

Annual Report to the Joint Minerals,
Business, and Economic
Development Interim Committee

Municipal Solid Waste Landfill
Prioritization, Monitoring, and Remediation

June 2018



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1.0 Introduction

This report is presented to the Joint Minerals, Business and Economic Development Interim Committee pursuant to Wyoming Statute § 35-11-524 which directs the Wyoming Department of Environmental Quality (Department) to establish a priority list of landfills requiring remediation and to follow-up with annual reports detailing monitoring results, remediation results, assessments of clean-up costs, landfill sites to be addressed in the coming year(s) and orphan landfill site information. This report provides an update on the status of the Municipal Solid Waste Landfill Remediation Program (Program).

2.0 Background Information

Subtitle D of the Resource Conservation and Recovery Act (RCRA), proposed by the U.S. Environmental Protection Agency (EPA), became effective in October of 1991. The Subtitle D rules established minimum criteria for municipal solid waste landfills for location standards, operation and design requirements, groundwater monitoring, closure requirements and financial assurance. Subtitle D established the minimum landfill management requirements states had to meet in order to be delegated the responsibility for managing the Subtitle D program. Each state was required to submit plans proving that it met the minimum criteria and Wyoming did so.

Historically, it was believed that the climate in the arid west would prevent the generation of significant quantities of landfill leachate (liquid that has passed through or emerged from solid waste and materials removed from such wastes) and the migration of leachate to groundwater. Therefore, landfill design standards in Wyoming and other arid states included provisions whereby landfill operators could demonstrate that liners would not be necessary. For almost 20 years after the promulgation of regulations under Subtitle D, landfills in Wyoming operated without liners.

Over time, groundwater monitoring at Wyoming landfills began to reveal evidence of groundwater contamination, indicating that landfills in Wyoming are generating leachate in quantities sufficient to pollute groundwater. The Department and the Wyoming Solid Waste and Recycling Association (WSWRA) realized that pollution and other factors were increasing waste management costs and believed Wyoming needed to investigate ways to minimize those cost increases. The need to address existing groundwater contamination and the need for the lining of new landfill units to prevent future contamination were brought to the attention of Governor Freudenthal in late 2003. At the Governor's request, the Department formed a Citizens' Advisory Group to study solid waste issues and propose solutions.

Legislation passed in 2006 required the Department to work with landfill operators to install or upgrade monitoring systems that detect releases of pollutants from landfills. The Department evaluated all available monitoring data and prepared a report in June of 2010, describing the extent to which such facilities cause or contribute to pollution of groundwater. The report included an estimate of the statewide groundwater remediation cost obligation faced by local governments. The potential cost estimated in the 2010 report was \$226 million. This estimate was for costs related to remediation such as improvements to previously capped disposal areas, improvements to the cap design anticipated by operators, additional monitoring wells to assess the progress of remediation, and systems to address contaminated groundwater. In 2011, the Legislature authorized additional investigations to determine the need for landfill monitoring and remediation. The Department established a priority list of landfills requiring remediation and prepared an initial report in December 2012, describing an assessment of the clean-up costs at the highest priority landfills.

In 2013, the Legislature passed HB No. 0065, Enrolled Act No. 43, which created the Landfill Remediation Program. Under the Program, the Department would oversee and fund up to seventy-five percent (75%) of the cost of investigating and remediating contamination at municipal solid waste landfills for ten (10) years after the completion of the remedy.

In October of 2013, the Department initiated the rulemaking process to develop regulations to implement the Program. The Department conducted a robust outreach effort, holding public meetings in Green River, Cody, Gillette, Casper, and Cheyenne, in order to solicit input from the regulated community. Through this process, the Department developed Chapter 17 of the Wyoming Solid Waste Rules and Regulations.

Legislation, passed in 2014, directed that the Legislature shall approve the prioritized list of qualified projects prior to the expenditure of funds to conduct remediation activities at high priority landfills. The priority list was approved during the 2015 session, clearing the way for remediation activities to begin.

3.0 Landfill Prioritization

To date, 112 landfills have been included in the landfill assessment program. Evidence of impacts above Groundwater Protection Standards (GPS) have been detected at 83 of these landfills. Impacts have not been detected or have been detected below a GPS at 21 facilities. The Department is awaiting additional information at the remaining 8 sites in order to determine if there are groundwater impacts at those landfills.

The Department worked with the Water and Waste Advisory Board (WWAB) to develop ranking criteria for the Program. The ranking criteria included an evaluation of contamination at

the facility as well as the facility's proximity to neighboring wells, residences, and surface water. The Department then used the ranking criteria to develop a priority list of impacted landfills. The Department's ranking identified 11 facilities whose scores were notably higher than other facilities on the list. These 11 were considered to be the "highest priority" and the Department estimated the cost associated with the anticipated remediation for each facility. The Department has divided the priority list into three classifications; highest priority, medium priority, and low priority (Tables 1, 2 and 3 respectively).

4.0 Assessment of Remediation Cost Estimates

With regard to the highest priority landfills, the Department estimated the most likely remedial option(s) for each facility, and then estimated the potential cost of remediation. Cost estimates were primarily developed through the use of Remedial Action Cost Engineering and Requirements (RACER) software, a remediation cost-estimating system developed under the direction of the U.S. Air Force. The RACER software estimates costs for all phases of environmental remediation projects; from site investigation through site closeout. RACER, however, lacked the ability to estimate some remedial costs, such as transferring waste from a leaking landfill to another lined landfill; therefore the Department generated its own cost estimate in some instances. Capping costs, or the costs associated with placing an impermeable cap on the top of a landfill to prevent infiltration of precipitation through the waste, were estimated at \$100,000 per acre based on actual costs derived from Wyoming landfills and the Department's research into financial assurance requirements in surrounding states.

Except where indicated otherwise, the costs presented below are not engineers' estimates and do not include engineering, permitting and design fees, costs to formally assess potential corrective measures, markups, contingency fees, or the effects of inflation. Consistent with past reports, the cost estimates in this report are based on remedial systems operating for 20 years. If systems are operated for shorter or longer periods, costs would change accordingly. The Department will update these numbers as more information becomes available.

Table 1 (below) summarizes the current remediation cost estimates for the highest priority landfills. Cost estimates are based on the remedial actions believed most appropriate at this time. It is important to note that the remedial options and cost estimates contained in this report are preliminary in nature. More accurate cost estimates can only be obtained after investigations have been conducted at each landfill site to understand the nature and extent of contamination, an evaluation of potential remedial actions, and the selection of the remedy determined to be most appropriate.

**Table 1 – Remedial Action Summary
Highest Priority Landfills**

Landfill	Landfill Rank	Potential Remedial Actions	Estimated Cost of Construction, Operation and Monitoring First 10 Years	Estimated Cost Second 10 Years	Facility Total
*Campbell County - Balefill #1	1	Capping, Gas System Monitoring	\$11,240,000	\$1,700,000	\$12,940,000
Sheridan #2	2	Monitoring, Gas System	\$517,387	\$369,795	\$887,182
Casper Balefill	3	Capping, Gas System, Monitoring	\$3,433,258	\$426,082	\$3,859,340
Evanston #1	4	Monitoring, Gas System, Pump & Treat	\$1,275,224	\$587,040	\$1,862,264
Sheridan #1	5	Monitoring, Gas System, Cut-off Wall w/ Permeable Treatment Barrier	\$1,783,604	\$405,765	\$2,189,369
Guernsey	6	Capping, Gas System, Monitoring	\$2,769,396	\$349,339	\$3,118,735
Newcastle #1	7	Cut-off Wall W/ Pump & Treat, Monitoring	\$1,338,487	\$308,844	\$1,647,331
Buffalo #1	8	Capping, Monitoring	\$2,335,109	\$516,495	\$2,851,604
Cheyenne	9	Capping, Gas System, Monitoring	\$8,631,859	\$911,865	\$9,543,724
Riverton #1	10	Repair cap, Dig and Haul, Pump & Treat, Monitoring	\$863,301	\$681,696	\$1,544,997

Table 1 – Remedial Action Summary Highest Priority Landfills					
Landfill	Landfill Rank	Potential Remedial Actions	Estimated Cost of Construction, Operation and Monitoring First 10 Years	Estimated Cost Second 10 Years	Facility Total
*Campbell County #2	11	Capping, Gas System, Monitoring	\$3,820,000	\$700,000	\$4,520,000
		Total	\$38,007,625	\$6,428,681	
Estimated Total Cost for the Highest Priority Landfills (Ranked 1-11) Over 20 Years					\$44,436,306

*Preliminary Engineer’s Estimate.

Table 2 (below) identifies the medium priority landfills. These landfills are those where contaminant concentrations exceed GPS, but the priority ranking scores did not elevate them into the high priority status. Anticipated remedial activities and estimated costs for medium priority landfills have not been provided due to the uncertainty associated with the costs and the likelihood that the costs will change by the time these projects are in line to receive funding.

Table 2 – Medium Priority Landfills Ranked 12-49	
Landfill	Priority Rank
Lusk	12
Clearmont #2	13
Douglas	14
Glenrock #1	15
Rawlins	16
Lincoln Co. - Thayne (Transfer Station, Incinerator & C/D)	17
Buffalo, Old Dump	18
Big Piney #2	19
Pine Bluffs	20
Fremont Co. SWDD – Lander	21
Thermopolis	22
Park County – Cody	23

**Table 2 – Medium Priority Landfills
Ranked 12-49**

Landfill	Priority Rank
Horsethief Canyon #2 - Transfer Station	24
Baggs SWDD	25
Rock River #1	26
Torrington #1	27
Sundance	28
Elk Mountain	29
Medicine Bow	30
Sublette Co. - Marbleton #2	31
Park County – Meeteetse	32
Sinclair #2	33
Laramie Landfill	34
Park County - Kysar	35
Reliance, SWDD 1	36
Eden Valley SWDD	37
Encampment	38
Saratoga, Old Community Dump	39
Bridger Valley	40
Sweetwater Co. SWDD #1 - Point of Rocks	41
High Country Joint Powers Board - Hanna	42
Hanna (Old Site)	43
Hulett #1	44
Bairoil # 1	45
Bairoil #2	46
Big Horn County - North #1	47
Rock River #2	48
Big Horn County - South	49

Table 3 (below) identifies the low priority landfills. These landfills are those where contaminant concentrations exceed GPS, but the priority ranking scores did not elevate them to medium priority status. Anticipated remedial activities and estimated costs for low priority landfills have not been provided due to the uncertainty associated with the costs and likelihood that those costs will change by the time these projects are in line to receive funding.

**Table 3 – Low Priority Landfills
Ranked 50-83**

Landfill	Priority Rank
Sweetwater Co. SWDD #1 – Rock Springs	50
Park County - Powell	51
Big Piney #1	52
Hyattville Landfill	53
Superior	54
Saratoga	55
Park County - Clark #1	56
Big Horn County - North #2	57
Lincoln County - Kemmerer #1	58
Torrington #2	59
Moorcroft #2	60
Newcastle #2	61
Manville #1	62
Ten Sleep SWDD #1	63
Kaycee	64
Uinta County - Evanston #2	65
Washakie Co. SWDD - Worland #1, #2	66
Fremont Co. SWDD - Shoshoni	67
Chugwater	68
Lincoln County - Kemmerer #2	69
LaGrange	70
Park County - Clark #2	71
Central Weston Co. SWDD, Osage	72
Moorcroft #1	73
Bosler	74
Natrona County Parks - Alcova Landfill	75
Wheatland #2	76
Green River (old) #1, #2	77
Glendo #1	78
Glendo #2	79

Table 3 – Low Priority Landfills Ranked 50-83	
Landfill	Priority Rank
Sweetwater Co. SWDD - Wamsutter #2	80
Eastern Laramie Co. SWDD	81
Natrona County Parks - Alcova #2	82
LaBarge - Transfer Station	83

Table 4 (below) contains the list of landfills where additional information is needed in order to determine whether they require remediation. As additional information is submitted and processed, the facility would either be placed on the appropriate list or dropped from this report.

Table 4 – Need More Information Landfills	
Landfill	Status
Emblem Burlington	Closed
Sundance, Old Dump	Historic
Boulder	Historic
Daniel Junction	Historic
Fremont Co. SWDD – Little Sand Draw	Open
Midwest-Edgerton #1	Closed
Midwest-Edgerton #2	Open
Pinedale #2 - Transfer Station	Closed
Total	8

5.0 Remediation Program Status

In 2015, the City of Casper, City of Sheridan, and Campbell County entered the Program. The following is a brief explanation of the current status of each facility:

The City of Casper (#3 on the list) entered into the Program on October 20, 2015. The City of Casper is the furthest along in the remediation process, in comparison to other facilities, as its Nature and Extent of Contamination Study (NES) is completed and a number of corrective measures have been identified in their Assessment of Corrective Measures (ACM) study, which is conducted to determine what remedy(s) are to be selected for the facility.

One remedy identified by the City of Casper in its ACM was a landfill gas collection system that would use a series of wells to pull landfill gas toward a single point and flare the gas, keeping it from going off site. The Department agreed with the City of Casper that a landfill gas collection system would be the best option to address GPS exceedances. The construction of the

active gas collection system and flare was initiated in September of 2016 and operations began in May of 2017. Shortly after the startup of the gas system, improvements were noted in a number of groundwater monitoring wells throughout the site. However, during the installation of the gas system, the Department discovered that the existing cap covering a portion of the closed landfill was not sufficient to prevent infiltration of precipitation and could jeopardize the operation of the gas system. Therefore, it was determined additional work would be needed to improve the cap at that portion of the landfill. Designs to cap this area were completed and construction to cap this area is underway at the time of this report with completion slated for later this summer.

The City of Sheridan's landfills (#2 and #5 on the list) entered into the Program on September 29, 2015. These landfills are contiguous and, due to groundwater flow direction at the site, difficult to address independent of one another. For that reason, and to gain some economies of scale, the decision was made to address the contamination at both sites concurrently. Work on the NES began in the summer of 2016 with groundwater monitoring wells being installed and sampled. In the spring of 2017, work resumed to delineate unknown waste burial areas, potholing to confirm the edges of those burial trenches, and the installation of additional monitoring wells to determine the extent of on and offsite contamination based on information provided by the first round of installed wells. New samples collected from on and offsite monitoring wells was analyzed in July 2017 to identify any offsite contamination. A draft NES was presented to the Department and City in April 2018 in which it was determined that some measures would be needed to address contamination leaving the facility. Work is currently underway on the ACM report to develop options to address this contamination. The Department believes that remedy selection for this facility will be made in late 2018 with a goal of beginning construction of the selected remedy(s) in summer of 2019.

Campbell County's landfills (#1 and #11 on the list) entered into the Program on October 6, 2015. The initial round of monitoring well installation to determine the extent of on and offsite contamination at the #1 landfill was completed in July 2017 and sampling of those wells for analysis began shortly thereafter. However, because of a fairly robust network of previously installed monitoring wells, and based on data from those wells, Campbell County and the Department agreed that the existing cap and gas extraction systems at that facility will require replacement. The work on the cap and gas system will occur simultaneously with NES work on offsite contamination. Recently the Department received the draft NES report that concluded contamination was migrating offsite in a number of areas at the facility and work is ongoing on potential remedies (if needed) to address offsite migration. This information will be captured in the ACM report and considered by the Department upon its submittal. Currently, investigative work on the #11 landfill, located north of Gillette, has not begun. Additional monitoring well installation at that facility will not begin until well installation work at the #1 landfill is complete. At this time, routine monitoring well data at the north landfill continues to be evaluated to determine what, if any, action may be needed for the NES at that facility.

Additionally, the Department is taking action to address facilities on the priority list where additional information is needed. The Department is working to gather additional information to assess whether or not active remediation is necessary at facilities where either some activity (capping) has occurred and where more information is needed to either place a facility on the priority list or to remove a facility from the lists altogether. Investigation is slated to begin in early summer 2018 at a total of eight (8) facilities. Some of the work conducted is to refine costs at some high priority sites, while other work will yield data for that facility's placement or ultimate removal from the priority list. Findings from this project will be detailed in future annual reports to the Legislature.

Lastly, the Department understands the significance of the Landfill Remediation Program and is devoting resources through other programs to address as many facilities on the priority list as possible. The Department, in collaboration with impacted facilities, have conducted closure activities at eighteen (18) lower priority facilities on the Landfill Remediation priority list. The Department has worked with communities to provide funding to cap and close facilities through the Department's Cease & Transfer Program or the State Revolving Fund Program. These eighteen (18) landfills have remediation priority rankings ranging from #12 (Lusk) to #77 (Green River).

Table 5 (below) contains a list of those facilities that have received closure funds through State programs and will be monitored for groundwater improvement prior to remediation action:

Table 5 – Facilities That Have Closed With State Assistance	
Landfill	Priority
Lusk	12
Clearmont	13
Douglas	14
Rawlins	16
Lincoln County – Thayne	17
Park County – Cody	23
Horsethief Canyon – Teton County	24
Sundance	28
Park County – Meeteetse	32
HCJPB – Hanna	42
Rock River	48
Park County – Powell	51
Park County – Clark #1	56
Manville	62

Table 5 – Facilities That Have Closed With State Assistance	
Landfill	Priority
Kaycee	64
Park County – Clark #2	71
Wheatland #2	76
Green River	77
Total	18

The closure of these sites, prior to entry into the Landfill Remediation Program, will provide time for the engineered caps to restrict the infiltration of precipitation and reduce groundwater contamination. These sites will be closely monitored to determine if groundwater conditions have improved to the point where they can ultimately be removed from the Landfill Remediation Program.

6.0 Landfill Remediation Funding

In 2013, the Legislature established the Landfill Remediation Account and provided \$45 million dollars to the account for the purposes of funding the remediation activities. The Legislature then appropriated \$17 of the \$45 million for the Department to begin remediation. In 2015, the Legislature established a reliable source of long term funding for the Program by diverting funds from the Corrective Action Account beginning in 2019, while maintaining fund soundness for the Storage Tank Program. In 2016, the Legislature appropriated \$17 million from the remaining \$28 million in the account to the Cease and Transfer Program to continue funding activities under that program. During the 2018 budget session, the Legislature appropriated an additional \$2 million from the Landfill Remediation account to the Cease and Transfer Program leaving a balance of \$9 million dollars in the Landfill Remediation Account. The remaining \$9 million was then appropriated to the Department for remediation activities.

The Department has obligated \$11 million to current remediation activities at the City of Casper, City of Sheridan and Campbell County. This leaves an unencumbered balance of \$15 million dollars in the Landfill Remediation Account. The Department anticipates that this unencumbered balance will be obligated for remediation activities during 2018 and 2019 construction seasons at participating facilities. The Department will then begin drawing funds from the Corrective Action Account for future investigation and remediation activities under the Program.

7.0 Summary

In 2006, the Department was charged with evaluating 112 landfills across the state for determining the extent to which landfills were contaminating groundwater. After evaluating groundwater data collected through the date of this report, 83 landfills have been determined to have had a release to the extent that may require some form of remedial activity. These landfills have been assigned priority rankings and placed on one of three priority tables. The Department is awaiting additional information from 8 facilities to determine whether there is an exceedance of a GPS or the facility can be removed from the list. The Department expects that additional sites will be removed from the priority list as annual groundwater reports are received and groundwater protection standards are determined at more sites.

The current cumulative remediation cost estimate for the 11 highest priority landfills is \$44,436,306. As work to determine remedies has recently begun, the Department expects annual revisions to this estimate. Due to the uncertainties in estimating remediation costs years into the future and a lack of site specific information, the Department has not estimated costs for medium and low priority landfills at this time. The Department will update this information when data that is more accurate becomes available.

This report will be updated annually to reflect remediation work completed at facilities. Additional adjustments to the lists will be made based upon the Department's receipt and evaluation of groundwater monitoring data, and other information gathered for the purpose of ranking landfills in the Program.