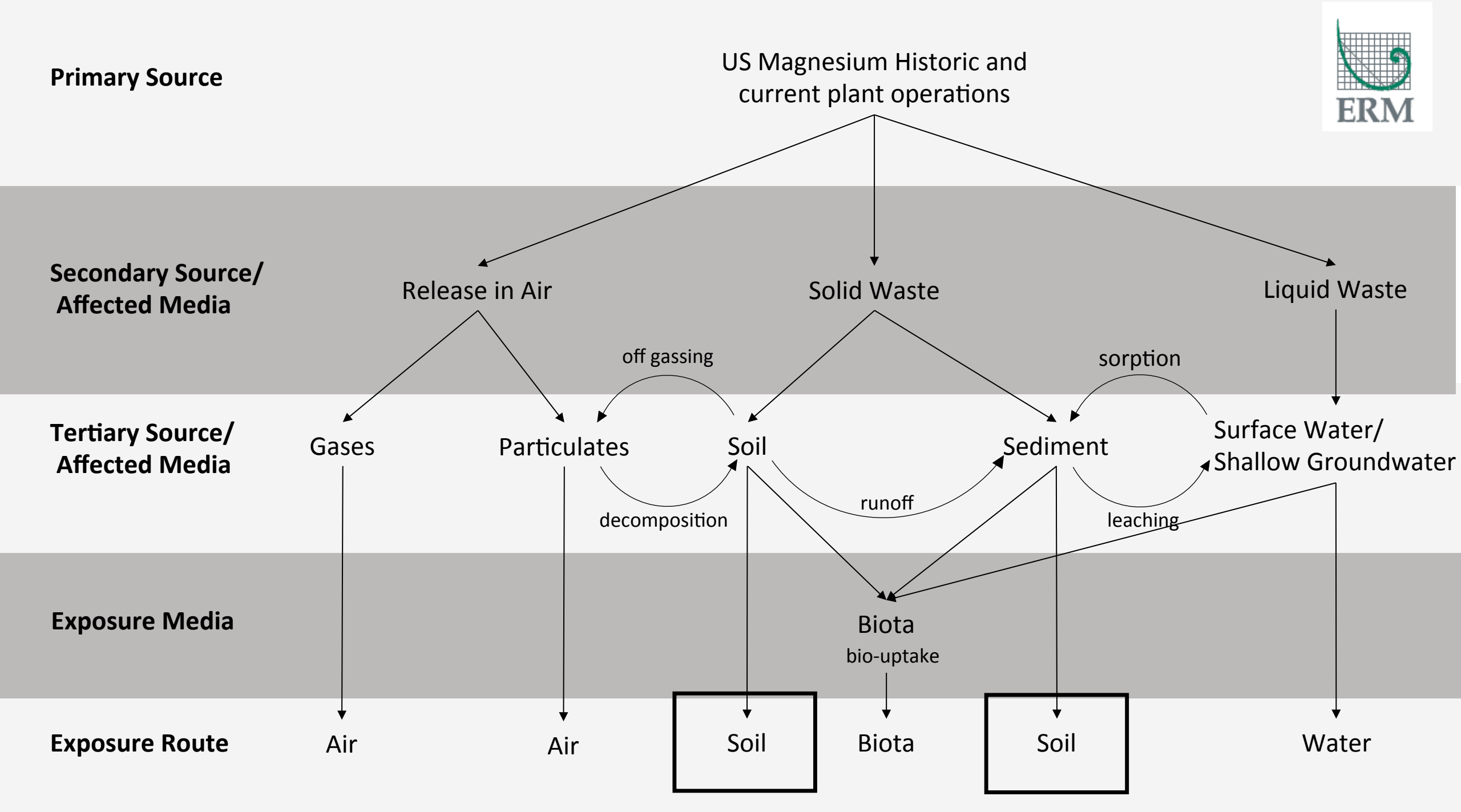
-PM10, PM2.5, Cl2, and dioxins/furans

1 chlorine bypass scrubber

-Cl2, PCBs, and HCB

1 Emergency off gas scrubber

- Sampling sites in Phase 1A and Phase 1B were determined
  - Model for air dispersion (AERMOD) with site-specific meteorological data from the nearby ATI Titanium facilities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Soil

- Concern for high concentrations in soil and risk for fugitive emissions into the air or water
- Previous investigations and an understanding of plant operations indicate that the following are potential COPC:
  - Dioxins/furans
  - Polychlorinated Biphenyl (PCBs)
  - Hexachlorobenzene (HCBs)
- Results indicate that chemical concentrations are thousands of times higher than safe environmental levels

Soil - Ditches (PRI 1)

Main Ditch

Chlorine Ditch

Central Ditch

Soil - Waste Ponds (PRIs 5,6,&7)

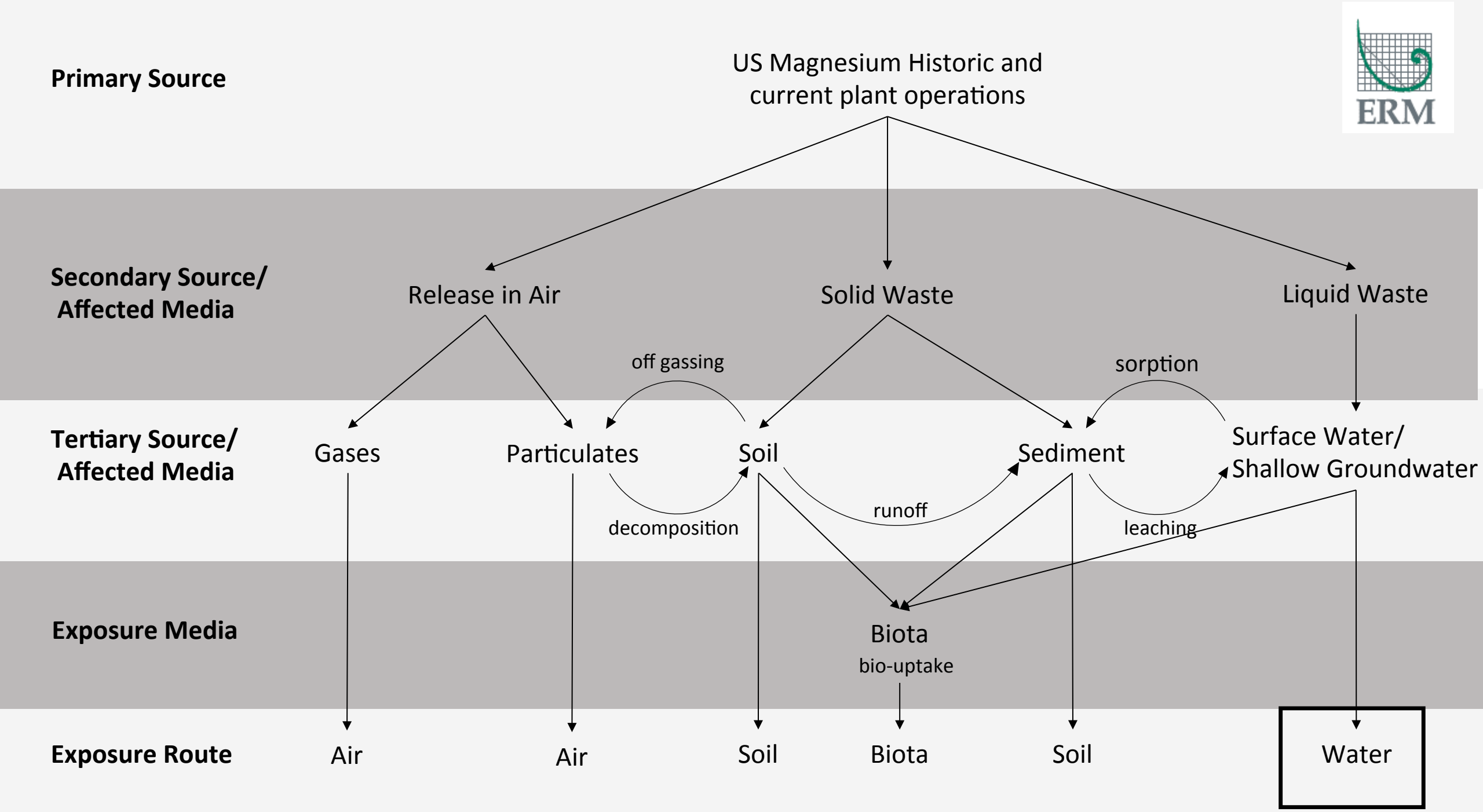
NE Waste Lagoon (Inactive)

SE Waste Lagoon

NW Waste Lagoon

Soil

- Utah division of air quality collected sediment from the central ditch in 1998 and found high levels of dioxin (31.1 ppb) and HCB (320 ppm)
- EPA collected soil samples in 1999 found HCBs ranging 210-400 ppm
- Consistent measurements of HCB, PCBs, dioxins, and furans from top 18 inches GSL impoundment
- Concern for transport in soil through release into air and fluctuating GSL level (flood ~20 years ago)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Surface Water

Surface Water:

- Areas of highest concern are the sanitary lagoon, active waste pond, gypsum pile, and the old waste pond near the former inlet.
  - water in the active waste pond (and most ditches) has a pH <1, which causes distress in any bird that comes into contact with the water

Water – Sanitary Lagoon, Waste Lagoons (PRIs 3,5,6 & 7)

Sanitary Lagoon

NW Ponded Waste Lagoon

SE Ponded Waste Lagoon

Groundwater

- Less extensive than soil and sediment contamination
- HCB, PCDDs, and PCDFs in isolated areas, and a localized VOC plume
- Contaminants stay in environment (10s of years):
  - Unreactive
  - Insoluble
  - Do not vaporize quickly into the atmosphere
- Possible leakage from acidic waste impoundments

Groundwater

- Groundwater was not considered in the HRS
  - US Mag draws its water from 4 miles away
  - No one is using groundwater close to the site
- Little oxygen - anoxic
- Native groundwater is brackish to saline (class IV by DWQ)
- Chlorine was the dominate anion, but bromide, sulfate, and fluoride were found
- Sodium, calcium, and magnesium were primary cations

Groundwater

- PCBs- not detected in groundwater, even in areas with high sediment concentrations
- HCBs- measured in isolated areas (wells near the PR1 Area ditches)
  - 0.41 to 3.0 ppm
- pH in the groundwater aquifer below the site is 6.42 to 7.12

- Great Salt Lake is not a PRI, but is proximal to the site