ADAMS COUNTY
COLORADO
BOARD OF COUNTY COMMISSIONERS

STUDY SESSION AGENDA
TUESDAY
November 5, 2019

ALL TIMES LISTED ON THIS AGENDA ARE SUBJECT TO CHANGE

10:00 A.M.	**ATTENDEE(S):**	**Jill Jennings Golich / Katie Keefe / Keith Huck**
	ITEM:	**Oil and Gas Update**
10:30 A.M.	**ATTENDEE(S):**	**Jill Jennings Golich / Katie Keefe**
	ITEM:	**Rocky Mountain Arsenal (RMA) Landfill Oversight Contract with Tri-County Health Department**
11:00 A.M.	**ATTENDEE(S):**	**Jill Ryan, Executive Director, Colorado Department of Public Health & Environment (CDPHE)**
	ITEM:	**CDPHE Update**
12:00 P.M.	**ATTENDEE(S):**	**Nancy Duncan**
	ITEM:	**Review of 2020 Proposed Budget**
12:30 P.M.	**ATTENDEE(S):**	**Nancy Duncan**
	ITEM:	**Fourth Amendment to the 2019 Adopted Budget**
1:00 P.M.	**ATTENDEE(S):**	**Raymond Gonzales**
	ITEM:	**Administrative Item Review / Commissioners Communication**
1:30 P.M.	**ATTENDEE(S):**	**Heidi Miller**
	ITEM:	**Executive Session Pursuant to C.R.S. 24-6-402(4)(b) and (e) for the Purpose of Receiving Legal Advice and Instructing Negotiators Regarding Employment Claims**

(AND SUCH OTHER MATTERS OF PUBLIC BUSINESS WHICH MAY ARISE)

AGENDA IS SUBJECT TO CHANGE

STUDY SESSION AGENDA ITEM

DATE:	**November 5, 2019**
SUBJECT:	**Oil and Gas Update**
FROM:	**Jill Jennings Golich, Director** **Katie Keefe, Environmental Program Manager**
AGENCY/DEPARTMENT:	**Community & Economic Development**
ATTENDEES:	**Jill Jennings Golich, Katie Keefe, Keith Huck**
PURPOSE OF ITEM:	**Update on task force addressing worker safety requirements; current status of oil and gas activity; COGCC and CDPHE rulemaking schedules; implementation of amended oil and gas regulations.**
STAFF RECOMMENDATION:	**Update**

BACKGROUND:

Staff will brief the Board on oil and gas facility permits submitted since moratorium lifted, implementation status of adopted oil and gas regulations, and recent meetings and hearings associated with rulemakings for COGCC and CDPHE.

AGENCIES, DEPARTMENTS OR OTHER OFFICES INVOLVED:

ATTACHED DOCUMENTS:

Presentation

FISCAL IMPACT:

Please check if there is no fiscal impact ☒. If there is fiscal impact, please fully complete the section below.

Fund:	
Cost Center:	

	Object Account	Subledger	Amount
Current Budgeted Revenue:			
Additional Revenue not included in Current Budget:			
Total Revenues:			

	Object Account	Subledger	Amount
Current Budgeted Operating Expenditure:			
Add'l Operating Expenditure not included in Current Budget:			
Current Budgeted Capital Expenditure:			
Add'l Capital Expenditure not included in Current Budget:			
Total Expenditures:			

New FTEs requested: ☐ **YES** ☐ **NO**

Future Amendment Needed: ☐ **YES** ☐ **NO**

Additional Note:

APPROVAL SIGNATURES:

EHannah for
Raymond H. Gonzales, County Manager

Alisha Reis, Deputy County Manager

Bryan Ostler, Deputy County Manager

Chris Kline, Deputy County Manager

APPROVAL OF FISCAL IMPACT:

Nancy Dunn
Budget

CDPHE Air Emissions Study Review

"Evaluating Potential Human Health Risks from Modeled Inhalation Exposures to Volatile Organic Compounds Emitted from Oil and Gas Operations" (Holder et al., 2019)

Why is this study important?

- Utilized O&G air emissions data collected in 2014 to model health risks associated with several well pad size and exposure scenarios

- Found an *elevated risk* of short-term health effects during *drilling and completions* activities
  - Higher risk for residents within 1,000-ft from center of well pad
  - Moderate risk for residents within 2,000-ft from center of well pad

- Found *minimal risk* of both short-term and long-term health effects during *production* activities

- COGCC response:
  - Increased distance from building unit to 2,000-ft from 1,500-ft under the Director's Objective Criteria when assessing Form 2A/2 applications
  - Conduct air monitoring of oil and gas sites to better characterize emissions, sources and dispersion patterns
  - Air monitoring results will inform Mission Change, Cumulative Impacts and Alternative Site Analysis rulemakings

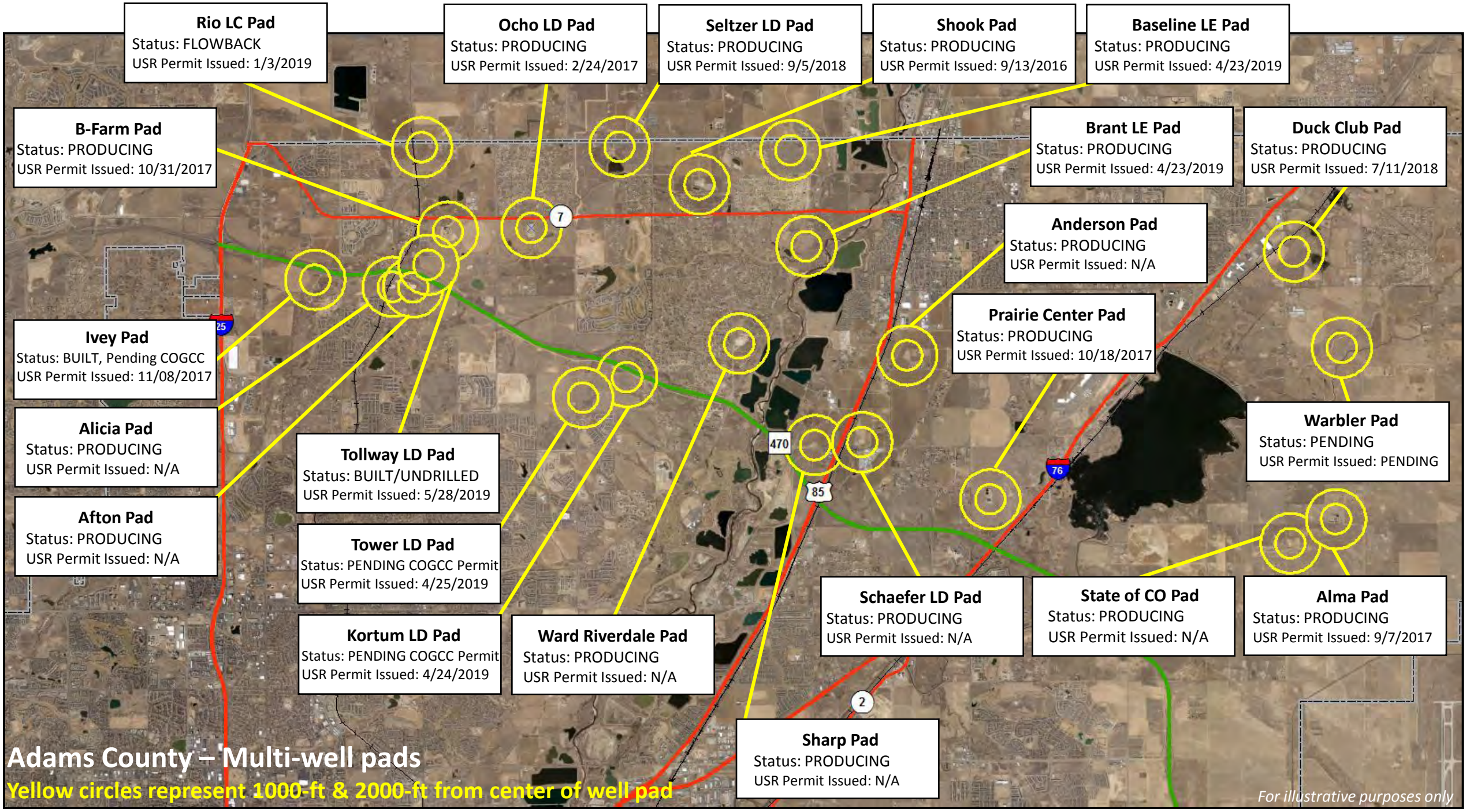
- Adams County response:
  - Potential resolution implementing increased scrutiny for proposed locations that have less than 2,000-ft setbacks
  - Require full suite of air quality BMPs listed in OGF regulations when site warrants it
  - Could impact future amendments to County OGF regulations

CDPHE Air Emissions Study Review

"Evaluating Potential Human Health Risks from Modeled Inhalation Exposures to Volatile Organic Compounds Emitted from Oil and Gas Operations" (Holder et al., 2019)

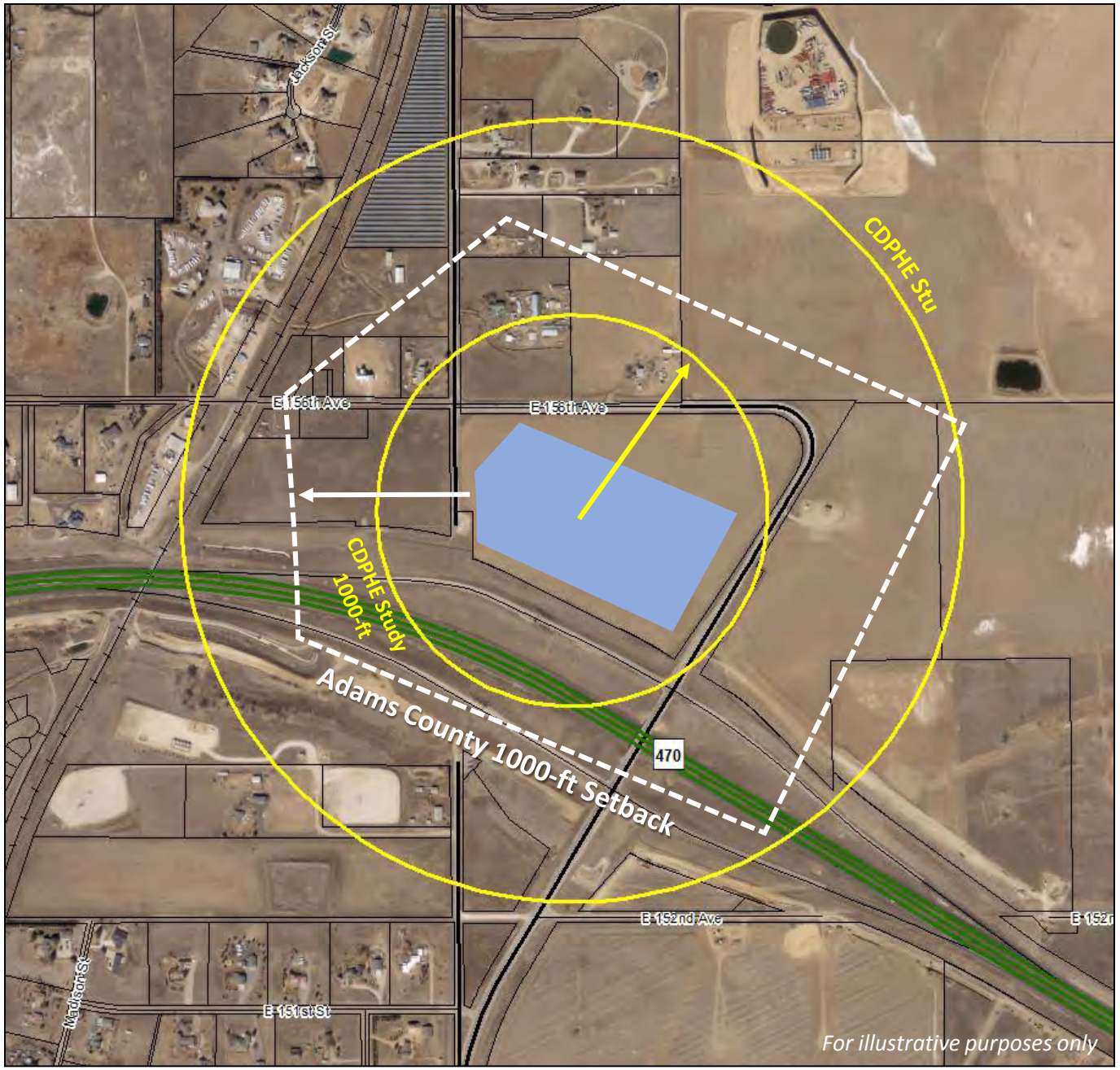
Study-specific Assumptions:

- This a modeling study utilizing actual emissions data from well sites taken between 2013-2015
    - Air monitoring conducted prior to more stringent EPA air quality regulations for oil and gas (NSPS Subpart OOOOa, eff. 8/2/2016)
- Study design did not consider aggregated exposure from background sources of emissions
- Study design did not consider cumulative impacts from multi-chemical exposures or proximal O&G locations
- O&G emission rates are highly irregular → introduces uncertainty in the results, specifically for acute health studies
- Study used a limited number of air monitoring points from absolute-maximum model iterations under conservative metrological conditions
    - may not be typical, real-world exposure/emission rates
    - "site-specific monitoring and metrological data would better characterize the relationship between highest and typical exposure"
- Study only examined specific VOCs and human carcinogens and did not calculate cancer risks for other chemicals known to be released during oil and gas operations


Rio LC Pad
Status: FLOWBACK
USR Permit Issued: 1/3/2019
Ocho LD Pad
Status: PRODUCING
USR Permit Issued: 2/24/2017
Seltzer LD Pad
Status: PRODUCING
USR Permit Issued: 9/5/2018
Shook Pad
Status: PRODUCING
USR Permit Issued: 9/13/2016
Baseline LE Pad
Status: PRODUCING
USR Permit Issued: 4/23/2019
B-Farm Pad
Status: PRODUCING
USR Permit Issued: 10/31/2017
Brant LE Pad
Status: PRODUCING
USR Permit Issued: 4/23/2019
Duck Club Pad
Status: PRODUCING
USR Permit Issued: 7/11/2018
Anderson Pad
Status: PRODUCING
USR Permit Issued: N/A
Prairie Center Pad
Status: PRODUCING
USR Permit Issued: 10/18/2017
Ivey Pad
Status: BUILT, Pending COGCC
USR Permit Issued: 11/08/2017
Alicia Pad
Status: PRODUCING
USR Permit Issued: N/A
Tollway LD Pad
Status: BUILT/UNDRILLED
USR Permit Issued: 5/28/2019
Warbler Pad
Status: PENDING
USR Permit Issued: PENDING
Afton Pad
Status: PRODUCING
USR Permit Issued: N/A
Tower LD Pad
Status: PENDING COGCC Permit
USR Permit Issued: 4/25/2019
Kortum LD Pad
Status: PENDING COGCC Permit
USR Permit Issued: 4/24/2019
Ward Riverdale Pad
Status: PRODUCING
USR Permit Issued: N/A
Schaefer LD Pad
Status: PRODUCING
USR Permit Issued: N/A
State of CO Pad
Status: PRODUCING
USR Permit Issued: N/A
Alma Pad
Status: PRODUCING
USR Permit Issued: 9/7/2017
Sharp Pad
Status: PRODUCING
USR Permit Issued: N/A
7
25
470
85
76
2
Adams County – Multi-well pads
Yellow circles represent 1000-ft & 2000-ft from center of well pad
For illustrative purposes only

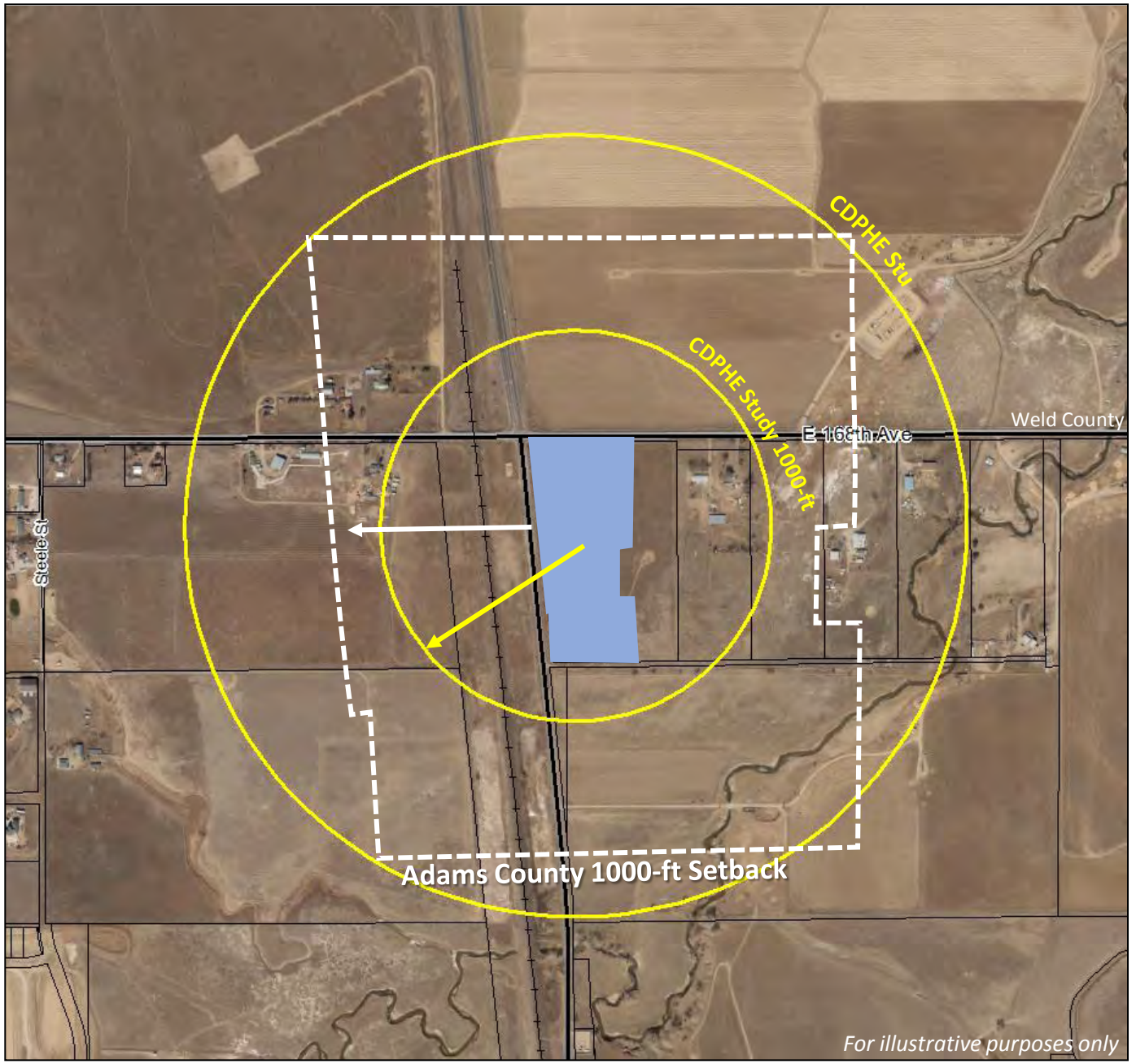
Tollway LD Pad: Permitted 5/28/2019

- 15.3 –acre well pad
- 30 horizontal wells
  - ✓ 0 Drilled – Building Location
  - ✓ 30 Remaining
- 8 structures within CDPHE Study 1,000-ft radius
- 6 residences within OGF regulation 1,000-ft setback
- Nearest High Occupancy Building Unit: 4,620-ft
  - ✓ Elementary school
- BMPs in place via MOU and CoAs of USR Permit
  - ✓ Baseline water well sampling within ½ mile
  - ✓ Emergency Preparedness Plan in place
  - ✓ Oil transportation via pipeline
  - ✓ Traffic impact fee paid
  - ✓ Continuous air monitoring program
    - 2-week baseline test prior to on-site activities
- OGF regulation setback extends beyond study's 1,000-ft radius



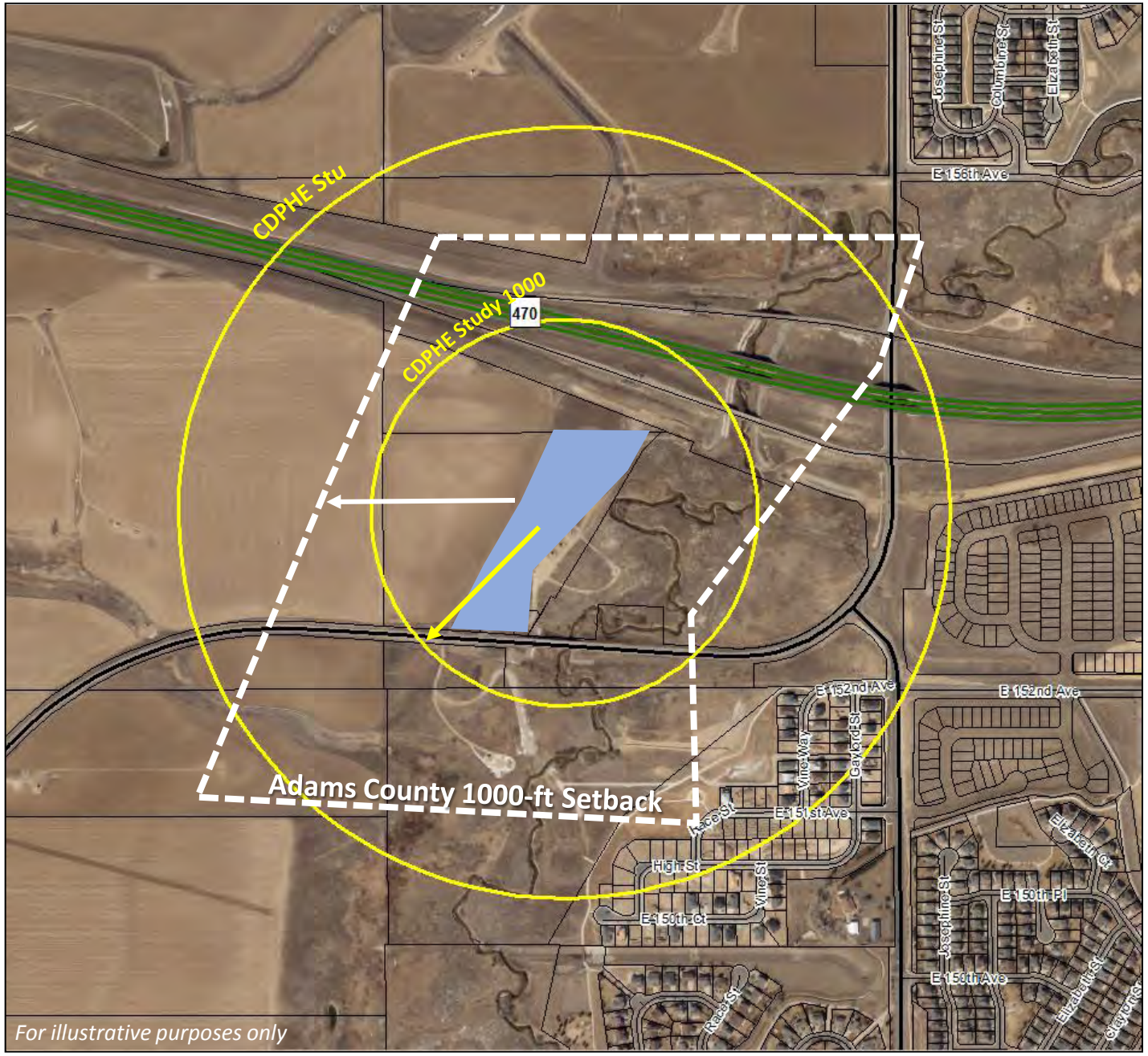
Rio LC Pad: Permitted 1/3/2019

- 13.9 –acre well pad
- 26 horizontal wells
  - ✓ 11 Drilled – Flowing Back Production
  - ✓ 15 Remaining
- 4 structures within CDPHE Study 1,000-ft radius
- 4 residences within OGF regulation setback (within ADCO)
- Nearest High Occupancy Building Unit: >1 miles
  - ✓ Elementary school – 10,225-ft
- BMPs in place via MOU and CoAs of USR Permit
  - ✓ Baseline water well sampling within ½ mile
  - ✓ Landscaping, weed mitigation and fencing plans
  - ✓ Oil transportation via pipeline
  - ✓ Traffic impact fee paid
- OGF regulation setback extends beyond study's 1,000-ft radius



Ivey Pad: Permitted 11/8/2017

- 6.8 –acre well pad
- 26 horizontal wells
  - ✓ 0 drilled – Location built, Pending COGCC Permits
  - ✓ 26 Remaining
- No structures within CDPHE Study 1,000-ft setback
- 0-3 residences within OGF regulation setback (subdivision)
- Nearest High Occupancy Building Unit: 2,854-ft
  - ✓ Child Care Facility
  - ✓ 3,479-ft from Elementary school
- BMPs in place via MOU and CoAs of USR Permit
  - ✓ Baseline water well sampling within ½ mile
  - ✓ Emergency Preparedness Plan in place
  - ✓ Closed loop drilling system utilized
  - ✓ Oil transportation via pipeline
- OGF regulation setback extends beyond study's 1,000-ft radius



CDPHE Air Emissions Study Review

"Evaluating Potential Human Health Risks from Modeled Inhalation Exposures to Volatile Organic Compounds Emitted from Oil and Gas Operations" (Holder et al., 2019)

Take Aways:

- New OGF regulations are currently equipped to address potential increased risks of acute health effects presented by CDPHE study
- Best location selected via alternative site analysis requirement
- 1,000-ft setback requirement; waiver does not have to be granted
- Air quality BMPs and controls currently required for all sites:
  - ✓ Reduced emission completions
  - ✓ No flaring or venting of gas
  - ✓ Enclosed combustion devices with 98% hydrocarbon destruction efficiency
  - ✓ Restricted activities on ozone alert days
  - ✓ Tanks with 98% HC emission destruction control
  - ✓ 72-hour leak repair
- Air quality BMPs and emission controls that could be required for sites located within CDPHE study setback radius:
  - ✓ Tier 4 engines / electric powered drill rigs
  - ✓ Air monitoring – baseline and continuous
  - ✓ Tankless production techniques
  - ✓ Zero emission dehydrators
  - ✓ Pipeline transport of produced (flowback) water
  - ✓ No-bleed continuous and intermittent pneumatic devices
  - ✓ Automated tank gauging

ADAMS COUNTY
COLORADO

STUDY SESSION AGENDA ITEM

DATE:	**November 5, 2019**
SUBJECT:	**Rocky Mountain Arsenal (RMA) Landfill Oversight Contract with Tri- County Health Department**
FROM:	**Katie Keefe, Environmental Program Manager** **Jill Jennings Gollich, Director**
AGENCY/DEPARTMENT:	**Community and Economic Development**
ATTENDEES:	**Jill Jennings Golich, Katie Keefe**
PURPOSE OF ITEM:	**Review Background, Purpose and Outcomes of Tri-County Health Department Oversight of U.S Army's Construction and Operation of RMA Hazardous Waste Landfill**
STAFF RECOMMENDATION:	**Renew Agreement with Tri-County Health Department for Oversight of Construction and Operation of RMA Hazardous Waste Landfill**

BACKGROUND:

In September 1997 Adams County approved a Certificate of Designation allowing the Army to Construct Hazardous Waste Landfills at the Rocky Mountain Arsenal. Condition Precedent Number 4 of the Certificate of Designation, Case Number 45-97-CD, requires the County to contract with Tri-County Health Department (TCHD) to conduct oversight services at the Rocky Mountain Arsenal's Hazardous Waste Landfill and cover projects. Adams County has satisfactorily contracted with TCHD to provide these services since October 1, 1997 with several five-year renewal periods. The current fiver-year contract term ended on September 30, 2019 with the option to extend. TCHD services include oversight of the environmental cleanup and post closure operation and maintenance. TCHD has provided Adams County with comprehensive annual reports describing contract activities since 2015. Funding for the oversight program is provided by an existing MOU between the Army and TCHD. The Community and Economic Development Department is satisfied with the services and deliverables provided by TCHD.

AGENCIES, DEPARTMENTS OR OTHER OFFICES INVOLVED:

N/A

ATTACHED DOCUMENTS:

TCHD Annual Report Summary from 2017 and 2018

FISCAL IMPACT:

Please check if there is no fiscal impact ☒. If there is fiscal impact, please fully complete the section below.

Fund:	
Cost Center:	

	Object Account	Subledger	Amount
Current Budgeted Revenue:			
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Add'l Capital Expenditure not included in Current Budget:			
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New FTEs requested: ☐ **YES** ☐ **NO**

Future Amendment Needed: ☐ **YES** ☐ **NO**

Additional Note:

APPROVAL SIGNATURES:

EHannah for
Raymond H. Gonzales, County Manager

Alisha Reis, Deputy County Manager

Bryan Ostler, Deputy County Manager

Chris Kline, Deputy County Manager

APPROVAL OF FISCAL IMPACT:

Nancy Dunn
Budget

ROCKY MOUNTAIN ARSENAL OVERSIGHT CONTRACT TRI-COUNTY HEALTH DEPARTMENT SERVICES

- Attend Rocky Mountain Arsenal meetings
- Document compliance review
- Post-closure surveillance
- Long-term monitoring activities
- Off-site private well water testing
- Five-year review participation

ROCKY MOUNTAIN ARSENAL OVERSIGHT CONTRACT TRI-COUNTY HEALTH DEPARTMENT SERVICES

- Certificate of Designation #45-97-CD issued to Army for remediation, hazardous waste landfill operations and post-closure operations at Rocky Mountain Arsenal site.
  - Condition Precedent #4 requires the County to contract with TCHD for oversight of remediation, landfill operations, and post-closure operations
- First 4-year contract with TCHD approved by BOCC resolution in 1997
  - Current 4-year service contract expired 9/30/2019
- TCHD invoices Army directly for contract services
- County is satisfied with TCHD oversight services and contract deliverables
  - Annual reports provided

Tri-County Health Department

May 31, 2018

Ms. Jennifer Rutter
Senior Environmental Analyst,
Community & Economic Development Department
4430 South Adams County Parkway
1st Floor, Suite W2000A
Brighton, CO 80601

Re: Fiscal Year 2017 Annual Report to Adams County
Rocky Mountain Arsenal Oversight Activities

Dear Ms. Rutter:

Please find included five copies of TCHD's Executive Summary from the FY 2017 Annual Report to Adams County for your distribution to the commissioners. I have also included a complete copy of the report for your records. TCHD is available to present the results to BOCC at their request.

The following is an abbreviated summary of that contained in the report. The report covers the reporting period from October 1, 2016 – September 30, 2017.

REMEDIATION PROJECTS

- In the fall of 2014, a Post-Remedy Soil Sampling Program (PRSSP) was completed to provide additional information about post-remedy surface soil conditions throughout the RMA. Three soil samples from the former Basin C contained excessive concentrations of contaminants. Additional soil samples were collected in 2015 and 2016 in order to delineate the area of contamination. A Data Summary Report for the Phase 2 sampling was approved in March 2017 and a Remedy Decision Summary was submitted for review by the Regulatory Agency's (RA's) in June 2017. A Design Change Notice and 100 Percent Design Package were submitted for Regulatory Agency review in April 2018.

- The Shell Disposal Trenches RCRA-Equivalent Cover was constructed over the former RMA disposal site in 2006 and 2007. On May 21, 2015 the Army notified the RA's via email that the amount of water collected by Lysimeters 001, and 002 exceeded the percolation compliance standard. In June 2015 Lysimeter 003 also exceeded the compliance standard and Lysimeter 004 exceeded the standard in June 2016. In January 2016 samples were collected around the lysimeters that exceeded the percolation compliance standard as well as Lysimeter 004 (which exceeded the compliance standard 6-months later) and several other locations on the Integrated Cover System as well as one sample from an undisturbed soil area on the west side of the RMA. Investigation into possible causes for the exceedances is ongoing and the current theory is that the cause is due to preferential pathways due to compaction issues. Further investigation continues

and Phase 2 of the investigation is planned for June 2018. A Corrective Action Plan will be developed once the issue is positively identified.

RCRA POST CLOSURE PLANS

- The Hazardous Waste Landfill and Enhanced Landfill continue to be monitored according to their respective Post Closure Plans and are currently in compliance. Army/Shell has concluded that groundwater quality below and around the landfills has not been impacted. Normal monitoring will continue.

CERCLA LONG TERM CARE PLAN (LTCP)

- The Integrated Cover System (ICS) is monitored according to the LTCP. Percolation performance of the Shell Disposal Trenches (SDT) RCRA-Equivalent Cover was above the non-routine action trigger level and percolation compliance standard that became effective on April 21, 2015 when the 5-Year Interim O&M Period ended. Although all lysimeters are currently in compliance, the excessive percolation collected by SDT lysimeters is part of an ongoing investigation focusing on the cover soil and root density of the vegetation (see paragraph above, listed under remediation projects).

LONG TERM MONITORING PLAN (LTMP)

- The LTMP specified the monitoring criteria and frequency for the groundwater treatment systems and surface water monitoring both on and off-post. In FY17, the on-post and off-post groundwater treatment systems met the performance criteria and objectives established in the 2010 LTMP and are functioning as intended.

- The Railyard Containment System (RYCS) pre-shut-off monitoring program was conducted during FY14. The results of this pre-shut off program met the criteria for continuation of the shut-off process. A Decision Document and Shut-Off Monitoring SAP were prepared for review and approved by the RA's in 2016. The RYCS functioned as intended and was shut down during the third quarter of FY2016.

- The Army/Shell continued the operation of two (2) slurry/barrier wall dewatering projects for the Complex Army Trenches and Lime Basins. These projects have not met their dewatering goals but they are trending lower, and therefore making progress towards achieving these goals. The dewatering goals and issues have been a topic for discussion during Water Team meetings and progress is being made toward actions that can be taken to meet dewatering goals in the future.

Overall, TCHD believes that regulatory oversight and Army responsiveness is appropriate and that the public health is being protected.

Tri-County Health Department

Thank you for distributing this cover letter and Executive Report to the Commissioners. We are also available to answer any questions you may have regarding RMA oversight activities, RMA remediation status, or any concerns related to the implementation of the Record of Decision. Any questions regarding this report may be directed to me or any of our RMA staff at (303) 288-6816.

Sincerely,

TRI-COUNTY HEALTH DEPARTMENT

Deanne Kelly

Deanne Kelly
TCHD RMA Program Field Supervisor

CC: Adams County Board of County Commissioners (5) (Executive Summary Only) ✓
Heidi Miller, County Attorney ✓
Raymond Gonzales, County Manager
Charles Scharmann, RVO
Roberta Ober, RVO
Susan Newton, CDPHE
Greg Hargreaves, EPA
Dr. John Douglas, TCHD
Brian Hlavacek, TCHD
TCHD RMA Program File

FISCAL YEAR 2017 ANNUAL REPORT TO ADAMS COUNTY

Regarding:

TRI-COUNTY HEALTH DEPARTMENT'S ROCKY MOUNTAIN ARSENAL CLOSURE/POST-CLOSURE OVERSIGHT ACTIVITIES

(Bison– photo by D. Kelly)

Reporting Period October 1, 2016 – September 30, 2017

Prepared by: Tri-County Health Department

TRI-COUNTY HEALTH DEPARTMENT

RMA OVERSIGHT TEAM

4201 East 72nd Avenue, Suite D
Commerce City, CO 80022
Phone: (303) 288-6816

TABLE OF CONTENTS

ACRONYMS

AMA	Army Maintained Area
APCD	Air Pollution Control Division
APEN	Air Pollution Emission Notice
ARARs	Applicable or Relevant and Appropriate Requirements
Army	United States Department of the Army
Army/Shell	United States Department of the Army/Shell Oil Company
ASR	Annual Summary Report
BANS	Basin A-Neck Groundwater Intercept and Treatment System
BBM	Biota Barrier Material
BOA	Balance of Areas
BOCC	Board of County Commissioners
BRES	Bedrock Ridge Extraction System
CAMU	Corrective Action Management Unit
CAT	Complex Army Trenches
CCR	Construction Completion Report
CD	Certificate of Designation
CDAT	Complex Army Trenches Dewatering System
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CMP	Comprehensive Management Plan
CQA	Construction Quality Assurance
CSL	Candidate Sample List
CSRG	Containment System Remediation Goals
CWTP	CERCLA Wastewater Treatment Plant
DIMP	Diisopropyl methylphosphonate
DCN	Design Change Notice
DNAPL	Dense Non-Aqueous Phase Liquid
ELF	Enhanced Hazardous Waste Landfill
EPA	U.S. Environmental Protection Agency
ESD	Explanation of Significant Differences
FS	Feasibility Study
GWMRP	Groundwater Mass Removal Project
HHE	Human Health Exceedance
HWL	Hazardous Waste Landfill
IC	Institutional Control
ICS	Integrated Cover System
LB	Lime Basins
LCS	Leachate Collection System
LDS	Leak Detection System
LEMS	Long-Term Environmental Management System

LNAPL	Light Non-Aqueous Phase Liquid
LTCP	Long-Term Care Plan
LTMP	Long-Term Monitoring Plan
LWTS	Landfill Wastewater Treatment System
LUCP	Land Use Control Plan
MCR	Monitoring Completion Report
MOA	Memorandum of Understanding
MRL	Method Reporting Limit
NBCS	North Boundary Containment System
NNDMEA	n-Nitrosodimethylamine
NPL	National Priorities List
NPS	Northern Pathway System
NRAP	Non-Routine Action Plan
NWBCS	Northwest Boundary Containment System
O&F	Operational and Functional
O&M	Operations & Maintenance
OCN	Operations & Maintenance Change Notice
OGITS	Off-Post Groundwater Intercept and Treatment System
PMC	Program Management Contractor
PMRMA	Program Manager Rocky Mountain Arsenal
PPDDT	p,p-Dichlorodiphenyltrichloroethane
PQL	Practical Quantitation Limit
PRSSP	Post Remedy Soil Sampling Program
PT	Principal Threat
QC	Quality Control
QA	Quality Assurance
RA's	Regulatory Agencies
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RISR	Remedial Investigation Summary Report
RMA	Rocky Mountain Arsenal
ROD	Record of Decision
RVO	Remediation Venture Office
RYCS	Railyard Containment System
SAPC	Steering and Policy Committee
SCL	Soil Cushion Layer
SDT	Shell Disposal Trenches
SEC	Site Evaluation Criteria
STF	South Tank Farm
TCHD	Tri-County Health Department
TCLEE	Tetrachloroethene

TSS	Total Suspended Solids
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Tri-County Health Department (TCHD) performs oversight of the Rocky Mountain Arsenal (RMA) Project on behalf of Adams County pursuant to a Certificate of Designation (CD) issued by the County to the U.S. Department of the Army (Army) on September 29, 1997. In accordance with the stipulations of the CD, TCHD has conducted oversight of the RMA project during the past fiscal year (FY) and has performed these functions in accordance with the Rocky Mountain Arsenal Environmental Cleanup Agreement for Substantive Certificate Designation Oversight Services (Agreement) between Adams County and TCHD. This Agreement stipulates that TCHD submit an annual report to Adams County summarizing its oversight activities, this report constitutes the FY17 (October 1, 2016 - September 30, 2017) report to the County under this agreement.

This report covers the long-term and post-closure monitoring of the landfills and various caps and covers. In addition, the annual reports have been expanded to cover items related to groundwater remediation and monitoring both on-post and off-post of the RMA. With respect to the summary of oversight activities performed by TCHD, this report has been organized according to the main elements of: post-closure and long-term monitoring activities; document reviews; and groundwater and surface water activities.

TCHD has prepared this FY17 Annual Report to the County to summarize the RMA oversight activities that have been conducted by TCHD on behalf of the County. In performing its duties, TCHD has attended numerous RMA meetings, reviewed site-wide and project-specific documents, and conducted surveillance of post-closure and long-term monitoring activities. TCHD also continues to sample off-post private wells for diisopropyl methylphosponate (DIMP) and 1, 4-Dioxane.

TCHD also participates in the EPA Five-Year Review (FYR) process. During a FYR a multiagency team evaluates if environmental standards that affect the site have changed in the past five years, whether the cleanup continues to be protective of public health and the environment, and whether the remedy can be expected to remain protective. This most recent FYR covered the period from 2011 to 2015 and is the fourth FYR to be completed for the RMA. The next FYR will occur in 2020.

Through our efforts, TCHD continues to perform the oversight necessary to verify that the Army/Shell are conducting the remaining remediation work and ongoing post-closure operation maintenance activities in a manner that is consistent with: the CD; the On-Post and Off-Post Record of Decisions (RODs) with regulatory agency approved modifications; and acceptable public health practices; and to assure the remedy remains protective of human health and the environment.

During this reporting period, both onsite landfills, (Hazardous Waste Landfill and the Enhanced Hazardous Waste Landfill) are functioning according to design and groundwater quality under the landfills has not been impacted by the post-closure operations and maintenance of the landfills.

During this reporting period, the Basin F and Integrated Cover System (ICS) Covers have been functioning according to design and the water quality downgradient of the former Basin F Wastepile has not been impacted by post-closure operations and maintenance activities.

There was one issue discussed in the November 2015 Annual ICS Covers Report that required corrective action. Percolation performance of the Shell Disposal Trenches (SDT) RCRA-Equivalent Cover was above the non-routine action trigger level and percolation compliance standard that became effective on April 21, 2015 when the 5-year Interim Operations & Maintenance (O&M) period ended. All of the ICS lysimeters including the Shell Disposal Trenches (SDT) lysimeters are currently in compliance as of September 2017. The previous excessive water percolation collected by SDT lysimeters is currently an ongoing investigation. The second phase of the investigation will focus on the identification of preferential flow paths that may have developed in the low density soil. Once the root cause of the percolation exceedances has been determined, the Army and Shell will prepare a Corrective Measures Plan of Action for review and approval by the Regulatory Agencies.

The soil cover of the ICS was reported to be in good condition throughout 2017. Cover deficiencies observed during the reporting period included differential settlement, burrowing animal holes, areas of poor growth of vegetation, noxious or undesirable weeds, and repairs to the perimeter fence due to bison activity. The site will be examined for weeds throughout FY18 and any occurrences of unwanted weeds will be spot sprayed. The site will continue to be examined for any new areas of differential settlement, erosion rills, ponding areas, or burrowing animal holes. Areas already identified with differential settlement will continue to be monitored and the larger diameter holes will be repaired and seeded.

In the fall of 2014, a Post-Remedy Soil Sampling Program (PRSSP) was completed to provide additional information about post-remedy surface soil conditions throughout the RMA. Three soil samples from the former Basin C located in Section 26 contained concentrations of contaminants in excess of the ROD acute human health site evaluation criteria (SEC). Investigation of these exceedances has included additional sampling in the area around the three locations where the concentrations of contamination were found to exceed the SEC. Additional sampling was completed in December 2015 and September 2016. As a result of the additional sampling, it is believed that the delineation of contamination has been determined and indicates that areas of the former ditch may not have been excavated deep enough to remove contamination. The final Basin C Data Summary Report (DSR) was issued in April 2017 and the next step in remediation is to document a remedy decision. A design for remediation is expected in spring 2018. Discussions on this topic are planned for a March 2018 Council meeting. Further discussions as to how the remedy has proceeded will be included in future annual reports.

One deep well in the Off-post study area has consistently contained elevated DIMP concentrations dating back to the summer and fall of 2014. Due to these elevated DIMP results, the residents at this property were provided with bottled drinking water and the Army replaced the well in November 2016. Sampling of the new well during the summer of 2017 resulted in DIMP levels of 7.72 ug/L and 10.5 ug/L. A decision was made by the Army/Shell and regulatory agencies to continue to sample this well in the future to track the DIMP levels and determine if the levels

decrease with use of the well. New residents of the property are currently being provided with bottled drinking water.

More details on the above described activities can be found in the corresponding sections of the report.

1.0 INTRODUCTION

TCHD performs oversight of the RMA Project on behalf of Adams County (County) pursuant to a Certificate of Designation (CD) issued by the County to the Army on September 29, 1997. Condition 4(c) of the CD gave Adams County the authority to conduct oversight of the design, construction, operation, closure and post-closure of the landfills constructed at RMA as part of the Corrective Action Management Unit (CAMU) established by the Compliance Order on Consent between the CDPHE and the Army. Furthermore, The Conditions Precedent and Stipulations set forth by the County in its approval of the Army's substantive CD request (Case #45-97-CD) established that the County will contract with TCHD, or other qualified entity to conduct oversight of the hazardous waste landfills and other elements of the RMA during environmental cleanup. According to these stipulations, TCHD has conducted oversight of the RMA cleanup during the past year and is operating under the Rocky Mountain Arsenal Environmental Cleanup Agreement for Substantive Certificate Designation Oversight Services (Agreement) between Adams County and TCHD. The scope of the oversight activities as contained in the Agreement are designed to provide assurance to the County and its residents that the U.S. Army is conducting the RMA remediation and post closure Operation and Maintenance (O&M) activities in conformance with: a) the CD; b) the On-Post and Off-Post RODs with Regulatory Agency approved modifications; and c) acceptable public health practices.

The Agreement requires that TCHD submit an annual report to Adams County summarizing remediation and post-closure activities, and this report constitutes the FY17 report to the County under this agreement. TCHD continues to prepare the annual reports to provide emphasis on the post-closure activities that have become a significant portion of the work being conducted at RMA. This report covers the execution of the on-going or newly required remediation projects and the post-closure O&M activities such as routine inspections of the landfills and various caps and covers. In addition, the annual reports have been expanded to cover items related to groundwater remediation and monitoring both on-post and off-post of the RMA. Although not officially covered by the Agreement, TCHD oversees these activities and directly conducts off-post private well groundwater monitoring under its MOA with the Program Manager for Rocky Mountain Arsenal, effective October 1, 2014. TCHD's decision to include this additional information in the annual report is based on its relevance and ongoing interest to the residents of Adams County.

The Off-Post ROD, signed December 19, 1995, and the On-Post ROD, signed June 11, 1996, provides the objectives, rationale and framework for the cleanup actions to be executed at RMA. The ROD for the On-Post Operable Unit was signed by the U.S. Army (Army), the EPA, and the State of Colorado. Principal components of the on-post cleanup program at RMA were the design, construction, and operation of two (2) on-post hazardous waste landfills in conjunction with the continued operation of previously installed groundwater treatment systems.

This report is assembled from a variety of reports submitted by the Army to the Regulatory Agencies. These reports provide data covering different activities and timeframes. Therefore, the timeframe of the data presented in these reports and this report

to Adams County do not always overlap. The Army/Shell reports used to assemble the data in this report include:

- 2017 RCRA Landfills and Groundwater Monitoring (June 26, 2017)
- 2017 Basin F Cover and Groundwater Monitoring Report (November 20, 2017)
- Annual Covers Report for Integrated Cover System 2017 (November 20, 2017)
- Annual Summary Report for Groundwater and Surface Water Fiscal Year 2016 (September 27, 2017)

This report covers the reporting period from October 1, 2016 to September 30, 2017 and is organized according to the following sections:

- Section 1.0 – Introduction provides background information related to the basis of TCHD's oversight responsibilities and describes the contents of the annual report.

- Section 2.0 – Oversight of Remediation Project Activities summarizes the ongoing remediation and O&M projects that have been conducted at RMA and TCHD's oversight of these projects during this reporting period.

- Section 3.0 – Oversight of Post-Closure and Long-Term Monitoring Activities summarizes ongoing post-closure and long-term monitoring activities, as segregated by controlling documents, that have been conducted at RMA and TCHD's oversight of these activities during this reporting period. The controlling documents encompass both project-specific and site-wide operations/monitoring plans.

- Section 4.0 – Document Reviews summarizes the types of documents reviewed by TCHD.

- Section 5.0 – Groundwater and Surface Water Activities summarizes the off-post private well groundwater monitoring conducted by TCHD and the oversight of on-post and off-post groundwater remediation and monitoring activities conducted by the Army/Shell.

- Section 6.0 – Other RMA Program Elements/Activities summarizes other miscellaneous and programmatic activities being conducted in support of remediation and/or transition of the Superfund Site to the Rocky Mountain Arsenal National Wildlife Refuge.

- Section 7.0 – Activities Anticipated for the Next Reporting Period provides a brief synopsis of future RMA activities anticipated to occur during the next reporting period including: remediation project activities; post-closure and long-term monitoring activities; groundwater remediation and monitoring activities; and review of documents submitted by the Army/Shell for Regulatory Agency review. This section also describes the anticipated oversight that TCHD will provide for these future activities.

2.0 OVERSIGHT OF REMEDIATION PROJECT ACTIVITIES

This section summarizes the ongoing remediation projects that have been conducted at RMA which include TCHD's oversight of these projects during this reporting period.

Basin C Exceedance Area

In the fall of 2014, a Post-Remedy Soil Sampling Program (PRSSP) was completed to provide additional information about post-remedy surface soil conditions throughout the RMA. Three soil samples from the former Basin C located in Section 26 contained concentrations of contaminants in excess of the ROD acute human health site evaluation criteria (SEC). An additional 12 samples located around the center point of the previous Human Health Exceedance discovery were collected in December 2015. One of the additional samples contained concentrations above the ROD acute Human Health Exceedance Site Evaluation Criteria. CDPHE and EPA requested that additional locations be sampled along the former Basin C berm adjacent to the remediated HHE area. An additional 12 samples used to delineate the exceedance area were collected along the historic ditch area in April 2016. Twenty-two additional samples were collected at various depths between 0-3 feet below ground surface along the former ditch alignment in September 2016. Two of these additional samples exceeded the ROD HHE criteria. Both of these samples were found at 2ft depth along the former ditch. A final Data Summary Report was issued in April 2017 and a Basin C Soil Exceedance Area Remedy Decision Summary was issued in July 2017. The next step towards remediation will be to prepare a Design Change Notice (DCN) to the Secondary Basins design for implementation of a selected remedy.

Shell Disposal Trenches (SDT) RCRA-Equivalent Cover

The SDT RCRA-Equivalent Cover was constructed over the former RMA disposal site in 2006 and 2007. The Interim O&M period is the period of time between when the construction is complete and when a determination can be made that the cover is Operational and Functional (O&F). According to the Long-Term Care Plan, compliance with the performance standards became enforceable by the Regulatory Agencies (RA's) on April 21, 2015 and an initial compliance determination was made in May 2016 based on cover performance data collected over the previous 12-month period. One of the three enforceable compliance standards is for percolation which may not be greater than 1.3 mm/year of water measured in the lysimeters over a rolling 12-month evaluation.

- On May 21, 2015 the Army notified the RA's via email that the amount of water collected by Shell Disposal Trenches (SDT) Lysimeters 001, and 002 exceeded the percolation compliance standard. In June 2015 SDT Lysimeter 003 also exceeded the compliance standard. Lysimeter 004 which is located over the Complex Army Trenches portion of the ICS also exceeded the compliance standard for percolation in June 2016. The Phase I investigation included a cover soil testing program that included collecting soil samples around the lysimeters that were out of compliance as well as other similar lysimeters found on the ICS and one soil sample collected in a historically undisturbed area on the west side of the RMA property. These

samples were collected in January 2016 and the samples were analyzed for soil texture, Atterberg limits, hydraulic conductivity, calcium carbonate equivalent and root system establishment. The results of the Phase I investigation concluded that the soil and vegetation on the various areas of the ICS RCRA-equivalent covers are very similar and no single aspect of the data collected could explain the difference in percolation performance between the cover area. Currently, the theory on the cause of the percolation exceedances include the potential of preferential pathways due to compaction issues. The Army will develop a Corrective Measures Plan of Action (CMPA) to address the percolation exceedance of the three (3) SDT lysimeters and a separate CMPA to address the percolation exceedance of ICS Lysimeter 004. A Sampling and Analysis Plan will be developed in early 2018 to move forward with this investigation once the root cause is identified. More discussion on this topic will be included in future annual reports.

3.0 OVERSIGHT OF POST-CLOSURE AND LONG-TERM MONITORING ACTIVITIES

This section provides a summary of the post-closure and long-term monitoring activities that have been conducted by TCHD and also discusses TCHD's role in those activities. These oversight and monitoring activities are conducted to ensure adherence to the requirements outlined in the following documents, and all subordinate and appended plans found within these documents:

- RCRA-Equivalent, 2- and 3-Foot Covers
- Hazardous Waste Landfill (HWL) Post-Closure Plan
- Enhanced Hazardous Waste Landfill (ELF) Post-Closure Plan
- Basin F Post-Closure Plan
- RCRA-Equivalent, 2- and 3-Foot Covers
- ICS- Long-Term Care Plan (LTCP)
- Long-Term Monitoring Plan (LTMP)
- Land Use Control Plan (LUCP)

The following sections are organized according to those projects that fall under the RCRA post-closure plans, LTCP, LTMP and LUCP. The RCRA post-closure designation applies to the HWL, ELF, and Basin F and requires the post-closure monitoring of these projects to be outlined in individual post-closure plans.

3.1 RCRA Post-Closure Projects

Post-closure care for the RCRA caps of the HWL and ELF are dictated respectively by the HWL Post-Closure Plan and the ELF Post-Closure Plan. As previously indicated, the Basin F RCRA-equivalent cover was monitored under the LTCP until the Basin F Post-Closure Plan was finalized in October 2011; after which, the cover was monitored according to the requirements of the post-closure plan. Results of these inspections are captured in the following documents:

- 2017 RCRA Landfills and Groundwater Monitoring Report (June 26, 2017)
- 2017 Basin F Cover and Groundwater Monitoring Report (November 20, 2017)

Oversight by TCHD of the caps and covers is focused on the Army Maintained Areas (AMA). The AMA constitutes completed remedy areas of the RMA (approximately 1,700 acres) that will be retained by the Army and will not become part of the Rocky Mountain Arsenal National Wildlife Refuge, and includes the Hazardous Waste Landfill (HWL), Enhance Hazardous Waste Landfill (ELF), Basin F, Integrated Cover System (ICS), 2-foot cover areas and 3-foot cover areas.

The RCRA post-closure designation applies to the HWL, ELF, and Basin F and requires the post-closure monitoring of these projects to be outlined in individual post-closure plans. Once a cap or cover was constructed and a final inspection had been completed by the Regulatory Agencies, post-closure compliance monitoring was initiated and continues for a minimum of 30 years. Post-closure monitoring is intended to verify that remedy components are functioning properly and is used to identify any deficiencies or potential compliance issues. Monitoring frequencies as dictated in the post-closure plans include monthly and semi-annual inspections.

Post-closure care of the HWL and ELF includes: the inspection, maintenance and repair (as required) of the RCRA caps; the monitoring of quantity and quality of leachate and leak detection water; and the monitoring of groundwater upgradient and downgradient of the landfills. The results of the O&M and monitoring activities are captured in the *2017 RCRA Landfills and Groundwater Monitoring Report*. This report typically provides a summary of post-closure care activities that occurred during the reporting period of FY17 and provides recommendations for the post-closure care during the reporting period of FY18. The 2017 activities presented in the report include items applicable to both the HWL and the ELF including inspections of the AMA, Leachate Collection (LCS) and Leak Detection (LDS) Systems, analysis of the Action Leachate Rate (ALR), quantities and quality of wastewater from the LCS, and groundwater monitoring and assessment.

3.1.1 Hazardous Waste Landfill Post-Closure Plan

The HWL (double-lined landfill) was designed and constructed for the disposal of human health exceedance and principal threat exceedance soils, debris from Agent History Structures, and debris from Significant Contamination History Structures.

Soil Cover Assessment

In general, the monitoring results for the HWL, as presented in the report were assessed by the Army/Shell to indicate the condition of the soil cap and associated vegetation and were found to be in good condition. The presence of weedy species in the vegetation triggered ongoing weed control efforts including application of ground herbicide for cheatgrass control. Maintenance and repair activities related to the HWL inspections included a combination of herbicides that were used to ground clear the perimeter roads, the manhole access roads, around bollards, and in working areas for the safety of personnel working in

those areas. Tumbleweeds were also removed from the perimeter fence during 2017 maintenance efforts. One erosion monument (a permanent metal marker installed to a specific elevation on the ground surface, used for measuring soil erosion) located on the HWL measured 4 inches of soil loss during the September 2016 Type II inspection. This measurement was below the Non-Routine Action trigger and it was noted that most likely the soil thickness loss was a result of natural consolidation or loosely compacted soil around the monument. The HWL cover continues to function as designed.

Leachate collection and leak detection systems

The HWL leachate collection and leak detection systems are sampled and analyzed for Indicator Compounds on a quarterly basis and for the full analyte suite annually in the second quarter. Indicator Compounds (ICs) comprise a subset of the Contaminants of Concern that have been routinely detected in the landfill leachate. Since detection levels are much lower in liquids than in soils these compounds tend to show up in the leachate.

Analytical results for the leachate collection system (LCS) detected the presence of Indicator Compounds; dichlorodifluoromethane, dicyclopentadiene (DCPD), dieldrin, DIMP, and lead. The concentrations of ICs detected in the HWL LCS sumps are consistent with wastes placed in the landfills.

Analytical results for the leak detection system (LDS) indicated the presence of Indicator Compounds, DIMP, dichlorodifluoromethane, dieldrin and lead.

Groundwater Monitoring

Monitoring under the HWL Post-Closure Groundwater Monitoring Plan began in July 2009 with quarterly sampling of wells in the HWL groundwater monitoring network. This network of wells, both upgradient and downgradient of the HWL, is intended to monitor flow direction and groundwater contamination associated with the landfill. Groundwater is monitored for Indicator Compounds as a way to detect potential releases of contamination from the landfill.

Lead and dieldrin were the only indicator compounds detected in HWL downgradient wells. None of the lead detections exceeded the 2016 prediction limits. Dieldrin concentrations in one well were above the 2016 upper prediction limit of 0.051 ug/L during the first three quarters of 2016. Discussions to install a new well downgradient of the HWL in order to investigate the source of dieldrin are ongoing in 2018. No statistically significant variations for dieldrin exist between upgradient or downgradient wells based on an intrawell comparison where compliance is determined by evaluation of each well's historical data, therefore, it can be concluded that the groundwater quality around the HWL has not been impacted by the operations, closure and post-closure O&M of the landfill.

To meet RCRA requirements and as stipulated in the HWL Post-Closure Plan, the quantity of liquid that is collected in the leak detection system is compared against an Action Leakage Rate that is calculated for the landfill. An excessive quantity of liquid collected in

the leak detection system could indicate a potential leak through the landfill liner. The trend in HWL wastewater production continues to decrease.

The following O&M Change Notices were approved for the HWL during the reporting period:

- OCN-HWL-2017-001 – This OCN included technical specifications for the installation of well 25184 and changes to the HWL Post-Closure Groundwater Monitoring Plan (PCGMP) to reflect the addition of the well to the HWL groundwater monitoring network.
- OCN-HWL-2017-002 – This OCN revised the HWL PCGMP to reflect the addition of wells 25041, 25059, and 25502 and the deletion of well 26157 from the HWL water level monitoring network. It also revised a Figure in the PCGMP to include these changes in the wells.
- OCN-HWL-2017-003 – This OCN revised the HWL PCGMP to incorporate Table 6.1-1: *Upper Prediction Limits for the HWL as of 2016* into the Plan.

3.1.2 Enhanced Hazardous Waste Landfill Post-Closure Plan

The Enhanced Hazardous Waste Landfill (ELF) is a triple-lined landfill designed to exceed the standards of a RCRA hazardous waste landfill. As a result, it was used exclusively to dispose of Principal Threat Exceedance waste that has higher levels of contamination than the Human Health Exceedance waste disposed in the HWL. In October 2005, an Amendment to the ROD was finalized for an alternative remedy to the Lime Basins Remediation Project that allowed for the Lime Basins waste to be contained in-place using a slurry wall, RCRA-equivalent cover and dewatering system. This ROD Amendment made space available within the ELF to dispose of Principal Threat Exceedance wastes generated by the Basin F Wastepile Remediation Project and the Former Basin F Principal Threat Soils Remediation Project, as well as waste from other remedial operations.

Soil Cover Assessment

In general, the monitoring results for the ELF, as presented in the Annual Post-Closure Report for RCRA Landfills and Groundwater Monitoring 2017 assessed the results which indicate the condition of the soil cap and associated vegetation to be in good condition with some areas of sparse vegetation on the south face between the perimeter channel and the mid-slope drainage channel. There was not much evidence of soil erosion anywhere on the cap.

Routine maintenance and repairs are undertaken by the Army/Shell to ensure that the ELF cap continues to function as designed. In 2014 the frequency of inspections was changed from monthly to quarterly. Inspections are also conducted after significant storm events. Weed control efforts for noxious and undesirable weeds are ongoing using ground herbicide application. OMC personnel repaired washouts under wells 25122 and 25123 with cover soil from a stockpile in November 2016. Tumbleweeds were removed from the perimeter

fence, a combination of herbicides was used to ground clear perimeter roads, manhole access roads, around bollards and in working areas, the prairie dog barrier on the south perimeter fence was repaired, and OMC personnel sprayed wasp nests around the LS/LF building during 2017.

Erosion survey monuments were measured for soil thickness loss during September 2016 and April 2017, all eight (8) monuments measured a soil thickness loss but were below the Non-Routine Action trigger level, Erosion monument locations were also surveyed during the semiannual inspections.

Leachate collection and leak detection system

The ELF leachate collection and leak detection system are sampled and analyzed for Indicator Compounds on a quarterly basis, and for a larger and more comprehensive list of RMA Contaminants of Concern on an annual basis. Indicator Compounds comprise a subset of the Contaminants of Concern that have been routinely detected in the landfill leachate.

Analytical results for the leachate collection system (LCS) could not be collected due to an insufficient quantity of leachate to collect a sample in 2016 or 2017. Sampling of the LCS sumps will resume as leachate becomes available. Analytical results for the leak detection system (LDS) were consistent with the wastes placed in the landfill and indicated the presence of Indicator Compounds; chloroform, chromium, dieldrin, and lead.

There was insufficient water in the ELF LCS sumps to collect a 1,4-Dioxane sample, however, low-level detections in the ELF LDS sumps were found. Due to intermittent detections and low concentrations in two of the LDS sumps and no detections in two other LDS sumps, no further sampling of 1,4-dioxane is proposed for the ELF.

Groundwater Monitoring

Monitoring under the ELF Post-Closure Groundwater Monitoring Plan began in May 2010 with quarterly sampling of wells in the ELF groundwater monitoring network. This network of wells, both up-gradient and down-gradient of the ELF, is intended to monitor flow direction and groundwater contamination associated with the landfill. Groundwater is monitored for Indicator Compounds as a way to detect potential releases to groundwater from the landfill.

Sampling of the ELF groundwater was performed quarterly in conjunction with the wastewater sampling schedule. Lead was the only IC detected and was below the prediction limits in downgradient monitoring wells in 2016. In conclusion, the groundwater quality below and around the ELF has not been impacted by the operations, closure and post-closure O&M of the landfill.

The following O&M Change Notices were approved for the ELF during the reporting period:

- OCN-ELF-2017-001 – This OCN revised Table 3.2-1 in the ELF PCGMP to reflect the addition of wells 25183, 25189, 25194, 25195, 25203, 25502, 25090, 25094, 25095 and 25103 from the ELF water level monitoring network, it also included the addition of wells 25502, 25041, and 26059 to Figure 3.2-1.
- OCN-ELF-2017-002 – This OCN revised the ELF PCGMP to incorporate Table 6.1: *Upper Prediction Limits for the ELF as of 2016* into the ELF PCGMP.

3.1.3 Basin F Post-Closure Plan

Basin F achieved closure as a RCRA interim status unit, and is therefore subject to the RCRA post-closure requirements contained in the Basin F Post-Closure Plan that was finalized in October 2011. Similarly, groundwater monitoring for Basin F was conducted according to the requirements contained in the Basin F Closure and Post-Closure Groundwater Monitoring Plan that was finalized in April 2006. The final Basin F Post-Closure Plan also contains the Basin F Post-Closure Groundwater Monitoring Plan that dictates groundwater monitoring requirements beyond October 2011. To summarize, the requirements for monitoring of the RCRA-equivalent cover and groundwater are now contained in a single document with the issuance of the final Basin F Post-Closure Plan.

Soil Cover Assessment

The Army/Shell is required to submit annual reports summarizing the performance of the Basin F RCRA-equivalent cover. The latest of these documents that was submitted during FY17 is the 2017 Basin F Cover and Groundwater Monitoring Report (November 20, 2017). In general, the Basin F soil cover was reported by the Army/Shell to be in excellent condition throughout FY17. Potential deficiencies observed during the reporting period included noxious or undesirable weeds. A combination of herbicides was applied as a ground clear along the shoulders of the roadways, the cattle guards, the gate entrances and between the bollards for the groundwater wells located on the perimeter road. The inspections also determined that the loss in soil cover thickness was below the compliance standard and non-routine trigger levels.

Vegetation

Total live vegetation and absolute ground cover (live vegetation and detritus) is required by the Basin F Post-Closure Plan to meet certain performance criteria. According to the 2017 assessment data, performance criteria for the Basin F cover have been met during the reporting period. Several plant species not previously encountered on the Basin F Cover were observed which indicates an increase in species diversity and continued development of plant community complexity.

Percolation Monitoring

Post-closure care of the Basin F Cover also involves percolation monitoring with lysimeters that were constructed in strategic locations of the RCRA-equivalent covers. These lysimeters are designed and constructed to measure the quantity of precipitation that is percolating through the cover. The lysimeters within the Basin F cover collected no

measurable percolation over the reporting period and are therefore well below the 9-month and 12-month non-routine action trigger levels. All Basin F cover areas inspected during this time frame were found to be in conformance with compliance standards which were first required at the end of the Interim O&M Period in March 2015.

Groundwater Monitoring

Groundwater monitoring for Basin F was conducted in accordance with the requirements contained in the Basin F Closure and Post-Closure Groundwater Monitoring Plan. The groundwater monitoring effort is intended to demonstrate the proper post-closure performance of the Basin F project which includes the requirement to control, minimize or eliminate post-closure migration of hazardous contaminants to groundwater. Groundwater monitoring results for the reporting period are summarized in the Basin F Post-Closure Groundwater Monitoring Report 2017 that was included as Appendix E to the 2017 Basin F Cover and Groundwater Monitoring Report. Concentrations for most Indicator Compounds during post-closure monitoring have decreased compared to baseline data. The Army and Shell will consult with the Regulatory Agencies in 2018 to discuss revising the statistical approach for post-closure groundwater monitoring to support a more robust approach to evaluate water quality for Basin F.

A total of nine (9) Basin F network wells were monitored in May 2017 to detect any potential releases of contaminants to groundwater. The groundwater is tested for Indicator Compounds that constitute a subset of the more comprehensive list of RMA Contaminants of Concern. These Indicator Compounds constitute the contaminants that have been detected in the leachate of the former Basin F Wastepile and would expect to be detected in groundwater.

As presented in the 2017 Basin F Cover and Groundwater Monitoring Report, Indicator Compounds detected in the upgradient wells included:

Arsenic (AS)
Chloride (CL)
n-Nitrosodimethylamine (NNDMEA)
Sulfate (SO4)
Chloroform
Dicyclopentadiene (DCPD)
Dieldrin (DLDRN)
Diisopropylmethyl phosphonate (DIMP)
Tetrachloroethene (TCLEE)
p-Chlorophenylmethyl sulfoxide (CPMSO2)
Copper

Indicator Compounds detected in the downgradient monitoring wells included;

Arsenic (AS)
Chloride (CL)
Chloroform (CHCL3)
Tetrachloroethene (TCLEE)
p-Chlorophenylmethyl sulfoxide (CPMSO2)
Dicyclopentadiene (DCPD)
Sulfate (SO4)
Dieldrin (DLDRN)
Diisopropylmethyl phosphonate (DIMP)
n-Nitrosodimethylamine (NNDMEA)
Copper

There were no O&M Change Notices for the Basin F Cover during the reporting period.

3.2 CERCLA Long-Term Care Plan (LTCP)

The LTCP was finalized in September 2008 and specifies CERCLA monitoring requirements for the portions of the AMA that are not under RCRA post-closure care. The LTCP requirements are applied following construction completion that coincides with the re-vegetation of the ICS. The LTCP is applicable to the ICS that comprises the RCRA-equivalent covers of Basin A, Complex Army Trenches, Lime Basins, Shell Disposal Trenches, and South Plants Central Processing and Balance of Area, and the contiguous 2-foot and 3-foot covers.

The results of LTCP monitoring are documented in the Annual Covers Report for Integrated Cover System 2017 (November 20, 2017). This report presents the results of monitoring and cover maintenance including percolation and vegetation performance assessments. Long-term monitoring of the ICS also involves percolation monitoring with lysimeters that were constructed in strategic locations of the RCRA-equivalent covers. These lysimeters are designed and constructed to measure the quantity of precipitation that is percolating through the cover.

3.2.1 Integrated Cover System

The ICS comprises the following RCRA-equivalent covers, as well as the 2-foot soil and 3-foot soil covers that total approximately 730 acres:

- Complex Army Trenches RCRA-equivalent cover
- Shell Disposal Trenches RCRA-equivalent cover
- Lime Basins RCRA-equivalent cover
- Basin A RCRA-equivalent cover including the Basin A Notch
- South Plants Central Processing Area and Balance of Area RCRA-equivalent cover

Monitoring and inspections under CERCLA for the remaining AMA began at completion of the final inspection. These areas include the ICS that comprises the RCRA-equivalent covers of Basin A, Complex Army Trenches, Lime Basins, Shell Disposal Trenches, and South Plants Central Processing and Balance of Area, and the contiguous 2-foot and 3-foot cover areas. Monitoring, inspection and Operations & Maintenance (O&M) requirements for these areas are outlined in the LTCP. Cover performance of these areas is currently being evaluated over the first five-year period following cover construction that has been designated as the Interim O&M Period. During this Interim O&M Period, assessments are made of all cover elements including vegetation establishment, percolation and soil moisture. However, monitoring for conformance with compliance criteria stipulated in the LTCP are not enforced during the Interim O&M Period with the understanding that the covers are not expected to perform as designed until the vegetation has been fully established. The five-year Interim O&M Period ended on April 21, 2015 and the compliance standards became enforceable at that time.

The monitoring of the ICS to verify compliance with the LTCP is accomplished through monthly and semi-annual inspections that are attended by representatives of the Regulatory Agencies. These inspections were conducted with full participation by TCHD.

There was one issue discussed in the November 2015 Annual Report that needs corrective action. Percolation performance of the Shell Disposal Trenches (SDT) RCRA-Equivalent Cover was above the non-routine action trigger level and percolation compliance standard that became effective on April 21, 2015 when the 5-Year Interim O&M Period ended. The excessive percolation collected by SDT lysimeters is part of an ongoing investigation focusing on the cover soil and root density of the vegetation and is discussed in further detail below.

Soil Cover Assessment

In general, the soil cover of the ICS was reported by the Army/Shell to be in good condition throughout FY2017. Cover deficiencies observed during the reporting period included differential settlement, noxious or undesirable weeds, areas of poor vegetation, and occasional erosion rills and ruts.

Vegetation

Total live vegetation and absolute ground cover (live vegetation and detritus) is required by the LTCP to meet certain performance criteria. The Integrated Cover System Vegetation Performance Assessment Summary is contained in the Annual Covers Report for ICS 2017. According to the 2017 assessment data, vegetation performance criteria for the ICS cover have been met during the reporting period. Vegetation compliance standard states that; 1) total live vegetation not less than 25 percent in any single year, and 2) two-year running average value for total ground cover not less than 50 percent, and 3) three- year running average value for total ground cover not less than 67 percent. Vegetation appeared to be growing favorably with a mix of mostly native grasses and some weeds. Increased species diversity was observed, likely due to increased precipitation.

Percolation Monitoring

Percolation monitoring is required in order to determine if a capillary break is being created that will prevent groundwater from coming into contact with the liquid waste. To test this, lysimeters were installed in the Shell Trenches portion of the ICS, which was the first full-scale RCRA – equivalent cover. Cover construction and lysimeter installation was completed in October 2007. The Shell Trenches portion of the ICS was a unique cover design which utilized a geotextile fabric between the biota barrier and soil cover to serve as a capillary break layer. The remaining portions of ICS RCRA- Equivalent cover utilized 1-3 inches of pea gravel. This change was made through an approved Design Change Notice. Along with the 4 lysimeters installed in the Shell Trench portion of the cover were 5 nests of moisture sensing probes installed within the lysimeter. The soil moisture data provides information on the effectiveness of evapotranspiration in the removal of water from the cover.

In September 2013, an estimated 1,000 year rain storm occurred. The inspections which followed this event showed that the lysimeters had been flooded and were inoperable, indicating that the standard of 1.33 millimeters (mm)/year had been exceeded. From September 1, 2013 to September 30, 2013 measurements of total rainfall showed that 18.45 inches of rain fell during that one month period.

Other lysimeters located on the ICS but outside the Shell Trenches Portion were successful in achieving the less than 1.33 mm/year standard.

Also unique to the Shell Disposal Trenches cover are nests of moisture sensing probes that were installed within each lysimeter to collect soil moisture data from various depths of the soil cover. Evaluation of soil moisture data provides information relative to the effectiveness of evapotranspiration in the removal of water from the cover. In addition, the soil moisture data is compared with percolation data to indicate whether a functioning capillary break has been formed between the soil cover and underlying biota barrier. A total of five (5) nests of moisture sensing probes were placed at each of the four (4) lysimeters of the Shell Trenches cover. The moisture probes also assist in selection of an appropriate corrective action in the event that percolation in excess of the 1.33 mm/yr compliance criterion is measured in a lysimeter and to assess the effectiveness of corrective actions performed.

The SDT Lysimeters 001 and 002 exceeded the percolation compliance standard of 1.3 mm/year in May of 2015 followed by Lysimeter 003 in June 2015. The remaining 12 ICS lysimeters collected little or no percolation water in May and June of 2015. A Sample Collection and Analysis Plan was developed and soil core samples were collected in January 2016 near the three SDT lysimeters as wells as three lysimeters on other portions of the ICS and a native site in the west-central area of Section 33. The soil samples were analyzed for soil texture, Atterberg limits, hydraulic conductivity, calcium carbonate equivalent and root system establishment by off-site laboratories. Results of the soil analyses did not indicate a definitive root cause for the excessive percolation in these lysimeters. In June 2016 Lysimeter 004 located on the former Complex Army Trenches area of the ICS also exceeded the compliance standard and remained out of compliance through May 2017. Lysimeters 001 and 003 remained out of compliance through May 2017 and Lysimeter 002 remained out of compliance through August 2017.

Based on the Phase 1 Investigation, conclusions as to the cause for the compliance exceedance have not yet been determined. Recommendations from a consultative meeting held in April 2017 includes considering a Phase 2 field investigation to include a variety of soil density field tests, tracer dye testing and trenching in the vicinity of the moisture probes and on other area of the ICS and SDT and the possible installation of piezometers in the Biota Barrier Material (BBM) runout area to look for percolation water that could be backed up within the drainage layer. The Army is committed to determining the root cause of the out-of-compliance situation and ultimately to execute the corrective measures necessary to prevent further non-compliance. The Phase 2 Field Investigation is planned for spring/summer 2018. Further discussion on this topic will be included in future annual reports.

3.3 Site-Wide Monitoring

In addition to the project-specific monitoring and surveillance discussed in Section 3.1, additional monitoring at the RMA is dictated by site-wide monitoring and O&M plans; in particular, the LTMP and the LUCP. The requirements contained in these plans and the results of the monitoring conducted in accordance with these requirements are discussed in the following sections. Site-wide issues impacting the LUCP such as the management of bison by the USFWS are also discussed in this section.

3.3.1 Long-Term Monitoring Plan for Groundwater and Surface Water

The Final Long-Term Monitoring Plan (LTMP) contains the requirements for the monitoring of groundwater and surface water on a site-wide basis to assess the effectiveness of the ROD remedies and assess the performance and effectiveness of the following on-post and off-post groundwater treatment systems:

- North Boundary Containment System (NBCS)
- Northwest Boundary Containment System (NWBCS)
- Basin A-Neck Groundwater Intercept and Treatment System (BANS)
- Complex Army Disposal Trenches (CDAT) Dewatering System
- Lime Basins
- Bedrock Ridge Extraction System (BRES)
- Railyard Containment System (RYCS)
- Off-Post Groundwater Intercept and Treatment System (OGITS)

The specific monitoring activities required by the LTMP include: on-post water level and water quality monitoring; water level and water quality monitoring upgradient and downgradient of groundwater treatment systems; and off-post Containment System Remediation Goals exceedance monitoring.

This reporting period to the County represents the seventh year of comprehensive application of the 2010 LTMP towards the monitoring of groundwater and surface water with the results of the monitoring program being reported in the Annual Summary Report (ASR) for Groundwater and Surface Water Fiscal Year 2016 (September 27, 2017). This monitoring report was reviewed by TCHD during this reporting period and the results and conclusions are summarized below.

North Boundary Containment System (NBCS)

The NBCS was designed to intercept contaminated groundwater from the upgradient side of a barrier wall, treat it, and inject the treated water back into the alluvial aquifer on the downgradient side of the barrier wall. A two extraction well addition (south channel well system) was added in 2002 to improve the NBCS operations.

In FY16, the NBCS met the performance criteria and objectives established in the 2010 LTMP. There were no CSRG analyte exceedances in the four-quarter moving averages or annual ROD CSRG samples in the NBCS treatment system effluent in FY16. The reverse gradient was maintained throughout the year which shows that an inward gradient towards the arsenal across the bentonite slurry wall occurred. The reverse gradient ensures that water is pulled through the treatment system before it is injected back into the aquifer. The NBCS is functioning as intended.

Northwest Boundary Containment System (NWBCS)

The Northwest Boundary Containment System consists of 3 different construction segments:

- NWBCS Original System - slurry wall
- NWBCS Northeast Extension - slurry wall
- NWBCS Southwest Extension - no slurry wall

In FY 2016, the NWBCS met the primary performance criteria and objectives established in the 2010 LTMP. Except for dieldrin, the secondary performance criterion in downgradient wells was met. The NWBCS had no CSRG/PQL analyte exceedances of the four-quarter moving averages in the treatment system effluent in FY16. The NWBCS appears to be functioning as intended, but additional steps are needed to meet the secondary criteria.

Basin A-Neck Groundwater Intercept and Treatment System (BANS)

The BANS was constructed in 1989 to intercept contaminated groundwater from Basin A. As with other systems, contaminated groundwater is pumped, treated and re-injected downgradient from a slurry wall. Two other extraction systems were added in 2000 (Bedrock Ridge Extraction System and Complex Army Disposal Trenches) and one in 2011 (Lime Basins) to the BANS treatment inflow.

In FY16, the BANS met both of the performance criteria and objectives established in the 2010 LTMP. Therefore, the BANS functioned as intended for FY16.

Complex Army Disposal Trenches (CADT) Dewatering System

The 2010 LTMP contained performance criteria for this project which was based on achieving water elevation goals, not water quality or mass flux goals.

In FY16, the CADT system met some of the performance criteria and objectives in the 2010 LTMP. The inward gradient was maintained across the slurry wall and the target water-level elevation goal was met in one of the two compliance wells. However, the water levels remained above the trench-bottom elevation in compliance well 36217. Attainment of the

dewatering goals was evaluated further in the 2015 Five-Year Review, and a cost benefit evaluation of installing dewatering wells is planned.

Bedrock Ridge Extraction System (BRES)

Extraction water from BRES is pumped to and treated at BANS. In FY16, the BRES appears to have met the plume capture performance criteria and objectives established in the 2010 LTMP.

Railyard Containment System (RYCS)

The RYCS is designed to capture the Railyard DBCP plume. In July 2001, the original system was modified to the present system. Only two extraction wells remain from the original Motor Pool System/Irondale Containment System. There were no DBCP detections above the CSRG in FY16.

A RYCS pre-shut-off monitoring program was conducted during FY14. The results of the pre-shut off program met the criteria for continuation of the shut-off process. A Decision Document and Shut-Off Monitoring SAP were prepared for review and approval by the RAs in 2016. In FY16 the RYCS met the performance criteria and objectives established in the 2010 LTMP. There were no trigger events for RYCS during FY16 and the RYCS functioned as intended until it was shut down during the third quarter of FY16.

Groundwater Dewatering Projects

During the current reporting period, the Army/Shell was engaged in remediation projects involving: dewatering of slurry/barrier walls; remediation of dense non-aqueous phase liquid (DNAPL); and the remediation of light non-aqueous phase liquid (LNAPL). Significant activities that transpired within these projects are summarized as follows:

- The Army/Shell continued the operation of two (2) slurry/barrier wall dewatering projects for the Complex Army Trenches and Lime Basins, where slurry/barrier containment and dewatering systems are utilized to lower the groundwater table to a level below the bottom of the contained waste. These projects have not met their dewatering goals but they are trending lower, and therefore making progress towards achieving these goals. A Non-Routine Action Plan (NRAP) to the LTMP was issued in FY 16 to revise the dates when meeting the dewatering goals is projected to occur (June 2016 for water levels below the waste, and April 2021 for the inward gradient in the north well pairs).

- The Lime Basins DNAPL Remediation Project was implemented under the Comprehensive Environmental Response, Compensation, & Liability Act (CERCLA) to remediate DNAPL that was discovered in the Lime Basins slurry wall dewatering system. The project entailed the execution of a remedial investigation/feasibility study (RI/FS) that established a remediation strategy comprising the construction of four (4) paired monitoring wells located inside and outside of the Lime Basins slurry wall to

detect additional DNAPL source zones and evaluate the impact of the existing DNAPL on the integrity of the slurry wall. Construction of the project was completed in September 2012 and a Construction Completion Report (CCR) was provided to the Regulatory Agencies in June 2013 to certify that the project has achieved its objectives and was executed in accordance with applicable design and construction documents. The FY16 data was presented in the Annual Summary Report for Groundwater and Surface Water Fiscal Year 2016. The Lime Basins DNAPL Remediation Project is functioning as intended.

- The Army/Shell continued its monitoring for LNAPL in the former North Plants area as part of the on-going North Plants Pilot LNAPL Removal Project. The monitoring data reported in FY16 indicated no detection of recoverable LNAPL to support an LNAPL removal action. The future of this project was evaluated during the 2015 Five-Year Review and the monitoring frequency was decreased to annually in FY15.

3.3.2 Land Use Control Plan (LUCP)

Institutional controls were required by the On-Post and Off-Post RODs to provide administrative, legal and/or physical controls that would minimize the potential for human exposure to contamination and/or protect the integrity of the remedy whenever a site cannot support unlimited use and unrestricted exposure. As part of the long-term remedy at RMA, the land use controls included both institutional and engineering controls to ensure long-term protectiveness of the remedy. Some of the IC's listed in the LUCP are:

- Land use restrictions and the prohibition of residential development at RMA.
- Prohibitions on the use of groundwater as a drinking water source, consumption of fish and game, and use of land for agricultural purposes.
- Engineering controls to prevent access to caps and covers.
- Inclusion of a map identifying off-post CSRG exceedance areas to assist the State Engineer's Office in their issuance of water well permits and notification of the public.

Changes to the ROD and Refuge Act will be needed in order to address any land use control agreements between parties/agencies.

3.3.3 Use of On-Post Bunk House

During the FY14 reporting period, an agreement was developed at the Committee level that established the process whereby the USFWS would request Committee approval for bunk house use on a case-by-case basis. During FY17, several bunk house requests were submitted by the USFWS and approved.

3.3.4 Management of Bison

Land use controls also impacted a bison management issue that required Regulatory Agency intervention in FY2014. Bison were originally introduced to RMA through the pilot bison program in 2007 with a total herd of 15 animals that included 5 bulls and 10 cows. These

animals were especially selected for relocation to RMA because of their genetic purity to ensure the propagation of genetically pure bison at RMA. The initial herd was managed within approximately 1,470 acres of the bison pilot area. In 2012, the bison management area was expanded an additional 770 acres. The ultimate area of the wildlife refuge that will be made available for bison management is estimated to be 12,000 acres.

In 2017, the bison herd grew and an additional area of rangeland was opened to support the growing herd. It was not necessary to transfer any bison to other bison management reserves after the October 2017 bison roundup event. The main purposes of the annual bison roundup event is to check the health of the herd, vaccinate animals that were born since the previous event, and to segregate specific animals to a separate area for transfer to another federal bison management facility, if needed, to reduce the size of the herd.

4.0 DOCUMENT REVIEWS

TCHD reviewed and commented on numerous documents associated with the RMA post-closure activities to ensure that the on-post remedy for the ongoing landfill and other remediation projects were implemented in a manner consistent with the conditions of the CD and in accordance with the design documents, regulatory requirements and good public health practices. The documents that were reviewed generally fell into two (2) categories: site-wide plans; and project-specific plans. During FY2017, TCHD reviewed eight (8) documents related to the RCRA Covers/ICS, two (2) documents, related to the Bison Tissue Study, three (3) documents regarding Basin F, three (3) documents related to the Biomonitoring Program, three (3) Treatment Plant sampling data reports, one (1) Land Use Control document, one (1) Sanitary Sewer document, four (4) documents related to emerging contaminants, three (3) Basin C documents, and two (2) Basin A related documents.

5.0 GROUNDWATER AND SURFACE WATER ACTIVITIES

Additional groundwater related activities were conducted outside of the requirements of the LTMP. These activities included: TCHD's private well sampling program; on-post groundwater plume mapping; and supplemental surface water monitoring programs. Results from project-specific groundwater monitoring are reported in the annual covers reports and have been previously discussed in this report. The status and results of the remaining groundwater and surface water monitoring efforts and related activities are summarized in the following sections.

5.1 Tri-County Health Department Private Well Sampling Program

In accordance with the MOA Between TCHD and PMRMA, Article III., Item 1., TCHD is required to conduct the Off-Post Private Well Sampling Program including reporting of results to the PMRMA on an annual basis, and assist in the Off-Post Groundwater Exceedance Monitoring Program. Pursuant to this requirement, TCHD has completed the 2017 sampling program and has submitted to the PMRMA a final report summarizing the sampling results. Although not specifically related to the CD that would require reporting to

the County, TCHD has summarized the results in this report to notify the County of its findings relative to off-post private wells that either have been or have the potential to be impacted by RMA contaminants.

TCHD conducts annual sampling of select private groundwater wells in the RMA Off-Post study area to monitor potential exposure of area residents to DIMP. A database of off-post private wells is maintained and a Candidate Sampling List (CSL) is produced prior to the start of each annual sampling event. The list of candidate wells selected for sampling vary with each sampling event because of site access, availability, well operational limitations, previous sampling history and requests from owners of private wells.

During the RMA 2010 Five-Year Review, 1,4-dioxane was identified as an emerging contaminant by the EPA and had relevance to the RMA remedy because of a cleanup standard of 3.2 micrograms per liter (ug/l) for groundwater and surface water that has been established by the State of Colorado Regulation No. 41. The State of Colorado has since lowered this standard to 0.35 ug/l on January 31, 2013. For these reasons, TCHD in conjunction with the Army/Shell and other Regulatory Agencies agreed to sample the wells on the Candidate Sampling List for 1,4-dioxane as part of an on-going effort to characterize this contaminant in the off-post study area. The 1,4-dioxane sampling effort started in 2012 and has continued through 2017.

In addition to the analysis for DIMP and 1,4-dioxane, the samples were analyzed for the routine inorganic analytes of nitrate and fluoride, and water quality parameters of conductivity and hardness. The monitoring for these and other analytes as well as water quality parameters dates to the inception of the private well sampling program to satisfy objectives that included: 1) fingerprint identification of the groundwater with its source aquifer; 2) detection of potential cross-contamination between aquifers; and 3) response to property owner's request for water quality information regarding their groundwater.

Wells are selected for the CSL based on the following criteria:

- Available well construction data indicating proper well completion within the aquifer(s) of interest.
- Spatial relationship of the well to other candidate wells that allow for definitive tracking of off-post DIMP concentrations and plumes.
- Past history of detection of RMA contaminants of concern.

Data collected through the TCHD private well sampling program is maintained in its database but is also maintained in the RMA environmental database to supplement the development of off-post plume maps. Consequently, the candidate sampling list and associated results are transmitted to the Army/Shell, CDPHE and EPA for review and concurrence.

A total of twenty-four (24) sample locations were targeted by the Fiscal Year 2017 CSL comprising of sixteen (16) alluvial wells, six (6) confined system wells and two (2) surface water samples. Of these sample locations, TCHD was able to gain access to nine (9) alluvial wells, four (4) confined system wells and two (2) surface water samples. One

confined system well was sampled twice. Some of the targeted sampling locations could not be sampled for various reasons including: inability to contact the property owner; inoperable well pumps; and abandoned property and/or wells All of the wells and surface water locations sampled in FY2017 were analyzed for both DIMP and 1, 4-dioxane.

DIMP detections in the wells and surface water samples ranged from 0.937 ug/L to 10.50 ug/L. It can be concluded that detections of DIMP in the well and surface water samples during FY2017 were below the State standard of 8.0 ppb for groundwater and surface water with the exception of one confined well (359D) which is discussed below. The sampling results also indicated that DIMP concentrations generally remained within historic concentrations or continued to fluctuate at low levels. Overall, it can be stated that DIMP concentrations in the TCHD off-post study area remain stable or were slightly lower with the exception of one (1) alluvial well that showed an increase in DIMP in addition to the confined well that was out of compliance. Potential pathways for the domestic use of contaminated groundwater continue to decrease, as the majority of residents continue to use municipal water sources or deeper confined flow system wells.

One area of potential concern is the confined well 359A. On May 31, 2011, DIMP was detected in the water from this well at a level of 10.50 ug/L. Due to this exceedance and the fact this well is used for domestic purposes, the well was resampled on June 16, 2011 with a DIMP result of <0.5 ug/L. On July 23, 2013 the well was sampled and yielded a DIMP result of 2.02 ug/L. The 2014 samples had an initial result of 7.32 ug/L on June 26, 2014 with a follow up confirmation sample of 7.07 ug/L on September 15, 2014. The well was sampled again on February 9, 2015 with a DIMP result of 6.13 ug/L prior to purging and 8.14 ug/L after purging. This well was sampled as part of the 2015 summer sampling program with a DIMP detection of 8.64 ug/L. The 2016 DIMP detection was 9.53 ug/L. These results represented an increase from DIMP detections obtained during FY2013 of 2.02 ug/L and a decrease from 10.05 ug/L in 2011. This well has had a variable use history since the residence was vacant for a period of time due to a death and subsequent resale of the property. During the time that the previous owner was living at the property they would not allow TCHD to purge the well prior to collecting samples, therefore many of the sampling results in the past were based on "grab samples". TCHD believes the high results indicate a damaged well casing which allows a cross-connection between the alluvial and confined aquifers. The residents at this property were provided bottled water for much of 2015 and 2016. Well 359A was replaced with a new deep well (359D) and properly abandoned in November 2016. The initial sample results for the new well were 2.35 ug/L for DIMP (down from 9.53 ug/L in the old, abandoned well). The replacement well, 359D was sampled in July 2017 with a result of 7.72 ug/L DIMP. Because this result was very close to the state standard for DIMP (8.0 ug/L) it was sampled again in August 2017. The August DIMP result was 10.5 ug/L. The new resident at the rental property was again provided with bottled drinking water beginning in October 2017 when it became occupied. The current theory for the contamination of this deep well is the past contamination due to a probable damaged casing leaving residual contamination in the area of the new well. It is believed that this residual contamination will be diluted and move downgradient from this well over time. The new well will continue to be sampled in 2018 as part of the annual routine off-post sampling program.

The surface water sampling results continue to confirm that Denver Water storage operations are not discharging water into the South Platte River that contain DIMP in excess of the State standard of 8.0 ug/L for groundwater and surface water.

Sampling results for 1,4-dioxane indicated two (2) alluvial wells that exceeded the current State standard for groundwater and surface water of 0.35 ug/L with results of 0.444 ug/L and 0.137 ug/L. A total of seven (7) alluvial and confined system wells had a detection of less than (LT) 0.137 ug/L of 1,4-dioxane. 1,4-dioxane has only been sampled from 2012-2017. Of the alluvial and confined system wells that were sampled in both 2016 and 2017, two (2) wells exhibited slight decreases in concentration while two (2) exhibited slight increases in concentration. The remaining wells had all non-detect results however, 1,4-dioxane was detected in both surface water sample at a concentrations of 0.29 ug/L and 0.495 ug/L. Every effort was made to collect the surface water samples from the same general area in both 2016 and 2017.

Since 1,4-dioxane is regulated as a groundwater and surface water contaminant in the State of Colorado and represents a contaminant of interest to the RMA, TCHD will continue to recommend the sampling and analysis for this compound in future off-post groundwater monitoring efforts.

5.2 FY 2015 On-Post Plume Mapping

The LTMP contains provisions for the on-post plume extent mapping of select indicator analytes, beginning in 2014 and occurring every 20 years thereafter. Since the LTMP was not definitive with respect to the requirements of the plume mapping, the Army/Shell and Regulatory Agencies had to develop the sampling objectives and approach through a series of meetings that were conducted during 2014. The current On-Post Plume Mapping effort was completed in 2014 with results showing significant decline in the contaminants previously found on-post.

6.0 OTHER RMA PROGRAM ELEMENTS AND ACTIVITIES

During this reporting period, TCHD had involvement or provided oversight on the following additional RMA program elements and activities:

- Attendance of operations and maintenance related meetings including RMA site-wide program meetings, and RMA project-specific meetings.
- Reporting to Adams County.

TCHD involvement in the above program elements and activities are discussed in the following sections.

6.1 Remedy Related Meetings

TCHD personnel attended numerous meetings to address issues and receive updates related to the RMA remedy and RMA National Wildlife Refuge. These meetings allowed TCHD

staff to stay current of ongoing issues, assist in conflict resolution to help advance the objectives of the remedy, and to keep the community perspective in front of the Army/Shell, Army/Shell contractors, and state and federal regulators. Meetings attended by TCHD typically fell into RMA site-wide program meetings and project-specific meetings, and are summarized as follows:

RMA Site-Wide Program Meetings:

- Water Team meetings
- RMA Committee meetings
- RMA Council meetings
- Biomonitoring meetings
- Land use control meetings

RMA Project-Specific Meetings:

- Semi-Annual Vegetation and Lysimeter (Caps and Covers) Monitoring Progress meetings
- Bison meetings

Community Meetings:

- Area Boards meetings
- Win Win Coalition meetings

EPA Five-Year Review:

During 2015, TCHD participated in the EPA Five-Year Report process which included numerous meetings amongst the regulatory agencies and the parties. There was also a public meeting and interviews with interested parties in the community. During a FYR a multiagency team evaluates if environmental standards that affect the site have changed in the past five years, whether the cleanup continues to be protective of public health and the environment, and whether the remedy can be expected to remain protective. This most recent FYR covered the period from 2011 to 2015 and is the fourth FYR to be completed for the RMA. There are two protective determinations made as part of the Five-Year Review, one protective determination is for the On-Post Operating Unit (OU), and one is made for the Off-Post OU.

All parties were in consensus that the Off-Post OU was found to be protective in the short term. In terms of the On-Post OU, the EPA agreed that many parts of the remedy are functioning as the remedial action objectives intended and that human health is currently protected, although some adjustments are needed. This includes completion of an eco-risk assessment for wildlife exposures. The biomonitoring (eco-risk) assessment was completed in 2017, the data summary report for this assessment is expected in 2018 for review and approval by the regulatory agencies at which time the protectiveness statement for this issue can be changed to "protective".

The Final Five-Year report was issued on September 26, 2016 and the corrected EPA Determination Letter was issued December 5, 2016. CDPHE concurred with the final report on October 3, 2016. The next Five-Year Review report will be completed in 2021.

6.2 Air and Odor Emissions Support

TCHD staff continued to receive training in Visible Emission Evaluations and monitoring of odor intensity using the Scentometer in preparation of any need to monitor dust and odor emissions related to RMA remedy projects. There weren't any remediation and/or O&M activities that required odor response or investigation by TCHD during this reporting period.

6.3 Reporting

The CD requires that TCHD submit reports to Adams County to summarize RMA oversight activities. Semi-annual reporting was required until completion of the caps on the landfills, at which time the reporting requirements were revised to an annual frequency. This report represents the sixth annual report and covers the period of October 1, 2016 to September 30, 2017. CD condition 4(b) (6) provides for post-closure monitoring of maintenance activities until the end of post-closure maintenance as determined by CDPHE. The next annual report will cover the period of **October 1, 2017 to September 30, 2018.**

7.0 ACTIVITIES ANTICIPATED FOR THE NEXT REPORTING PERIOD

Activities that are anticipated to be reviewed by TCHD during the next reporting period (October 1, 2017 to September 30, 2018) are summarized as follows and are organized according to site-wide/programmatic activities, and post-closure O&M projects.

Site-Wide/Programmatic Activities:

- Continuation of 1, 4-dioxane investigation.
- Long-term monitoring of on-post and off-post groundwater and surface water.
- Complex Army Trenches dewatering wells design and/or installation.
- Shell Trenches dewatering wells design and/or installation.
- Shell Disposal Trenches percolation exceedances Phase 2 Investigation.
- Lysimeter 004 percolation exceedances Phase 2 Investigation.
- Consumption of bison, tissue sampling program.
- Monitoring wells installation for dieldrin downgradient of NWBCS.

Post-Closure O&M Projects:

- Long-term care of the ICS.
- Soil moisture monitoring of Shell Disposal Trenches RCRA-equivalent cover.
- Post-closure monitoring of Hazardous Waste Landfill.
- Post-closure monitoring of Enhanced Hazardous Waste Landfill.
- Post-closure monitoring of Basin F.

TCHD will continue to review and provide comments on the documents submitted for Regulatory Agency review by the Army/Shell or USFWS. Comments will be prepared by TCHD and submitted to the Army/Shell as appropriate.

The following submittals from the Army/Shell are anticipated during the next reporting period:

- Annual Covers Report for ICS 2017.
- Annual Covers Report for Basin F 2017.
- Annual Covers Report for RCRA Caps 2017.
- Treatment Plant Effluent Water Quality Data Report (Quarterly and Annual)
- Shell Disposal Trenches RCRA-Equivalent Cover Soil Cover Moisture Monitoring System Data Evaluation Summary Report (Quarterly).
- Short-Term Surface Water Monitoring Data Summary Report.
- FY2017 Annual Summary Report for Groundwater and Surface Water.
- Land Use Control Monitoring Report for FY2017.
- Various Non-Routine Action Plans (NRAPS).
- Various O&M Change Notices (OCNs).
- SAP for Part 2 investigation of ICS lysimeter non-compliance issue.
- Corrective Action Plan for ICS lysimeter non-compliance issue.
- DCN for Basin C Exceedance area Secondary Basins design/excavation of contaminated soils.
- Biomonitoring program soil data review, Data Summary Report and final Monitoring Completion Report.
- Access control language for Wildlife Drive through former munitions area and risk-associated warnings.

ADAMS COUNTY
COLORADO

STUDY SESSION AGENDA ITEM

DATE: November 5, 2019
SUBJECT: Review of 2020 Proposed Budget
FROM: Nancy Duncan, Budget & Performance Measurement Director
AGENCY/DEPARTMENT: Budget & Performance Measurement Department
ATTENDEES: Budget & Performance Measurement Department
PURPOSE OF ITEM: To provide information to the Board of County Commissioners regarding the 2020 Proposed Budget
STAFF RECOMMENDATION: Direction from the Board of County Commissioners regarding the 2020 Proposed Budget

BACKGROUND:

The Annual Budget Process began in February 2019. This is to provide information and answer any remaining questions regarding the 2020 Proposed Budget before the First Reading of the 2020 Proposed Budget in Pubic Hearing on December 3, 2019.

AGENCIES, DEPARTMENTS OR OTHER OFFICES INVOLVED:

County Manager's Office and Budget & Performance Measurement Department

ATTACHED DOCUMENTS:

None.

FISCAL IMPACT:

Please check if there is no fiscal impact. If there is fiscal impact, please fully complete the section below.

Fund:	
Cost Center:	

	Object Account	Subledger	Amount
Current Budgeted Revenue:			
Additional Revenue not included in Current Budget:			
Total Revenues:			

	Object Account	Subledger	Amount
Current Budgeted Operating Expenditure:			
Add'l Operating Expenditure not included in Current Budget:			
Current Budgeted Capital Expenditure:			
Add'l Capital Expenditure not included in Current Budget:			
Total Expenditures:			

New FTEs requested: ☐ **YES** ☐ **NO**

Future Amendment Needed: ☐ **YES** ☐ **NO**

Additional Note:

The fiscal impact will be discussed at this Study Session.

APPROVAL SIGNATURES:

EHanna for

Raymond H. Gonzales, County Manager

Alisha Reis, Deputy County Manager

Bryan Ostler, Deputy County Manager

Chris Kline, Deputy County Manager

APPROVAL OF FISCAL IMPACT:

Budget

ADAMS COUNTY
COLORADO

STUDY SESSION AGENDA ITEM

DATE:	November 5, 2019
SUBJECT:	Fourth Amendment to the 2019 Adopted Budget
FROM:	Nancy Duncan, Budget & Performance Measurement Director
AGENCY/DEPARTMENT:	Budget & Performance Measurement Department
ATTENDEES:	Budget & Performance Measurement Department
PURPOSE OF ITEM:	Review requested amendment items with the Board of County Commissioners and answer any questions regarding these items.
STAFF RECOMMENDATION:	After review of the Fourth Amendment, to adopt the 2019 Fourth Budget Amendment at a future Public Hearing.

BACKGROUND:

This is to amend the 2019 Adams County Budget

AGENCIES, DEPARTMENTS OR OTHER OFFICES INVOLVED:

County Manager's Office and Budget & Performance Management Department

ATTACHED DOCUMENTS:

2019 4th Amendment Summary
2019 4th Amendment Detail

FISCAL IMPACT:

Please check if there is no fiscal impact ☐. If there is fiscal impact, please fully complete the section below.

Fund:

Cost Center:

	Object Account	Subledger	Amount
Current Budgeted Revenue:			
Additional Revenue not included in Current Budget:			
Total Revenues:			

	Object Account	Subledger	Amount
Current Budgeted Operating Expenditure:			
Add'l Operating Expenditure not included in Current Budget:			
Current Budgeted Capital Expenditure:			
Add'l Capital Expenditure not included in Current Budget:			
Total Expenditures:			

New FTEs requested: ☐ **YES** ☐ **NO**

Future Amendment Needed: ☐ **YES** ☐ **NO**

Additional Note:

Due to the length of the amendment, please see attached Amendment Summary and Amendment Detail for fiscal impact.

APPROVAL SIGNATURES:

EHalmark for

Raymond H. Gonzales, County Manager

Alisha Reis, Deputy County Manager

Bryan Ostler, Deputy County Manager

Chris Kline, Deputy County Manager

APPROVAL OF FISCAL IMPACT:

Nancy Dunn

Budget

Exhibit A - Amendments

Fourth Amendment to the 2019 Budget
Resolution No. TBD
For Adoption on November 12, 2019
Study Session: November 5, 2019

Purpose of Resolution:

A resolution to amend the 2019 Budget. Summary information by Fund and Department is listed below. Additional detailed information is attached for consideration and review.

Fund	Department	Expenditure Amount	Revenue Amount	Use of Fund Balance	FTE
GENERAL FUND	CED - Oil & Gas	$32,009	$0	$32,009	1.00
	General Fund	32,000	0	32,000	0.00
	Community Transit	100,000	100,000	0	0.00
	District Attorney's Office	153,655	0	153,655	10.00
	Fleet & Facilities Management	285,000	0	285,000	0.00
	Admin Org	(285,000)	0	(285,000)	0.00
	Sheriff's Office	58,110	0	58,110	4.00
	Stormwater - GF	37,500	0	37,500	0.00
ROAD & BRIDGE FUND	Public Works - Engineering	188,182	0	188,182	9.00
	Public Works - Administrative	41,818	0	41,818	2.00
OPEN SPACE PROJECTS FUND	Open Space Projects	500,000	0	500,000	0.00
FLEET MANAGEMENT FUND	Fleet Fund	0	32,000	(32,000)	0.00
	Fleet - CIP	32,000	0	32,000	0.00
COLORADO AIR & SPACE PORT FUND	Colorado Air & Space Port	260,000	626,820	(366,820)	0.00
Total Appropriation		**$1,435,274**	**$758,820**	**$676,454**	**26.00**

Fund Summary	Expenditure Amount	Revenue Amount	Use of Fund Balance	FTE
GENERAL FUND	**$413,274**	**$100,000**	**$313,274**	**15.00**
ROAD & BRIDGE FUND	**230,000**	**0**	**230,000**	**11.00**
OPEN SPACE PROJECTS FUND	**500,000**	**0**	**500,000**	**0.00**
FLEET MANAGEMENT FUND	**32,000**	**32,000**	**0**	**0.00**
COLORADO AIR & SPACE PORT FUND	**260,000**	**626,820**	**(366,820)**	**0.00**
Total Appropriation	**$1,435,274**	**$758,820**	**$676,454**	**26.00**

AMENDMENTS

Fourth Amendment to the 2019 Budget
Resolution No. TBD
For Adoption on November 12, 2019
Study Session: November 5, 2019

ADAMS COUNTY
COLORADO

Department - (Division)	Source of Funding (Carryover, Fund Balance, Grant, Miscellaneous Revenue)	Expenditure Amount	Revenue Amount	Use of Fund Balance	Ongoing (X)	Reason for Amendment	FTE
GENERAL FUND							
CED - Oil & Gas	Fund Balance	$32,009	$0	$32,009	X	An Oil & Gas Inspector was approved in PH on September 3, 2019. This is for salaries and benefits for the rest of 2019 and inspection equipment. A vehicle will also be purchased for this position in the Fleet Fund.	1.0
General Fund	Transfer Out	$32,000	$0	$32,000		This transfer will be made from the General Fund to the Fleet Fund for the purchase of the vehicle for the Oil & Gas Inspector.	
Community Transit	Grant Revenue	100,000	100,000	0		On May 7, 2019, DRCOG's Board of Directors approved Adams County Title III funding request for the A LIFT Community Transit Program. This proposal has been approved for the period beginning January 1, 2019 through June 30, 2021 in the amount of $450,000. While these contracts are intended to be two year contracts, funding is awarded annually at the option of DRCOG. This was approved in Study Session on July 11, 2019.	
District Attorney's Office	Fund Balance	153,655	0	153,655	X	A state mandated district court is being staffed for 2020. To be able to recruit and train employees, the county is moving forward now with new FTEs in the District Attorney's Office to meet the January 1, 2020 timeframe. Deputy DA III - 3; Legal Assistant - 3; Investigator - 1; Paralegal - 1; Restitution Technician - 1; Victim Advocate - 1.	10.0
Fleet & Facilities Management	Transfer	285,000	0	285,000		In order to re-build Chillers at the Detention Center in 2019, budget is being transferred from Admin Org to this project. This contract was approved in Public Hearing on October 8, 2019.	
Admin Org	Transfer	(285,000)	0	(285,000)		In order to re-build Chillers at the Detention Center in 2019, budget is being transferred from Admin Org to this project. This contract was approved in Public Hearing on October 8, 2019.	
Sheriff's Office	Fund Balance	58,110	0	58,110	X	A state mandated district court is being staffed for 2020. To be able to recruit and train employees, the county is moving forward now with new FTEs in the Sheriff's Office to meet the January 1, 2020 timeframe. Deputy Sheriffs - 4.	4.0
Stormwater - GF	Fund Balance	37,500	0	37,500		Adams County has entered into an IGA with Mile High Flood District (formerly Urban Drainage) to do projects along the S Platte River. This is in conjunction with The Greenway Foundation. This was approved in Pubic Hearing.	
TOTAL GENERAL FUND		***$413,274***	***$100,000***	***$313,274***			***15.0***
ROAD & BRIDGE FUND							
Public Works - Engineering	Fund Balance	$188,182	$0	$188,182	X	In reviewing the R&B Fund uses with the County Attorney's Office it was determined the engineering duties of Public Works could be moved from the General Fund to the Road & Bridge Fund.	9.0
Public Works - Administrative	Fund Balance	41,818	0	41,818	X	In order to expedite more projects, it was determined a dedicated contract specialist and Right of Way specialist are needed in Public Works. This will help clear any backlog and keep new projects moving toward completion.	2.0
TOTAL ROAD & BRIDGE FUND		***$230,000***	***$0***	***$230,000***			***11.0***

Department - (Division)	Source of Funding (Carryover, Fund Balance, Grant, Miscellaneous Revenue)	Expenditure Amount	Revenue Amount	Use of Fund Balance	Ongoing (X)	Reason for Amendment	FTE
OPEN SPACE PROJECTS FUND							
Open Space Projects	Fund Balance	$500,000	$0	$500,000		This appropriation is for the additional amount needed for the purchase of the Murata Brothers Farm. On the 2nd Amendment for 2019, a transfer was done from the DIA Noise Mitigation Fund for this purchase.	0.0
TOTAL OPEN SPACE PROJECTS FUND		***$500,000***	***$0***	***$500,000***			***0.0***
FLEET MANAGEMENT FUND							
Fleet Fund	Transfer In	$0	$32,000	($32,000)		This transfer will be made from the General Fund to the Fleet Fund for the purchase of the vehicle for the Oil & Gas Inspector.	
Fleet - CIP	Fund Balance	32,000	0	32,000		An Oil & Gas Inspector was approved in PH on September 3, 2019. This is for salaries and benefits for the rest of 2019 and inspection equipment. A vehicle will also be purchased for this position in the Fleet Fund.	
TOTAL FLEET MANAGEMENT FUND		***$32,000***	***$32,000***	***$0***			***0.0***
COLORADO AIR & SPACE PORT FUND							
Colorado Air & Space Port	Misc. Revenue	$260,000	$626,820	($366,820)		In July 2019, CASP received revenue for the sale of easement rights for property located at CASP. New signage was constructed for CASP and installed in August 2019. This is to recognize both the revenue from the easement and the expenditure for the signage.	
TOTAL COLORADO AIR & SPACE PORT FUND		***$260,000***	***$626,820***	***($366,820)***			***0.0***
TOTAL ALL FUNDS - 2019 4th AMENDMENT		***$1,435,274***	***$758,820***	***$676,454***			***26.0***