ENFORM The Safety Association for Canada's Upstream Oil and Gas Industry

Horizontal Well Blowout
Encountering Water Flood Pressure

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Enform: Your Partner in Safety
Enform is the upstream oil and gas industry's advocate and leading resource for the continuous improvement of safety performance. Our mission is to help companies achieve their safety goals by providing practices, assessment, training, support, metrics and communication. Our vision is no work-related incidents or injuries in the Canadian upstream oil and gas industry.

An Industry Product
This document was developed by industry for industry. Working collaboratively, Enform led cross-industry representatives in developing a guidance sheet that meets the industry's needs. Canada's leading oil and gas industry trade associations support the use of shared information to help companies of all sizes improve performance.

Details
Release Date: March 11, 2011
Incidence Type: Well Control
Country and Region: Western Canada

For more information on this event, please contact: safety@ enform.ca

Description of Incident:

- While drilling a shallow, horizontal, infill heavy oil well, a kick and subsequent blowout occurred. The blowout condition lasted for approximately two days.
- At the point of loss control, the operation was directionally drilling intermediate hole. The wellbore was immediately above the porosity pay zone and nearly at intermediate casing point. Estimated formation pressures due to the water flood in the area were 6900 kPa (16.8 kPa/m gradient). The blow out fluids consisted of produced water with small amounts of polymer. Gas or H_2S was not detected during this event.
- At the time of the blowout there was 20m of conductor casing set that had been pressure cemented and well control was provided by a Class 1A BOP with a diverter line to a flare tank. Weight material was available on site but was not mixed at this point. The well was eventually killed using the "Weight and Weight" method of well control. A first batch of mud was mixed and pumped down the wellbore resulting in the well being killed, however the pumps at surface failed and the well began to flow again. A second batch of weighted mud was mixed, and after circulating the well over to a higher weight mud the well was killed.

What Caused It:

- Encountering high water flood pressure before setting intermediate casing was the cause of the blowout.

Corrective Actions:

Prevention:
- Increase separation between water flood pressure and intermediate casing depth
- Place an upper limit on drilling in high pressure gradient areas of a water flood
- Well design for drilling in areas of high pressure gradients should consider setting deeper conductor casing
- conducting a Formation Integrity Test prior to approaching the water flood pressure

Management of pressure kicks:
- Kill weight mud is premixed and available to immediately displace
- Specific well control procedures are to be developed and in place before commencing drilling
- Use of Bottom Hole Assembles and circulating system that are designed to handle the pressures and solids associated with displacing kill mud;
- Ensure surface storage capacity will be sufficient to contain produced fluids until well is killed.