

WELL DECOMMISSIONING ON THE LUMMI INDIAN RESERVATION DURING 2013

Prepared for: Water Resources Division of the
Lummi Natural Resources Department

Project No. 130218 • December 31, 2013



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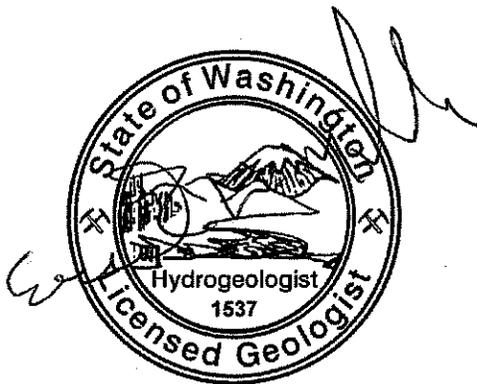


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Aspect Consulting, LLC



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12-31-13

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Introduction

This report documents well evaluation and decommissioning activities during November and December 2013 on the Lummi Indian Reservation (Reservation) in northwestern Washington State (Figure 1). Since the formation of the Lummi Water District in 1970s, use of many domestic water supply wells has been discontinued (Salix, 2010). Proper decommissioning of unused domestic water supply wells eliminates potential groundwater contamination pathways and protects the Reservation's groundwater system. The Lummi Natural Resources Department (LNRD) well decommissioning effort began in 2006; and prior to 2013, 17 wells were decommissioned (Figure 2) (Salix, 2010). Aspect Consulting, LLC's (Aspect) scope of work included a site visit to candidate wells, completing well evaluation worksheets, documentation of decommissioning methods, and preparation of this report.

Well Decommissioning Methods and Results

The LNRD provided Aspect with a list of candidate wells for decommissioning or conversion to monitoring wells. After obtaining landowner permission, Aspect and a LNRD representative inventoried eight unused domestic wells at six properties in November, 2013 (Appendix A: Well Evaluation Worksheets). Well construction logs were not available for any of the wells, and consultation with the Water Resources Manager of LNRD indicated that none of the wells would contribute substantially to the existing monitoring well network. Considering these factors and the condition of the wells, Aspect recommended that all eight wells be decommissioned. Due to budget limitations, six of the eight wells were selected for decommissioning in 2013 (Figure 3).

The LNRD contracted with Aquatech Well Drilling & Pumps (Aquatech) to conduct decommissioning activities following a competitive bid process. Aquatech conducted site visits of each well in December 2013 and provided LNRD with proposed decommissioning methods. Decommissioning methods were approved by LNRD prior to well decommissioning.

Of the six wells, five required variances from 17 LAR 04.130 due to access restrictions. Aspect submitted the variance requests on behalf of Aquatech (Appendix B: December 4, 2013 Request for variance from 17 LAR 04.130); and the Water Resources Manager of LNRD approved the variance requests (Appendix C: Approval of December 4, 2013 Variance Request for Well Decommissioning). Additional decommissioning measures that meet the requirements of 17 LAR 04.130 could be performed at a future date at such time as the conflicting structures are removed.

Aspect provided field documentation for the wells decommissioned on December 5, 2013 (GW052, GW092, and GW438). Aquatech documented and photographed decommissioning activities for the wells decommissioned on December 12 and

December 19 (GW043, GW436, and GW437). Pre-decommissioning, during decommissioning, and post-decommissioning photographs are provided in Figures 4 through 9. Appendix D contains Aquatech's Well Decommissioning Report forms.

GW043

GW043 was located at 3745 Haxton Way. The well consisted of 6-inch diameter steel casing to a total depth of 107 feet (ft) below ground surface (bgs). From these dimensions, the well casing volume was estimated to be 21 cubic ft or 157 gallons. The well was decommissioned on December 19, 2012 according to 17 LAR 04.130; pre-decommissioning static water level was 22 ft bgs. Decommissioning activities included removing the pumpstring, perforating the casing from the bottom to 3 ft bgs, cutting the casing to 1 ft bgs, pressure grouting the casing with 220 gallons of grout, topping the grout with 1, 50 pound (lb) bag of bentonite, and covering the decommissioned well with topsoil.

GW052

GW052 was located at 3319 Lummi Shore Road. The well consisted of 6-inch diameter steel casing to a total depth of 68 ft bgs. Access restrictions caused the need for a variance from 17 LAR 04.130. The well was decommissioned on December 5, 2013; pre-decommissioning static water level was 47 ft bgs. Decommissioning activities included removal and disposal of the pump string, cutting of the casing to 1 ft bgs, filling the casing to 1 ft bgs with 18, 50 lb bags of medium bentonite chips, welding a steel cap to the top of the casing, and covering the decommissioned well with topsoil.

GW092

GW092 was located at 2289 Lummi Shore Road. The well consisted of 4-inch diameter steel casing to a total depth of 50.5 ft bgs. Access restrictions caused the need for a variance from 17 LAR 04.130. The well was decommissioned on December 5, 2013; pre-decommissioning water level was 0.7 ft bgs. Decommissioning activities included demolition of the pump house, removal and disposal of the pump string, cutting of the casing to 1 ft bgs, filling the casing to 1 ft bgs with 5.5, 50 lb bags of medium bentonite chips, and covering the decommissioned well with topsoil. Excessive rust and corrosion of the casing prevented the welding of a cap to the top of the casing.

GW436

GW436 was located at 3415 Lummi Shore Road. The well consisted of 30-inch diameter concrete casing to a total depth of 14 ft bgs. A variance from 17 LAR 04.130 was obtained. The well was decommissioned on December 12, 2013; pre-decommissioning static water level was 11.5 ft bgs. Decommissioning activities included removal and disposal of the pump string, filling the casing with 110, 50 lb bags of medium bentonite chips, and replacing the concrete lid.

GW437

GW437 was located at 3413 Lummi Shore Road. The well consisted of 30 inch diameter concrete casing to a total depth of 11 ft bgs. Access restrictions caused the need for a variance from 17 LAR 04.130. The well was decommissioned on December 12, 2013; pre-decommissioning static water level was 7.2 ft bgs. Decommissioning activities

included filling the casing with 63, 50 lb bags of medium bentonite chips and replacing the concrete lid.

GW438

GW438 was located at 2119 Lummi Shore Road. The well consisted of 6 inch diameter steel casing to a total depth of 46 ft bgs. Access restrictions caused the need for a variance from 17 LAR 04.130. The well was decommissioned on December 5, 2013; pre-decommissioning static water level was 5.4 ft bgs. Decommissioning activities included disposing of the pump string, cutting the casing to 1 ft bgs, filling the casing to 1 ft bgs with 12, 50 lb bags of medium bentonite chips, and covering the decommissioned well with topsoil. Ponded water over the decommissioned well prevented the welding of a cap to the top of the casing.

Conclusions

Six wells were decommissioned in 2013. The LNRD well decommissioning program has decommissioned a total of 26 wells since 2006. Additional unused wells exist on the Reservation. Unused wells can present physical safety and environmental concerns including becoming conduits for contaminant migration. We recommend that the Tribe's decommissioning program of unused wells continue.

References

Salix Environmental Services (Salix), 2010, Well Decommissioning on the Lummi Indian Reservation During 2010. Prepared for the Water Resources Division of the Natural Resources Department of the Lummi Indian Business Council.

Limitations

Work for this project was performed for the Water Resources Division of the Lummi Natural Resources Department (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

FIGURES

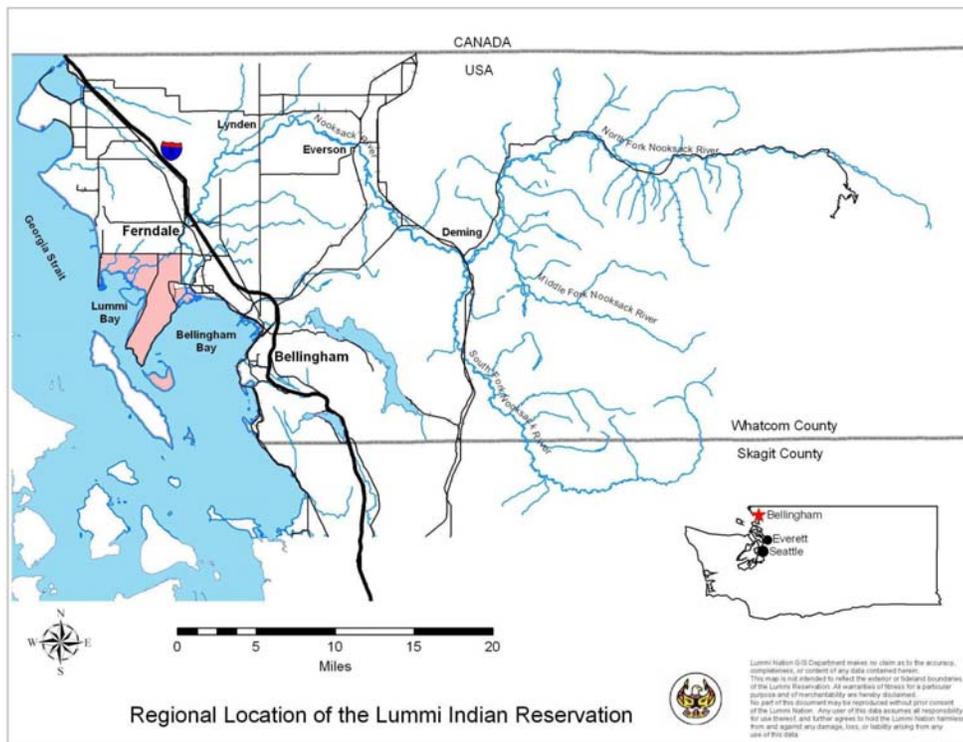


Figure 1. Location of the Lummi Indian Reservation (from Salix, 2010).

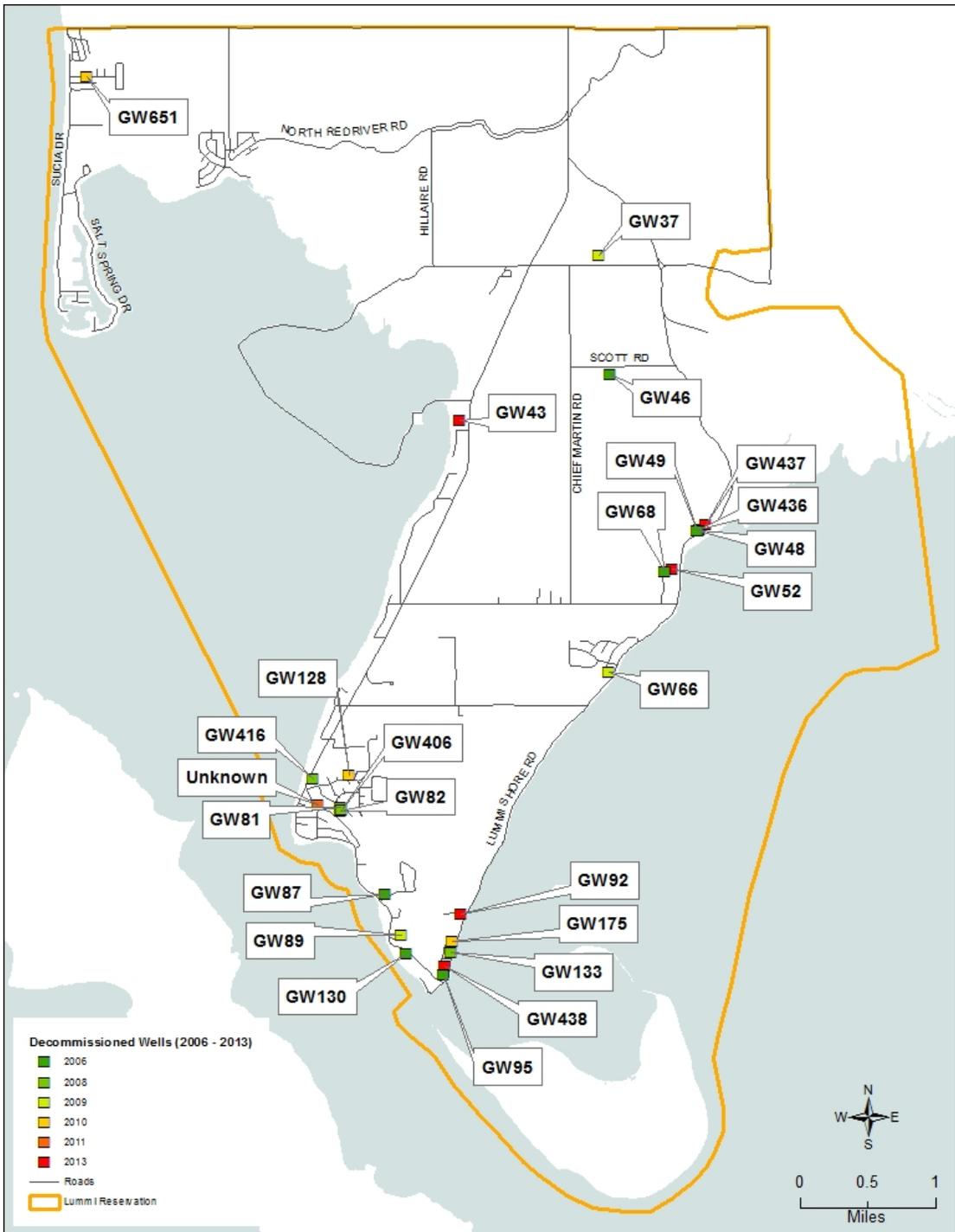


Figure 2. Location of all wells decommissioned on Lummi Indian Reservation since 2006.

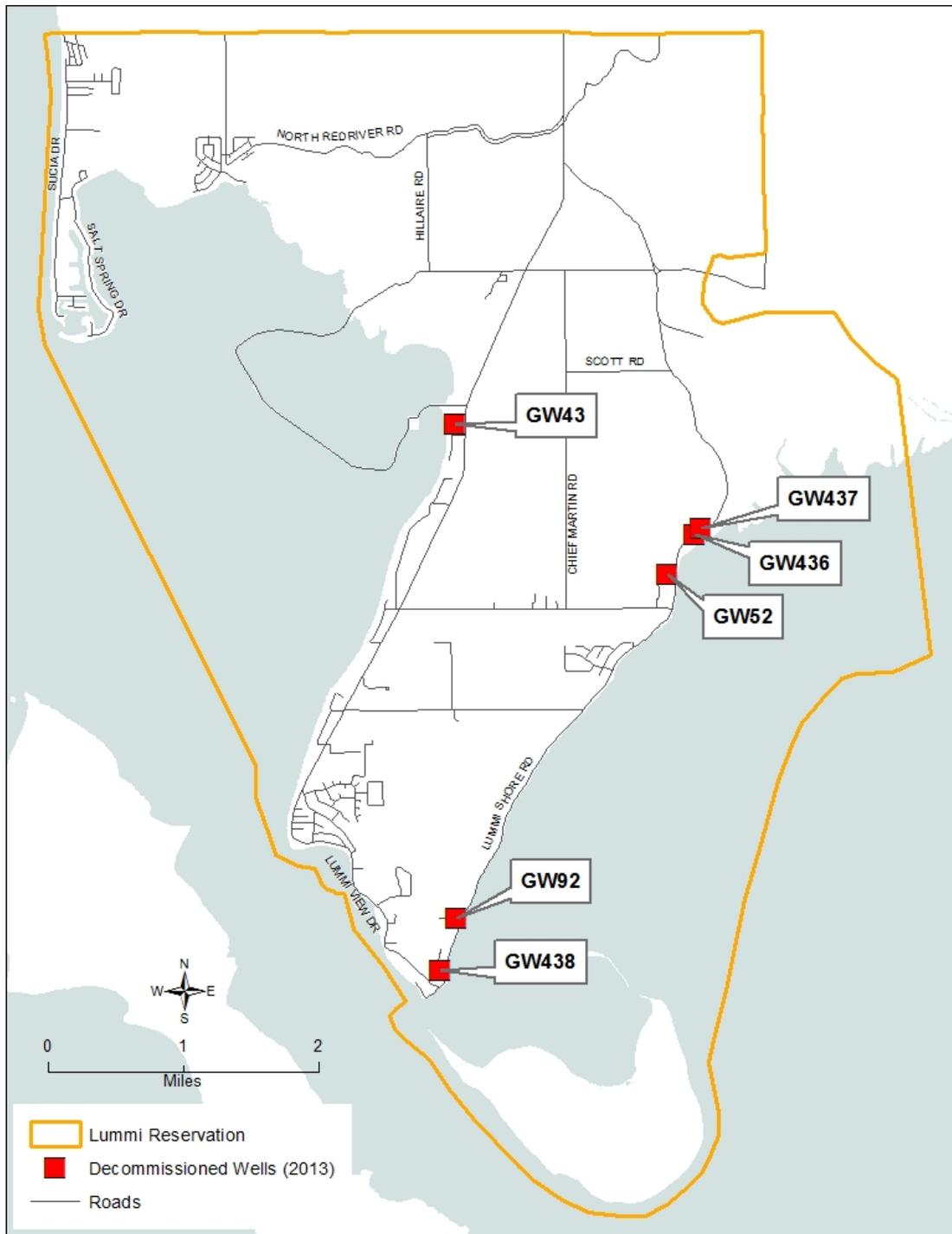


Figure 3. Location of wells decommissioned on Lummi Indian Reservation in 2013.



(a)



(b)



(c)

Figure 4. GW043 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.



(a)



(b)



(c)

Figure 5. GW052 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.



(a)



(b)



(c)

Figure 6. GW092 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.



(a)



(b)



(c)

Figure 7. GW436 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.



(a)



(b)



(c)

Figure 8. GW437 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.



(a)



(b)



(c)

Figure 9. GW438 (a) pre-decommissioning, (b) during decommissioning, and (c) post-decommissioning.

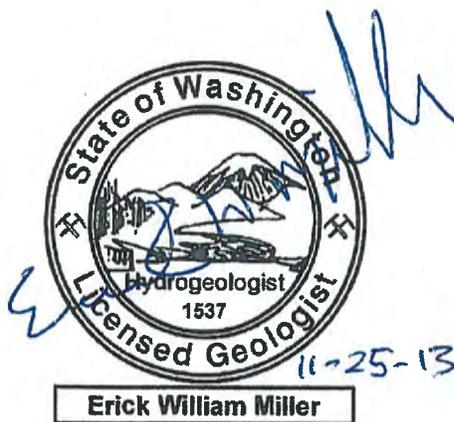
APPENDIX A

Well Evaluation Worksheets

**WORKSHEETS FOR DETERMINING IF
ABANDONED WATER WELLS SHOULD BE
MONITORING WELLS OR DECOMMISSIONED
ON THE LUMMI RESERVATION**

PREPARED FOR:

**LUMMI NATION
DEPARTMENT OF NATURAL RESOURCES
2665 KWINA ROAD
BELLINGHAM, WASHINGTON 98226**



PREPARED BY:

**ASPECT CONSULTING, LLC
350 MADISON AVENUE NORTH
BAINBRIDGE ISLAND, WASHINGTON 98110**

WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW092, Adams, 2289 Lummi Shore Road*

Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Not good Corroded monument; rotten floorboards around monument; well house in poor condition</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>No Adjacent to private and shared driveways; in active storage area</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>No</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No (See above)</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>Unlikely</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>Yes Access port for water level measurements</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> Well dimensions known? Water level, production known? Well construction details known? Stratigraphy recorded and reliable? <p>Not all information is necessary, depending upon location and need for monitoring well.</p>	<i>No well log Dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> The aquifer is not tapped by other wells. Are wells that tap the aquifer proximate or distant? There is access to other wells that tap the aquifer. Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

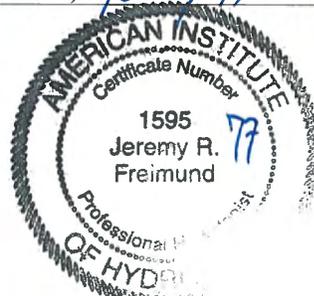
X decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager, Yes No (circle one):

Jeremy Freimund Date: *11/26/13*



WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW438, Jerome Vandembroucke, 2119 Lummi Shore Road*
 Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Unknown Above-ground monument appears to be in good condition</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>Yes</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>Unlikely No septic; house is on municipal sewer; well located about 1 ft from the house</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>Yes</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No Located next to house in side yard; potential for contamination from yard activities</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>Unlikely</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>No Access issues: gated driveway, well behind house</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> Well dimensions known? Water level, production known? Well construction details known? Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	<i>No log Dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> The aquifer is not tapped by other wells. Are wells that tap the aquifer proximate or distant? There is access to other wells that tap the aquifer. Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

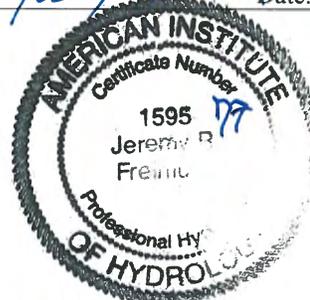
X decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager: Yes No (circle one):

Jeremy R. French Date: *11/26/13*



WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW052, Victor Hubbard, 3319 Lummi Shore Road*

Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Unknown Flush-mount monument appears to be in good condition</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>Yes Up-gradient of house and driveway; adequate buffer between well and next up-gradient house</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>Yes</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>Yes</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>Yes</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>Yes</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>Access issues: gated driveway and may need to create a more functional well head access port</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> • Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? <p>Not all information is necessary, depending upon location and need for monitoring well.</p>	<i>No log Dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

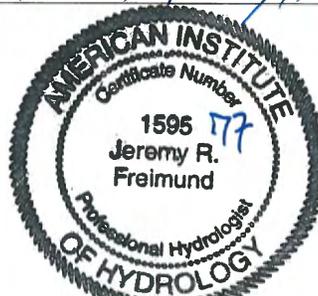
decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager, Yes No (circle one): *Jeremy Freimund*

Date: *11/26/13*



**WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE
MONITORING WELLS OR DECOMMISSIONED**

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW043, James Temple, 3745 Haxton Way*

Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Unknown Above-ground monument appears to be in good condition</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>Unlikely Located in yard about 1 ft from shed</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>Yes</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No Potential for contamination from shed and yard activities</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>Unlikely</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>No Access issues: gated driveway</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> • Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	<i>Yes Well log in Cline (1974) Dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>Yes</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

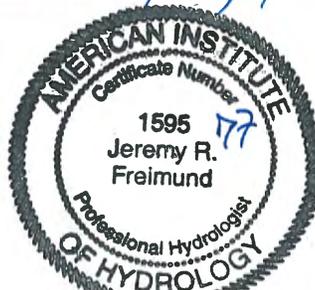
decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager, Yes No (circle one):

Jeremy Freimund Date: *11/26/13*



WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW448, Michael Johnson, 3415 Lummi Shore Road*

Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Not good Buried with soil in a local depression</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>No (See above)</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>No</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No Next to driveway</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>No In surface depression and well cover is likely not sealed</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>No</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>No</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> Well dimensions known? Water level, production known? Well construction details known? Stratigraphy recorded and reliable? <p>Not all information is necessary, depending upon location and need for monitoring well.</p>	<i>No log Approximate dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> The aquifer is not tapped by other wells. Are wells that tap the aquifer proximate or distant? There is access to other wells that tap the aquifer. Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

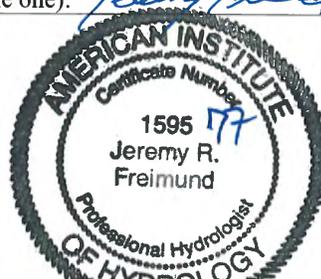
decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager Yes No (circle one): *Jeremy Freimund*

Date: *11/26/13*



WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW447, Michael Johnson, 3415 Lummi Shore Road*

Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Not good Buried with soil in a local depression</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>No (See above)</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>No</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No Next to barn and driveway</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>No In surface depression and well cover is likely not sealed</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>No</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>No</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> Well dimensions known? Water level, production known? Well construction details known? Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	<i>No log Approximate dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> The aquifer is not tapped by other wells. Are wells that tap the aquifer proximate or distant? There is access to other wells that tap the aquifer. Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

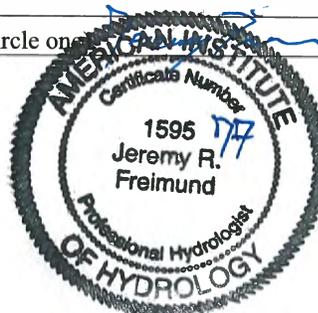
decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager, Yes No (circle one)

Date: *11/26/13*



WORKSHEET FOR DETERMINING IF ABANDONED WATER WELLS SHOULD BE MONITORING WELLS OR DECOMMISSIONED

Criteria to determine if abandoned wells should be decommissioned or become candidates for use as a monitoring well. If the answer for questions 1 through 7 is "yes" then the well is a candidate for use as a monitoring well.

Well number, owner, and street address: *GW436, Michael Johnson, 3415 Lummi Shore Road*
 Person performing determination and date: *Jared Bean, November 15, 2013*

Criteria Description	Sub-category/ Explanation	Actual Well Information	Evaluation	Answer (Yes or No)
1. Is the well in good condition?	Good, not good, or unknown. In rare situations, unknown condition may not preclude use as a monitoring depending upon location of the well and if sufficient information can be gathered about its condition.	<i>Unknown Dug well in shed</i>	Good condition = Yes If unknown but important location and sufficient information gathered about condition = Yes Otherwise = No	<i>No</i>
2. Is the well <u>unlikely</u> to be a source of ground water contamination now or in the foreseeable future?	For example, is the well located at the bottom of a local depression?	<i>Unlikely</i>	Unlikely to be a source of contamination = Yes Otherwise = No	<i>Yes</i>
3. Is the well located a sufficient distance from current and foreseeable sources of contamination?	Case-specific. In general, are sources of contamination located or likely to be proximate to the well (e.g., septic tank, gas station).	<i>No Potential for contamination from shed activities and equipment</i>	Sources of current and foreseeable contamination unlikely to be proximate to the well = Yes Otherwise = No	<i>No</i>
4. Is the well <u>unlikely</u> to be influenced by factors which diminish the utility of the well to serve as a monitoring well?	For example, is the well shallow and close to home with a foundation drain?	<i>Unlikely</i>	Unlikely that well influenced by factors that diminish use as a monitoring well = Yes Otherwise = No	<i>Yes</i>
5. Is the well suitable for use as a monitoring well?	For example, is the well conducive to water level measurements or obtaining water quality measurements? Both water level and quality are not necessary, depending upon the location of the well.	<i>No Difficult to access</i>	Suitable for use as a monitoring well = Yes Otherwise = No	<i>No</i>
6. Is there a Well Log for the well?	<ul style="list-style-type: none"> • Well dimensions known? • Water level, production known? • Well construction details known? • Stratigraphy recorded and reliable? Not all information is necessary, depending upon location and need for monitoring well.	<i>No log Approximate dimensions known</i>	Sufficient information in well log = Yes Otherwise = No	<i>No</i>
7. Does the well tap an aquifer where additional information would be useful?	For example: <ul style="list-style-type: none"> • The aquifer is not tapped by other wells. • Are wells that tap the aquifer proximate or distant? • There is access to other wells that tap the aquifer. • Are aquifer characteristics or uses sufficiently variable or unique to warrant an additional monitoring well? 	<i>No</i>	Additional aquifer information at well location useful = Yes Otherwise = No	<i>No</i>

Check the appropriate result:

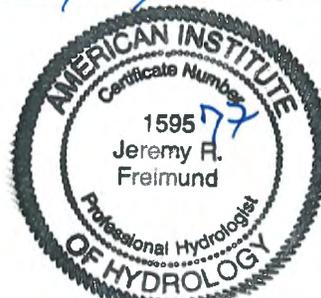
decommission well, candidate for use as monitoring well, or further information is required.

Assessment Completed by: *Erick Miller/Jared Bean*

Date: *November 20, 2013*

Concurrence by Water Resources Manager: Yes No (circle one): *Jeremy R. Freimund*

Date: *11/26/13*



APPENDIX B

**December 4, 2013 Request for
Variance from 17 LAR 04.130**

MEMORANDUM

Project No.: 130218

December 4, 2013

To: Jeremy Freimund, P.H.
Water Resources Manager
Lummi Natural Resources Department

From: Jared Bean, Staff Hydrogeologist
Aspect Consulting, LLC

Re: **Request for variance from 17 LAR04.130**

The memorandum requests variances from 17 LAR 04.130 for decommissioning of five wells on the Lummi Peninsula. Aquatech (Representative: Ron Walden, 360-742-6005, 2675 Butler Creek Rd, Sedro-Woolley, WA 98284) intends to decommission these wells by the end of the year. We understand that you have already given verbal approval of the proposed methods to Aquatech. This memorandum documents the procedures provided to us by Aquatech for variance approval. Additional decommissioning measures for these wells that meets the requirements of 17 LAR 04.130 could be performed at a future date at such time as the conflicting structures are removed.

1. GW092 (Adams) 2289 Lummi Shore Road

Aquatech requests a variance from 17 LAR 04.130(c) because power lines above the well house prevent a drill rig from accessing the well head. No well log exists for this well.

Therefore, Aquatech proposes the following methods for effective decommissioning: disconnect plumbing, remove suction line, backfill with chips, cut casing down, weld plate on casing.

2. GW438 (Vandenbroucke) 2119 Lummi Shore Road

Aquatech requests a variance from 17 LAR 04.130(c) because the house, shed, and fence layout prevent a drill rig from accessing the well head. No well log exists for this well.

Therefore, Aquatech proposes the following methods for effective decommissioning: remove cap, backfill with chips, cut casing down to minus 1 ft, weld plate on casing, backfill to grade.

3. GW052 (Hubbard) 3319 Lummi Shore Road

Aquatech requests a variance from 17 LAR 04.130(c) because the drill rig and pressure grouting equipment cannot access the well head without dismantling the gate and fence at the head of the driveway. No well log exists for this well.

Therefore, Aquatech proposes the following methods for effective decommissioning: pull pump by hand, backfill with chips, cut casing down, weld plate on casing, backfill to grade.

December 4, 2013

4. GW436 (Johnson) 3415 Lummi Shore Road

Aquatech requests a variance from 17 LAR 04.130(c) which calls for clean chlorinated pea gravel to be installed to two feet above static water level.

Aquatech proposes the following methods for effective decommissioning: remove concrete lid, remove any plumbing, backfill with chips, replace lid. Aquatech argues that backfilling entirely with bentonite chips will provide a better seal than placing chlorinated pea gravel at the bottom of the well.

5. GW437 (Brown) 3413 Lummi Shore Road

Aquatech requests a variance from 17 LAR 04.130(c) which calls for clean chlorinated pea gravel to be installed to two feet above static water level.

Aquatech proposes the following methods for effective decommissioning: remove concrete lid, remove any plumbing, backfill with chips, replace lid. Aquatech argues that backfilling entirely with bentonite chips will provide a better seal than placing chlorinated pea gravel at the bottom of the well.

Limitations

Work for this project was performed for the Lummi Natural Resources Department Water Resources Manager (Client), and this memorandum was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This memorandum does not represent a legal opinion. No other warranty, expressed or implied, is made.

All reports prepared by Aspect Consulting for the Client apply only to the services described in the Agreement(s) with the Client. Any use or reuse by any party other than the Client is at the sole risk of that party, and without liability to Aspect Consulting. Aspect Consulting's original files/reports shall govern in the event of any dispute regarding the content of electronic documents furnished to others.

APPENDIX C

**Approval of December 4, 2013
Variance Request for Well
Decommissioning**



December 4, 2013

Mr. Jared Bean, Staff Hydrogeologist
Aspect Consulting, LLC
350 Madison Avenue North
Bainbridge Island, WA 98110

SUBJECT: Approval of December 4, 2013 Variance Request for Well Decommissioning

Dear Jared,

I am in receipt of your written request for a variance from the minimum well decommissioning standards identified in 17 LAR 04.130. This variance request is authorized by 17 LAR 04.010(d) and your request provides the required information. As noted in your variance request, I met with Ron Walden from Aquatech Well Drilling and Pumps on December 2, 2013 following his site visits and assessments to discuss the challenges associated with decommissioning the wells that have been identified for decommissioning during 2013. The information in your December 4, 2013 memorandum requesting a variance is aligned with the discussion that I had with Ron Walden.

The purpose of this letter is to notify you that your request for a variance from 17 LAR 04.130 is **APPROVED** for the five wells identified in you memorandum.

Please do not hesitate to contact me (360-312-2314) if you need any further information or clarification.

Sincerely,

Jeremy Freimund, P.H.
Water Resources Manager



Cc Leroy Deardorff, LIBC Environmental Program Director
Erick Miller, Senior Associate Hydrogeologist

APPENDIX D

Well Decommissioning Reports

