



The Future of RCRA — Making the Business Case

Prepared by The Horinko Group

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Table of Contents

Forward

Executive Summary

I. Introduction

II. Historical Successes & Innovations

- a. Waste & Materials Management
- b. Corrective Action
- c. Programmatic Efficiencies

III. Existing and Future Challenges for RCRA

- a. Waste & Materials Management
- b. Corrective Action
- c. Programmatic Efficiencies

IV. Toward 2040: Priority Focus Areas Going Forward

- a. Defining 2040 goals
- b. Waste & Materials Management
- c. Corrective Action
- d. Programmatic Efficiencies

V. Conclusion

Forward

Our nation's waste programs are at an historic crossroads. The Resource Conservation and Recovery Act (RCRA) has made great strides in its first 40 years since enactment, revolutionizing the way wastes are managed in this country and spurring ever increasing recycling and resource recovery by the public and private sector. Yet, as we plot the course of this important program for the next several decades, enormous challenges remain. In the fall of 2016, The Horinko Group engaged in a wide-ranging and constructive dialogue with hundreds of stakeholders to debate the ideal future state for the RCRA program. Harking on the successes of EPA's "RCRA 2020" vision, we have termed this strategy the "RCRA 2040" initiative. In developing this blueprint, we have identified several important themes:

— Sustainable materials management will be key to future environmental progress and economic success. Most forecasts suggest that the need for materials will grow by 30% just to keep pace with economic growth globally. In addition to the challenge of materials management, this issue is compounded by the fact that materials are responsible for approximately 40% of greenhouse gas emissions worldwide. Our survey of thought leaders revealed that this issue is one of the most pressing as we move from RCRA 2020 to RCRA 2040.

— The interconnectivity of RCRA and the Toxic Substance Control Act (TSCA) also resonated strongly. TSCA requires manufacturers and importers to notify EPA when there is a significant new use or new chemical in commerce. However, there is little to no coordination of EPA's assessment of the risks associated with the new use or chemical, and potential issues further down the supply chain and ultimate disposition. If downstream users, arrangers for disposal, and cleanup regulators could have some advance screening tools of the new uses or chemicals, it could result in expenditure of few cleanup efforts as well as reduced hazards from exposure.

— Significant new tools are growing to speed up the cleanup process, improve outcomes, and promote revitalization. The RCRA Lean pilots are already taking years off the lifetime of many corrective action processes. Innovative GIS concepts are providing integrity to long-term stewardship controls, empowering local communities and developers, and spurring economic growth. Green and sustainable remediation projects are bringing contaminated properties to new life as pollinator gardens and public parks. All of these efforts promote efficiency and public-private partnerships.

Tackling these new ideas will not be easy, but the stakeholders with whom we worked showed great enthusiasm and energy. Key to success will be open-mindedness to experimentation, willingness to take risk, and commitment to cooperation across the board. The RCRA practice community has a long track record of success, and I am confident that we are up to this important task.

Marianne L. Horinko, President, The Horinko Group

Executive Summary

As the Resource Conservation and Recovery Act (RCRA) reaches the 40th anniversary of its enactment, we have the opportunity to reflect on the progress made, acknowledge the challenges overcome, and by learning from its history, consider how to plan for those that might arise in the program's future.

The Horinko Group has worked to collect lessons from RCRA's past and opportunities for its future by interviewing an array of experts who approach the topic with extensive experience from private sector, federal government, and state government perspectives. Also reflected here are insights shared on these topics at THG's 2016 Summit, *The Future of RCRA – Making the Business Case*, held on October 26, 2016 in Washington, DC. The event convened a community of experienced practitioners to exchange ideas and discuss priorities for RCRA's future.

This report is not a comprehensive analysis of every aspect of RCRA, but instead highlights a selection of the common themes and key takeaways heard in both the interviews and Summit. Our goal is to identify priority focus areas as EPA looks towards RCRA's future and its "2040 goals."

Notable themes heard regarding RCRA's successes include:

- *Tailored Regulations* – Onerous rules have evolved to become more focused and less burdensome for the regulated community, while resulting in comparable protection of human health and environment (e.g., conditionally exempt small quantity generators; miscellaneous units standard; universal waste regulations; industrial wipes).
- *Sustainable Materials Management* – Life cycle or "cradle-to-cradle" approach has been promoted to emphasize waste reduction, prevention, reuse, and recycling to minimize disposal rates and reduce environmental impact of materials throughout their life cycle.
- *Corrective Action Milestones* – Environmental indicators have been established to provide important interim milestones in the cleanup process. Risk-based concepts have been embraced giving companies the flexibility to resolve their liabilities related to legacy contamination. Delegation of authority from the EPA Region to the State has been transformative. Program has moved towards a focus on greener cleanups and sustainable reuse, while embracing new technologies.
- *Programmatic Efficiencies* – Administrative and financial burden of compliance and enforcement has been streamlined through e-manifest and Lean initiatives.

Notable themes heard regarding RCRA's challenges include:

- *Raw Materials Consumption* – The rate of raw materials consumption necessary to support global economic expansion poses a significant challenge that will require global coordination and implementation of sustainable materials management practices.
- *Ever-Changing Marketplace* – Since its enactment, new types of waste and chemicals have emerged that RCRA may not be well suited to manage.
- *Greater Resource Efficiency* – Areas remain in which the program may be overly complex and unnecessarily burdensome, and in some cases does not encourage resource efficiency (critics point to the Definition of Solid Waste and the Land Disposal Restriction standards as areas for potential continued improvement).
- *Prioritizing Protectiveness* – Areas remain where regulations are less stringent or exemptions may benefit from reexamination to ensure proper waste management practices and protection of human health and the environment.
- *Corrective Action Challenges* – Persistent and emerging challenges include evolving science and new information on contaminants requiring reexamination of cleanups, undergoing large-facility cleanups while private industry operations are ongoing, legal clarity for local government exemptions in cases where municipalities take title to blighted properties, length of time companies and regulators are engaged in site cleanups, and improved groundwater monitoring.

Notable themes heard regarding key priorities for EPA to consider going forward:

- *Life Cycle Analysis (LCA)* – LCA can improve the productivity of material use as well as make the business case for sustainable materials management. LCA should combine elements of life cycle *impact* assessment with life cycle *costing* for any set of alternatives being examined. Incentivizing upstream behavior and influencing the design process so as to improve end of life issues will be a critical component moving forward.
- *Regulatory and Programmatic Refinements* – It may be time for states and EPA to strengthen land disposal requirements for large volume special wastes or develop a framework for managing materials that are excluded from the definition of hazardous waste. There may also be a need for continued refinement of corrective action and compliance assistance programs.
- *Better Informed Resource Recovery* – A more complete understanding on the part of companies and regulators is needed of what chemicals and materials comprise products entering into the marketplace. This information must be transparent, declared, reported, and communicated throughout the supply chain. RCRA's

programs would benefit from closer coordination and exchange of information with EPA's TSCA and ORD programs.

- *P3s and Municipal Waste Management* – Another emerging area of opportunity is the public-private partnerships (P3s) that are developing in the municipal solid waste realm, providing municipalities with innovative and alternative project/service delivery and financing opportunities.
- *State Delegation* – RCRA has seen success where EPA delegation to states has been robust. A broadening of this practice may result in safer waste management and expeditious site cleanups across the country.
- *Greener Cleanups* – RCRA's trend towards green and sustainable corrective action cleanups and site reuse is a trajectory that looks promising for the program. Building upon this so it becomes the status quo for all cleanups could further improve the economic efficiency and social and environmental outcomes of cleanups.
- *Expanded Programmatic Efficiencies* – Continuing to prioritize the rollout of e-manifest in a manner that carefully considers the fee structure in relation to state program structures is necessary and building upon the successes of early RCRA FIRST/Lean pilots so that these efficiencies may be realized across the compliance and regulatory communities.

Moving forward, it is imperative that EPA transforms its traditional role as a top down, command and control federal agency into a laboratory of innovation and excellence. Given the evolution of state programs as mature, responsible oversight agencies, it is clear that the Agency must evolve into an area or a resource of strength, new ideas, and cutting edge science upon which the states may draw.

This report reflects ideas collected from various subject matter experts through interviews and stakeholder discussions. The views and opinions expressed herein do not represent the position of The Horinko Group.

I. Introduction

RCRA's Enactment

The enactment of the Resource Conservation and Recovery Act in 1976 marked the dawn of comprehensive federal regulation of waste in the United States. In the preceding decades, materials were disposed of directly into rivers or unlined landfills, often located near water bodies, allowing contaminants to migrate easily into water supplies. Trash was burned in the open, and liquids containing toxic pollutants were discharged into unlined evaporation ponds and migrated into groundwater and waterways. This array of unregulated waste disposal practices posed increasing risks to human health and the environment

As a result, citizens and lawmakers began to mobilize around a comprehensive waste management law in the early 1960s, resulting in the passage of the Solid Waste Disposal Act (SWDA) in 1965. The SWDA set minimum requirements for local landfills and established the framework for state management of trash disposal.¹ Despite the new legislation, problems persisted with improper disposal of toxic byproducts from industrial operations as well as growing volumes of all types of municipal and industrial wastes.

After the establishment of the U.S. Environmental Protection Agency (EPA) in 1970, the Agency undertook a review of the risks posed by waste disposal practices across the nation that demonstrated the need for an overhaul of waste management regulations. This overhaul came in 1976 with the passage of significant amendments to the SWDA, known as the Resource Conservation and Recovery Act (RCRA). Since the amending legislation was so comprehensive, RCRA is now commonly referred to without reference to the original Solid Waste Disposal Act.

RCRA's Provisions

RCRA is a joint federal and state enterprise whereby the federal program provides basic requirements that are implemented by states and adapted to each state's needs, resources, and economy. RCRA sets national goals for (1) protecting human health and the environment from the potential hazards of waste disposal, (2) conserving energy and natural resources, (3) reducing the amount of waste generated, and (4) ensuring the wastes are managed in an environmentally sound manner.²

The major subtitles of the RCRA statute are the hazardous waste program, Subtitle C, and the nonhazardous solid waste program, Subtitle D. Subtitle C establishes a federal program for managing waste from generation to disposal. EPA may authorize states to implement hazardous waste programs that must be as protective as the federal program. Regulations under Subtitle C—including permitting, enforcement, and corrective action requirements—apply to hazardous waste generators and transporters, and to facilities that treat, store, or dispose of hazardous waste.

¹ *25 Years of RCRA: Building on Our Past to Protect Our Future*, U.S. EPA, April 2002, p. 1.

² *RCRA's Critical Mission and the Path Forward*, U.S.EPA, June 2014, p. 5.

Subtitle D, the solid waste program, creates a framework for states to develop plans to manage nonhazardous industrial and municipal solid waste. It also bans open dumping of solid waste and establishes federal criteria for the proper design and operation of landfills and other waste disposal facilities.

Fifty states and territories have been authorized to implement the RCRA “base” or initial program, which is subdivided into Subtitle C and D programs.

RCRA has brought about a robust permitting and oversight framework, primarily for hazardous waste but also for municipal and industrial wastes under Subtitle D. The legislation specifically defines solid and hazardous waste and promotes source reduction (minimizing the amount of waste generated), recycling, and safe disposal of wastes.

Amendments

The first round of amendments to RCRA, the 1980 Solid Waste Disposal Act Amendments, introduced two notable amendments, known as the Bevill and Bentsen Amendments, which exclude specific large-volume industrial solid waste from regulation under Subtitle C of RCRA. The Bevill Amendment excludes wastes associated with coal combustion and mining processes as well as cement kiln dust. The Bentsen Amendment excludes wastes associated with exploration, development, and production of crude oil, natural gas, or geothermal energy.

The most significant of RCRA’s amendments, the Hazardous and Solid Waste Amendments (HSWA) were passed in 1984, establishing the RCRA Corrective Action program, the Land Disposal Restrictions program, and the Underground Storage Tank program, among other changes.

The Corrective Action (CA) program requires facilities that manage hazardous waste to clean up any releases at the facility owner’s expense and ensures that facilities permitted to manage newly generated waste address all existing cleanup obligations. The requirements of this program thus prevent the creation of new Superfund³ sites, or sites where the level of contamination may pose an unacceptable risk to human health and the environment. Corrective Action cleanups also play an essential role in revitalizing communities and promoting economic development.

The Land Disposal Restrictions (LDR) program establishes treatment requirements for waste that must be met before it is disposed of in land units (e.g. landfills, surface impoundments, or tanks). The treatment methods and requirements, originally issued between 1986 and 1998, have been continually adapted over the years as new wastes and new technologies have emerged. The LDR requirements encourage businesses to put plans in place to minimize their waste generation.

³ Act of Superfund is a United States federal government program designed to fund the cleanup of sites contaminated with hazardous substances and pollutants. It was established by the Comprehensive Environmental Response and Liability Act of 1980.

The Underground Storage Tanks (UST) Program, under Subtitle I, were also introduced in the 1984 amendments and regulate the underground storage of hazardous substances and petroleum products to prevent and clean up releases. The UST program is primarily a state-implemented program.

Following the enactment of HSWA, RCRA was amended on two further occasions: 1) the Federal Facility Compliance Act passed in 1992 strengthened EPA's RCRA enforcement at federal facilities, and 2) the Land Disposal Program Flexibility Act of 1996 provided regulatory flexibility for land disposal of specific wastes, including, for instance, wastes sent to an industrial wastewater treatment facility, a municipal sewage treatment plant, or a zero-discharge facility.⁴

Looking Towards RCRA 2040

The following sections aim to survey RCRA's history in order to identify priorities for its future. While neither section is intended to be a comprehensive analysis of every aspect of the program, a selection of key success and challenge areas have been identified through interviews with RCRA experts and key observations gathered from THG's 2016 Summit, *The Future of RCRA – Making the Business Case*, held on October 26, 2016 in Washington, DC, and those have formed the foundation of the reporting within this paper. Section I discusses notable successes and innovations within RCRA's programs over the past forty years. Section II identifies challenges the program has faced and may encounter in the future. After considering the strengths and weaknesses of RCRA, Section III identifies several priority focus areas for the program as it looks to establish its "2040 goals."

II. Historical Successes & Innovations

RCRA has contributed significantly to the protection of human health and the environment in the 40 years since its enactment, and it has done so at a relatively low cost. While there are many data points that reveal RCRA's successes, the intention here is not to cover the breadth of RCRA's accomplishments but to investigate a selection of the strategies, adaptations, and program improvements that have enabled continued progress and success under RCRA.

For roughly \$100 million per year⁵, RCRA has brought hundreds of thousands of hazardous waste generators into routine compliance, controlled the unregulated dumping

⁴ Land Disposal Program Flexibility Act of 1996, H.R. 2036 <https://www.congress.gov/bill/104th-congress/house-bill/2036>

⁵ Estimation based on EPA FY2016 budget justification which proposes allocations of \$70.8 million to RCRA's waste management programs and \$37 million for RCRA corrective action programs. This figure does not include proposed funding for ancillary programs under RCRA including: state assistance through the hazardous waste financial assistance grants; hazardous waste e-manifest; or leaking underground storage tank (LUST) programs and LUST state assistance. See U.S. Environmental Protection Agency, Fiscal Year 2016: Justification of Appropriation Estimates for the Committee on Appropriations, February

of hazardous waste, cleaned up thousands of corrective action sites—totaling over 18 million acres of contaminated land⁶—to productive reuse, stopped major releases, fires, and explosions at transfer storage and disposal facilities, and prevented the creation of Superfund sites across the country. Looking at the program broadly, RCRA has been successful in ensuring that the relevant entities are responsible for, and capable of, the safe and appropriate treatment and disposal of waste.

Waste & Materials Management

Tailored Regulations – There are a number of examples under RCRA where originally onerous rules have evolved to become more focused and less burdensome for the regulated community while resulting in comparable protection of human health and environment. A few examples of those adaptations and innovations to more appropriately tailor the program include:

- Through HSWA, EPA introduced the category of **conditionally exempt small quantity generators**, making facilities that generate less than 100 kilograms of hazardous waste per month exempt from hazardous waste management and reporting provisions under Subtitle C provided that they remained below waste production and accumulation thresholds and disposed of their hazardous waste by sending it to an authorized facility.
- As EPA developed standards for treatment, storage, and disposal facilities (TSDFs) in the early 1990s, it became clear that developing standards for every type of permitted treatment unit was unrealistic. EPA introduced a **miscellaneous standard** to capture units that do not fall into the typical categories. The broad provisions for miscellaneous units allow for the use of new and innovative waste management technologies and the tailoring of permit standards on a case-by-case basis.
- In 1995, EPA promulgated the **universal waste regulations**, which introduced regulatory flexibility while ensuring safe handling of ubiquitous wastes such as batteries, pesticides, and thermostats.⁷ Mercury-containing equipment and hazardous waste lamps would later be added to the universal waste list.
- **Industrial wipes**, used in conjunction with hazardous solvents for cleaning and other purposes across industrial sectors, were originally subject to hazardous waste regulations under Subtitle C. In 2013, EPA issued a final ruling to conditionally exclude solvent-contaminated wipes from hazardous waste regulations following a number of years of investigation and a final risk analysis

2015, https://www.epa.gov/sites/production/files/2015-02/documents/epa_fy_2016_congressional_justification.pdf.

⁶ *RCRA's Critical Mission*, p. 6

⁷ U.S. EPA Office of Solid Waste and Emergency Response, Introduction to Universal Waste, September 2005, <https://www.eli.org/sites/default/files/docs/seminars/06.25.13dc/CERCLA/Universal%20Waste%20Summary.pdf>

finding that solvent-contaminated wipes, when managed properly, do not pose a significant risk to human health and the environment. EPA estimated that the rule would result in a net savings for industry of up to \$27.8 million.⁸

Sustainable Materials Management – Beyond the many examples of regulatory fine-tuning and evolution since its enactment, the guiding framework of RCRA’s hazardous and solid waste regulations has also shifted. Early on, RCRA promoted end-of-the-line or “cradle-to-grave” waste management but over the years has steadily evolved to prioritize sustainable materials management (SMM) taking a life cycle or “cradle-to-cradle” approach. This framework places primary emphasis on waste reduction, prevention, reuse, and recycling to minimize disposal rates as well as reducing the environmental impact of materials throughout their life cycle. More recently, its focus has also been directed towards the rate of raw material consumption and a market dynamic embracing principals of a new circular economy.

EPA along with state agencies began efforts to prioritize waste reduction and efficiency of resource use in 1999 through the national Future of Waste Roundtable.⁹ The need to shift from waste to materials management was elaborated in EPA’s 2002 report, *Beyond RCRA: Prospects for Waste and Materials Management in the Year 2020*. Recommendations and a framework for moving towards an SMM approach were provided in EPA’s 2009 report, *Sustainable Materials Management: The Road Ahead*.

More recently, EPA has prioritized three specific areas for SMM programmatic focus for FY2017 to FY2022, which include: 1) The Built Environment; 2) Sustainable Food Management; and 3) Sustainable Packaging.¹⁰ In addition to these priority areas, EPA continues to work on sustainable management of electronics and its alignment with international SMM efforts through the G7 Alliance on Resource Efficiency. Moreover, there are many parallel tracks within the SMM scope, including design-for-recycling or design-for-deconstruction and efforts to build up secondary materials markets, all with the goal of moving towards a circular economy.

Many efforts under the SMM initiative have relied on non-regulatory tools such as goal setting and standards development. EPA’s recently revised Definition of Solid Waste Rule, however, provides an example of SMM principles being operationalized through regulations. The revised regulation encourages and streamlines requirements for in-process recycling and contains a targeted exclusion for higher-value spent solvents that are remanufactured into commercial-grade products.¹¹ The regulation leads to energy and resource savings, greenhouse gas reductions, and cost savings for industry.

⁸ U.S. EPA, Press Release: EPA Reduces Regulatory Burden for Industrial Facilities Using Solvent Wipes, 23 July 2013, <https://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceecac8525735900400c27/c8f3d2b0b740904b85257bb0005cfd6d!OpenDocument>

⁹ *SMM: The Road Ahead*, p. 3

¹⁰ U.S. EPA Sustainable Materials Management Program Strategic Plan FY 2017-2022, October 2015,

¹¹ Mathy Stanislaus, “A Virtuous Circle,” *The Environmental Forum*, Vol. 33 No. 5, September/October 2016

Corrective Action

The RCRA Corrective Action (CA) program has likewise seen notable progress and innovation since its early implementation.

Milestones & Long-term Goals – Markers of progress in the form of project-level milestones and broader programmatic goals are frequently cited as keys to the progress of the RCRA CA program. For instance, reforms in the 1990s established environmental indicators (EIs) that provided important interim milestones for the compliance community and other stakeholders in the cleanup process to work towards. Those reforms also embraced risk-based concepts for CA and gave companies the flexibility to resolve their liabilities related to legacy contamination.

Many also point to the RCRA 2020 goals as an important guiding framework for the CA program, creating tangible targets to shepherd the program. The goals prioritized EIs and construction complete targets, leading to the cleanup, reuse, and revitalization of many sites and their surrounding communities.

State & Regional Collaboration – In some cases, delegation of authority from the EPA Region to the State has been transformative for the success of RCRA corrective action programs. For example, in the State of Wisconsin, this delegation of authority is established through the *One Cleanup Program Memorandum of Agreement*, signed between the State and EPA Region 5.¹² Given that the state rules are substantially equivalent to EPA's rules for RCRA CA and UST cleanups, EPA has made clear under this memorandum that there are limited times in which it will be involved in cleanups. This policy has streamlined requirements for the regulated community and given them the comfort to move ahead with cleanups in Wisconsin. Similar agreements have been reached in a number of other states.¹³

Green and Sustainable Remediation – Another trend in RCRA CA has been the evolution of the program from one of simply getting cleanups done, to prioritizing productive site reuse alongside cleanups, to where the program stands today, moving towards a focus on greener cleanups and sustainable reuse. RCRA has been successful in many instances in promoting cleanup technologies and strategies that minimize the environmental footprint of the cleanup while meeting cleanup goals and maximizing economic and social benefits.¹⁴ There is certainly room for more growth and emphasis on this for all RCRA sites.¹⁵

¹² One Cleanup Program Memorandum of Agreement Between the U.S. EPA Region 5 and the Wisconsin Department of Natural Resources, November 2006, <http://dnr.wi.gov/topic/Brownfields/documents/ocp.pdf>

¹³ More information on state and EPA cleanup MOAs is available at <https://www.epa.gov/brownfields/brownfields-state-local-tribal-information>

¹⁴ The Rise and Future of Green and Sustainable Remediation, The Horinko Group, February 2014, <http://www.thehorinkogroup.org/wp-content/uploads/2014/03/The-Rise-and-Future-of-Green-and-Sustainable-Remediation.pdf>

¹⁵ In August 2016, EPA's Office of Superfund Remediation issued a memo to regional Superfund programs recommending approaches for considering greener cleanup strategies in the Superfund process. *See* Memo: Consideration of Greener Cleanup Activities in the Superfund Cleanup Process, 02 Aug 2016,

Adopting New Technologies – RCRA has also embraced new technologies to advance its mandate. For instance, EPA Region 3 has introduced geographic information system (GIS) mapping of RCRA sites, including the site and institutional control boundaries to promote effective long-term stewardship.¹⁶ This information helps to inform Uniform Environmental Covenants Act (UECA) compliance and enforcement. Moreover, communities are benefiting from GIS resources as a tool to better understand site characteristics and empower visioning and messaging for redevelopment.

Programmatic Efficiencies

RCRA has taken steps to streamline the administrative and financial burden of compliance and enforcement and has continually worked to improve its efficiency.

E-Manifest – One such example of this is EPA’s early adoption and ongoing efforts to improve electronic data management systems for waste management reporting. RCRA has worked to move reporting and data management to various electronic systems, from the Resource Conservation and Recovery Information System (RCRIS) in the early 1990s, which superseded the Hazardous Waste Data Management System (HWDMS) and the Corrective Action Reporting System (CARS)¹⁷, to RCRA Info, which replaced RCRIS in the early 2000s. EPA is now working to develop an electronic system to track hazardous waste shipment manifests. The development of the system, known as e-Manifest, is well underway and is expected to reduce the reporting burden for regulated entities. EPA expects to deploy the e-Manifest system in Spring 2018.¹⁸

RCRA Lean – A second example of programmatic efficiency is the RCRA program’s comprehensive efforts to adopt Lean strategies, also referred to as RCRA First, in its requirements for RCRA Corrective Action cleanups. There is a growing recognition, in both industry and federal and state agencies, that Lean principles can significantly enhance EMS performance. Integration with a facility’s overall Lean culture can enhance environmental risk identification and management, employee engagement and continuous improvement. Also, a Lean approach to environmental procedures can improve their efficiency, effectiveness and “usability.” A new public-private collaboration could help share and improve thinking on Lean-enhanced EMSs.

<https://semspub.epa.gov/work/HQ/100000160.pdf>. While many EPA regions have existing policies to promote greener cleanups in both RCRA and Superfund programs, this step by the Superfund headquarters office was an important one for offering higher-level guidance specific to the program. The Office of Resource Conservation and Recovery could mirror this and offer guidance on the specifics of integrating greener approaches to RCRA cleanups.

¹⁶ EPA Region 3, RCRA Corrective Action Facilities, https://www3.epa.gov/reg3wcmd/ca/ca_facilities.htm

¹⁷ [https://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/85B6E36B8B5FD82F85256AC5004FC1BB/\\$file/13531.pdf](https://yosemite.epa.gov/osw/rcra.nsf/ea6e50dc6214725285256bf00063269d/85B6E36B8B5FD82F85256AC5004FC1BB/$file/13531.pdf)

¹⁸ Frequently Asked Questions about the e-Manifest Initiative, <https://www.epa.gov/hwgenerators/hazardous-waste-electronic-manifest-system-e-manifest#frequent>

III. Existing and Future Challenges for RCRA

Waste & Materials Management

Raw Materials Consumption – As development across the globe continues to advance so too will the need for materials to meet the demands of that development. There is a growing consensus that economic expansion and raw materials need to be decoupled. During the 20th century, data shows global raw material use rose at about twice the rate of population growth, and that for every 1% increase in GDP, raw material use has risen by 0.4%. Furthermore, much of the raw material used by industrial economies is returned to the environment as waste within one year.¹⁹

Keeping Up with the Ever-Changing Marketplace – As with many environmental statutes designed for the prevailing circumstances and scientific understanding of the 20th century, the application of RCRA to new scenarios can present challenges. Since its enactment new types of waste have emerged that RCRA may not be well suited to manage. For instance, electronics waste and other articles are managed under RCRA as a collection of chemicals, which can detract from recycling and energy efficiency objectives.

Likewise, RCRA, along with other environmental statutes, is challenged with being forward looking while having incomplete information on new chemicals and materials in the supply chain. The program has often found itself behind the waste production and waste management curve because, as new chemicals are introduced to the marketplace, there is a lag time in which information is gathered in order to make decisions on waste management requirements (i.e., is the substance regulated as a solid or hazardous waste). Those decisions drive cleanup requirements 20 to 30 years after the chemicals are in production. In order to avoid revisiting legacy contamination at cleanup sites, this lag time must be shortened, and ideally, waste management decisions made in parallel with the decision process of whether to allow the chemical into the marketplace. This would require a stronger linkage with the Toxic Substances Control Act's new chemicals program.

Tailored Regulations – As discussed in Section II, the program has taken many steps to become more targeted and reduce its burden, though there are still areas in which it may be overly complex and unnecessarily burdensome, and in some cases does not encourage resource efficiency. Critics point to the Definition of Solid Waste and the Land Disposal Restriction standards as areas for potential continued improvement in this respect.

¹⁹ Mathy Stanislaus, "A Virtuous Circle," *The Environmental Forum*, Vol. 33 No. 5, September/October 2016

Prioritizing Protectiveness – On the other hand, cases where regulations are less stringent or exemptions remain in place might benefit from reexamination to ensure proper waste management practices and protection of human health and the environment. Examples include:

- Special large volume wastes, such as Bentsen and Bevill wastes. Though the exclusions for these large volume special wastes were established with supportive reasoning in 1980, these wastes will need to be dealt with in the future to ensure protectiveness.
- More thorough regulations for other types of industrial wastes managed under Subtitle D.
- Disposal of pharmaceuticals has largely been managed at the state level but might benefit from national consistency. EPA had originally proposed adding pharmaceuticals to the Universal Waste list in 2008, but did not finalize the rule following the comment period. In 2015, EPA proposed a rule that would ban flushing of hazardous waste pharmaceuticals at healthcare facilities. Some states have already implemented such bans.

Corrective Action (CA)

Changing Science & Emerging Contaminants – A number of challenges persist and are emerging for RCRA CA as well. Many of these relate to evolving science and new information on contaminants, requiring the reexamination of cleanups. For instance, vapor intrusion has come to be a better understood pathway of contamination at RCRA CA sites over the past decade or so and has required EPA to reinvestigate the protectiveness of cleanups at many sites.

Emerging or newly understood contaminants such as polyfluorocarbons (PFCs), 1-4 dioxane, pharmaceuticals, perchlorate, nanomaterials, and others have and will present similar challenges. As more contaminants are discovered or better understood there may be an increased resource need for site cleanups while at the same time, government programs are already struggling to obtain adequate funding.

Large Facility Cleanups – Encouraging RCRA cleanups while private industry operations are ongoing presents a major challenge. In many instances, the status quo for an operating facility becomes maintenance, or an extended interim action of sorts, until business has ended, because of equipment and other barriers preventing cleanup during operations. Once operations conclude, the remaining buildings, materials, and groundwater systems—that many times are outdated and expensive to operate—present many questions, especially as new land uses and the future of the property are considered.

Furthermore, as many large industrial facilities, particularly coal facilities, are beginning to be decommissioned, the involvement of second party actors at the sites has also raised new challenges for RCRA enforcement. When businesses close down and other parties come in to salvage materials, often, these secondary parties create bigger problems at the site than the original owner/operator, and the legal authority to deal with these cases is unclear.

Property Title Exemptions for Municipalities – Legal clarity is likewise needed for local government exemptions under RCRA in cases where municipalities take title to blighted properties. Such exemptions are unclear for the RCRA hazardous waste and UST programs. If municipalities are subject to federal and state hazardous waste laws when they take title to blighted property—despite a state exemption and federal Superfund exemption—it is difficult to get them to do so. In many cases, municipalities are the only hope for the revitalization of these properties and thus are in need of relief from certain requirements.

Time Horizon for RCRA CA – Another existing challenge for RCRA CA sites is the length of time that companies and regulators are engaged in site cleanups. Oftentimes there is a lack of incentive for companies to cleanup sites quickly given the expense. Furthermore, as long as the responsible company is making gradual progress, EPA has few tools to encourage quicker action. At the same time, EPA is restricted by limited resources and cannot always be responsive to private industry in a timely manner. Companies lack sufficient incentives while EPA lacks sufficient resources to move cleanups along more quickly. RCRA's focus on Lean efforts and efficiency gained through state leadership of RCRA cleanups present partial solutions to this problem, but need to be further explored.

Prioritizing Protectiveness – As to the protectiveness of the regulations, experts have pointed to the potential need for improved groundwater monitoring requirements. When contamination remains in place in landfills, it is monitored forever, but when groundwater contamination is left in place, the requirements for monitoring are not as rigorous.

The lack of a federal program specific to dry cleaners has left states in a difficult position for addressing these sites. Some states treat dry cleaners as RCRA CA sites, while others do not. These sites might benefit from increased federal EPA presence and clearer guidance across the board.

Some have also pointed to the need to further base RCRA CA goals on real risk rather than zero risk and potentially consider the use of a risk range. RCRA-regulated parties are often required to cleanup to a near-zero level before their obligations are complete. The circumstances or cost to cleanup to these levels is at times unrealistic or unreasonable and may not align with the protectiveness that results. The question of whether it is worth the societal cost to cleanup to these levels is one worthy of further consideration and discussion.

Programmatic Efficiencies

E-Manifest – Though the rollout of e-manifest has been long anticipated and thought to be beneficial to RCRA’s efficiency, some experts also point out that the potential domino effect of e-manifest fees with state program fees may present a challenge as to how to distinguish between two and avoid double taxation. Some states have relied on generator and manifest fees to generate match money, while others may have fees depending on category of generator. E-manifest is important and will enable new ways to do compliance and audits, but how it interfaces with the set up of state programs will require careful thought.

IV. Priority Areas of Focus Going Forward

Through a consideration of some of the factors that have enabled RCRA’s successes alongside the challenges it has encountered and those that are emerging, a number of areas can be identified as priorities upon which to focus going forward.

Given the structure and direction that the program was able to build off of following the establishment of the 2020 goals, RCRA may enjoy similar advantages by defining clear 2040 goals to guide its next decades of work.

Waste & Materials Management

Life Cycle Analysis (LCA) – LCA can improve the productivity of material use as well as make the business case for sustainable materials management. Life cycle analysis should combine elements of life cycle *impact* assessment with life cycle *costing* (both the direct internal costs and the external societal costs) for any set of alternatives being examined. There needs to be more intentionality upstream so that reuse becomes more efficient and widespread. Incentivizing upstream behavior and influencing the design process so as to improve end of life issues will be a critical component moving forward. All of these improvements will result in an easing in “re-manufacturing,” which will increase our ability to use materials more sustainably.

Regulatory and Programmatic Refinements – It may be time for states and EPA to strengthen the land disposal requirements for large volume special wastes or develop some sort of framework for managing materials that are excluded from the definition of hazardous waste.

There may also be a need for continued refinement of corrective action and compliance assistance programs. These are currently focused primarily on large quantity generators and TSDFs, but small generators and facilities, often newer and less experienced with RCRA compliance, greatly outnumber large generators that are most knowledgeable about managing and cleaning up waste.

Better Informed Resource Recovery – There will continually be a need to focus further and attempt to stay ahead of new substances and materials as well as significant new uses. Since the development of substances and materials will always outpace the scientific community’s ability to fully understand all associated risks and therefore the government’s ability to appropriately regulate the substance if needed, there is a need to reduce this lag time to the greatest extent possibly via supply chain transparency. As new products and materials are released into the market, a more complete understanding, on the part of companies and regulators, of what chemicals and materials are in those products through supply chain communication, transparency, and material declaration and reporting, could be quite beneficial to the efficient mitigation of emerging issues that arise. A national material declaration standard could ensure supply chain management systems and procedures across sectors are harmonized and a consistent level of chemical communication and transparency is achieved. Decision-makers will have the ability to make upstream life cycle decisions that may keep certain chemicals out of the supply chain or reduce their usage. Since RCRA requires the regulated community to take certain actions at the end-of-life, having up front knowledge will create efficiency during the disposal phase.

RCRA’s programs would benefit from closer coordination and exchange of information with EPA’s TSCA and ORD programs, which deal with the management of new and existing chemicals and materials and the study of their effects as they travel through the supply chain. If, as new chemicals came into the marketplace, RCRA decision making could align with the analysis done by TSCA and ORD and identify at the outset what the proper waste disposal requirements would be for that substance, RCRA might face fewer challenges of catching up with evolving science and revisiting contamination previously thought to be benign.

This concept has been echoed in broader conversations about life cycle thinking and supply chain management to achieve resource efficiency. Participants in the G7 Alliance on Resource Efficiency workshop in March 2016 noted to opportunity presented by ensuring that data is available and transparent across the supply chain, with proper management of confidential business information through third-part systems or contractual means.²⁰

EPA is continuing its collaboration with international sustainable materials management efforts through the G7. As noted, EPA’s path forward on domestic SMM programs related to the build environment, sustainable food management, and sustainable packaging are well laid out. EPA’s further incorporation of these concepts into its regulatory actions, as demonstrated by the DSW example described in Section II, could be a continued area of opportunity.

²⁰ Stanislaus, “A Virtuous Circle,” and U.S. EPA, U.S.-hosted Workshop on the Use of Life Cycle Concepts in Supply Chain Management to Achieve Resource Efficiency March 22-23, 2016, Workshop Summary Proceedings, June 2016, https://www.epa.gov/sites/production/files/2016-09/documents/g7_us_workshop_summary_proceedings_final.pdf

P3s and Municipal Waste Management – Another emerging area of opportunity is the public-private partnerships (P3s) that are developing in the municipal solid waste realm. A P3 is a contractual agreement between the public and private sector, sharing skills, assets, risks, and rewards, to jointly deliver a service or a project. P3s can offer municipalities innovative and alternative project/service delivery and financing opportunities.

P3s can transfer important risks, provide access to private sector expertise and investment capital, enable more cost effective and timely infrastructure and service delivery, offer the potential for better ongoing maintenance, and leverage limited public sector resources, all while maintaining the appropriate level of public control over the project. Private sector partners operating numerous facilities of different sizes and in various geographical settings can provide industry-wide best practices and take advantage of economies of scale to further contribute to cost efficiencies and quality of service, while spreading the costs of expertise in advanced technology, operational efficiency, preventive maintenance, and environmental compliance across the entire infrastructure it operates.

Moreover, new sources of financial capital through *impact investment* are providing the incentives to stand up and validate investment potential in new market opportunities that deliver meaningful social, environmental, and economic returns. Impact investment funds can provide the “catalytic” capital necessary to overcome barriers for early investment and to scale up solutions until a viable market can establish and self sustain. One example is the Closed Loop Fund, which is investing \$100 million in the advancement of materials recovery and reuse projects and infrastructure.

Corrective Action

State Delegation – RCRA has seen success where EPA delegation to states has been robust. A broadening of this practice may bring even greater results for safe waste management and expeditious site cleanups across the country. Given that the federal involvement in RCRA CA sites is somewhat rare, the case for further delegation of CA to the states is a compelling one.

Greener Cleanups – RCRA’s trend towards green and sustainable corrective action cleanups and site reuse is a trajectory that looks to be promising for the program. Building upon this so that it becomes the status quo for all cleanups could further improve the economic efficiency and the social and environmental outcomes of cleanups.

Similarly, the building out of technologies and practices like the mapping of institutional controls using GIS in Region 3 to other regions would help to spread the success of those tools. Moreover, repurposing sites with low impact development techniques through green infrastructure can overcome stormwater and flooding challenges while enhancing ecosystem services.

Remedy Optimization – Decision logic can be established with pre-approved options that result in automated optimization of decisions when agreed-upon metrics and milestones are achieved, removing obstacles from the outset. In spirit of Lean practices, unnecessary procedural events to advance to the next step can be eliminated, such as seeking separate approval after achieving an agreed-upon milestone, in order to further optimize the remedy process and achieve final remedial objectives sooner.

Programmatic Efficiencies

E-Manifest – With respect to programmatic efficiencies, continuing to prioritize the rollout of e-manifest in a manner that carefully considers the fee structure in relation to state program structures is necessary.

RCRA Lean – Building upon the successes of early RCRA FIRST/Lean pilots so that these efficiencies may be realized across the compliance and regulatory communities will be essential going forward.

V. Conclusion

Moving forward, it is imperative that EPA transforms its traditional role as a top down, command and control federal agency into a laboratory of innovation and excellence. Given the evolution of state programs as mature, responsible oversight agencies, it is clear that the Agency must evolve into an area or a resource of strength, new ideas, and cutting edge science upon which the states may draw.

Next generation challenges such as new scientific information or information on new chemicals and substances, drawn from the reauthorized Toxic Substances Control Act, will help to guide and shape state program efforts. In addition, emerging areas of secondary materials management, such as e-waste, automotive industry materials, and construction and demolition debris, will require attentive action by the federal government to raise awareness among the state programs.

What is clear is that the federal-state partnership, long in the area of collaboration and innovation, will continue to grow and mature as we enter the next generation of environmental protection.



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