

UNION GAS LIMITED

Response to Interrogatory  
from the Ministry of Natural Resources

Question:

1. Given what Union has learned from its studies of the geological and rock mechanic properties of the subject storage pools and overlying formations, how would Union characterize the magnitude of the proposed pressure increase relative to the maximum delta-pressuring that the pool could safely be subjected to, e.g. very minor, moderate, major?

Can this assessment be quantified in terms of percentages or pressures?

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Response

- 1) The magnitude of the proposed pressure increases relative to the maximum delta-pressuring that the pool could safely be subjected to is considered very minor. The following Table shows the current maximum operating pressure compared with the proposed maximum operating pressure in terms of percentages and pressures.

	(A)	(B)	(C)	(D)	(E)	(F)
Pool	Maximum Formation Operating Pressure <sup>(1)</sup>  kPaa	Current PMOP  kPaa	Proposed PMOP  kPaa	Proposed Pressure Increase  (C)-(B) kPaa	PMOP as percentage of Maximum Formation Operating Pressure allowed by CSA	
					Current (B)/(A) %	Proposed (C)/(A) %
Dow A	12,590	10,310	10,690	380	82	85
Payne	10,896	8,900	9,250	350	82	85
Enniskillen	10,280	8,500	8,730	230	83	85
Oil Springs East	9,491	7,760	8,060	300	82	85

Notes:

- (1) The Maximum Formation Operating Pressure is equivalent to 80% of the Fracture Closure Pressure as required by CSA Z341. Union conducted tests to determine the Fracture Closure Pressure. The results of these tests can be found in Schedule 2 of the pre-filed evidence.
- (2) All pressures are wellhead pressures

CSA restricts the maximum formation operating pressure to 80% of the Fracture Closure Pressure. Union proposes to operate at 68% of the Fracture Closure Pressure. As shown in the above table this is equivalent to 85% of the maximum operating pressure allowed for by code.

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Question:

2. What is the maximum operating pressure of the subject pools given Union's analysis?

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Response

Please see Column A of the table in Union's response to MNR Interrogatory # 1.

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Question:

3. How accurate is Union's technology respecting detection of gas storage problems at higher operating pressures, e.g. inventory control, metering, etc.?

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Response

Union uses measurement devices which are approved for custody transfer metering on all storage pools. Meters are calibrated and inspected periodically to ensure accurate measurements. In addition, Union continuously monitors each pool's official observation well pressures using telemetry. The data is used by Union's Underground Storage Engineers to track inventory. The ability to track gas storage problems at the higher pressures is clearly a function of the accuracy of the metering facilities and pressure measurement equipment. Union places a high priority on calibration and maintenance of these facilities.

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Question:

4. Given the relatively small increase in operating pressure, if a gas loss problem from the reservoir itself were to occur, is it likely to be detected? How much volume loss would have to occur before a problem is detected?
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Response

It is unlikely that the small increase in pressure would result in a loss. The pressure required to fracture the overlying caprock formations is considerably higher than the proposed maximum operating pressure. In the unlikely event of a loss, the problem would most likely be detected by monitoring inventories and pressure responses in the reservoir. The actual volume loss would depend largely on operations, geology and the mechanism under which the loss was caused to occur.

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Question:

5. Given that storage wells can be used for several decades, does Union have an ongoing mechanical integrity assessment program for its wells? What is Union's experience with casing and cement failure with the storage wells across their systems? What is the length of time that a storage well will remain mechanically sound and have any studies been conducted for this assessment?
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Response

The integrity of Union's storage wells is managed through Union's Downhole Integrity Management Program. As part of this program a casing inspection log on each well is completed every 5 years. The results of the casing inspection logs are evaluated and integrated with other data to determine if remedial action is required. Remedial action may include any of the following:

- running additional logs
- completing a pressure test
- setting a plug in the well
- casing replacement
- casing relining
- well abandonment

There is no set schedule for the retirement or workover of storage wells. Each well is evaluated on its own merits. As part of the Storage Enhancement Project each well in the four pools have received:

- new wellheads
- new master valves
- production casing and wellhead has been pressure tested to 12,075 kPa

In addition, eight wells in the four pools will be relined and three wells have been abandoned.

Union Gas is not aware of any wells in Union's storage system that have had casing or cement failure.

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Question:

6. Are Union's pipeline systems suitable for the increased operating pressures?
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Response

Union has completed a thorough engineering review of all the pipeline gathering systems and gas handling equipment. Minor modifications at the Payne and Dow A Compressor Stations are required to meet the higher operating pressures. These modifications are described in more detail in response to Board Staff's Interrogatory # 4. Once this work is completed all piping systems will meet the proposed operating pressures.

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Question:

7. If a gas release event occurs at a pipeline, how quickly can the wells feeding into the pipeline be shut-in or otherwise isolated from the point of the pipeline failure? Would this be done remotely or manually at the site(s)?
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Response

In the event of an upset, including a gas release event at a pipeline, Union has the ability to immediately close the Emergency Shutdown Valves at each pool station by remote control from Dawn. Closing the Emergency Shutdown Valves would isolate the affected pool from the transmission system. Immediately after the Emergency Shutdown Valves are remotely closed, Union would also dispatch personnel to any affected storage pool to manually shut-in all affected storage wells.

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Question:

8. Are any of the subject pools' well or pipeline facilities located in or near densely populated areas and how has the Applicant given consideration to this in its Application?

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Response

None of the pools are located near densely populated areas. The Applicant has considered location of the storage facility in the "What if" Analysis of Hazards and Operability Issues and has submitted the risk assessment to the MNR for review.



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Question:

9. Will Union implement any new operating or monitoring procedures or install any new surface control or monitoring equipment as a result of the increased operating pressure? If yes, provide details.
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Response

Upon receipt of the approval to increase the operating pressure Union's Underground Storage Department will provide maximum operating pressure limits to Gas Control and Dawn Operations. No other changes requiring surface control or monitoring equipment are required.

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Question:

10. How many other pools is Union considering for increased delta pressuring at the present time?

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Response

Union plans to conduct the necessary engineering and geological studies on six additional pools to determine if their operating pressures can be increased to 0.73 psi/ft. in compliance with CSA Z341. If the studies are positive, Union will need to apply to the OEB to vary the conditions of approval for those six pools. The timing of those applications is uncertain.