Section 1.0—Introduction and Background

Rockwater Energy Solutions, Inc. (and all its affiliated and subsidiary companies, hereinafter collectively referred to as “Rockwater”) is committed to providing its employees a safe working environment and avoiding injury to our contractors, customers, and neighbors. As part of our overall commitment to safety, Rockwater seeks to prevent acts or conditions that could result in injury and/or illness to any employee, customer, contractor, neighbor, and/or the environment.

In an effort to prevent potentially harmful acts or conditions, Rockwater has developed this Standard Operating Procedure (SOP). This SOP will discuss steps to be taken to promote a safe process, as well as a list of potential hazards that should be identified and remediated prior to commencing these activities.

This SOP will be reviewed and revised on an ongoing basis to keep pace with best oilfield practices. This SOP will be a part of the training provided to all affected employees when they begin their employment with Rockwater and any time the plan is changed. This SOP will also be reviewed with an employee if his/her responsibilities change under the plan. A written copy of this plan will remain in the regional Safety Office, and will be available for employee review. The Vice-President of Health Safety and Environment, or his agents, may be contacted by any employee if he/she needs additional information about this SOP.

This SOP has been developed to assist affected employees with the operational steps that may be used to complete the task safely. It must be noted, however, that the experience and background of a trained flowback operator is essential to the success of any project or task. Nothing contained in this SOP is a substitute for each employee’s individual judgment in any given situation. In the event that any employee believes that any task outlined in any SOP cannot be completed safely, then that employee should immediately halt the performance of such task and notify their direct supervisor.

In addition to this SOP, the policies and procedures of each operating company will be strictly observed by Rockwater personnel.

Section 2.0—Process Steps, Sand Separator Rig Up and Operations

A sand separator a piece of equipment utilized during well flowback operations that acts as a filter and removes solid debris from the well production output. The separator is essentially a low pressure tank with an internal array of metal plates. The unit looks like a tank that is attached to an L-shaped metal frame. The sand separator is horizontally oriented during transportation, and is staged vertically while in operation. The well output blows into the sand separator unit and strikes the plates. The solid debris, consisting mostly of proppant or sand coming back out of the well, strikes the plates and settles at the bottom of the tank. The fluids and gases coming out of the well continue through the sand separator unit and are transferred into other tanks for processing. The solids are then removed from the unit for ultimate disposition.

This section of the SOP is broken down into six separate units that account for the various modules of sand separator rig up and operations. These units are:
• Erecting Sand Separator with Powered Industrial Trucks
• Erecting Sand Separator with roller-tail, flat bed truck
• Rigging up inlet and outlet lines
• Rigging up Sand Separator blow-down lines
• General Sand Separator operations
• Sand Separator inspection and maintenance

**Erecting Sand Separator with powered industrial truck**

• The sand separator unit must be unloaded from the trailer using a standard forklift or an extending boom, rough terrain forklift (tele-handler or equivalent) with appropriate weight ratings.
  o Tele-handler/forklift may only be operated by a certified operator.
• Use sound mechanical lifting techniques to remove the sand separator from the flat bed and place it on the ground, clear of containment (to avoid ripping containment as you stand the unit up).
  o Typically the sand separator can be lifted with the forks underneath the vessel or with a proper sling assembly used in conjunction with lifting lugs attached by manufacturer.
• The sand separator is then adjusted into the final, upright position with the powered industrial truck. The truck will connect to the cross-bar at the top of the unit framing skid and lift the unit, while simultaneously extending boom until sand separator is staged in the upright position. At this point, it can be lifted from the top of the skid using sound mechanical lifting techniques.
  o Once erect, the sand separator can be maneuvered into position to proceed with rig up.
  o Use tag lines any time that a man on the ground helps to maneuver over head loads. Always keep all personnel clear of overhead loads.
• At the instruction of the operating company, secondary containment may be laid beneath the sand separator.
• At the instruction of the operating company, sufficient cribbing may be used to stabilize sand separator during placement and to prevent damage to containment.

**Erecting sand separator with roller-tail flat-bed trailer**

• This operation should only be conducted by a qualified and experienced truck driver.
• Adjust the winch cable to the appropriate length, and ensure that all mechanical components (e.g. winch, roller bars, trailer deck) are in good working order. Ensure that the winch cable is properly attached to the cross-bar on top of the sand separator back-skid.
• Using backward momentum from the truck and trailer, slide the base-skid end of the sand separator off of the trailer until the whole unit is pitched at an angle, suspended off of the roller tail.
• Lower the sand separator into desired footprint location using the winch.
• Raise the sand separator erect by pushing it up with the end of the roller tail trailer.
  o Ensure that all personnel are clear of the sand separator during this operation.
  o There should be a designated ground guide to assist the driver.

**Rigging up inlet and outlet lines to sand separator**

• Inlets and outlets on sand separators are generally more than six feet off the ground. Use a man-lift whenever available to make this operation safe and effective.
  o When you use a man-lift, ensure that the operator is certified for man-lift operation and that a proper fall-restraint harness is used.
  o Be cautious of pinch points as you maneuver the man-basket into position.
  o Never stand on the railings of the man-basket to hammer tight connections.
  o Maintain proper footing at all times and utilize proper hammer technique.
  o When using hammers, always be aware of tool “line of fire” and ensure body parts are not in danger of being struck.
  o Use securement (such as whip checks, cable and clamp restraint system, or nylon restraints), to secure all iron as prescribed by the SOP of the operating company.

**Rigging up sand separator blow-down line**

• A dedicated line generally rigged up with 2” diameter 1502 iron will be rigged up from the bottom of the sand separator that runs to a dedicated solids tank or to the inlet of a gas-buster. A gas buster is a vessel on the tank which has an array of baffles inside. It is used to break gas out of the fluid stream, causing liquids and solids to fall out into the tank at a sufficiently slow velocity. This line is used to discharge solids which accumulate in the bottom of the vessel.
• Coming off of the blow-down outlet, rig up two 2” x 2” plug valves followed by an appropriate choke.
  o If the sand separator is in line upstream of the choke manifold, the following appurtenances must be used for your sand separator blow-down choke:
    ▪ choke tee
    ▪ choke stop
    ▪ blast joint
    ▪ choke bonnet assembly
      ▪ Typically, this set up will be outfitted with a ¾” adjustable seat and trim.
If the sand separator is in line downstream of the manifold, a threaded adjustable choke body is an acceptable substitute for a 1502 choke bonnet, if allowed by the operating company SOP.

- Rig up the sand separator blow-down line to the tank. Once at the tank designated for depositing sand, the line can be rigged up onto a gas buster or secured to the top of the tank with an adequate chain and binder.
- Proper securement should be used on the blow-down line, as prescribed by the SOP of the operating company. This may include whip checks, nylon restraints, and/or cement blocks.

**General Sand Separator Operation**

- A sand separator is a vertical pressure vessel which is used primarily to extract sand from the flow-stream, preventing the sand from washing coils in the line heater, from washing out chokes, and from contaminating the test separator. The solids discharge of the sand separator may be directed to a tank other than the primary flow tank, if this is desirable by the operating company.
- Always analyze flowing conditions to ensure that the sand separator has pressure rating capacity sufficient to handle the well conditions.
  - Routinely inspect and replace all pressure relief valves on sand separator vessels. Always use the appropriate pop-off to correspond to the vessel rating.
- Two 2” x 2” plug valves and an appropriate choke should be employed at the sand separator blow down. This will allow for the replacement of the downstream 2” x 2”, if necessary. Also, proper use of the choke will prevent excessive wear and tear on the plug valves that are immediately upstream.
  - When removing solids from the sand separator, open the upstream plug valve first, and then the secondary (downstream) plug valve. Once both valves are fully open, slowly open the adjustable in-line choke to achieve the desired rate of flow to evacuate all solids from the bottom of the sand separator.
  - Sand separators should be blown down as often as necessary to discharge accumulated solids.
    - If sand separator is not blown down regularly, it is possible to plug off the discharge port with accumulated sand.

**Sand separator inspection and maintenance**

- Regularly inspect and replace pop-off safety valves.
- Visually inspect inlet, outlet, and discharge ports before and after each job. Check for signs of excessive wear and for obstructions.
  - Replace companion flanges if excessive wear is present. Always use a new gasket when you swap out flanges.
- Regularly inspect the internal mechanics of the sand separator with a telescoping camera. Inspect internals for excessive wear and for structural integrity.
• Visually inspect the sand separator skid to ensure that it is undamaged and has good structural integrity.
• Replace needle valves and gauges as needed.

Section 3.0—Potential Hazards
Any time that flowback operations are in progress, the following potential hazards must be considered and mitigated:
• Latent natural gas
• Wind direction
• Ignition sources within 100 feet of the wellhead and/or frac tanks
• Pressure
• Line of fire/body placement/grease valve placement
• Hydrogen Sulfide (H₂S)
• Stored energy
• Overhead work or suspended loads

Section 4.0—Other Safety Items
In addition to the above potential hazards, the following items should be discussed and implemented during the pre-project tailgate safety meeting and JSA process, prior to commencement of onsite activities:
• All possible flammable gas or liquid sources are to be identified and controlled or remediated.
• All possible ignition sources are to be identified and controlled or remediated.
• Environmental controls;
  o Erosion and Sedimentation (E&S) controls in place?
  o E&S controls appropriately located?
  o E&S controls adequate for situation?
• Ensure that safety equipment and personal protective equipment (PPE) is onsite and available and properly utilized when necessary or otherwise required pursuant to this SOP or the operating company’s policies and procedures.
• Access signs or tape (as required) are available.
• Non-sparking tools for potential leaks are available.
• Potential communication issues should be identified and resolved;
  o Among Rockwater employees.
  o Between Rockwater and other contractors onsite.
• Strategies for limiting site access should be discusses and implemented, if possible.
• Rally points for and routes for emergency evacuations should be identified.
  o Identify a secondary rally point, along with a secondary evacuation route.
• Grounding and bonding of tanks and equipment must be completed.
• Appropriate actions on/around tanks must be discussed.
• Spill/leak cleanup procedures must be reviewed.
• Containment requirements must be reviewed.
• Reporting requirements and procedures must be reviewed.
• Discuss that the integrity of lines is not guaranteed, and can be negatively impacted by
- Pressure;
- Vibration;
- Torque; or
- Binds.

- Record-keeping and project log requirements should be reviewed.
- Water for pressure testing, purging requirements and processes must be identified.
- A minimum of two workers must be present onsite at all times.
SOP In-Field Checklist, Sand Separator Operations

Erecting Sand Separator with powered industrial truck

☐ Unload unit from trailer using PIT. Always use tag lines when unit is suspended.
☐ Spot unit on ground, clear of containment
☐ Adjust unit into final, upright position with PIT
☐ Once unit is upright, maneuver into position and proceed with rig up
☐ Spot secondary containment under unit (as per operating company instructions)
☐ Use cribbing to stabilize unit and protect containment (as per operating company instructions)

Erecting sand separator with roller-tail flat-bed trailer

☐ This operation should only be conducted by a qualified and experienced truck driver
☐ Adjust winch cable to appropriate length and ensure all mechanical components are in good working order. Ensure winch cable is properly attached to cross-bar at top of unit back-skid.
☐ Using backward momentum from truck/trailer, slide base-skid end of unit off trailer until unit is suspended off of the roller tail.
☐ Lower unit into desired location with winch
☐ Raise unit erect by pushing with end of roller tail trailer

Rigging up inlet and outlet lines to sand separator

☐ Inlets/outlets are generally more than six feet off the ground. Use a man-lift whenever possible.
☐ Ensure man-lift operator is certified and proper fall-restraint system is used
☐ Be aware of pinch points and never stand on the railings of the man-lift
☐ Maintain proper footing and utilize proper hammer technique
☐ Be aware of tool “line of fire”
☐ Use securement on all iron (as per operating company instructions)

Rigging up sand separator blow-down line

☐ Rig up dedicated line (2” diameter 1502 iron) from bottom of unit to solids tank or gas-buster.
☐ Rig up two 2” x 2” plug valves off of the blow-down outlet, followed by appropriate choke
☐ If unit is in line upstream of choke manifold, the following must be used for blow-down choke:
  ☐ choke tee
  ☐ choke stop
  ☐ blast joint
  ☐ choke bonnet assembly
☐ Outfit set up with a ¾” adjustable seat and trim
☐ If unit is downstream of manifold, a threaded adjustable choke body is an acceptable substitute for a 1502 choke bonnet (as per operating company).
☐ Rig up blow-down line to tank. Once at solids tank, the line can be rigged up onto a gas buster or secured to the top of the tank with an adequate chain and binder.
☐ Use proper securement as per operating company instructions
**General Sand Separator Operation**

- Always analyze flowing conditions to ensure unit has proper pressure rating
- Routinely inspect/replace all pressure relief valves. Always use appropriate pop-off to correspond to the vessel rating.
- Use two 2” x 2” plug valves and an appropriate choke at the unit blow down.
- When removing solids from unit, open upstream plug valve first, and then secondary (downstream) plug valve. Once both valves are fully open, slowly open the adjustable in-line choke to evacuate solids from the bottom unit.
- Units should be blown down as often as necessary to discharge accumulated solids.

**Sand separator inspection and maintenance**

- Regularly inspect and replace pop-off safety valves
- Visually inspect inlet, outlet, and discharge ports before and after each job. Check for signs of excessive wear and for obstructions.
- Replace companion flanges as needed. Always use a new gasket when you swap out flanges.
- Regularly inspect the internal mechanicals with telescoping camera. Inspect for excessive wear and for structural integrity.
- Visually inspect the sand separator skid to ensure that it is undamaged and has good structural integrity.
- Replace needle valves and gauges as needed.