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Controlled Document

Quest CCS Project

Well Programme for Completion and Interventions


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Revision History shown on next page

Revision History

REVISION STATUS			APPROVAL		
Rev.	Date	Description	Originator	Reviewer	Approver
01	2011-08-11	Draft for approval	Raul Caldera	Vincent Hugonet	John Coblens
<ul style="list-style-type: none"> All signed originals will be retained by the UA Document Control Center and an electronic copy will be stored in Livelink 					

Signatures for this revision

Date	Role	Name	Signature or electronic reference (email)
	Originator	Raul Caldera	
	Reviewer	Vincent Hugonet	
	Approver	John Coblens	

Summary

Well Programme for Completion and Intervention of the well Quest SCL Radway 7-11-59-20 and subsequent Quest injection wells.

Keywords

Completion program, Radway 7-11-59-20.

PCAP Authorities

Date	Role	Name	Signature or electronic reference (email)
	C&WI TA-2	John Coblens	

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1. OBJECTIVE

3rd well was designed to achieve the following objectives:

- Successful injectivity test enabling to determine the stable water injectivity of the BCS with an acceptable injection profile across the perforation interval.
- Minimized skin after the injection test
- Confirmation of fracture pressure within the LMS
- Put well on service for CO2 injection

In order to achieve these objectives, well will be perforated, completed and monitored (Memory gauges, PLT, Fibre optic) during injection testing and later suspended until further data evaluation; When the project requires it well will be recompleted and prepared for injection by displacing it with CO2.

2. PROJECT BACKGROUND

3rd well like The Radway well is part of the Quest CCS Project which proposes injection and subsurface storage of CO2 from the Scofield Upgrader into the deep saline formation of the Basal Cambrian Sand (BCS). Two prior appraisal wells were drilled over the winter season of 2008-9 and have been evaluated.

3. PROGRAM DRAFT SUMMARY FOR MAIN ACTIVITIES

PART A– 1 M E-LINE PERFORATION @ TOP BCS FOR MINIFRAC

- Handover from drilling department ensuring lease is clean and well has been left full of fresh water
- Run 156 mm drift gauge ring w/junk basket to TD
- MIRU Service Rig to install 11" BOPs
- Run 156 mm scraper with service rig to PBD
- W/Scraper on bottom circulate well to 5% KCL till returns are clean then POOH
- Swab from the well in order to leave the fluid column up to depth TBD (To create under balance)
- Run E-Line to perforate 1 M @ Top of BCS

PART B – MINIFRAC TOP BCS

- RIH minifrac BHA and set packer above open perforations @ TBD
- Minifrac
- POOH minifrac BHA and download data from memory gauges

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PART C – 30 M TCP PERFORATIONS @ BOTTOM BCS FOR INJECTION TEST

- RIH TCP BHA (Without SL TCF Firing Head) and set below the perforated interval (2048.5 – 2049.5 mMD) (correlate w/wire line) to perforate 30 m interval.
- Swab from the well in order to leave the fluid column inside the tubing up to TBD mMD to create an under balance
- RIH w/slick line to set the firing head
- Perforate by jarring down
- POOH slick line w/trigger and jars
- Pump TBD m3 of 5% KCl (2 tbg volumes) to check feed rate
- POOH TCP BHA

PART D – SHORT INJECTION TEST

- RIH TBG + BHA for injection test @ 2016 mMD (On top of all perforation intervals), packer needs to be set so distance from bottom oh BHA to top BCS has to be 25 m for the CPLT (For program details can be found in the appendix section)
- Run PLT (surface read out)
- Perform a Short Injection Test TBD m3 (rate & time TBD)
- POOH PLT
 - *Depending on PLT data outcome completion will need to be reset in the blank section between the perforation intervals (TBD mMD)*

PART E – LONG INJECTION TEST

- RIH Down hole memory gauges w/slick line to be set at the lower XN nipple
- RIH DHSIT (Down hole shut in tool) w/slick line to be set at the upper X nipple
- Perform a Long Injection Test with 5% KCl (rate and time TBD)
 - Well will shut in due to DHSIT activation
 - Stop injection test
 - Rig down pumping equipment
- POOH DHSIT and DH memory gauges w/slickline
- POOH Completion
 - *Depending on memory gauges data outcome 5 m blank section might be perforated w/e-line.*

PART F – RIH FINAL COMPLETION & WELL SUSPENTION

- RIH Final Completion
 - Replace packer and tail end w/final I.P.C metallic 3000 coated BHA
 - Run back in.
 - Circulate well with final completion fluid
 - Set packer within 15 m max from top open perforations in order to comply with ERCB Directive 65 regulations for injection and disposal wells

- RIH w/slick line and set a plug in X nipple

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- Complete both annular and tubing spacing with antifreeze
- Rig out BOPs
- Install X-mas tree
- Rig out service rig
- Hand over well to operations

PART G – PREPARE WELL FOR INJECTION SERVICE

- Receive well from operations
- MIRU Slick line
- RIH w/slick line and retrieve plug on XN nipple
- MIRU CO2 pumping truck
- Pump CO2 and displace well to formation
- Shutdown well and hand over to operations

4. WELL STATUS

- Sweet new drill well
- Cased
 - 339.7 mm (13 3/8") @ TBDmMD
 - 244.5 mm (9 5/8") @ TBD mMD
 - 177.8 mm (7") @ TBD mMD
 - TVD TBD mMD
- Not perforated
- Fresh water in the well
- Fracture gradient: TBD KPa/m (estimated)
- All activities will be covered under the Radway ERP.

ESTIMATED RESERVOIR PRESSURES, TEMPERATURES AND H2S CONTENT					
ZONE	DEPTH TVD(m)	PRESSURE kPa	SITP kPa	H ₂ S / CO ₂ CONTENT ppm	TEMPERATURE °C
BCS				0 ppm H ₂ S	60

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WELL DATA	MD	TVD	STIM. INTERVALS	TOP PERF (MD)	BOTTOM PERF. (MD)
RKB ELEVATION (mASL)		-	MINIFRAC		
GL ELEVATION (mASL)		-	INJECTION TEST		
CF ELEVATION (mASL)					
PBTD (mKB)		-			

TUBULAR AND ANNULAR CAPACITIES				
OD mm	WEIGHT kg/m	DEPTH mKB	VOLUME m ³ /m	TOTAL VOLUME m ³
88.9	13.84		0.00454	
177.8	38.69		0.019958	

TUBULAR DIMENSIONS										
SIZE mm	WGT Kg/m	GRD	THREAD TYPE	MAX OD mm	ID mm	DRIFT mm	BURST MPa	COLLAPSE MPa	YIELD 1000 lb	MAKE-UP TORQUE ft. lb
88.9	13.84	J-55	EUE	114.3	76.00	72.82	48.2	51.0	122	2,280
177.8	38.69	L-80	LTC	-	159.41	156.23	49.9	37.3	511	5,110
177.8	38.69	22CR-140	NK3SB	-	159.41	156.23	87.35	46.12	1,057	6,430

5. WELL RESTRICTIONS

EQUIPMENT	ID (mm)	DEPTH (m)
Otis "X" Seating nipple	71.45 mm	TBD m below hornet packer
Otis "XN" Seating nipple	67.72 mm	TBD m below hornet packer
Hornet Packer	74.17 mm	TBD

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6. COMPLETION FLUIDS AND EQUIPMENT

All tanks will be steam cleaned prior to coming to location. All lines will be flushed clean prior to use.

PROGRAM COST CONTROL INFORMATION	
Estimated Cost	TBD
Network #	TBD

7. HSSD PLAN

- Perform safety meetings with all personnel on site prior to beginning any new scope of work. Review all WSPP's, JSA's and/or equivalents prior to job.
- All personnel must adhere to the HSE workplace rules when on location.
- Live saving rules should be review it and reminded as they apply totally during the operation development.
- Pressure Testing: **As a minimum**, pressure test above the lower master valve, Christmas tree equipment, and surface lines exposed to treatment pressure to 10% above the maximum pressure expected during the job without exceeding the maximum working pressure rating of the wellhead and other equipment. All high pressure tests must be held for a minimum of 10 minutes and not have a pressure drop greater than 5% over a one hour period (Shell Global Standard for Temporary Pipework).
- Maximum pumping pressure: During the actual acidizing or fracturing operation, the maximum pumping pressure must not exceed 90% of the pre-job test pressure. The program will dictate the pressure testing requirements, and consideration should be give to pressure limitations of all equipment involved.
- The emergency response plan (ERP) must be reviewed and understood by all parties working on site
- Project vehicle speed in the surroundings area is set @ 60 km/h max.
- **<<<Frequent LEL gas measurements need to be taken around the wellhead during completions and work over operations>>>**

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8. PROGRAM OPERATIONS CONTACT INFO

8.1. WSPP REFERENCES

- WSPP-020 Personnel Orientation and Certificates
- WSPP-070 Acid and fracturing operations
- WSPP-090 Perforating
- WSPP-200 Hazard Assessment
- WSPP-240 Information Exchange and Custody Transfer
- WSPP-270 Well Services – General HSE Requirements
- IRP-7 Std. For wellsite supervision
- Dir 33 EUB Lubricator pressure testing
- WSPP-060 Wireline Work
- WSPP-050 Wellhead Installation
- WSPP-150 Well Swabbing
- WSPP-240 Information Exchange/Custody Transfer

8.2. DIRECTIONS TO LOCATION

TBD

8.3. SPECIAL CONSIDERATION

- Ensure safe, efficient operation and **zero tolerance** safety policy.
- All Shell safety regulations and procedures should be strictly adhered to.
- **Any deviation from the program needs prior approval from Well Services Superintendent Jeremy Friesen.**
- Even when safe charges systems will be used, no cellphone communication allowed signage will be placed in the lease and road at the time of perforation for extra precautions, ensure all cellphones and radios are off. In some instances when "Onstar", vehicle theft/security GPS systems are involved, the unit may have to be removed to outside the interference range.
- All activities will be covered under the well ERP.

NOTE: PRIOR TO COMMENCEMENT OF WORK NOTIFY SCOTFORD COMPLEX SECURITY DEPARTMENT AT 1-780-992-3746

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