

Oil & Natural Gas Technology

DOE Award No.: DE-FE0010667

Research Performance Progress Report

Quarterly Report: January 2017 to March 2017

Liquid-Rich Shale Potential of Utah's Uinta and Paradox Basins: Reservoir Characterization and Development Optimization

Project period: October 1, 2012 to September 30, 2015 (extended to March 31, 2017)



Submitted by:
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A handwritten signature in black ink, appearing to read "Michael D. Vanden Berg".

Prepared for:
United States Department of Energy
National Energy Technology Laboratory

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Office of Fossil Energy



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EXECUTIVE SUMMARY

The project officially concluded on March 31, 2017 and all project money has been spent. Typically, a Final Report is due to NETL 90-days post end of the project, but the PI has requested and was granted a 60-day extension. This extension is to give the graduate students working on portions of this project more time to write up their results and time for their advisors and the PI to review drafts of their reports. All project results will be delivered to NETL by August 31, 2017.

Several project related papers have already been published and more are currently in draft form. It is important for the team to not only deliver a Final Report to NETL, but to make this research available to a wide audience. To this end, the PI hosted a very successful core workshop in late January for 25 oil industry geologists from 11 different companies. This research will continue to be used well into the future as companies seek to better understand the tight oil deposits in Utah.

PROGRESS, RESULTS, AND DISCUSSION

Task 1.0: Project Management Plan

During January 2017, the PI wrote and submitted the project's 17th quarterly report for October to December 2016. This report was subsequently sent via email to all interested parties and posted on the UGS project website. In addition, the PI updated the Project Summary in February and posted it to the project website.

Task 2.0: Technology Transfer

- The UGS project website was updated with new information:
http://geology.utah.gov/emp/shale_oil
- The PI completed the 17th quarterly report and emailed it to all interested parties. The report is also available on the UGS project website.
- New publication on the Cane Creek play:
 - Chidsey, T.C., and Eby, D.E., 2017, Potential Oil-Prone Areas in the Cane Creek Shale Play, Paradox Basin, Utah, Identified by Epifluorescence Microscopy Techniques: UGS Special Study 160.
 - This publication is available on the UGS project website.
- One project-related poster was presented at the AAPG ACE Meeting, Houston, Texas, April 3, 2017.
 - Birdwell, J.E. (USGS), Vanden Berg, M.D., and Johnson, R.C. (USGS) – Geochemistry and Mineralogy of the Eocene Green River Formation Petroleum System, Uinta Basin, Utah.
- The PI hosted a Green River Formation core workshop for industry geologists on January 30-31, 2017.
 - 25 participants from 11 different companies
 - The PI gave several presentations on the Green River Formation, including results of research performed as part of this project.
 - The PI presented cores examined as part of this project.

Tasks 3.0 and 4.0: Data Compilation and Core-Based Geologic Analysis

Uteland Butte member: Research on the Uteland Butte in the Uinta Basin is essentially finished and the focus has shifted to preparing a comprehensive final report.

Finished publications:

- Schamel, S., 2015, Shale Oil Resource Play Potential of the Green River Formation, Uinta Basin, Utah: Open-File Report 639.
- Schamel, S., 2015, Rediscovered Shale Oil Resource Play Potential of the Green River Formation, Uinta Basin, Utah: Associated with Energy Resource Development, in Vanden Berg, M.D., Resselar, R., and Birgenheier, L.P., editors, Geology of Utah's Uinta Basin and Uinta Mountains: Utah Geological Association Publication 44, p. 275-303.
- Johnson, R.C., Birdwell, J.E., Mercier, T.J., Brownfield, M.E., Charpentier, R.R., Klett, T.R., Leathers, H.M., Schenk, C.J., and Tennyson, M.E., 2015, Assessment of Undiscovered Oil and Gas Resources in the Uteland Butte Member of the Eocene Green River Formation, Uinta Basin, Utah: USGS Fact Sheet 2015-3052.
- Logan, S.K., Sarg, J.F., and Vanden Berg, M.D., 2016, Lithofacies, Deposition, Early Diagenesis, and Porosity of the Uteland Butte Member, Green River Formation, Eastern Uinta Basin, Utah and Colorado: UGS Open-File Report 652.
- Birdwell, J., Vanden Berg, M.D., Johnson, R.C., Mercier, T.J., Boehlke, A.R., and Brownfield, M.E., 2016, Geological, Geochemical, and Reservoir Characterization of the Uteland Butte Member of the Green River Formation, Uinta Basin, Utah, in Dolan, M.P., Higley, D.K., and Lillis, P.G., editors, Hydrocarbon Source Rocks in Unconventional Plays, Rocky Mountain Region: Rocky Mountain Association of Geologists.

Pending publications:

- Origin of petroliferous dolomitic beds in the Uteland Butte member, lower Green River Formation, Uinta Basin, Utah.
 - M.S. student Federico Rueda and Dr. Hans Machel, University of Alberta
 - Currently writing final report, which will be Federico's M.S. thesis and will be submitted for publication in a scientific journal.
- Morgan, C.D. and Stimpson, R.W., in press, Characterization and horizontal drilling potential of carbonate grainstone reservoirs in the Paleogene (Eocene) Green River Formation, northeastern Uinta Basin, Utah: UGS Special Study.
 - Report is finished and in the peer-review process.
- Overview and characterization of the Uteland Butte tight oil play
 - The PI is currently working on a draft of this report

Cane Creek shale: Research on the Cane Creek shale in the Paradox Basin is essentially finished and the focus has shifted to preparing a comprehensive final report.

Finished publication:

- Chidsey, T.C., and Eby, D.E., 2017, Potential Oil-Prone Areas in the Cane Creek Shale Play, Paradox Basin, Utah, Identified by Epifluorescence Microscopy Techniques: UGS Special Study 160.

Pending publication:

- Overview and characterization of the Cane Creek tight oil play
 - Draft of this report is completed and is being reviewed

Task 5.0: Outcrop Examination and Characterization – Uinta Basin

Research related to Task 5 is finished and published:

- Logan, S.K., Sarg, J.F., and Vanden Berg, M.D., 2016, Lithofacies, Deposition, Early Diagenesis, and Porosity of the Uteland Butte Member, Green River Formation, Eastern Uinta Basin, Utah and Colorado: UGS Open-File Report 652.
- Federico Rueda and the PI's final reports will also include discussions of Uteland Butte outcrop.

Task 6.0: Well Completion Optimization

Research is mostly completed and the final report is being drafted. This project will be part of Josh Zannoni's PhD dissertation, supervised by Dr. John McLennan, University of Utah.

CONCLUSION

The project officially concluded on March 31, 2017 and all project money has been spent. Several reports have already been published and several more are currently in draft form. The PI was granted a 2-month extension for delivery of the Final Report to NETL, mostly to give the students involved in this project more time to write their final reports. All project results will be delivered to NETL by August 31, 2017.

COST STATUS

Table 1. Project costing profile for 1.5-year no-cost extension.

	Jan 2017		Feb 2017		Mar 2017	
	Plan	Actual	Plan	Actual	Plan	Actual
UGS-personnel		\$5,417		\$7,067		
Travel Expenses ¹		\$445				
Analyses						
Miscellaneous ²						
SUBTOTALS		\$5,862		\$7,067		\$0
UGS OVERHEAD (34.44%)		\$2,019		\$2,434		\$0
SUBCONTRACTS						
EGI		\$350				\$2,254
Eby						
CSM						
EGI - Moore						
U. of Alberta						\$4,861
GRAND TOTALS		\$8,231		\$9,500		\$7,114

¹Jan – AAPG registration

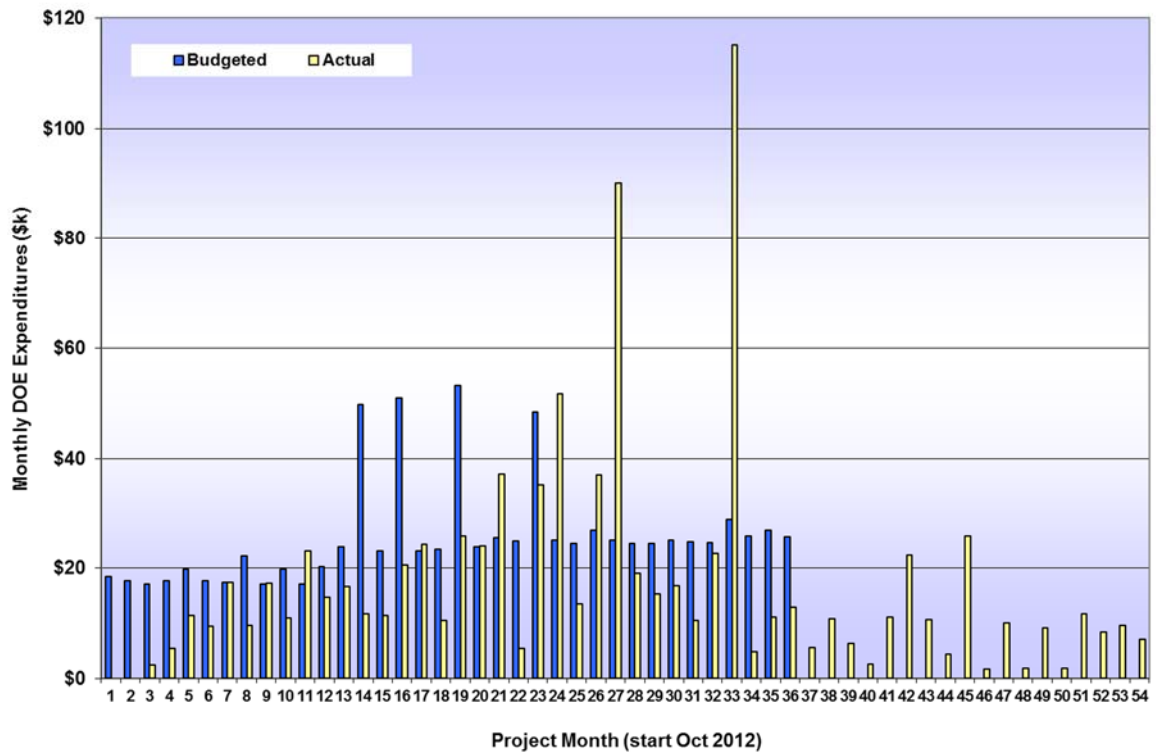


Figure 1. Project costing profile.

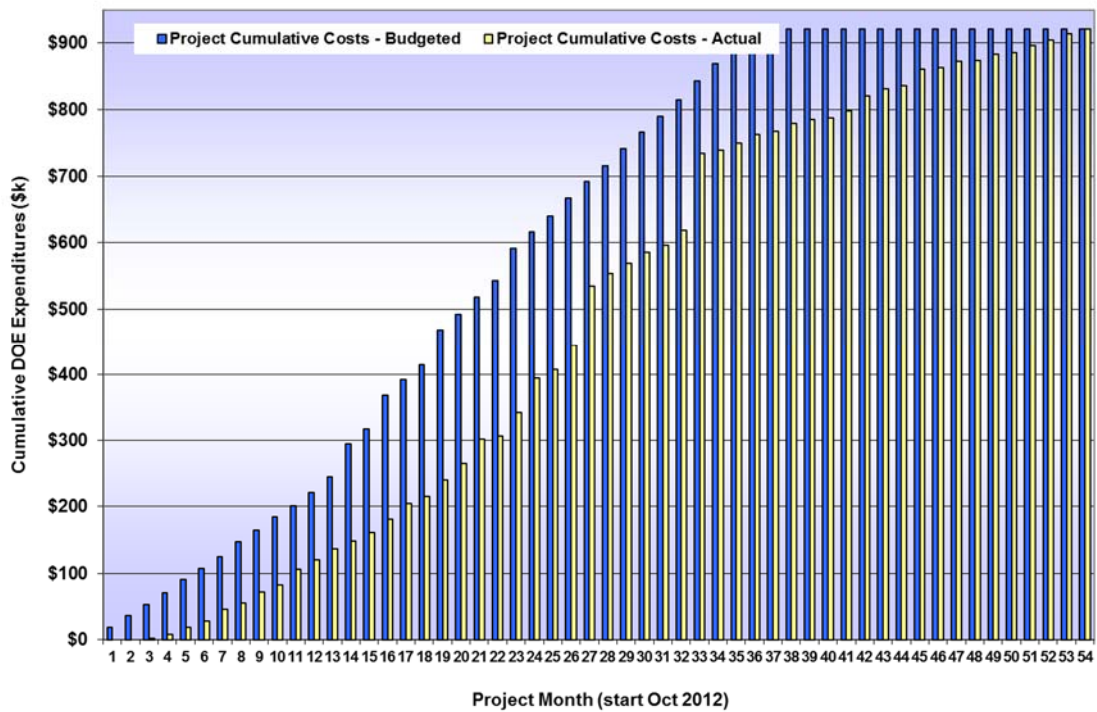


Figure 2. Project cumulative costs.

MILESTONE STATUS

Table 2. Milestone log for 1.5-year no-cost extension

	Title	Related task or subtask	Completion Date	Update/comments
Milestone 32	Quarterly updates of website	Subtask 2.1	Quarterly	Website will be updated as material is published
Milestone 33	Quarterly reports	Subtask 2.2	Quarterly	Final quarterly report
Milestone 34	Profiles of mechanical stratigraphy	Subtask 6.5	31-Mar-15	Preparing final report
Milestone 35	Regional correlation and mapping	Subtask 7.1	31-Mar-15	Preparing final report
Milestone 36	Regional cross sections	Subtask 7.2	31-Mar-15	Preparing final report
Milestone 37	Sweet spot maps	Subtask 7.3	31-Mar-15	Preparing final report
Milestone 38	Technical presentations at National AAPG	Subtask 2.4 & 5	Apr-15	1 poster presentation at AAPG 2017 (early April)
Milestone 39	Core workshop and/or field trip	Subtask 2.7	Jul-15	Core workshop was held on January 30-31, 2017
Milestone 40	Locating completions	Subtask 6.4	30-Sep-15	Preparing final report
Milestone 41	Stimulation diagnostics modeling	Subtask 6.6	30-Sep-15	Preparing final report
Milestone 42	Reservoir simulations/stimulation locating	Subtask 6.7	30-Sep-15	Preparing final report
Milestone 43	Final publications	Subtask 2.6	30-Sep-15	Due Aug 31, 2017
Milestone 44	Final interpretation	Task 8	30-Sep-15	Due Aug 31, 2017

ACCOMPLISHMENTS

- New publication:
 - Chidsey, T.C., and Eby, D.E., 2017, Potential Oil-Prone Areas in the Cane Creek Shale Play, Paradox Basin, Utah, Identified by Epifluorescence Microscopy Techniques: UGS Special Study 160.
 - http://ugspub.nr.utah.gov/publications/special_studies/ss-160.pdf
- “In-press” publication:
 - Morgan, C.D. and Stimpson, R.W., in press, Characterization and horizontal drilling potential of carbonate grainstone reservoirs in the Paleogene (Eocene) Green River Formation, northeastern Uinta Basin, Utah: UGS Special Study ??.
- One project-related poster was presented at the AAPG ACE Meeting, Houston, Texas, April 3, 2017.
 - Birdwell, J.E. (USGS), Vanden Berg, M.D., and Johnson, R.C. (USGS) – Geochemistry and Mineralogy of the Eocene Green River Formation Petroleum System, Uinta Basin, Utah.

PROBLEMS OR DELAYS

The project officially ended on March 31, 2017 and all project funds have been spent. The Final Report is due to NETL 90-days post the end of the project, but the PI recently requested and was granted a 60-day extension. The Final Report will be delivered to NETL no later than August 31, 2017.

PRODUCTS AND TECHNOLOGY TRANSFER ACTIVITIES

- Project website:
 - The project website has been updated with new reports, publications, and abstracts.
 - http://geology.utah.gov/emp/shale_oil
- Quarterly Report:
 - October to December 2016
 - Completed late January and is available on the project website.
- Publication:
 - Chidsey, T.C., and Eby, D.E., 2017, Potential Oil-Prone Areas in the Cane Creek Shale Play, Paradox Basin, Utah, Identified by Epifluorescence Microscopy Techniques: UGS Special Study 160.
 - This publication is available on the UGS project website
- Presentations:
 - One project-related poster was presented in the “Unconventional: Plays of the U.S. Lower 48” session at the AAPG ACE Meeting, Houston, Texas, April 3, 2017.
 - Birdwell, J.E. (USGS), Vanden Berg, M.D., and Johnson, R.C. (USGS) – Geochemistry and mineralogy of the Eocene Green River Formation petroleum system, Uinta Basin, Utah
 - The abstract has been posted on the UGS project website.
- The PI hosted a Green River Formation core workshop for industry geologists on January 30-31, 2017.
 - 25 participants from 11 different companies
 - The PI gave several presentations on the Green River Formation, including results of research performed as part of this project.
 - The PI presented cores examined as part of this project.

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