

CENTER FOR RESPONSIBLE SHALE DEVELOPMENT, INC.

**RECERTIFICATION
AUDIT SUMMARY REPORT**

SWEPI LP (Shell), Appalachia Asset

April 2017

AUDIT INFORMATION

OPERATOR INFORMATION					
Company	SWEPI LP (Shell), Appalachia Asset				
Address	12880 US-6, Wellsboro, PA 16901				
AUDITING FIRM INFORMATION					
Lead Auditor	John A. Stangline, ARM, CHMM, CPEA			Abbreviation	JAS
Auditor(s)	Hans Umhoefer, CIH				HDU
PERFORMANCE STANDARDS					
Water Performance Standards Audited:	Standard 1 - 8.3	Start Date of Audit	11/8/2016	End Date of Audit	11/10/2016
Air Performance Standards Audited:	Standard 9 - 15.4	Start Date of Audit	11/8/2016	End Date of Audit	11/10/2016
Field/Office Auditor Days	6	Offsite Auditor Days	4	Total Auditor Days	10
Scope of Certification:		<p>These standards apply to unconventional exploration, development, and gathering activities including site construction, drilling, hydraulic fracturing and production in the Appalachian Basin. These regional standards consider geology, topography, population density, infrastructure, surface water, ground water and other issues of particular concern in the Appalachian Basin.</p> <p>Accordingly, until such time as the scope of these standards may be amended, these standards and the CRSD evaluation and certification process will be limited to Operators' unconventional activities in the Appalachian Basin.</p>			

Audit Objective:

The audit objective was to measure conformance of the Appalachian Basin assets of SWEPI LP (Shell), Appalachia Asset to the Center for Responsible Shale Development (CRSD) Environmental Performance Standards.

SUMMARY

SWEPI LP (Shell), Appalachia Asset achieved initial, two-year certification to the Center for Responsible Shale Development's (CRSD) Performance Standards on February 3, 2015. Pursuant to CRSD certification requirements, Shell successfully confirmed ongoing conformance to CRSD's Performance Standards on March 24, 2016 by participating in an annual conformance assurance review.

Shell applied for *recertification* on October 31, 2016. On behalf of the CRSD, Bureau Veritas Certification (BVC) conducted a recertification audit of Shell operations within the Appalachian Basin. The recertification audit was conducted for conformance to the CRSD Performance Standards (Version 1.4) and in accordance with the requirements of the CRSD Verification Protocol (Version 1.1) and Guidance for Auditors (Version 1.5). Shell attained recertification on March 2, 2017. On February 23, 2017, CRSD's Certification Decision Committee confirmed the findings of this audit report as well as BVC's recommendation that Shell has demonstrated conformance to CRSD's 15 Performance Standards.

Pre-audit scoping telephone calls were held in October 2016 to review the geographical and operational scope of Shell activities in the Appalachian Basin and to determine the appropriate set of certification audit sites. The desktop portion (document review) of this audit was performed at Shell offices in Wellsboro, Pennsylvania on November 8, 2016. The field verification portion of the audit was performed at locations in Pennsylvania on November 9 and 10, 2016. Each site was visited by a team of at least two auditors with guides from Shell.

In September 2014, Shell Appalachia acquired the "Marshlands" unconventional assets located in eastern Potter and western Tioga Counties, in the vicinity of Marshlands, Pennsylvania. The area consisted of 8 compressor stations, 22 well pads and several freshwater impoundments. The purchased asset was evaluated by Shell for conformance with CRSD standards and facilities upgraded as necessary. The acquired assets were included in the recertification audit.

The verification process included audit team observations, interviews with responsible management, planning and operations personnel, documentation review and site visits. Where necessary and appropriate, the auditors requested explanations of site observations, equipment performance, operations, operating procedures and reviewed documents and records to verify conformance to the standards.

Over the course of the audit, the auditors reviewed approximately 55 records and documents and interviewed 7 employees (3 office based, 4 field personnel) to determine conformance with the performance standards.

Table 1, titled "CRSD Certification – SWEPI LP (Shell), Appalachia Asset Audit Summary Scorecard" summarizes BVC's audit findings with respect to each performance standard. Table 2, titled "CRSD Certification – Field Verification Visits SWEPI LP (Shell), Appalachia Asset" outlines the locations and associated operations visited for observation and verification of conformance to the CRSD Performance Standards. The sites selected include a cross section of SWEPI LP (Shell), Appalachia Asset's operations and geographic locations within the Appalachian Basin that were active during the audit "operational window" as required by CRSD's Verification Protocol. The standards identified in Table 2 for each site are a sample of the areas of field observation and verification addressed by the audit team.

TABLE(S)

**Table 1: CRSD Recertification Audit Summary Scorecard - 2016
SWEPI LP (Shell), Appalachia Asset**

WATER	WATER PERFORMANCE STANDARDS	Finding (C,N,NA)*
1.0	Std 1: No wastewater discharge	
1.0	Maintain zero discharge of wastewater (including drilling, flowback and produced waters) to Waters of the Commonwealth of PA and other states.	C
1.2	In order to facilitate comprehensive wastewater management programs that consider environmental, safety, health, and economic factors, Operators may send shale wastewater to a Centralized Waste Treatment facility (CWT) for treatment and discharge if the Operator demonstrates certain conditions are satisfied at the CWT.	C
1.3	Prior to using a CWT that may discharge, the operator must conduct an evaluation of the CWT's performance and permit compliance status.	C
1.4	Operator must conduct CWT effluent monitoring.	C
1.5	Operators may not initiate, and will immediately cease, deliveries to a CWT if the CRSD determines the CWT discharges increase the risk of harm to human health or the environment or is in substantial non-compliance with its NPDES permit.	C
1.6	Operator shall provide CWT evaluation data to the CRSD and in the event of identifying potential non-compliance findings, shall notify the CWT, the permitting agency, and CRSD.	C
2.0	Std 2: Recycle water	
2.1	Maintain a plan to recycle flowback and produced water, for usage in drilling or fracturing a well, to the maximum extent possible.	C
2.2	Recycle a minimum of 90% of the flowback and produced water, by volume, from wells in all core operating areas in which an Operator is a net water user.	NA ¹
3.0	Std 3: Closed loop drilling / pits	
3.1	Any new pits designed shall be double-lined and equipped with leak detection.	NA ²
3.2	Contain drilling fluid, when using oil-containing drilling fluids to drill a well, in a closed loop system at the well pad (e.g. no ground pits).	C
3.3	Contain all drilling fluid and flowback water in a closed loop system at the well pad, eliminating the use of pits for all wells.	C

*C = Conformance with the standard
 NC = Non-conformance with the standard
 NA = Not applicable

¹ SHELL did not have a core “operating” area during the audit period – exploration and extension activities only.
² SHELL has not installed any new pits in the past four years and no new pits are planned

4.0	Std 4: Centralized wastewater impoundments	
4.1	Ensure that free hydrocarbons are removed from the water prior to storage; new impoundments must be double-lined with an impermeable material, equipped with leak detection; and take measures to reasonably prevent hazards to wildlife.	NA ³
5.0	Std 5: Geologic risk assessment	
5.1	Establish an Area of Review, prior to drilling a well, which encompasses both the vertical and horizontal legs of the planned well; conduct a comprehensive characterization of subsurface geology, including a risk analysis; and conduct a thorough investigation of any active or abandoned wellbores within such area of review or other geologic vulnerabilities (e.g., faults) that penetrate the confining layer and adequately address identified risks.	C
6.0	Std 6: Groundwater monitoring	
6.1	Develop and implement a plan for monitoring existing water sources and demonstrate that water quality and chemistry measured during a pre-drilling assessment are not impacted by operations.	C
6.2	Conduct periodic monitoring for at least one year following completion of the well and monitoring must be extended if results indicate potentially adverse impacts on water quality or chemistry by operations.	C
6.3	Develop and implement an investigative and corrective action plan if monitoring establishes a possible link between an Operator's activities and of contamination of a water source	C
6.4	Conduct additional monitoring in the event a well is re-stimulated.	C
7.0	Std 7: Well integrity; fluid design & disclosure	
7.1	Design and install casing and cement to completely isolate the well and all drilling and produced fluids from surface waters and aquifers and prevent vertical movement of fluids in the annulus.	C
7.2	Do not use diesel fuel in the hydraulic fracturing fluids.	C
7.3	Publically disclose the chemical constituents intentionally used in well stimulation fluids.	C
7.5a	Work toward use of more environmentally neutral additives for hydraulic fracturing fluid.	C
7.5b	Perform mechanical integrity tests when refracturing an existing well.	C
8.0	Std 8: Spill containment & emergency response	
8.1	Design each well pad to minimize the risk that drilling related fluids and wastes come in contact with surface waters and fresh groundwater.	C
8.2	Develop and implement an emergency response plan and ensure local responders have appropriate training and equipment to respond to an emergency at the well.	C
8.3	In the event of spill or release, beyond the well pad, immediately provide notification to the local governing body and any affected landowner.	C

³ SHELL does not operate centralized wastewater impoundments.

AIR	AIR PERFORMANCE STANDARDS	
9.0	Std 9: gas to pipeline/ limited flaring	
9.1	Direct all pipeline-quality gas during well completion of development wells, and re-completion or workover of any well into a pipeline for sales.	C
9.2	Any gas not captured and put in the sales pipeline may not be vented and must be flared (in accordance with Standard No. 10).	C
9.3	Acceptable reasons for sending gas to a flare and not directing gas into the sales line include: (a) Low content of flammable gas and (b) for safety reasons.	C
9.4	Circumstances unacceptable for sending gas to flare, instead of directing it into a sales line, are: (a) lack of a pipeline connection except for wells that are designated as either exploratory or extension wells; (b) inadequate water disposal capacity; and (c) undersized flow back equipment, lack of flow back equipment or lack of equipment operating personnel.	C
9.5	Document any upset or unexpected condition that leads to flaring of gas and maintain records of description of the condition, the location, date, and quantity of gas flared.	C
9.6	Exploratory well verification	C
10.0	Std 10: Flare operation, if permitted	
10.1a	Use raised/elevated flares or an engineered combustion device with a reliable continuous ignition source, which have at least a 98% destruction efficiency of methane. Pit flaring is not permitted.	C
10.1b	Flaring may not be used for more than 14-days on any development well and no more than 30-days on any exploratory or extension wells. If flaring continues beyond 30-days for an exploratory or extension well, document the extent of additional flaring and reasons requiring flaring beyond the 30-days.	C
10.1c	Flares shall be designed for and operated with no visible emissions, except for periods not to exceed a total of five minutes during any two consecutive hours.	C
11.0	Std 11: Engine emissions - rig; frac pumps	
11.1a-e	Dedicated horizontal drill rig (non-road) diesel - average emissions must be equivalent to Tier 2 non-road diesel engine standards or better. All horizontal drill rig diesel non-road equipment must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.	C
11.2a-b	Dedicated frac pump diesel engines - average emissions must be equivalent to Tier 2 non-road diesel engine standards or better. All frac pump diesel engines must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.	C
12.0	Std 12: Engine emissions - compressors	
12.1	Existing compressor engines greater than 100 horsepower may not emit more than 1.5 grams of NOx per horsepower-hour.	C
12.2	Any new, purchased, replacement, reconstructed, or relocated lean-burn engines greater than 100 horsepower may not emit more than 1.0 g/hp-hr for NOx; 2.0 g/hp-hr for CO; 0.7 g/hp-hr for VOCs.	NA ⁴

⁴ Shell has not purchased or replaced any existing lean-burn engines in the Appalachia Basin

12.3	Any new, purchased, replacement, reconstructed, or relocated lean-burn engines greater than 500 horsepower may not emit more than 0.5 g/hp-hr for NOx; 47 ppmvd @ 15% O2 or 93% reduction of CO; 0.2 g/hp-hr for VOCs; and 0.05 g/hp-hr for HCHO.	C
12.4	Any new, purchased, replacement, reconstructed, or relocated rich-burn engines greater than 100 horsepower and up to 500 horsepower may not emit more than 0.25 g/hp-hr for NOx; 0.3 g/hp-hr for CO; 0.2 g/hp-hr for VOCs.	NA ⁵
12.5	Any new, purchased, replacement, reconstructed, or relocated rich-burn engines greater than 500 horsepower may not emit more than 0.2 g/hp-hr for NOx; 0.3 g/hp-hr CO; 0.20 g/hp-hr for VOCs; 2.7 ppmvd at 15% O2 or 76% reduction for HCHO.	NA ⁵
13.0	Std 13: Tank VOC emissions	
13.1	All individual storage vessels at the well pad with VOC emissions equal to or greater than 6 tpy must install controls to achieve at least a 95% reduction in VOC emissions.	C
14.0	Std 14: Fugitive emissions - controllers, seals, inspection	
14.1	Change rod packing at all reciprocating compressors (both existing and new), including those at the wellhead, either every 26,000 hours of operation or after 36 months.	C
14.2	All pneumatic controllers must be low – bleed, with a natural gas bleed rate limit of 6.0 scfh or less or zero bleed when electricity (3-phase electrical power) is on-site.	C
14.3	Replace worn out wet seals on existing centrifugal compressors with dry seals.	NA ⁶
14.4	Implement a directed inspection and maintenance program (DIM) for equipment leaks from all existing and new valves, pump seals, flanges, compressor seals, pressure relief valves, open-ended lines, tanks and other process and operation components that result in fugitive emissions. Monitor weekly (OVA) and annually (FLIR). Once significant leaks are detected, they are required to be repaired in a timely manner.	C
14.5	Eliminate VOC emissions associated with the prevention of well-bore freeze-up.	C
14.6	Pressurize compressors when they are off-line for operational reasons to reduce blowdown emissions.	C
15.0	Std 15: Engine emissions - water fleet, other	
15.1	80% of all trucks used to transport fresh water or well flowback water must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter (PM) emissions.	C
15.2	By September 24, 2015, 95% all trucks used to transport fresh water or well flowback water must meet U.S. EPA's Final Emission Standards for 2007 and Later Model Year Highway Heavy-Duty Vehicles and Engines for particulate matter emissions.	C
15.3	All on-road vehicles and equipment must limit unnecessary idling to 5 minutes, or abide by applicable local or state laws if they are more stringent.	C
15.4	All on-road and non-road vehicles and equipment must use Ultra-Low Sulfur Diesel fuel (15 ppm of sulfur) at all times.	C

⁵ Shell leases all applicable compressor engines from USA Compression. None of the engines are rich burn.

⁶ Shell does not own or operate any centrifugal compressors with wet seals in the Appalachian Basin.

**Table 2: CRSD Certification - Field Verification Visits
SWEPI LP (Shell), Appalachia**

Site Name	Assessors	Date	General Location	Operation / Activity	Key CRSD Performance Standards Assessed
Thomas 503	JAS, HDU	Nov 8, 2016	Tioga County, Pennsylvania	Drilling rig (Horizontal Drilling) and Production	<i>1 - Zero discharge, 3 – Pits/Impoundments, 4- Hydrocarbon, Double-Lined, Hazard Prevention; 8 – Containment and ERP**, 11 – Engines, and 14 – Controllers, Chemical Injectors, LDAR (Leak Detection and Repair) Containment, 15 - Truck idling</i>
Tice 653				Completions – Hydraulic Fracturing in progress	<i>1 - Zero discharge, 3- Pits/Impoundments, 7 - Frac Fluids, 8 – Containment and ERP, 11 – Engines, 15 - Truck idling</i>
Lick Run / Hillside				Production & Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>
Button B		Nov 9, 2016		Production & Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>
Parthemer				Production & Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>
Stock 3				Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Blowdown for Operations LDAR (Leak Detection and Repair) 15 - Truck idling</i>
Miller 394				Production	<i>1 - Zero discharge, 8 – Containment and ERP, 14 – Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>

Nestor 551			Production	<i>1 - Zero discharge, 8 – Containment and ERP, 14 – Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>
Houck 433			Production	<i>1 - Zero discharge, 8 – Containment and ERP, 14 – Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>
Sharrets C		Nov 10, 2016	Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Blowdown for Operations LDAR (Leak Detection and Repair) 15 - Truck idling</i>
Matz C			Compressor Station	<i>1 - Zero discharge, 8 – Containment and ERP, 12 - Engine Emissions, 14 – Rod Packing, Controllers, Blowdown for Operations LDAR (Leak Detection and Repair) 15 - Truck idling</i>
Delaney			Production	<i>1 - Zero discharge, 8 – Containment and ERP, 14 – Controllers, Chemical Injectors, LDAR (Leak Detection and Repair), 15 - Truck idling</i>

** ERP – Emergency Response Plan