



# EPA Update

## Waste Isolation Pilot Plant Multi-Agency Site Survey And Assessment Manual Phosphogypsum

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## Ongoing Activities



- Waste Isolation Pilot Plant (WIPP)
  - EPA is reviewing the Department of Energy's fourth Compliance Recertification Application (CRA), submitted in 2019
  - EPA will shortly publish a Federal Register notice announcing its determination that the CRA is complete and the end of the public comment period
  - The Agency will have six months to issue a recertification decision
- Multi-Agency Radiation Site Survey and Assessment Manual (MARSSIM)
  - MARSSIM is a tool for conducting final site surveys after decommissioning or cleanup
  - Revision 2 of MARSSIM is undergoing EPA Science Advisory Board review
  - SAB is operating again after re-constitution by the new administration
  - Public comment period ended September 14, 2021 but will be re-opened
- See <http://www.epa.gov/radiation> for more information

## Phosphogypsum



### Topics:

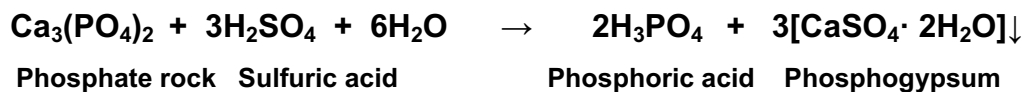
- Phosphogypsum Production and Management
- EPA's Regulation of Phosphogypsum
- Approving Other Uses of Phosphogypsum
- The Fertilizer Institute's Road Use Request
- Final Thoughts

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## What is Phosphogypsum?



- Phosphogypsum is a byproduct of processing phosphate rock into fertilizer:



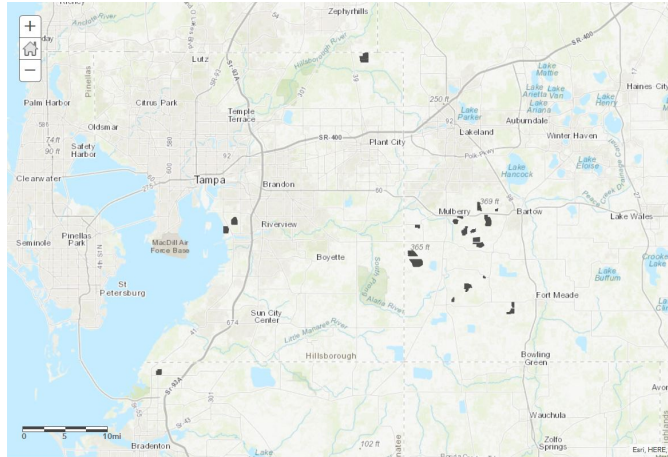
- Phosphogypsum contains elevated levels of radium-226 and emits radon
- 40 CFR Part 61 Subpart R (1989) requires phosphogypsum to be managed in stacks
  - Stacking was typical practice at the time of the regulation
  - Stacking was identified as the best disposal option, not an ideal solution
  - Stacks have grown in number and size since the regulation was promulgated

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# Phosphogypsum Stacks: Distribution

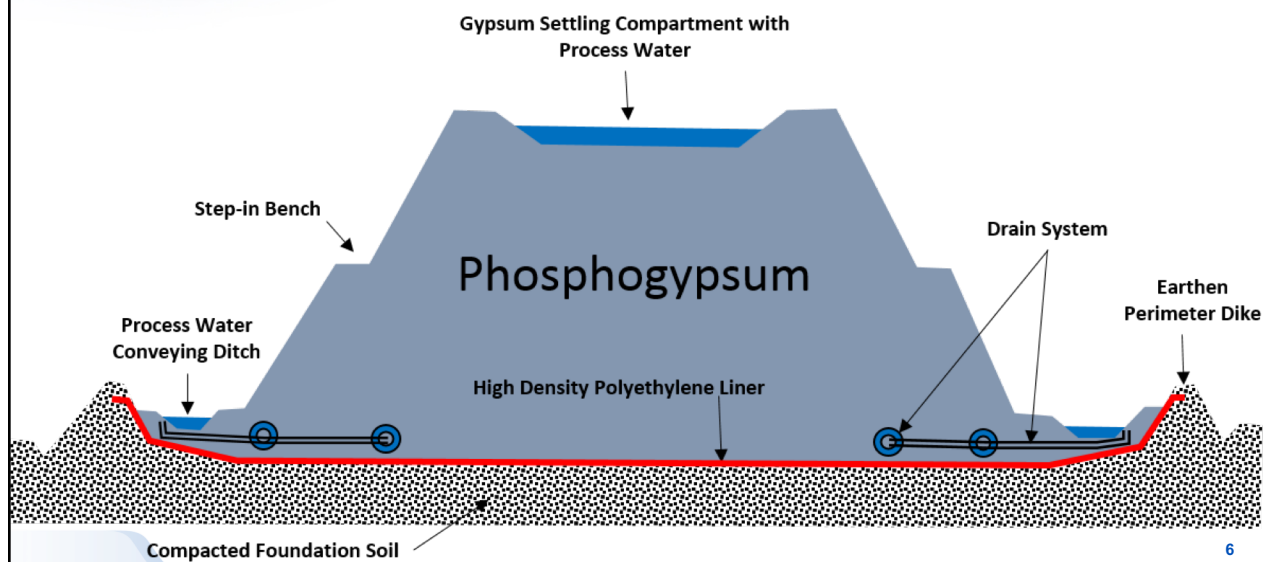


- ~50 facilities, 70 individual stacks
- EPA Regions 4, 5, 6, 7 and 10
- Stories high
- Hundreds of acres in extent



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# Major Components of a Gypsum Stack



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## Challenges of Stacking



- Mosaic Mulberry, Mulberry, FL: August 2016 sinkhole
- Mississippi Phosphates Corporation, Pascagoula, MS: added to National Priorities List January 2018
- Mosaic Uncle Sam, St. James Parish, LA: February 2019 stack instability issues
- Piney Point Plant, Manatee County, FL: March 2021 water releases and stack instability

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## Why Does EPA Regulate Phosphogypsum?



- Radionuclides were listed as a Hazardous Air Pollutant (HAP) under the Clean Air Act in 1979, and phosphogypsum was identified as a source category for radionuclides
- Phosphate rock typically contains elevated levels of uranium-238 and its decay products, including radium-226
  - Uranium recovery is possible from the wet acid process
- Phosphogypsum typically contains elevated levels of radium-226, which decays to radon-222 gas
- The National Emission Standard for Hazardous Air Pollutants (NESHAP) is designed to limit radon emissions to the environment

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## How does EPA regulate phosphogypsum?



- 40 CFR part 61, subpart R (1989)
  - Sets work practice requirement to manage phosphogypsum in stacks
  - Sets radon flux limits for inactive stacks of 20 pCi/m<sup>2</sup>/sec radon-222 into the air
    - Measured and reported once at closure
- Subpart R revised (1992)
  - Permits the following uses of phosphogypsum:
    - Agricultural application (if less than 10 pCi/g radium-226)
    - Indoor research and development (limited to 7,000 lbs)
    - Other uses may be approved by EPA on a case-by-case basis following a written request

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## Other Uses of Phosphogypsum



- Requests for other uses must demonstrate that the proposed use will present risks to the public or environment no greater than if the phosphogypsum were left in the stack
  - Based on analyses performed at the time of the rule and subsequent guidance, EPA has interpreted this threshold to be a  $3 \times 10^{-4}$  lifetime risk of fatal cancer.
  - Risk assessments for several agricultural, road construction, and research use scenarios are included in EPA's 1992 Background Information Document.
- EPA prepared a detailed workbook (2005) to aid those who are preparing petitions
- To date, no uses have been approved and implemented

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## Other Uses of Phosphogypsum



### (Continued)

- Proposal by the Florida Industrial and Phosphate Research Institute (FIPR) for use as daily landfill cover in Brevard County, FL
  - Process began in early 2003, in December 2004 EPA issued conditional approval for public comment
  - In May 2005 Brevard County withdrew, and FIPR formally withdrew the request in June 2005
- Louisiana State University (LSU) pilot study for erosion control barriers
  - In March 2005, LSU presented a concept to combine phosphogypsum with fly ash and Portland cement, encased in a limestone armor
  - LSU altered its request multiple times to develop an adequate risk assessment, but did not submit a complete final request
- From 2005-2019, EPA received inquiries about uses that included airport runways, paving stones, and roadbed
  - None resulted in written requests until road request in 2019

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## The Fertilizer Institute - Road Use Request



- September 6, 2018: EPA met with The Fertilizer Institute (TFI) and representatives of phosphate producers
  - TFI stated that management in stacks is more burdensome than anticipated
  - TFI felt that EPA's 1992 risk assessments were outdated and overly conservative
- TFI expressed interest in submitting a “master petition” with the goal of categorically approving uses, and identifying specific users later
  - Many potential users lack the expertise to perform a risk assessment
  - Potential users may not be able to go through a lengthy approval process
- RPD agreed to work with TFI and to review a generic risk assessment, which could then be used in support of a two-part application process for other uses
- TFI submitted a request to use phosphogypsum in road construction by governmental Departments of Transportation or Public Works
  - Initial request submitted October 2019, revised request submitted April 2020

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## TFI Risk Assessment



- TFI's risk assessment addressed risks to nearby residents, road users, road construction workers, and at EPA's request, future residents of the abandoned road site
- The results of TFI's risk assessment agreed closely with the EPA's 1992 generic risk assessments, allowing useful comparisons
- The lifetime risks to a resident living near a road constructed using phosphogypsum and to users of the road are small
- The generic risk assessments support approval for road use only
  - EPA previously used the scenario of a future resident on the site of the abandoned road to bound the maximum risk associated with "the ultimate disposition of the material"
  - TFI does not consider a future resident to be a credible risk assessment scenario
  - EPA staff investigated current road abandonment practices and found no reason to completely discount future residential use
  - Radiological risks associated with living in a structure constructed in or on phosphogypsum from a road bed are likely unacceptable

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## TFI Request: Risk Outcomes



### Lifetime Risks Scaled to a 35 pCi/g Ra-226 Concentration in Phosphogypsum

	Scenarios (Exposure Duration)	Total Risk for Exposure Duration (x 10 <sup>-4</sup> )	
		1992 EPA BID	2019 TFI Risk Assessment
1	Road Construction Worker (10 years)	2.0	1.3
2	Road User (30 years)	0.39	0.15
	Truck Driver (10 years)	N/A	0.26
3	Nearby Resident (30 or 26 years)	0.0067	0.10
	Utility Worker (10 years)	N/A	0.26
4	Reclaimer (30 or 26 years)	35	0.4

Note: Benchmark is lifetime risk <3 x 10<sup>-4</sup>

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## TFI Approval and Withdrawal



- EPA approved TFI request for use of phosphogypsum in government road projects on October 20, 2020
  - Conditions to keep road design within the parameters of the generic risk assessments
  - Conditions to preserve records and prevent future non-road use
- Response:
  - No specific road projects proposed
  - Center for Biological Diversity petitions for review and reconsideration of the decision
  - Hillsborough Co, FL ordinance prohibiting use in roads
- EPA review this spring found that the request did not provide all the information required by the regulation
  - EPA withdrew the approval on June 30, 2021

<https://www.regulations.gov/docket/EPA-HQ-OAR-2020-0442>

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## Final Thoughts



- Revisiting the 1992 risk assessments and adding a suite of reviewed calculations was valuable; particularly the comparability of results from differing modeling approaches
- Technical and policy issues associated with the management and of phosphogypsum will continue
  - ~ 1 billion tons of phosphogypsum stacked in Florida, > 30 million tons produced annually
  - 1,800 miles of four-lane highway would be required to divert Florida's annual phosphogypsum production
- Improved management will require creative changes to current business and regulatory paradigms
  - Emerging interest the recovery of rare earth elements
- Policy will be shaped by many factors other than radiological risk, including social and economic concerns
- Phosphogypsum management is worthy of continued study

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