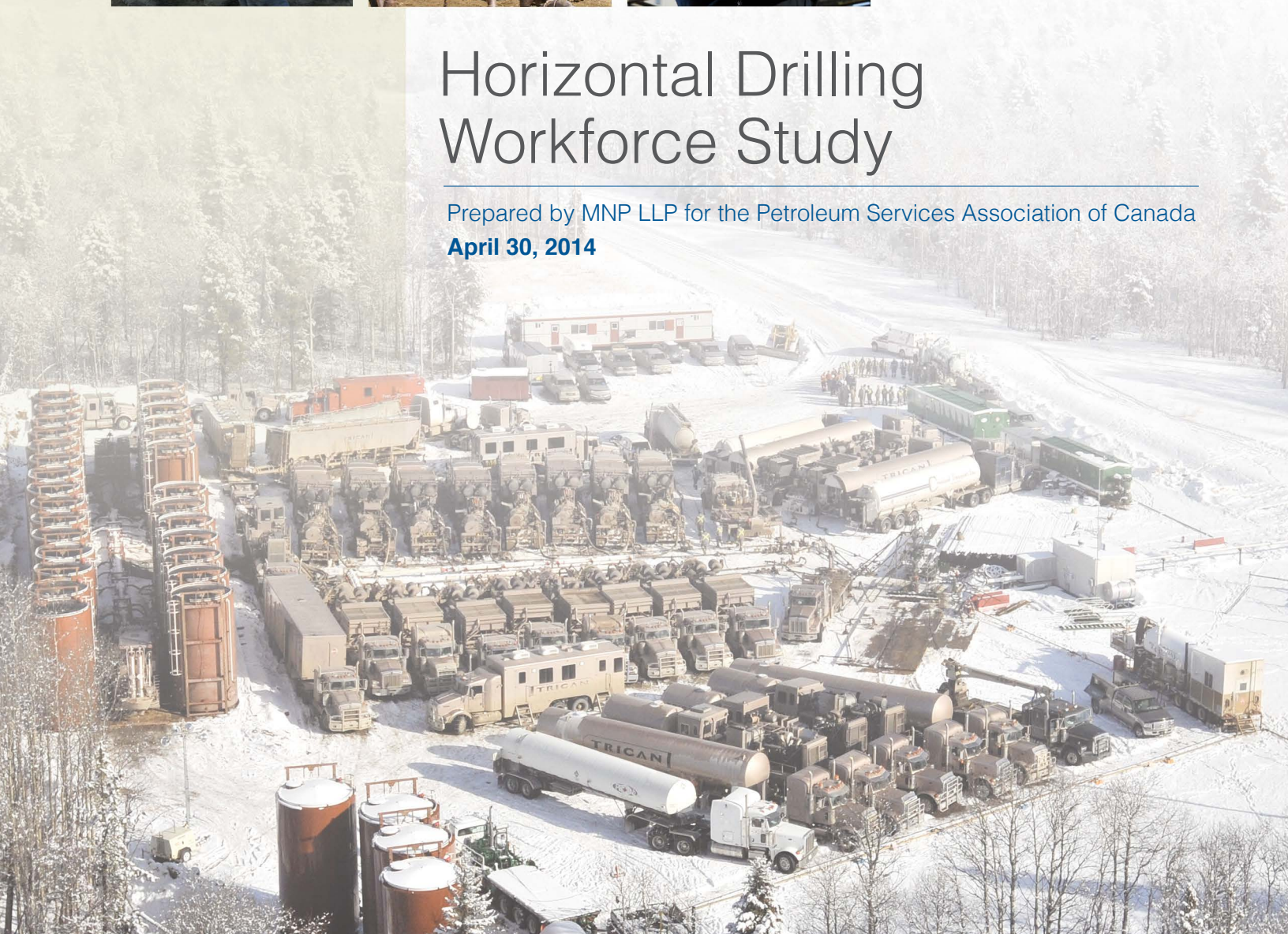




Horizontal Drilling Workforce Study

Prepared by MNP LLP for the Petroleum Services Association of Canada
April 30, 2014



The Study

The Petroleum Services Association of Canada (PSAC) is pleased to report the results of a study conducted on its behalf by MNP LLP.

In late 2013, PSAC recognized the need for a more accurate picture of workforce requirements created by the new generation of resource play wells that employ horizontal drilling and multistage hydraulic fracturing. This report aims to increase the understanding by members, government and educators of the types of workers and skills required to sustain development activities.

To determine the workforce required, PSAC approached MNP LLP to study three representative-type wells:

- A Horn River deep tight gas well typical in northeast B.C.;
- A natural gas liquids well from central Alberta;
- A tight oil well from southeast Saskatchewan.

While the actual equipment and services required for each of these wells is similar, the access costs, the depth and length of the horizontal well, and the number of hydraulic fracturing treatments are all different resulting in varying costs and total employment requirements.

Images courtesy of Trican Well Service

The Workforce Requirements

The breakdown of workforce requirements outlined in this report are based on the actual horizontal well count for 2013, with the understanding that year-over-year PSAC anticipates the application of this type of well will continue, thus making the information contained herein relevant for several years subject to minor adjustments for material technological, operational or engineering advancement.

The research includes information from drilling engineers, drilling superintendents, drilling contractors, well servicing and supply companies, service rig contractors, and equipment suppliers. It is the first study of its type that captures direct field employment on this type of drilling and completion activity.

To reach the total employment figures, for each well every service and type of equipment required from site survey and lease preparation through to having the well ready to go on stream is included. A minimum of 44 individual and unique drilling, service and supply companies (assuming all rental equipment comes from one vendor which is not likely to be the case) are contracted through the course of the drilling and completion process, employing personnel with 25 unique skill sets based on education, vocation, years of experience in various elements of the wellbore construction, completion and production process. A complete list of the services contracted provided is contained in Appendix A.

Also included in the study, is the number of people employed on each well type and the total person - days of employment per well. A multiplier of 0.2 for drilling and service field office and administration has been applied, meaning that for every five workers in the field there is one person employed at that company handling all other aspects of the business from field dispatch and repair to safety to finance and administration.



Of note:

- The number of people employed on the non-drilling completion and operations support elements of these types of wells substantially exceeds the number employed during drilling.
- The specific equipment and services required for each wellbore profile are similar, however the remoteness and depth of the wells in Northeast B.C. make these wells significantly more labor intensive than shallower wells in more developed areas with easier road access such as Central West Alberta or Southeast Saskatchewan.

Summary of the well types and workforce requirements

	Northeast British Columbia Type 1	West Central Alberta Type 2	Southeast Saskatchewan Type 3
Target	Natural Gas	NGLs	Oil
Measured Depth (metres)	6,000	3,800	3,000
Frac Stages	18	16	25
Individuals Employed	302	270	239
Person/Days of Employment	2,900	1,700	1,400
Suppliers Required	46	45	44

In 2013 there were 7,707 horizontal wells drilled in the Western Canadian Sedimentary Basin (WCSB). PSAC has determined that 5,790 or 75.1% of these wells were of the well type that approximate the three wells types that were analyzed to compile this information.

	Type 1	Type 2	Type 3	Totals
Wells	1,235	1,970	2,585	5,790
Person/Days of Employment	3,581,500	3,349,000	3,619,000	10,549,500

Most upstream oil and natural gas field workers, like those employed in the drilling and completion of new oil and natural gas wells, work 12 hours shifts 2/3 of the time, normally on a 14 days on/7 days off rotation. This equates to 126,594,000 hours of paid employment.

Other workers are employed 8 hours a day, 5 days a week and are paid for 52 weeks a year and includes a minimum of two weeks of paid vacation. This translates into 2,080 hours per year. Using this comparison the direct employment on 5,790 horizontal wells in 2013 was equivalent to 60,863 full time jobs in other industries.

Of the 11,170 wells PSAC estimates will be drilled in 2014, approximately 7,819 will be horizontal and the vast majority will approximate one of the above well types. Thus, anticipated person/days of employment for 2014 will see a directly proportional increase based on the above analysis of 2013 drilling activity and key well types.

The research and data compilation was completed under assignment by PSAC to MNP LLP, one of Canada's leading accounting, tax and consulting firms and a major provider of such services to the Canadian oil and gas services industry.

The following workforce requirements are **not** included in this study.

- Direct or indirect other employment categories critical to the well being drilled including:
- Oil company personnel or suppliers involved in exploration, land acquisition, engineering or finance. Any input labour for the fabrication, processing, or manufacturing of any component, equipment, fluids or chemicals employed.
- Transportation personnel employed other than to move equipment and supplies from the nearest field service location to the wellsite.
- Any workforce requirements or costs associated with moving the produced resources to market ranging from tank trucks to gas plants to batteries to pipelines.
- Any workforce requirements or costs associated with field treatment of the produced resources such as natural gas plants, compressor stations, oil batteries, or removal or disposal of produced water.

In the past, it typically took **75** workers to drill and complete a well. As of 2014, it now takes between **239 and 302** workers.

In 2013, work on horizontal / multi-staged fractured wells equaled **60,863** typical full-time jobs!

APPENDIX A - List of unique contractors employed by product or service

Surveyor

Construction Company
Trucking (Heavy Equipment) Class 1
Trucking (Rig Moving) Class 1
Trucking (Pipe) Class 1
Trucking (Light) Class 3
Camp and Catering
Camp Waste Water Disposal
Communications Equipment Supplier
Equipment Rentals
Conductor Hole Contractor
Water Hauling
Safety Services (H2S Medical) Contractors
Drilling Instrumentation
Drilling Contractor
Casing & Tubing Supplier
Power Tong Services
Cement Supplier
Cement Accessories
Cementing Services
Packer and Service Tool Services
Casing Accessory Suppliers
Drilling Supervisor

Geologist

Directional Drilling Services
Drilling Tool Suppliers
Rock Bit Suppliers
Drilling Mud Services
Solids Control Equipment Rentals
Drilling Waste Management Services
Service Rig Contractor
Wellhead Protection Services
Frac Pool Rentals
Pressure Pumping Services
Fire/Shower Services
Production Testing & Flowback Services
Coiled Tubing Services
Completions Supervisor
Wellhead & Valve Supplier
Production Tank Supplier
Artificial Lift Equipment Supplier
Production Separator Supplier
Instrumentation Supplier
Mobile Welding Services
Flare/Incinerator Provider
Site Fencing Contractor

APPENDIX B - Technical References

Mickey Sutherland P.Eng., President & CEO, Pajak Engineering Ltd.

David Browne P.Eng., Vice-President Marketing, Trican Well Service Ltd.

Keith Krausert P.Eng., Vice-President Engineering & Contracts, Beaver Drilling Ltd.

Ian Cook, Drilling Superintendent, Bonavista Energy Corporation

Bill Piers B.Comm., Marketing Manager, CanElsion Drilling Inc.

Mark Donahue, Drilling Superintendent, Nabors Canada

Travis Robertson P.Eng., President, Jewel Energy Service Inc.

Delton Campbell, President and CEO, Resource Well Completion Technologies, Inc.

Chris Challis, CEO, Maverick Oilfield Services Ltd.

For more information, contact the Petroleum Services Association of Canada (PSAC) at 403.264.4195 or info@psac.ca.