Quarterly Research Performance Progress Report

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FOA Name	Advanced Technology Solutions for Unconventional Oil & Gas Development
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Nature of the Report	Research Performance Progress Report (RPPR)
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Award Type	Cooperative Agreement
Name, Title, Email Address, and Phone Number for the Prime Recipient	**Technical Contact (Principal Investigator):** Dan Hill, Professor, danhill@tamu.edu, 979-845-2244 **Business Contact:** Ashlee Woolard, Senior Project Administrator II, awoolard@tamu.edu, 979-845-0707
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Prime Recipient Name and Address	Texas A&M Engineering Experiment Station 7607 Eastmark Drive, College Station, TX 77840
Prime Recipient Type	Not for profit organization
Project Title	**THE EAGLE FORD SHALE LABORATORY: A FIELD STUDY OF THE STIMULATED RESERVOIR VOLUME, DETAILED FRACTURE CHARACTERISTICS, AND EOR POTENTIAL**
Principal Investigator(s)	**PI:** Dan Hill, *Texas A&M University* **Co-PIs:** Jens Birkholzer, *Lawrence Berkeley National Laboratory* Mark Zoback, *Stanford University* Karthik Selvan, *INPEX Eagle Ford, LLC*
Prime Recipient's DUNS number	8472055720000
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Period Covered by the Report	October 1, 2019 – March 31, 2020
Reporting Frequency	Quarterly
Signature of Principal Investigator:	[signature] Dan Hill

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1. INTRODUCTION

This quarterly research progress report is intended to provide a summary of the work accomplished under this project during the seventh quarter of the first budget period (***October 1st, 2019 – March 31st, 2020***). Summarized herein is a description of the project accomplishments to date, along with the planed work to be conducted in the next quarter.

2. ACCOMPLISHMENTS

2.1. Project Goals

The ultimate objective of this project is to help improve the effectiveness of shale oil production by providing new scientific knowledge and new monitoring technology for both initial stimulation/production as well as enhanced recovery via re-fracturing and EOR. This project will develop methodologies and operational experience for optimized production of oil from fractured shale, an end result that would allow for more production from fewer new wells using less material and energy. While aspects of the proposed project are site-specific to the Eagle Ford formation, there will be many realistic and practical learnings that apply to other unconventional plays, or even apply to other subsurface applications such as unconventional gas recovery and geologic carbon sequestration and storage. The main scientific/technical objectives of the proposed project are:

- Develop and test new breakthrough monitoring solutions for hydraulic fracture stimulation, production, and EOR. In particular, for the first time in unconventional reservoirs, use active seismic monitoring with fiber optics in observation wells to conduct: (1) real-time monitoring of fracture propagation and stimulated volume, and (2) 4D seismic monitoring of reservoir changes during initial production and EOR from the re-fractured well.
- Improve understanding of the flow, transport, mechanical and chemical processes during and after stimulation (both initial and re-fracturing) and gain insights into the relationship between geological and stress conditions, stimulation design, and stimulated rock volume.
- Assess spatially and temporally resolved production characteristics and explore relationship with stimulated fracture characteristics.
- Evaluate suitability of re-fracturing to achieve dramatic improvements in stimulation volume and per well resource recovery.
- Evaluate suitability of gas-based EOR Huff and Puff methods to increase per well resource recovery.
- Optimize drilling practices in the Eagle Ford shale based on surface monitoring and near-bit diagnostic measurements during drilling.
- Conduct forward and inverse modeling to test reservoir and fracture models and calibrate simulations using all monitored data. Ultimately, provide relevant guidance for optimized production of oil from fractured shale.
- Disseminate research and project results among a broader technical and scientific audience, and ensure relevance of new findings and approaches across regions/basins/plays.

The project will start with the re-fracturing of a legacy well that was initially stimulated using now outdated fracturing technology (Task 2). The recipient will drill, complete, and instrument one vertical and one horizontal observation strategically located well to allow for real-time cross-well monitoring of evolving fracture characteristics and stimulated volume. These observation wells will also be used for the other two main project stages, involving a new state-of-the art stimulation effort (Task 3) and a Huff and Puff EOR test (Task 4). Task 3 will be conducted in two new wells of opportunity drilled; these wells will be situated parallel to the horizontal observation well on the other side of the re-fracturing well. Task 4 will be conducted to test the efficiency of a Huff and Puff process with natural gas injection for EOR. As described below, each main task comprises various field activities complemented by laboratory testing and coupled modeling for design, prediction, calibration, and code validation. In addition to the three main tasks aligned with re-fracturing, new stimulation, and EOR, the work plan also comprises Task 1 (Project Management and Planning) and Task 5 (Integrated Analysis, Lessons Learned, Products, and Reporting). The project milestones, description of tasks and subtasks, and current milestone status are shown in **Table 1**.

2.2. Accomplishments

This section summarizes the accomplishments for the current reporting quarter (***January 1, 2020 – March 31, 2020***).

2.2.1. **EFSL Project Performers Summit Meeting**

A series of meetings and webinars were held between key representatives from all project performer organizations, namely Texas A&M University (TAMU), Lawrence Berkeley National Laboratory (LBNL), Stanford University (Stanford), and the new site operator INPEX Eagle Ford, LLC (INPEX), to develop a detailed project plan for Phase 1 field activities. The EFSL project has been delayed given some changes in drilling sequence plans by Inpex. This may change due to the actual situation with Corona Virus – COVID 19 and oil prices drop. The sequence of field events has been discussed with Inpex, with drilling finished in two new producers (5H and 6H) and three new wells planned, which includes observation well 2H for Third quarter, 2020. The timing for the well 2H production casing to be run is estimated August-Sept./2020.The producer nearest the legacy well, designated the 2H well, will be instrumented with fiber optic cables and pressure gauges.

2.2.2. **Completion and Stimulation Fractal Design Conducted for Optimization**

The completion and stimulation fractal design has been updated for the new project site location and well configurations.

2.2.3. **Fracture Conductivity Design of Experiments**

A series of experiments have been conducted to measure fracture conductivity of various proppants and concentrations on using Eagle Ford outcrop samples. All procedures for conducting similar tests with the Eagle Ford core have been tested.

2.2.4. **Fracture Fluid Tracing**

A tracer program for tagging the fracturing fluid has been developed. An alternative source for the gadolinium oxide is being planned as a tracer and has been identified. The chemical tracer is a non-toxic, environment friendly, Low detection limit and non-reactive / physically and chemically stable and soluble in the desired phase and travels with the carrier fluid. We have modeled the expected response at the observation well to design the amount of tracer needed.

2.2.5. Fiber Optic Data Analysis Method Developments

A thermal-mechanical model for low frequency DAS measurements has been developed. This model will be used to analyze and interpret low frequency DAS data recorded by the project. We have also tested our models of DTS and high frequency DAS with field data from other sites, including the MSEEL site. A paper, SPE 199723, reporting our analysis of MSEEL fiber optic data, was presented at the SPE Hydraulic Fracturing Technology Conference in February 2020 at the Woodlands - Texas.

2.2.6. Numerical Simulation Efforts

The team has conducted further development of the Fast-Marching-Method (FMM) based on coupled flow and geomechanics simulations, with an extension to a full 3D model. A paper, SPE 197103, presenting a history matching study of 2 Eagle Ford wells similar, was given at the SPE Liquids-Rich Basins Conference.

2.2.7. Geomechanical Measurements and Testing

Analysis of existing log data for the new test site is underway. Analysis of the new log data will aid in the selection of intervals of interest for downhole core sampling and testing.

2.2.8. Monitoring System Design

Design of the active source and passive monitoring arrays as well as the integrated monitoring completion has been completed (Subtask 2.1).

2.3. Opportunities for Training and Professional Development.

Nothing to Report.

2.4. Dissemination of Results to Communities of Interest

Nothing to Report.

2.5. Plan for Next Quarters (BP2-Q9: April 1st – June 30th, and BP3-Q10: July 1st – Sept. 30, 2020)

Given the uncertainty on the impact of the CAVID19 pandemic and given the change on the drilling and completions sequence by the test site operator and related field test site location (See **Section 4**), the project schedule has been updated accordingly (see **Section 2.7**), with the primary change being the rescheduling of Subtask 2.2: Drill, Complete and Instrument Horizontal Observation Well, which is scheduled within next two quarters.

2.6. Summary of Tasks for Next Quarters (BP2-Q9: April 1st – June 30th, and BP3-Q10: July 1st – Sept. 30, 2020)

The following provides a summary of the tasks, subtasks, and activities planned in BP2-Q9 and BP3-Q10:

- Task 1 – Project Management and Planning
- Task 2 – Phase 1: Evaluation of Re-fracturing
  - ✓ Subtask 2.2 – Drill, Complete, & Instrument Horizontal Observation Well
    - *Activity 2.2.1 Drill Pilot Hole*
    - *Activity 2.2.2 Drill Horizontal Well Parallel to Refrac Well*
    - *Activity 2.2.3 Log Horizontal Observation Well (Open-hole logs)*

- *Activity 2.2.4 Installation of Fiber Optic Cable, Pressure Gauges, and Seismic Source*

2.7. Summary of Milestone Status

The following section provides a summary of milestones and updated planned completion dates:

1. The 5H and 6H wells have been drilled and are to be hydraulically fractured before the end of Q2/2020. While these wells are not directly part of our study because we will have no monitoring devices in place when they are fractured, we should learn valuable lessons from them, and their operation will influence our project. For example, Inpex will likely be injecting into the 5H well when the re-fracturing treatment is performed on the legacy well.

2. The 2H, 3H, and 4H wells will be simultaneously drilled next. By simultaneous, we mean that the drilling rig will drill the vertical sections of all 3 wells first, then switch to oil-based mud, and drill each of the horizontal laterals. Inpex is currently planning to do this by August-Sept./2020.

3. A vertical pilot hole through the Eagle Ford formation will be drilled in the 2H well, and will be cored from the bottom of the Austin Chalk, through the Eagle Ford, and into the top of the Buda limestone.

4. When the casing is run in the 2H well, fiber optic cable and a string of pressure gauges will be installed on the outside of the casing.

5. After the 2H, 3H, and 4H wells have been cased and cemented, the legacy Klattenhoff 1H well will be recompleted by running a smaller liner (4 inch or 4-1/2 inch) inside the existing 5-1/2 inch casing and cementing it place.

6. Geophones will be temporarily placed in the 2H horizontal lateral and the 3H vertical section to monitor the re-fracture treatment.

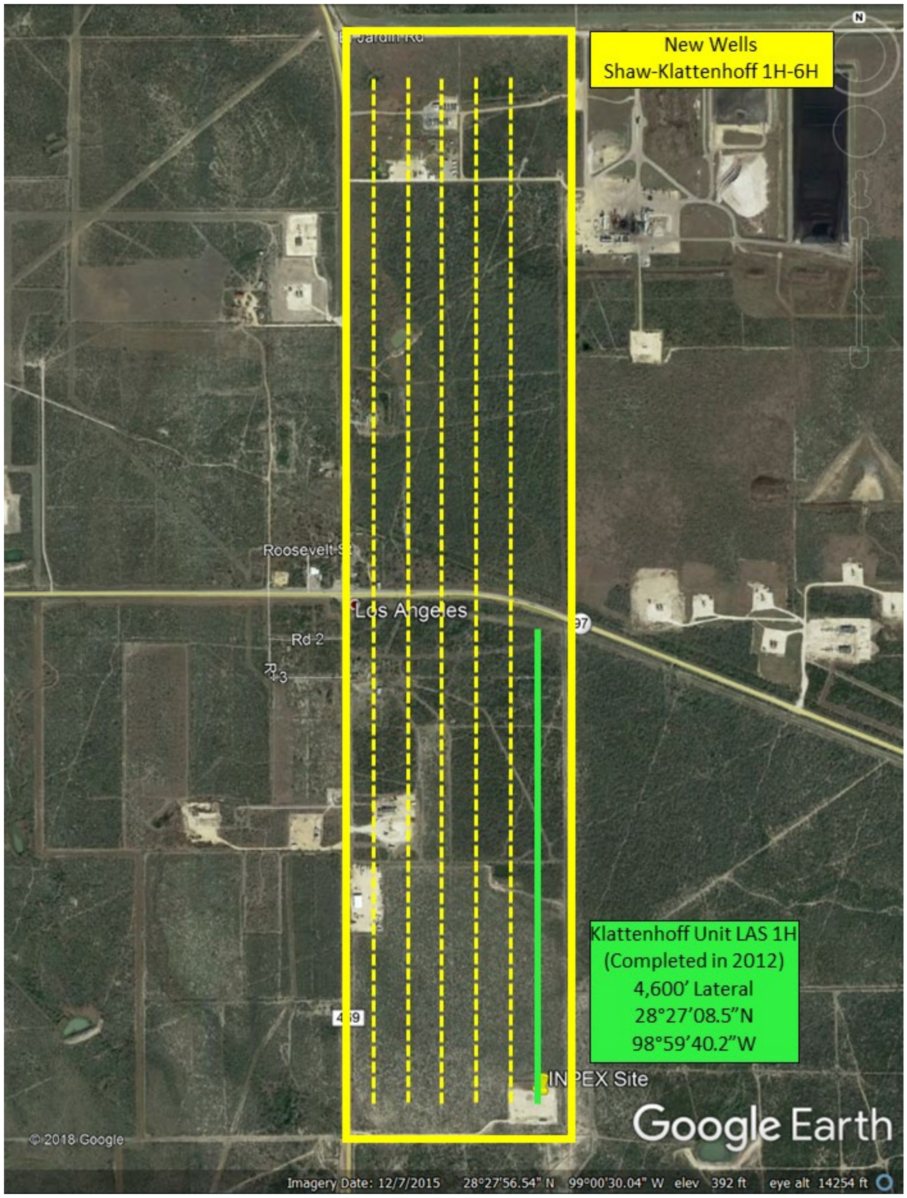
7. The SOVs will be ordered as soon as the Inpex subcontract is in place, and installed in the summer.

8. The legacy well will be re-fractured sometime in the fall after all the drilling and casing installations have been completed.

9. The 2H, 3H, and 4H wells will be zipper fractured shortly after the re-fracture treatment is completed. We will monitor these treatments using the instrumentation in the 2H well. It is also planned to install fiber in the 5H or the 6H well during the fracturing of these 3 wells. This will constitute the 2nd phase of our project. The current expectation is that these treatments will be completed this fall.

The above scenario is the latest plan that Inpex discussed with TAMU team early March/2020. However, given the world changes in the last two weeks, could cause Inpex to delay this plan substantially.

Fig. 1 Aerial View of EFSL site



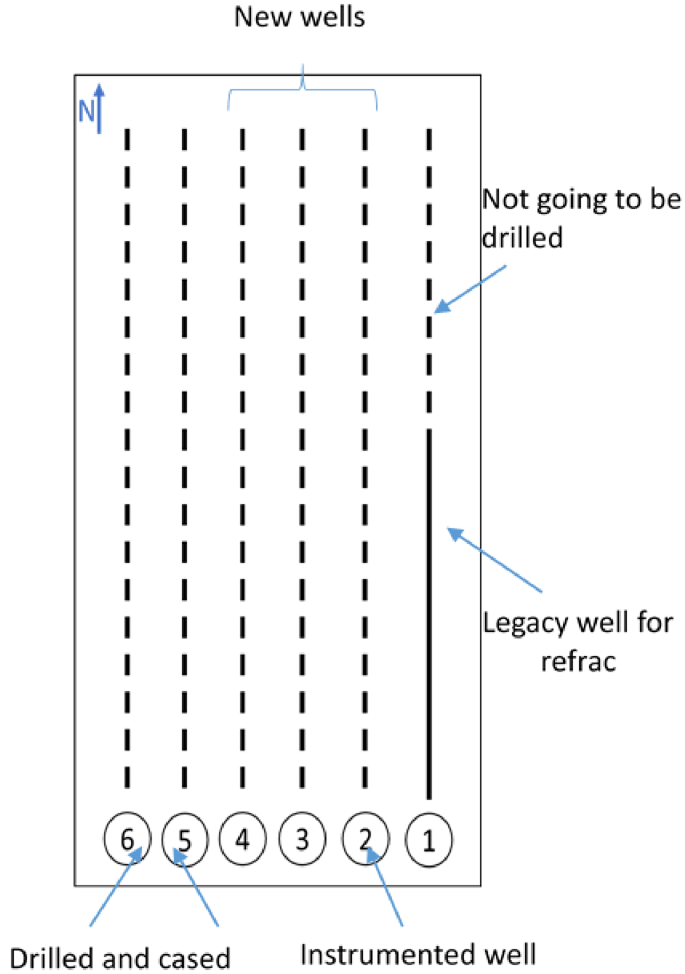
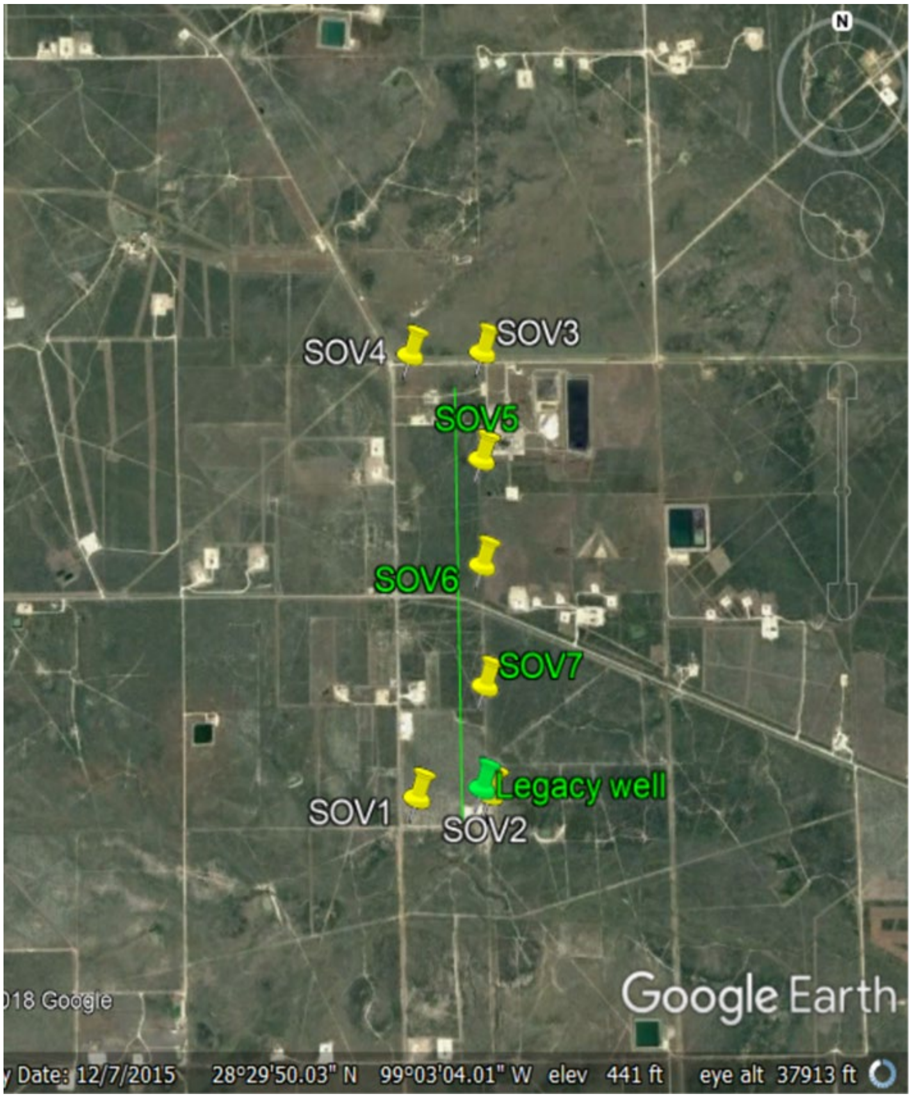


Fig. 2.- Schematics - EFSL site

Fig. 3.- SOV Field Tests for EFSL site

Modeling work underway to optimize locations for reflection imaging



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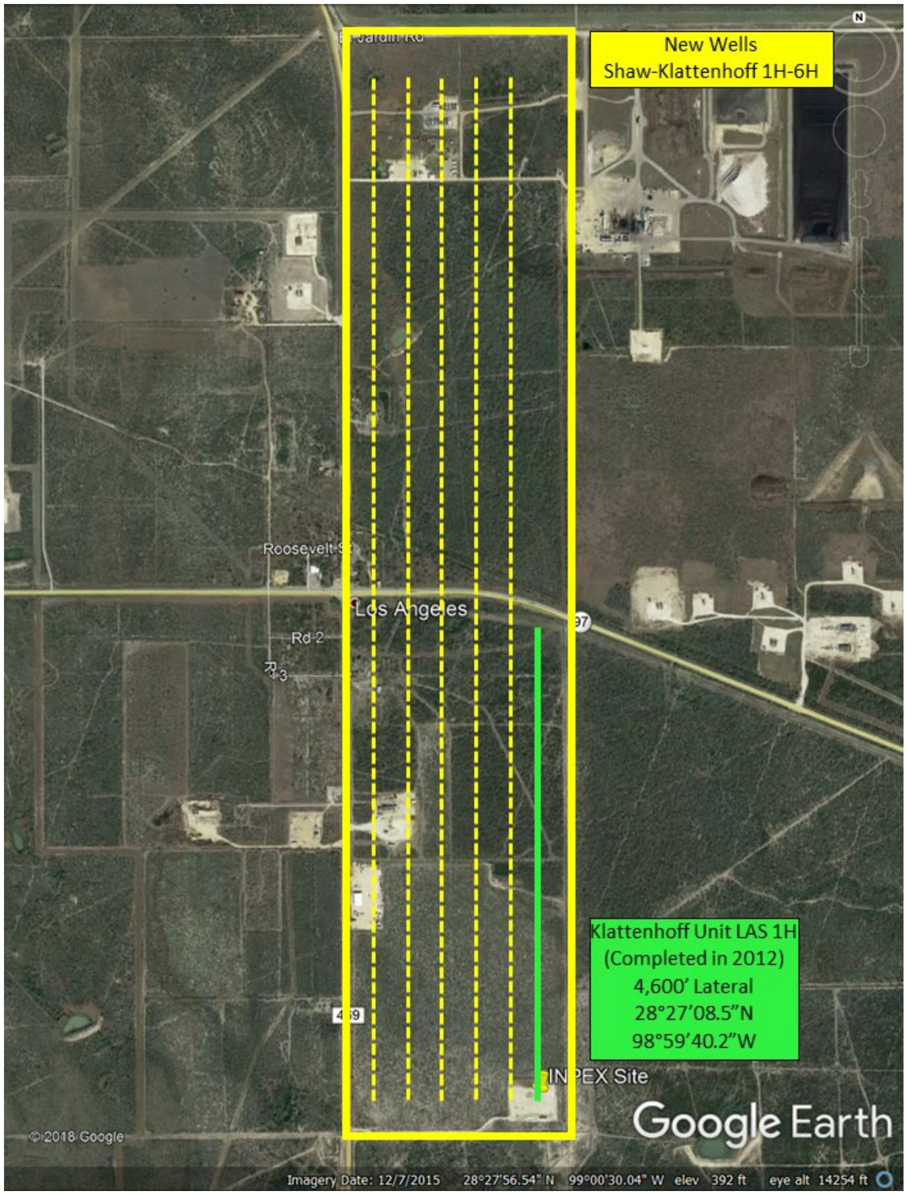

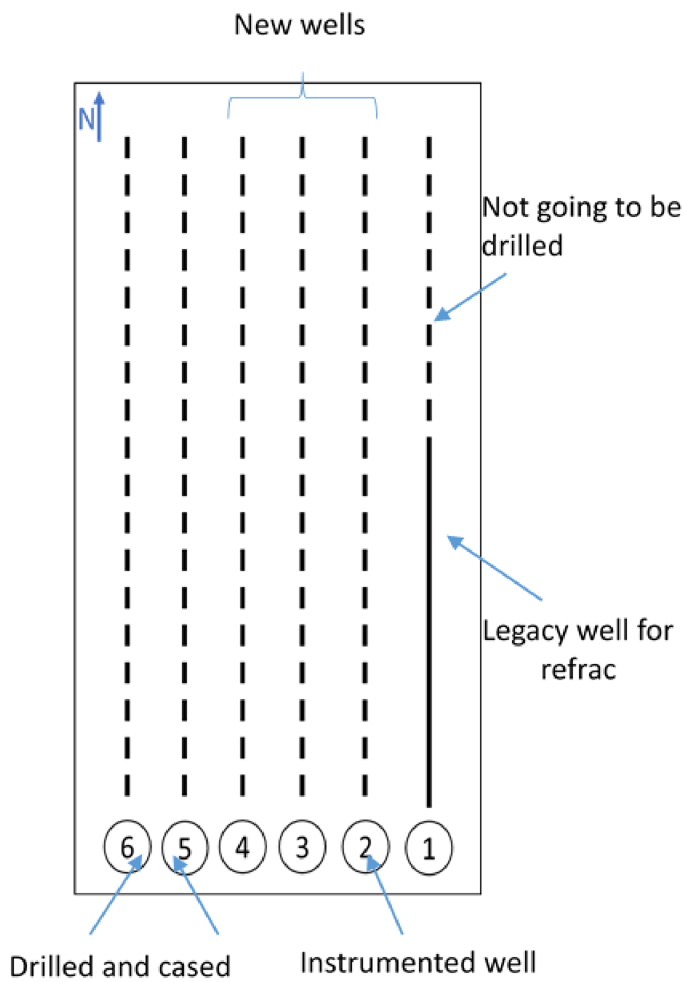

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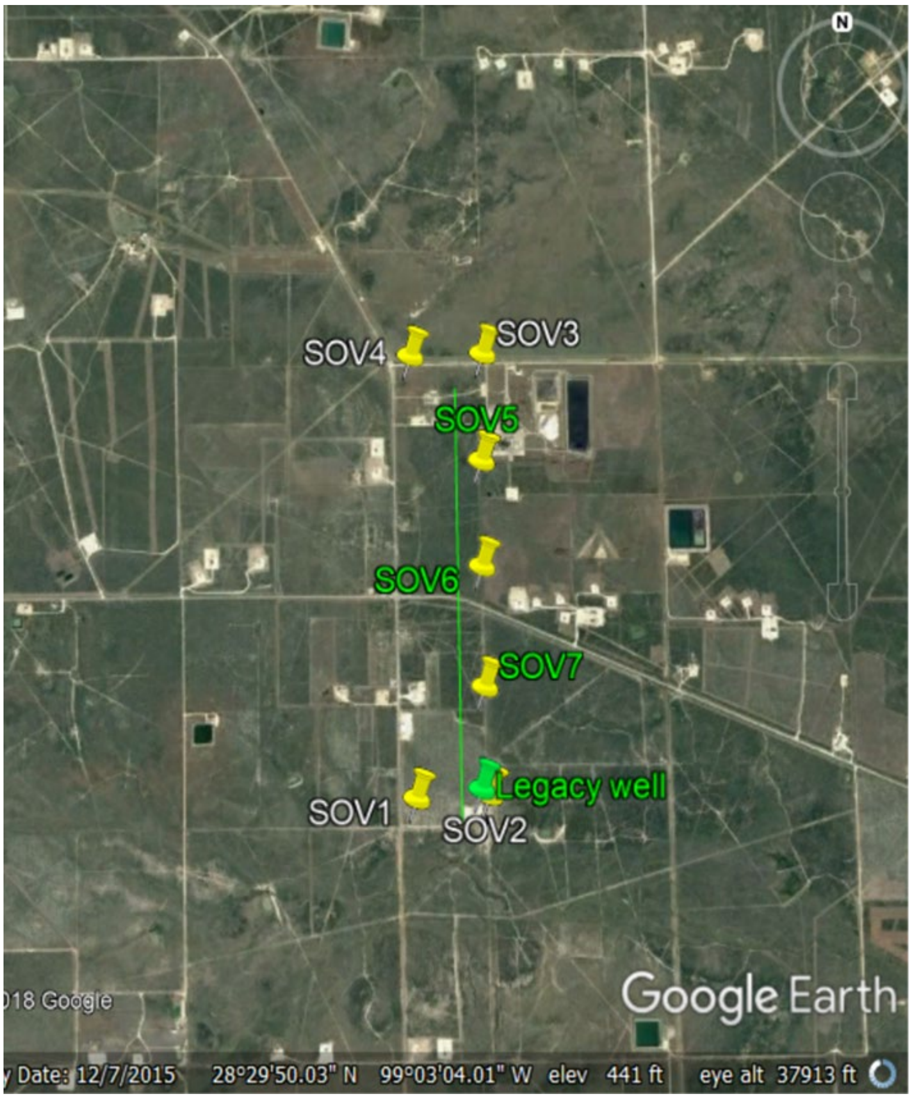

In order to evaluate the impact of source count towards a VSP walk-away image, we modelled the seismic response of a SOV network with limited number of SOV sources and limited offset (receiver-source distance). The modelling work had the objective to reproduce an active vertical seismic profile acquisition to evaluate the impact of limited SOV sources in reflection imaging, as well as to evaluate the optimum source-well geometry.

For this, we built a synthetic two-dimensional P velocity, S velocity and density models as an input for the forward modelling angorithm. To illustrate the fracture clusters induced by fracking, we introduced in the model low velocity zones at every 100 m, with each cluster being 80 m long. The fracture zones were located inside a high velocity zone at 3000-3080 m depth. The Vp, Vs and density models were input into a forward modeling software (Sofi2D) to simulate a VSP survey with SOVs. In total, 10 different source locations were used to compute VSP data, with distances from 3000 m to 300 m from the well. The synthetic well was 3070 m long in a vertical array with receivers every 10 m. Figure 4 illustrates the modelled raypath of P waves from each individual source with its reflection at the target interval. Note the closer the source is located to the well, the narrower is the reflected area at the target interval. Source 1 location is able to generate P waves that can reflect along the largest area at target interval as at this location the source is the farthest from the well at 3000 m far.

Fig. 4.- Raypath of P-waves reflecting off target layer at 3000m. Each display represents the raypath from the source at ten different locations, offsets from 3000m far from the well to 300m far from the well at every 300m. The displayed background model is P-velocity.

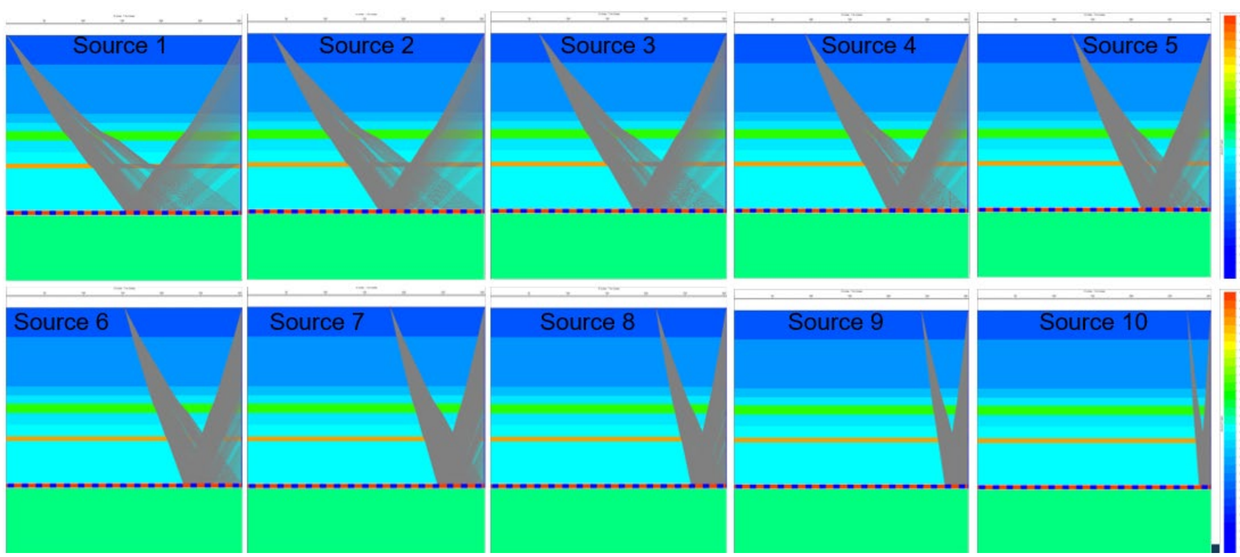

Figure 5 shows the synthetic seismic output from each shot. The image shows the P and S wavefield of a walk-away VSP with sources located at 3000 m to 300 m far from the well, at every 300 m. Each synthetic VSP shot gather was processed to obtain a walk-away VSP image. To processes the synthetic VSP, the downgoing wavefield was removed to obtain the upgoing reflected waves. VSP Kirchhoff migration was then applied to the upgoing P wavefield.

The VSP images were computed using increasing number of sources to test the effect of varying source count in the VSP image (Figure 6). Four images were produced using (from left to right) all ten sources, five sources at every 600 m distance, four sources, and five of the farthest sources.

Due to the limited offset, we can only image half of the target zone closest to the well. To be able to image the entire length of the target zone, the longest source offset should be approximately twice as the farthest offset modelled, therefore, approximately 6000 m far from the well. The highest source count provides sharper images, especially when comparing ten sources to source count of four sources. However, all simulations were able to identify lateral changes in velocity due to fracture zones.

Figure 5: Forward seismic modelling of a walk-away VSP survey with source positioned at ten different offsets, at 3000 m far from the well to 300 m far from the at every 300 m (from left to right).

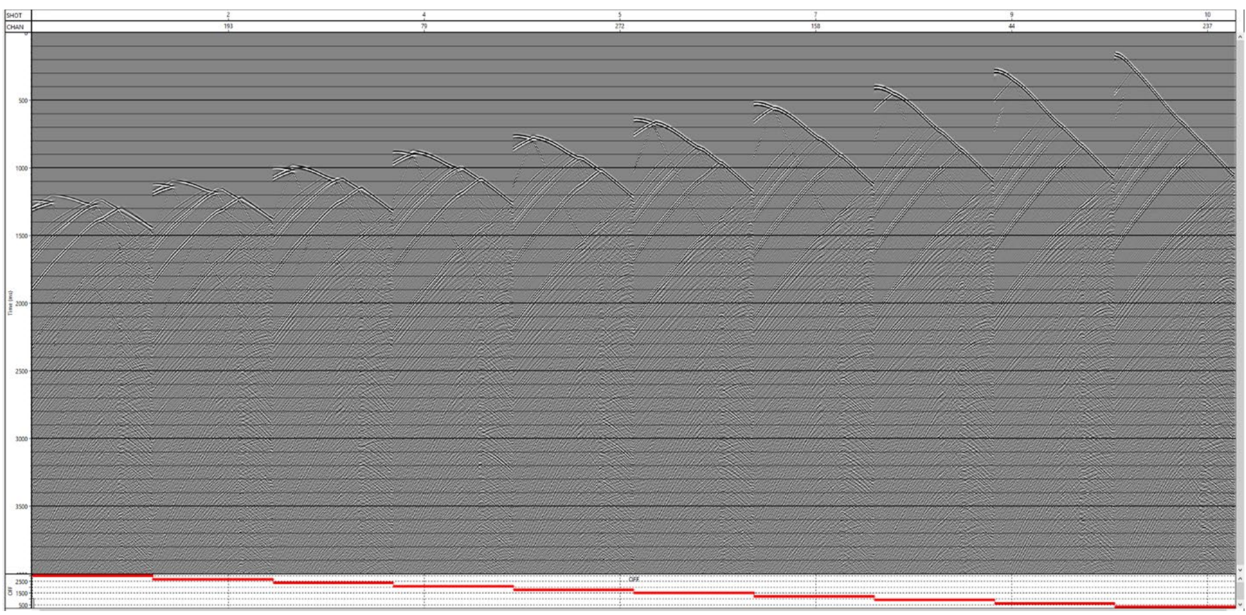

Fig. 6.- Migrated VSP image. Red arrow points at target interval. Each display represents the VSP image using different source geometry. From left to right: image computed using all ten source; image computed using five sources in total every 600m (source 1, 3, 5, 7, and 9); image computing using four sources in total (sources 1, 4, 7, 10); image computed using five sources in total (source 1 to source 5).

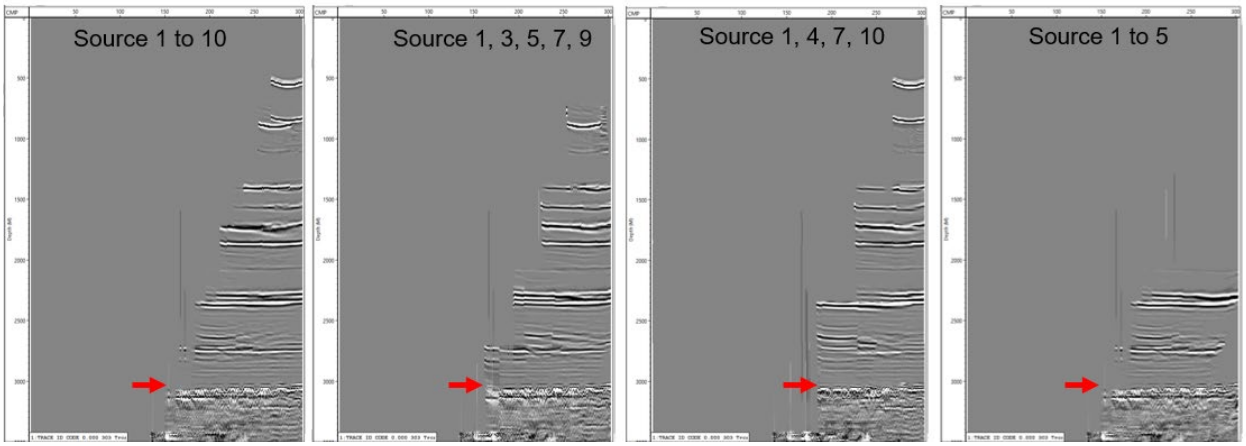

Table 1. Summary of Milestone Status

Milestone	Task	Sub-task	Title/Description	Planned Completion Date	Actual Completion Date	Verification Method	Comments
A	1	1	Project Management & Planning	12/31/2021	Ongoing	Report	None
A	2 - Phase 1: Re-Fracturing Evaluation	2.1	Evaluation of Existing Data and Design of Observation Wells	12/31/2019	Ongoing	Report	*To be partially perfromed during July-December, 2019 and during Y2020
B	2 - Phase 1: Re-Fracturing Evaluation	2.2	Drill, Complete, & Instrument Horizontal Observation Well	9/30/2018	*Not Started	Report	*Planned in August - September, 2020*
B	2 - Phase 1: Re-Fracturing Evaluation	2.3	Drill, Complete, & Instrument Vertical Observation Well	9/30/2018	*Not Started	Report	*Planned in August - September, 2020*
B	2 - Phase 1: Re-Fracturing Evaluation	2.4	Recomplete Well to be Re-Fractured	10/30/2018	*Not Started	Report	*Planned in October-Nov., 2020*
C	2 - Phase 1: Re-Fracturing Evaluation	2.5	Monitoring of Re-Fracturing	12/31/2018	*Not Started	Report	*Planned in October 2020-Feb., 2021*
C	2 - Phase 1: Re-Fracturing Evaluation	2.6	Analysis of Re-Fracturing Monitoring	12/31/2019	Not Started	Report	*To be partially perfromed during July-December, 2019 and during Y2020
D	2 - Phase 1: Re-Fracturing Evaluation	2.7	DTS/DAS/DSS & Seismic Monitoring During Production	12/31/2019	Not Started	Report	None
D	2 - Phase 1: Re-Fracturing Evaluation	2.8	Laboratory Evaluation of EOR Potential	6/30/2020	Not Started	Report	*To be partially perfromed during July-December, 2019 and during Y2020
E	2 - Phase 1: Re-Fracturing Evaluation	2.9	Coupled Modeling for Design, Prediction, Calibration & Code Validation	9/30/2020	Not Started	Report	*To be partially perfromed during July-December, 2019 and during Y2020
E	3 - Phase 2: Fracturing Evaluation	3.1	Drill, Complete & Instrument one New Producing Wells	6/30/2020	Not Started	Report	None
F	3 - Phase 2: Fracturing Evaluation	3.2	Drilling Optimization	6/30/2020	Not Started	Report	*To be partially perfromed during July-December, 2019 and during Y2020
F	3 - Phase 2: Fracturing Evaluation	3.3	Monitoring of Fracturing of Two New Producing Wells	12/31/2020	Not Started	Report	None
F	3 - Phase 2: Fracturing Evaluation	3.4	Analysis of Fracturing Monitoring of Two New Producing Wells	12/31/2020	Not Started	Report	None
F	3 - Phase 2: Fracturing Evaluation	3.5	Coupled Modeling for Design, Prediction, Calibration & Code Validation	12/31/2020	Not Started	Report	None
F	3 - Phase 2: Fracturing Evaluation	3.6	Evaluation of Fracture Conductivity in Laboratory	12/31/2020	Not Started	Report	*To be partially perfromed during July-December, 2019 and during Y2020
F	4 - Phase 3: EOR Pilot Test	4.1	Conduct Huff & Puff EOR Pilot Test	1/31/2021	Not Started	Report	None
F	4 - Phase 3: EOR Pilot Test	4.2	Monitor Injected Gas Placement with Active & Passive Seismic Monitoring	6/30/2021	Not Started	Report	None
F	4 - Phase 3: EOR Pilot Test	4.3	Monitor Injected Gas Distribution with DTS/DAS in Pilot Well	6/30/2021	Not Started	Report	None
G	4 - Phase 3: EOR Pilot Test	4.4	Modeling of the Huff & Puff EOR Pilot Test	8/31/2021	Not Started	Report	None
G	5 - Final Report	5.1	Multi-Purpose Optimization & Lessons Learned	12/31/2021	Not Started	Report	None
G	5 - Final Report	5.2	Products & Reporting	12/31/2021	Not Started	Report	None

PRODUCTS

Nothing to Report.

3. PARTICIPANTS & OTHER COLLABORATING ORGANIZATIONS

3.1. Field Test Site Operator

INPEX Eagle Ford, LLC is the project partner and committed to participate in the project. The field test site location for the project has been selected in La Salle County, TX within an area leased by INPEX Eagle Ford, LLC. Figure 1, shows the aerial view of the location.

4. IMPACT

A. D. Hill, D. Zhu, Pakhotina; Abstract submitted and accepted for the ATCE 2020. **Evaluating Perforation Erosion and its Effect on Limited Entry by Distributed Acoustic Sensor (DAS) Monitoring**

A. D. Hill, D. Zhu; Abstract submitted and accepted for the ATCE 2020. **Completion Effects on Diagnosing Multistage Fracture Treatments with Distributed Temperature Sensing**

Iuliia Pakhotina, Shohei Sakaida, Ding Zhu, and A. Daniel Hill, Texas A&M University SPE-199723-MS **Diagnosing Multistage Fracture Treatments with Distributed Fiber-Optic Sensors.** This paper was prepared for presentation at the SPE Hydraulic Fracturing Technology Conference and Exhibition held in The Woodlands, Texas, USA, 4-6 February 2020.

D. Hill, D. Zhu. M. Laprea-Bigott, G. Moridis, and D. Schechter, Texas A&M University; J. Correa, J. Birkholzer, and B. M. Friefeld, Lawrence Berkeley National Laboratory; M. D. Zoback and F. Rasouli; Stanford U.; J. Ajo-Franklin, Rice U., J. Renk and O. Ogunsolo, Department of Energy; and K. Selvan, Inpex Eagle Ford, LLC, **The Eagle Ford Shale Laboratory: A Field Study of Re-Fracturing, Zipper Fracturing, and Gas-Injection EOR in the Eagle Ford Formation - URTEC 2020**

Akhil Datta-Gupta Abstract submitted and accepted for the ATCE 2020.; Computing Pressure Front Propagation Using the Diffusive Time of Flight in Structured and Unstructured Grid Systems via the Fast Marching Method; Hongquan Chen, Tsubasa Onishi, Jaeyoung Park, and Akhil Datta-Gupta, Texas A&M University

Sara Abedi: one paper published in ATCE 2019, one journal paper now in review by Debora Martogi, Sara Abedi, Ian Mitchell, Crystal Saadeh, **Mechanical Properties of Drill Cuttings Based on Indentation Testing and Contact Mechanics Solutions** SPE Annual Technical Conference and Exhibition SPE – 196214-MS Abstract by Debora Martogi, Sara Abedi, Ian Mitchell, Crystal Saadeh which is going to be published in ATCE 2020. **Approximation of rock fracture toughness using scratch test and phase-field modeling approach**

Rassouli, F.S. Department of Geophysics, Stanford University, Stanford, CA, USA Zoback, M.D. Department of Geophysics, Stanford University, Stanford, CA, USA draft of a paper they have submitted to ARMA 20–1577. **Preliminary Results on Multi-Stage Creep Experiments of the Wolfcamp Shale at Elevated Temperature** This paper is on two of the five long-term creep tests that Fatemeh has conducted so far. She has received an email that the paper is accepted with minor revisions

CHALLENGES/PROBLEMS

Nothing to Report.

5. SPECIAL REPORTING REQUIREMENTS

5.1. No Cost Time Extension for Budget Period 1 (NCTE - BP1)

A no cost time extension (NCTE) has been submitted to extend Budget Period 1 to a current end date of March 31st, 2022. Under this requested NCTE, the current budget period start and end dates are as follows:

- BP1: 04/01/2018 - 03/31/2020
- BP1: 04/01/2020 - 03/31/2021
- BP2: 04/01/2020 - 03/31/2022

6. BUDGETARY INFORMATION

A summary of the budgetary information for the project is provided in **Tables 2 and 3**. These tables show the original planned costs, the actual incurred costs, and the variance. The costs are split between federal share and non-federal share.

Table 2. EFSL Budget Period 1 (04/01/2018 - 06/30/2019)

EFSL Budget Period 1 (04/01/2018 - 06/30/2019)											
Q1		Q2		Q3		Q4		Q5 - NCTE *(Projected Costs)*		Total	
04/01/2018 -		07/01/2018 -		10/01/2018 -		01/01/2019 - 03/31/2019		04/01/2019 - 06/30/2019		04/01/2018 - 06/30/2019	
Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
$182,670	$0	$182,670	$0	$182,670	$0	$182,670	$0	$0	$0	$730,678	$0
$850,001	$500,000	$850,001	$500,000	$850,001	$500,000	$850,001	$500,000	$0	$0	$3,400,003	$2,000,000
$166,750	$0	$166,750	$0	$166,750	$0	$166,750	$0	$0	$0	$667,000	$0
$31,456	$0	$31,456	$0	$31,456	$0	$31,456	$0	$0	$0	$125,825	$0
$1,230,877	$500,000	$1,230,877	$500,000	$1,230,877	$500,000	$1,230,877	$500,000	$0	$0	**$4,923,506**	**$2,000,000**
$119,579	$0	$152,177	$0	$108,898	$0	$99,069	$0	$156,672	$0	$636,396	$0
$0	$0	$0	$0	$0	$0	$0	$0	$3,400,003	$2,000,000	$3,400,003	$2,000,000
$57,679	$0	$104,547	$0	$168,294	$0	$240,859	$0	$95,462	$0	$666,841	$0
$29,084	$0	$4,847	$0	$16,552	$0	$35,783	$0	$31,993	$0	$118,260	$0
$206,342	$0	$261,572	$0	$293,745	$0	$375,711	$0	$3,684,130	$2,000,000	**$4,821,500**	**$2,000,000**
$63,090	$0	$30,492	$0	$73,771	$0	$83,600	$0	($156,672)	$0	$94,282	$0
$850,001	$500,000	$850,001	$500,000	$850,001	$500,000	$850,001	$500,000	($3,400,003)	($2,000,000)	$0	$0
$109,071	$0	$62,203	$0	($1,544)	$0	($74,109)	$0	($95,462)	$0	$159	$0
$2,372	$0	$26,609	$0	$14,904	$0	($4,327)	$0	($31,993)	$0	$7,565	$0
$1,024,534	$500,000	$969,305	$500,000	$937,132	$500,000	$855,165	$500,000	($3,684,130)	($2,000,000)	**$102,006**	**$0**

Table 3. EFSL Budget Period 2 (07/01/2019 - 06/30/2020)

EFSL Budget Period 2 (07/01/2019 - 06/30/2020)									
Q1		Q2		Q3		Q4		Total	
07/01/2019 -		10/01/2019 -		01/01/2020 -		04/01/2020 - 06/30/2020		07/01/2019 - 06/30/2020	
Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share	Federal Share	Non-Federal Share
$182,486	$0	$182,486	$0	$182,486	$0	$182,486	$0	$729,945	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$166,750	$0	$166,750	$0	$166,750	$0	$166,750	$0	$667,000	$0
$32,399	$0	$32,399	$0	$32,399	$0	$32,399	$0	$129,596	$0
$381,635	$0	$381,635	$0	$381,635	$0	$381,635	$0	**$1,526,541**	**$0**
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$0	$0	$0	$0	$0	$0	$0	$0	**$0**	**$0**
$182,486	$0	$182,486	$0	$182,486	$0	$182,486	$0	$729,945	$0
$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
$166,750	$0	$166,750	$0	$166,750	$0	$166,750	$0	$667,000	$0
$32,399	$0	$32,399	$0	$32,399	$0	$32,399	$0	$129,596	$0
$381,635	$0	$381,635	$0	$381,635	$0	$381,635	$0	**$1,526,541**	**$0**

7. PROJECT OUTCOMES

Technical Papers published and to be presented at Professional Conferences