WR File NR CG1-*03899C
WR Doc ID 6360549

# State of Washington
# DRAFT
# Report of Examination for Water Right Change

Changed/added points of withdrawal

| PRIORITY DATE | WATER RIGHT NUMBER |
|---|---|
| February 28, 1955 | CG1-*03899C |

| MAILING ADDRESS | SITE ADDRESS (IF DIFFERENT) |
|---|---|
| City of Ferndale<br>2095 Main Street, PO Box 936<br>Ferndale, WA 98248 | 2341 Douglas Road<br>Ferndale, WA 98248 |

## Total Quantity Authorized for Withdrawal

| WITHDRAWAL RATE | UNITS | ANNUAL QUANTITY (AF/YR) |
|---|---|---|
| 870 | GPM | 440 |

The total annual quantity available under all four rights involved in the City's package of change requests: CG1-*02509C@1 (GWC 1513), CG1-00720P@1 (G1-00729P), CG1-*03899C (GWC 3058), CG1-*10690C (GWC 7700); shall not exceed 2,140 af/yr with a maximum withdrawal rate (Qi) of 2,930 gpm.

## Purpose

| PURPOSE | WITHDRAWAL RATE | | | ANNUAL QUANTITY (AF/YR) | | PERIOD OF USE (mm/dd) |
|---|---|---|---|---|---|---|
| | ADDITIVE | NON-ADDITIVE | UNITS | ADDITIVE | NON-ADDITIVE | |
| Municipal | 870 | | GPM | 440 | | 01/01-12/31 |

| IRRIGATED ACRES | | PUBLIC WATER SYSTEM INFORMATION | |
|---|---|---|---|
| ADDITIVE | NON-ADDITIVE | WATER SYSTEM ID | CONNECTIONS |
| | | 24850 M | 5,099 |

## Source Location

| COUNTY | WATERBODY | TRIBUTARY TO | WATER RESOURCE INVENTORY AREA |
|---|---|---|---|
| Whatcom | Regional Aquifer | | 1 - Nooksack |

| SOURCE FACILITY/DEVICE | PARCEL | WELL TAG | TWN | RNG | SEC | QQ Q | LATITUDE | LONGITUDE |
|---|---|---|---|---|---|---|---|---|
| PW-1 (Shop Well) | 390219409029 | AMF090 | 39N | 2E | 19 | SW SE | 48.8495 | -122.6023 |
| PW-2 (Douglas Road Well) | 390230188340 | BCB347 | 39N | 2E | 30 | SE NW | 48.8447 | -122.6088 |
| PW-3 (Thornton Road Well) | 390124392440 | BHX510 | 39N | 1E | 24 | NW NE | 48.8605 | -122.6226 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| PW-4 (Central City Well) | 390219010345 | AGK343 | 39N | 2E | 19 | SW NW | 48.8567 | -122.6164 |
| Potential Future Wells[1] | See area outlined on Figure 1 (Attached) | | | | | | - | - |

Datum: NAD83/WGS84

[1] See Figure 1, representing a portion of the area requested in the public notice for potential points of withdrawal: Section 19, S ½ of Section 18, W½ of Sections 20 and 29, and N¾ of Section 30, in T39N, R2E, W.M.; and S½ of Section 13, and Sections 24 and 25, in T39N, R1E, W.M. Figure 1 prepared by Associated Earth Sciences, Inc. (AESI) to support the City's water right change.

## Place of Use (See Attached Map)

| LEGAL DESCRIPTION OF AUTHORIZED PLACE OF USE |
|---|
| The place of use (POU) of this water right is the service area described in the most recent City of Ferndale Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right. |

## Proposed Works

The City of Ferndale has four existing wells (designated as the Shop, Douglas Road, Thornton Road, and Central City Wells). Additional future wells (Figure 1) in the Regional Aquifer may be incorporated into the City's existing water system as part of this consolidation project.

## Development Schedule

| BEGIN PROJECT | COMPLETE PROJECT | PUT WATER TO FULL USE |
|---|---|---|
| Begun | December 31, 2031 | December 31, 2036 |

## Measurement of Water Use

| | |
|---|---|
| How often must water use be measured? | Daily |
| How often must water use data be reported to Ecology? | Annually |
| What volume should be reported? | Total Annual Volume for each well |
| What rate should be reported? | Annual Peak Rate of Withdrawal (gpm) for each well |

## Provisions

**No Impairment of Existing Rights**

This authorization to make use of public waters of the state is subject to existing rights, including any existing rights held by the United States for the benefit of tribes under treaty or settlement. If impairment does occur, the City will be required to diminish or cease pumping, or mitigate for this impairment.

**Same Source Requirement**

Any new wells installed under this change authorization shall be completed within the Regional Aquifer (i.e., the same source of water as the City's four existing wells). The City must file with the Department of Ecology a Showing of Compliance with RCW 90.44.100(3) prior to the use of any new wells.

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**Wells, Well Logs and Well Construction Standards**
All wells constructed in the state must meet the construction requirements of WAC 173-160 titled "Minimum Standards for the Construction and Maintenance of Wells" and RCW 18.104 titled "Water Well Construction". Any well which is unusable, abandoned, or whose use has been permanently discontinued, or which is in such disrepair that its continued use is impractical or is an environmental, safety or public health hazard must be decommissioned.

Flowing wells must be constructed and equipped with valves to ensure that the flow of water can be completely stopped when not in use. Likewise, the well must be continuously maintained to prevent the waste of water through leaky casings, pipes, fittings, valves, or pumps -- either above or below land surface.

All wells must be tagged with a Department of Ecology unique well identification number. If you have an existing well and it does not have a tag, please contact the well-drilling coordinator at the Department of Ecology Northwest Regional Office. This tag must remain attached to the well. If you are required to submit water measuring reports, reference this tag number.

Installation and maintenance of an access port as described in WAC 173-160- 291(3) is required.

**Measurements, Monitoring, Metering and Reporting**
An approved measuring device must be installed and maintained for each of the sources identified by this water right in accordance with the rule "Requirements for Measuring and Reporting Water Use", WAC 173-173.

Department of Ecology personnel, upon presentation of proper credentials, must have access at reasonable times, to the records of water use that are kept to meet the above conditions, and to inspect at reasonable times any measuring device used to meet the above conditions.

WAC 173-173 describes the requirements for data accuracy, device installation and operation, and information reporting. It also allows a water user to petition the Department of Ecology for modifications to some of the requirements.

**Water Level Measurements**
In order to maintain a sustainable supply of water, pumping must be managed so that static water levels do not progressively decline from year to year. Static water level is defined as the water level in a well when no pumping is occurring and the water level has fully recovered from previous pumping. Static water levels must be measured and recorded twice a year (April and October), using a consistent methodology. Data for the previous year must be submitted by January 31 to the Department of Ecology.

Static water level data must be submitted in digital format and must include the following elements:

Unique Well ID Number
Measurement date and time
Measurement method (air line, electric tape, pressure transducer, etc.)
Measurement accuracy (to nearest foot, tenth of foot, etc.)
Description of the measuring point (top of casing, sounding tube, etc.)
Measuring point elevation above or below land surface to the nearest 0.1 foot

Land surface elevation at the well head to the nearest foot.
Static water level below measuring point to the nearest 0.1 foot.

**Department of Health Requirements**
Prior to any new construction or alterations of a public water supply system, the State Board of Health rules require public water supply owners to obtain written approval from the Office of Drinking Water of the Washington State Department of Health. Please contact the Office of Drinking Water at Northwest Drinking Water Operations, 20435 72nd Avenue S, Suite 200, K17-12, Kent, WA 98032-2358, (253) 396-6750, prior to beginning (or modifying) your project.

**Easement and Right-of-Way**
Issuance of a water right change authorization by this department does not convey a right of access to, or other right to use, land which the applicant does not legally possess. Obtaining such a right is a private matter between applicant and owner of that land.

**Water Use Efficiency**
Use of water under this authorization will be contingent upon the water right holder's maintenance of efficient water delivery systems and use of up-to-date water conservation practices consistent with established regulation requirements and facility capabilities.

**Schedule and Inspections**
Department of Ecology personnel, upon presentation of proper credentials, will have access at reasonable times, to the project location, and to inspect at reasonable times, records of water use, wells, measuring devices and associated distribution systems for compliance with water law.

**Findings of Facts**
Upon reviewing the investigator's report, I find all facts, relevant and material to the subject application, have been thoroughly investigated and that the subject certificate (Ground Water Certificate No. 3058 ("GWC 3058")) is in good standing and is eligible for change. Furthermore, I find the change of water right as recommended is from the same body of public groundwater, and will not be detrimental to existing rights or the public interest.

Therefore, I ORDER the change to consolidate the multiple points of withdrawal requested in Change Application No. CG1-*03899C, be approved, subject to existing rights and the provisions specified above.

## Your Right To Appeal

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of the Order.

File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

- Serve a copy of your appeal and this Order on Ecology in paper form - by mail or in person. (See addresses below.) E-mail is not accepted.

- You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

| Street Addresses | Mailing Addresses |
|---|---|
| **Department of Ecology**<br>Attn: Appeals Processing Desk<br>300 Desmond Drive SE<br>Lacey, WA 98503<br><br>**Pollution Control Hearings Board**<br>1111 Israel RD SW<br>Suite 301<br>Tumwater, WA 98501 | **Department of Ecology**<br>Attn: Appeals Processing Desk<br>PO Box 47608<br>Olympia, WA 98504-7608<br><br>**Pollution Control Hearings Board**<br>PO Box 40903<br>Olympia, WA 98504-0903 |

**Please send a copy of your appeal to:**

Tom Buroker, Section Manager
Water Resources Program
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Signed at Bellevue, Washington, this _____ day of _____ 2016.

_____
Tom Buroker, Section Manager

For additional information visit the Environmental Hearings Office Website: http://www.eho.wa.gov. To find laws and agency rules visit the Washington State Legislature Website: http://www1.leg.wa.gov/CodeReviser.

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INVESTIGATOR'S REPORT
Water Right Control Number CG1-*03899C
City of Ferndale

## BACKGROUND

This report serves as the written findings of fact concerning Water Right Application Number CG1-*03899C.

On November 19, 2014, the City of Ferndale (City) filed four Applications for Change with the Washington State Department of Ecology (Ecology) to consolidate withdrawal locations for all of the City's sources for four water rights and allow flexibility among three existing points of withdrawal and additional future points of withdrawal. The additional points of withdrawal will be determined based on test wells to evaluate locations with appropriate water quality and production capabilities to meet the City's needs. The four applications are:

Table 1. Change Applications Filed by the City of Ferndale

| Change Application | Source | Water Right | Type | Priority Date |
|---|---|---|---|---|
| CG1-*02509C@1 | PW-2 Douglas Road Well | GWC 1513 | Certificate | 5/9/1952 |
| CG1-*03899C | PW-1 Shop Well | GWC 3058 | Certificate | 2/28/1955 |
| CG1-00720P@1 | PW-2 Douglas Road Well | G1-00720P | Permit | 7/22/1971 |
| CG1-*10690C | PW-4 Central City Well | GWC 7700 | Certificate | 3/10/1970 |

Future use of the existing appropriations will continue to be for municipal supply, and no changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

The City's water system currently serves a residential population of approximately 12,920 people with approximately 6,611 equivalent residential units (ERUs). The City's water system consists of water withdrawal, conveyance, storage, and treatment facilities. The place of use is consistent with the 2010 update to the 2006 City of Ferndale Water System Plan, which is within the designated City water service area (Reichhardt & EBE Engineering Inc. 2010).

Existing and requested water right attributes for the specific water right addressed by this Report of Examination (ROE) are as follows:

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## EXISTING Water Right Attributes

| | |
|---|---|
| **Water Right Owner:** | **City of Ferndale** |
| **Priority Date:** | February 28, 1955 |
| **Place of Use** | City of Ferndale approved water service area consistent with the most recently approved Water System Plan |

| County | Waterbody | Tributary To | WRIA |
|---|---|---|---|
| Whatcom | Regional Aquifer | | **1 - Nooksack** |

| Purpose | Rate | Unit | Ac-ft/yr | Begin Season | End Season |
|---|---|---|---|---|---|
| Municipal | 870 | GPM | 440 | Year Round | |

| Source Name | Parcel | Well Tag | Twp | Rng | Sec | QQ Q | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| PW-1 (Shop Well) | 390219409029 | AMF090 | 39N | 2E | 19 | SW SE | 48.8495 | -122.6023 |

Datum: NAD83/WGS84

WRIA = Water Resource Inventory Area; GPM = Gallons per Minute; Ac-ft/yr = Acre-feet per year; Twp = Township; Rng = Range; Sec. = Section; QQ Q = Quarter-quarter of a section

## REQUESTED Water Right Attributes

| | |
|---|---|
| **Applicant Name:** | **City of Ferndale** |
| **Date of Application:** | November 19, 2014 |
| **Place of Use** | City of Ferndale approved water service area consistent with the most recently approved Water System Plan |

| County | Waterbody | Tributary To | WRIA |
|---|---|---|---|
| Whatcom | Regional Aquifer[1] | | **1 - Nooksack** |

[1] Also referred to as Deep Confined Aquifer

| Purpose | Rate | Unit | Ac-ft/yr | Begin Season | End Season |
|---|---|---|---|---|---|
| Municipal | 870 | GPM | 440 | Year Round | |

| Source Name | Parcel | Well Tag | Twp | Rng | Sec | QQ Q | Latitude | Longitude |
|---|---|---|---|---|---|---|---|---|
| PW-1 (Shop Well) | 390219409029 | AMF090 | 39N | 2E | 19 | SW SE | 48.8495 | -122.6023 |
| PW-2 (Douglas Road Well) | 390230188340 | BCB347 | 39N | 2E | 30 | SE NW | 48.8447 | -122.6088 |
| PW-3 (Thornton Road Well) | 390124392440 | BHX510 | 39N | 1E | 24 | NW NE | 48.8605 | -122.6226 |
| PW-4 (Central City Well) | 390219010345 | AGK343 | 39N | 2E | 19 | SW NW | 48.8567 | -122.6164 |
| Potential Future Wells[2] | See area outlined on Figure 1 (Attached) | | | | | | | |

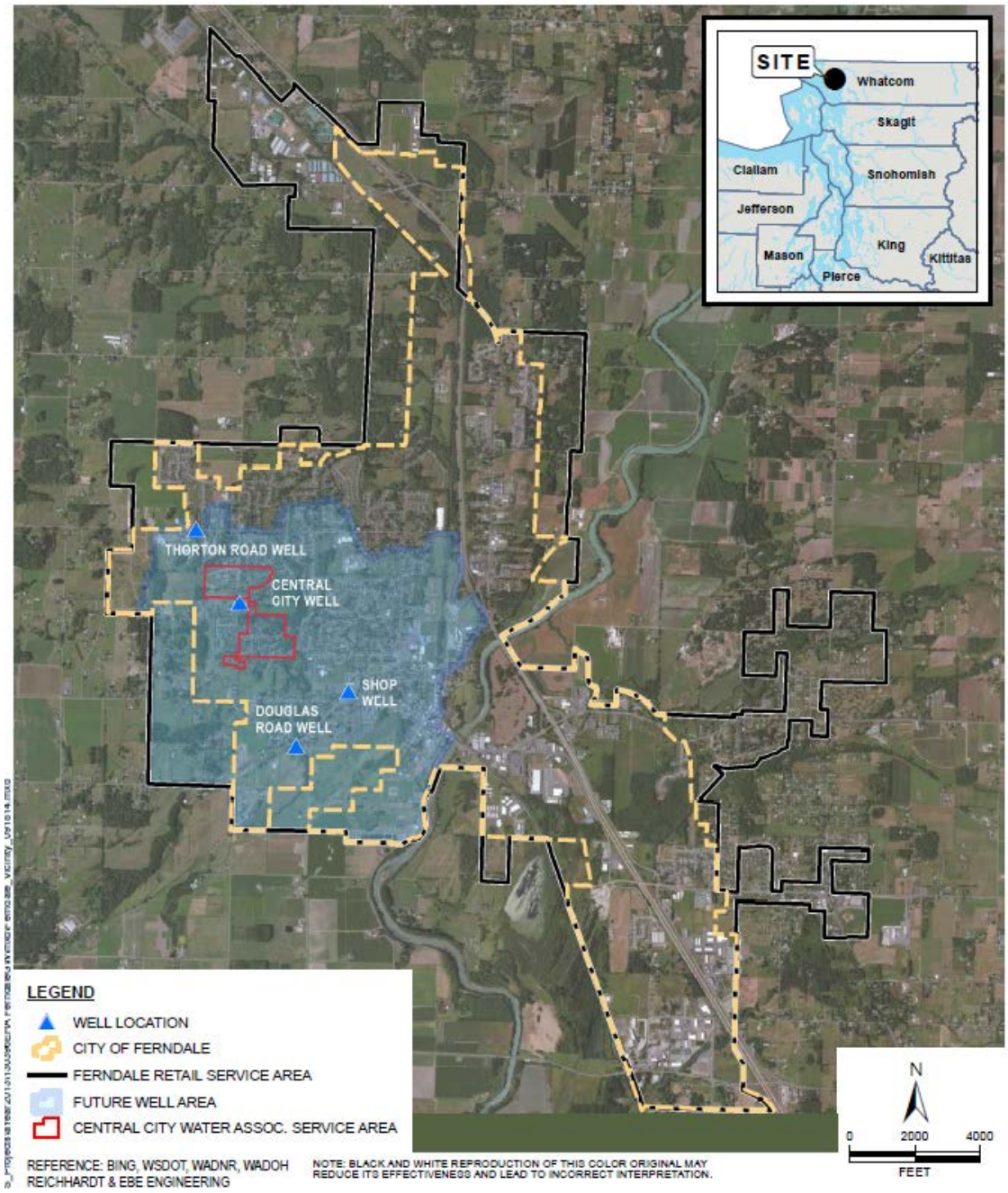
Datum: NAD83/WGS84

[2] See Figure 1, representing a portion of the area requested in the public notice for potential points of withdrawal: Section 19, S ½ of Section 18, W½ of Sections 20 and 29, and N¾ of Section 30, in T39N, R2E, W.M.; and S½ of Section 13, and Sections 24 and 25, in T39N, R1E, W.M. Figure 1 prepared by Associated Earth Sciences, Inc. (AESI) to support the City's water right change.

### *Cost Reimbursement*

This application is being processed under a cost reimbursement agreement between the applicant the Department of Ecology. This report has been prepared by Aspect Consulting, LLC (Aspect) and reviewed by Ecology.

**Figure 1. City of Ferndale Well Locations and Vicinity (source: AESI, 2013, modified by AESI in 2015)**




## Legal Requirements for Requested Change

***Public Notice***

RCW 90.03.280 requires that notice of a water right application be published once a week, for two consecutive weeks, in a newspaper of general circulation in the county or counties where the water is to be stored, diverted and used. Notice of this application was published in the Ferndale Record on February 11, 2015 and February 18, 2015.

There were no protests received during the 30 day statutory protest period.

***Consultation with the Department of Fish and Wildlife***
The Department must give notice to the Department of Fish and Wildlife (WDFW) of applications to divert, withdraw, or store water. Notice was provided to WDFW on January 14, 2016, of the four change applications filed by the City.

On January 29, 2016, Steve Boessow of WDFW responded in a letter to Ecology that:

> *"…based on impacts to fish and/or wildlife and the habitat they rely on, and pursuant to Chapter 77.57.020 RCW, WDFW does not oppose the issuance of these applications. These change applications do not increase the quantity of water allowed under any of the 4 water rights. Consolidation of wells is unlikely to impact fish."*

***State Environmental Policy Act (SEPA)***
A water right application is subject to a SEPA threshold determination (i.e., an evaluation whether there are likely to be significant adverse environmental impacts) if any one of the following conditions are met:

- It is a surface water right application for more than 1 cubic foot per second, unless that project is for agricultural irrigation, in which case the threshold is increased to 50 cubic feet per second, so long as that irrigation project will not receive public subsidies;
- It is a groundwater right application for more than 2,250 gallons per minute;
- It is an application that, in combination with other water right applications for the same project, collectively exceed the amounts above;
- It is a part of a larger proposal that is subject to SEPA for other reasons (e.g., the need to obtain other permits that are not exempt from SEPA);
- It is part of a series of exempt actions that, together, trigger the need to do a threshold determination, as defined under WAC 197-11-305.

This project is not categorically exempt from SEPA, because the four change applications associated with the project total more than 2,250 gallons per minute in additive instantaneous quantity. The total instantaneous quantity associated with the combined change applications is 2930 gallons per minute (gpm).

The City prepared a SEPA checklist and notice was posted in the Ferndale Record on February 10, 2016. No public comments were received during the public comment period, and a Determination of Non-Significance (DNS) was issued.

***Water Resources Statutes and Case Law***
RCW 90.03.380(1) states that a water right that has been put to beneficial use may be changed. The point of diversion, place of use, and purpose of use may be changed if it would not result in harm or injury to other water rights. The Washington Supreme Court has held that Ecology, when processing an application for change to a water right, is required to make a tentative determination of extent and validity of the claim or right. This is necessary to establish whether the claim or right is eligible for change. *R.D. Merrill v. PCHB* and *Okanogan Wilderness League v. Town of Twisp.*

RCW 90.03.386(3) requires a municipal water supplier to apply cost-effective water conservation measures as part of its water system planning. The water supplier must also evaluate the effects of delaying the use of inchoate water rights before it may increase use of those inchoate rights. RCW 90.03.320 requires Ecology to consider the public water supplier's use of conserved water when establishing a surface or ground water right construction schedule. The City's conservation program is outlined in Chapter 4 of the current water system plan (Reichhardt & EBE Engineering Inc. 2010).

RCW 90.03.386(2) states that a municipal water supplier may change its service area through the water system plan approval process. As long as the municipal water supplier is in compliance with the approved plan, the place of use for the water right is the service area of the plan.

RCW 90.44.100 allows Ecology to amend a ground water permit or certificate to: (1) allow the user to construct a replacement or additional well at a new location outside of the location of the original well, or to (2) change the manner or place of use of the water, if:

- The additional or replacement well taps the same body of public ground water as the original well. RCW 90.44.100(2)(a),
- Where a replacement well is approved, the user must discontinue use of the original well and properly decommission the original well. RCW 90.44.100(2)(b),
- Where an additional well is constructed, the user may continue to use the original well, but the combined total withdrawal from all wells shall not enlarge the right conveyed by the original permit or certificate. RCW 90.44.100(2)(c),
- Other existing rights shall not be impaired. RCW 90.44.100(2)(d).

When changing or adding points of withdrawal to groundwater rights (RCW 90.44.100), or when consolidating exempt wells with an existing permit or certificate (RCW 90.44.105), the wells must draw from the *same body of public groundwater*. Indicators that wells tap the *same body of public groundwater* include:

(a) Hydraulic connectivity.
(b) Common recharge (catchment) area.
(c) Common flow regime.
(d) Geologic materials that allow for storage and flow, with recognizable boundaries or effective barriers to flow.

## INVESTIGATION

In consideration of this application, Aspect reviewed available documents pertaining to the application's site conditions, existing well installations, and the potential effect of the proposed change on existing water right holders and established minimum instream flows. This review included information submitted by the applicant, including well construction and testing reports, water system plan, and water level data, along with pertinent Ecology records, including well logs and water rights records. The review also included reports from multiple investigations characterizing the hydrogeology of the Ferndale area and Mountain View Upland.

A site visit was performed on July 21, 2015. Carl Einberger of Aspect met with City representative Mike Olinger to discuss the application, visit existing well locations and the area proposed as future withdrawal points, and to discuss the City's current water system operations.

Using the available information in the Ecology file record, existing reports, the site visit, and communications with the City, Aspect evaluated potential effects of the proposed consolidation of

withdrawal locations for the four water rights involved in the package of change applications. The City's water rights are discussed in more detail in the following section.

## Existing Water Rights

The following table summarizes the City's existing water rights. The subject of this report is Groundwater Certificate (GWC) 3058, however all of these water rights have change applications being processed together, and all are discussed in this report.

**Table 2. City of Ferndale's Water Rights Portfolio**

| Source | Water Right | Type | Priority Date | Qi in gpm | Qa in ac-ft/yr | |
|---|---|---|---|---|---|---|
| | | | | | Additive | Non-Additive |
| PW-2 Douglas Road Well | GWC 1513 | Certificate | 5/9/1952 | 1000 | 1615 | - |
| PW-1 Shop Well | GWC 3058 | Certificate | 2/28/1955 | 870 | 440[1] | - |
| PW-2 Douglas Road Well | G1-00720P | Permit | 7/22/1971 | 1000 | - | 1614[1] |
| PW-4 Central City Well | GWC 7700 | Certificate | 3/10/1970 | 60 | 85 | - |
| | | | Total | 2930 | 2140 | 1614 |

[1]There is some confusion in the water right record as to the total annual quantity allowed to be withdrawn under all City of Ferndale water rights. As a result, Reports of Examination prepared for changes to GWC 1513 and G1-00720P in 2004 tentatively determined that the City of Ferndale should be allowed under its then existing water rights to withdraw up to a combined 2,055 acre-feet per year from all three of its then existing water rights and permits. The Superseding Permit issued in 2004 for G1-00720P noted that the total annual quantity from GWC 1513, GWC 3058, and G1-00720 shall not exceed 2,055 acre-feet per year. In 2014, the City of Ferndale acquired GWC 7700, giving the City a total combined annual quantity from the four water rights of 2,140 acre-feet per year. A recent review of files as part of this investigation suggests the interpretation noted in Table 2 is the intent of the original water right approvals.

Table 3 summarizes the nomenclature historically applied to these water rights:

**Table 3. Water right and change references numbers**

| Source | Original Designation | Previous Change Reference #'s | Current Change Reference #'s |
|---|---|---|---|
| PW-2 Douglas Road Well | GWC 1513 | G1-*02509C | CG1-*02509C@1 |
| PW-1 Shop Well | GWC 3058 | G1-*03899C | CG1-*03899C |
| PW-2 Douglas Road Well | G1-00720P | - | CG1-00720P@1 |
| PW-4 Central City Well | GWC 7700 | - | CG1-*10690C |

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The Thornton Creek Well, PW-3, did not have any water rights associated with it as of the time of submittal of this change application, but is a requested point of withdrawal under this consolidation project and change request.

## History of Water Use

The City has a complicated water supply history dating back to the early 1950s. All four of the water rights that have change applications filed for points of withdrawal consolidation are discussed in this summary.

A synopsis of key historical information includes:

- The City obtained two water rights in the early 1950s: GWC 1513 with a priority date of 5/9/52 and GWC 3058 (the subject of this ROE) with a priority date of 2/28/55. Both of these rights were certificated in the 1950s.

- The above water rights and associated wells near the City shop provided the main source of water for the City until 1975 (Reichhardt & EBE Engineering Inc. 2010).

- In 1983, the City obtained a permit for an additional water right at the City shop (G1-00720P).

- In 1974 the City entered into an agreement with Whatcom County Public Utilities District No. 1 (PUD 1) to provide water from the Nooksack River. It appears this was done to address water quality concerns in the existing wells. A water treatment plant was constructed in 1975 to switch to potable treated water from the Nooksack River. The well now known as the City Shop Well (PW-1) remained connected and used and relied on as an emergency and back-up water source; however, use of the well as a main source of water temporarily ceased.

- In early 1994, the City relocated one well (not the existing Shop Well) from the City shop area to the Douglas Road site to allow construction of a library near the shop location. This well (PW-2) was drilled but was not connected to the system (Reichhardt & EBE Engineering Inc. 2010) at that time. The City of Ferndale filed change applications for GWC 1513 and G1-00720P in 1992 for this relocation. GWC 3058 remained associated with a second well at the City Shop Well.

- In 2003, Ecology prepared a Hydrogeologic Report (Ecology, 2003) and ROEs supporting the above changes were completed in 2004. The change to G1-00720P was approved in a Superseding Permit on June 8, 2004. The change to GWC 1513 was approved by Ecology in a Superseding Certificate issued on February 25, 2005.

- Several years ago, the City began evaluating the possibility of switching off PUD water and returning to the City's back-up groundwater sources as the City's primary source of water. This switch had been encouraged by the Washington State Department of Health (DOH) for several years. The City also wanted to gain more control over costs of water delivery and treatment options for the water system (Associated Earth Sciences, Inc., 2013). This switch occurred on December 14, 2012.

- Soon after switching to the City's production wells as the primary source of water, the City encountered water quality changes from the both the Shop Well and the Douglas Road Well, with unanticipated increases in hardness and chloride. In response to this, the City installed a nanofiltration (reverse osmosis) treatment system to improve the quality of water delivered to its customers (Associated Earth Sciences, Inc., 2013).

- Records provided by the City indicate the City's two active wells (Douglas Well and the Shop Well), have had increasing production annually in the period from 2012 to 2015. In 2014, the Douglas and Shop Wells produced approximately 775 and 485 ac-ft/yr, respectively. In 2015, production through October indicated increased water use, with approximately 870 ac-ft/yr produced from the Douglas Road Well and approximately 275 ac-ft/yr produced from the Shop Well.

- In 2014, the City acquired a water right (GWC 7700) from the Central City Water Association (CCWA). The CCWA water right was originally certificated for community domestic supply (and municipal as a matter of law) and is authorized for 60 gpm and 85 ac-ft/yr. While the water right has been inactive since the acquisition, as part of this consolidation request the City intends to reactivate beneficial use of this water right. A review of records filed with DOH from 2009 to 2014 indicates that this water right was actively used prior to acquisition for 15 or more connections. In 2014, Ecology issued an amended certificate to the City for GWC 7700 conforming its purpose of use to municipal supply for the authorized 60 gpm and 85 ac-ft/yr.

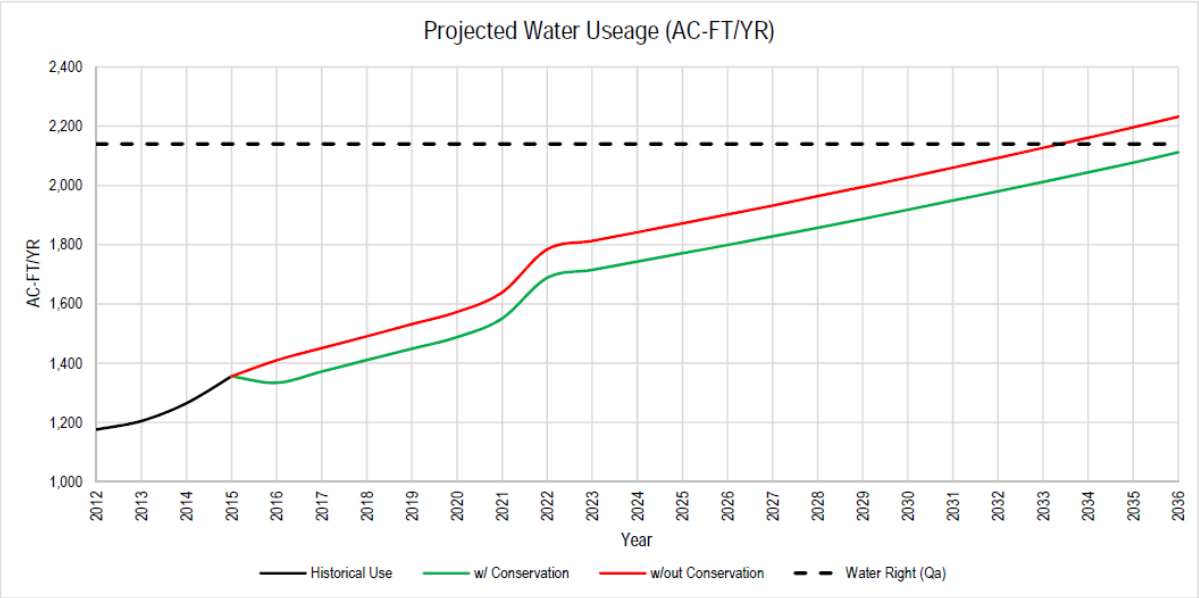
## City-Wide Growth and Diligence

In a letter dated June 3, 2016, Joseph A. Rehberger of Cascadia Law Group, on behalf of the City of Ferndale, provided the following information on City-wide growth and diligence in growing into the inchoate portions of GWC 1513, G1-00729P, and GWC 3058. Mr. Rehberger's letter included a number of attachments which are now on file with Ecology.

The City of Ferndale has been a growing community within Whatcom County for decades. That growth is expected to continue. The following table and graph from the City's *2016 Water System Plan, City of Ferndale* (Working Draft May 2016) describe the City's population growth from 1980 through 2015 and projected water usage through 2036 (see table and graph below).

| Year | Population |
|---|---|
| 1980 | 3,855 |
| 1990 | 5,398 |
| 2000 | 8,758 |
| 2010 | 11,415 |
| 2013 | 11,831 |
| 2014 | 12,710 |
| 2015 | 12,920 |

*Source: Washington State Office of Financial Management*
*City of Ferndale, May 2016*




The following table shows the City's water use trends and increased use associated with current growth (units are in thousand gallons).

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| Month | Shop Well | Douglas Well | Shop Well | Douglas Well | Shop Well | Douglas Well | Shop Well | Douglas Well |
| January | 0 | 0 | 20,044 | 9,753 | 11,653 | 16,424 | 12,963 | 18,146 |
| February | 0 | 0 | 17,448 | 8,455 | 10,976 | 15,379 | 10,602 | 16,742 |
| March | 9,888 | 13,274 | 20,843 | 10,267 | 12,239 | 17,100 | 11,528 | 19,158 |
| April | 9,880 | 17,152 | 18,390 | 8,920 | 11,746 | 16,578 | 11,623 | 19,257 |
| May | 13,088 | 21,028 | 19,020 | 12,270 | 13,465 | 18,693 | 13,083 | 24,416 |
| June | 12,566 | 19,298 | 20,113 | 14,273 | 15,998 | 21,443 | 13,993 | 36,822 |
| July | 16,377 | 19,930 | 22,057 | 27,815 | 14,842 | 32,414 | 9,520 | 44,060 |
| August | 23,287 | 20,150 | 16,437 | 27,333 | 14,306 | 30,416 | 6,115 | 40,504 |
| September | 25,066 | 9,249 | 11,860 | 20,049 | 12,239 | 24,548 | 80 | 32,429 |
| October | 22,132 | 7,189 | 11,586 | 17,614 | 13,072 | 20,778 | 398 | 31,921 |
| November | 18,546 | 9,897 | 10,827 | 16,307 | 13,531 | 18,588 | 112 | 31,265 |
| December | 19,158 | 10,209 | 12,149 | 17,039 | 13,965 | 19,637 | 471 | 31,286 |
| Total | 169,988 | 147,376 | 200,774 | 190,095 | 158,032 | 251,998 | 90,488 | 346,006 |
| Combined Total | 317,364 | | 390,869 | | 410,030 | | 436,494 | |

The City's Annexation History Map (on file with Ecology), shows the City's progressive annexation and growth of its municipal boundaries from the 1940s through present. The City's current urban growth area (UGA) and future growth and annexation phasing plan through 2034 are described in the City of Ferndale *Annexation Blueprint, Annexation Phasing Plan: 2013-2034* (also on file with Ecology).

The City is in the process of updating its Water System Plan (*2016 Water System Plan, City of Ferndale)*. The City's May 2016 working draft estimates a City-wide population growth rate of approximately 2.32%, increasing from a population of 12,920 in 2015 to 20,072 in 2036.

| Year | District | | | | | | | | Total Pop. |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| 2013 | 269 | 333 | 759 | 1,403 | 7,311 | 1,036 | 508 | 212 | 11,831 |
| 2014 | 282 | 352 | 817 | 1,518 | 7,831 | 1,131 | 548 | 231 | 12,710 |
| 2015 | 283 | 354 | 829 | 1,555 | 7,936 | 1,165 | 560 | 238 | 12,920 |
| 2016 | 283 | 357 | 847 | 1,600 | 8,079 | 1,208 | 574 | 246 | 13,194 |
| 2017 | 283 | 360 | 865 | 1,646 | 8,224 | 1,252 | 589 | 255 | 13,474 |
| 2018 | 284 | 363 | 883 | 1,693 | 8,371 | 1,298 | 604 | 264 | 13,760 |
| 2019 | 284 | 366 | 902 | 1,741 | 8,521 | 1,346 | 619 | 273 | 14,052 |
| 2020 | 284 | 369 | 921 | 1,790 | 8,673 | 1,395 | 635 | 283 | 14,350 |
| 2021 | 285 | 372 | 940 | 1,840 | 8,827 | 1,445 | 651 | 294 | 14,654 |
| 2022 | 285 | 375 | 960 | 1,892 | 8,984 | 1,498 | 667 | 304 | 14,965 |
| 2036 | 290 | 417 | 1,278 | 2,776 | 11,455 | 2,431 | 937 | 488 | 20,072 |
| Growth Rate | 0.33% | 0.98% | 2.29% | 3.01% | 1.97% | 3.78% | 2.70% | 3.69% | 2.32% |

This corresponds to a projected increase in ERUs from 6,611 in 2015 to an estimated 11,352 ERUs in 2036.

| Year | ERUs | | | | Total |
|---|---|---|---|---|---|
| | Single-Family | Multi-Family | Commercial / Industrial | Irrigation | |
| 2013 | 4,071 | 682 | 1,008 | 525 | 6,286 |
| 2014 | 4,169 | 689 | 1,149 | 567 | 6,574 |
| 2015 | 4,286 | 689 | 997 | 639 | 6,611 |
| 2016 | 4,365 | 704 | 1,074 | 659 | 6,802 |
| 2017 | 4,446 | 719 | 1,153 | 680 | 6,998 |
| 2018 | 4,529 | 733 | 1,232 | 700 | 7,194 |
| 2019 | 4,614 | 748 | 1,307 | 721 | 7,390 |
| 2020 | 4,701 | 763 | 1,380 | 742 | 7,586 |
| 2021 | 4,790 | 778 | 1,578 | 762 | 7,908 |
| 2022 | 4,881 | 793 | 2,150 | 783 | 8,607 |
| 2036 | 6,420 | 1,046 | 2,722 | 1,164 | 11,352 |

Using these projections, the City is expected to be at or in excess of its current water rights (2,140 af/yr) by 2036.

| | | | ADD (MGD) | | MDD (MGD) | | PHD (GPM) | | Annual (AC-FT/YR) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Total Population | ERUs | w/ Cons | w/out Cons | w/ Cons | w/out Cons | w/ Cons | w/out Cons | w/ Cons | w/out Cons |
| 2013 | 11,831 | 6,286 | 1.08 | 1.08 | 1.91 | 1.91 | 2,194 | 2,194 | 1,205 | 1,205 |
| 2014 | 12,710 | 6,574 | 1.13 | 1.13 | 1.91 | 1.91 | 1,300 | 1,300 | 1,265 | 1,265 |
| 2015 | 12,920 | 6,611 | 1.21 | 1.21 | 2.07 | 2.07 | 2,366 | 2,366 | 1,356 | 1,356 |
| 2016 | 13,194 | 6,802 | 1.19 | 1.26 | 2.07 | 2.21 | 2,371 | 2,526 | 1,334 | 1,410 |
| 2017 | 13,474 | 6,998 | 1.22 | 1.29 | 2.13 | 2.27 | 2,438 | 2,596 | 1,372 | 1,451 |
| 2018 | 13,760 | 7,194 | 1.26 | 1.33 | 2.19 | 2.34 | 2,504 | 2,667 | 1,411 | 1,491 |
| 2019 | 14,052 | 7,390 | 1.29 | 1.37 | 2.25 | 2.40 | 2,571 | 2,738 | 1,449 | 1,532 |
| 2020 | 14,350 | 7,586 | 1.33 | 1.40 | 2.31 | 2.47 | 2,637 | 2,809 | 1,488 | 1,573 |
| 2021 | 14,654 | 7,908 | 1.38 | 1.46 | 2.41 | 2.57 | 2,746 | 2,925 | 1,551 | 1,639 |
| 2022 | 14,965 | 8,607 | 1.51 | 1.59 | 2.63 | 2.80 | 2,983 | 3,177 | 1,688 | 1,784 |
| 2036 | 20,072 | 10,770[1] | 1.88 | 1.99 | 3.28 | 3.50 | 3,716 | 3,958 | 2,112 | 2,232 |

Based on the information provided by the City and upon Ecology's review, it is tentatively determined that the subject water right is in good standing and is eligible for change. This is a municipal water supply water right that is not subject to relinquishment. The full certificated instantaneous rate (870 gpm) has been perfected through beneficial use. The full annual quantity is not yet fully perfected through actual beneficial use. However, the City is a growing system, in good-standing, with a State Department of Health green operating permit. Their demand analysis indicates the City can easily grow into their full annual allocation. Therefore, the full certificated annual quantity of 440 ac-ft/yr shall be eligible for change.

## Proposed Use

The only change proposed for GWC 3058 is to allow the authorized quantities to be used with flexibility at any of the City's current points of withdrawal, and at possible new points of withdrawal within the area outlined on Figure 1. The goal is to allow the City the opportunity to tailor water withdrawals to water needs throughout the City's service area. In addition, the City is interested in finding potential new points of withdrawal that may have improved water quality compared to the current source wells.

Future use of the existing appropriations will continue to be for municipal supply, and no changes in the type of use or in the total allowable instantaneous or annual withdrawal quantities are proposed.

## Investigation of New Points of Withdrawal

The City has engaged Wilson Engineering and AESI to assist with identifying potential locations for new wells and with drilling test wells. A hydrogeologic evaluation in support of this goal was completed in 2013 that proposed drilling and testing of a new well at a location near the northwest corner of the City limits. This was designated as the "Thornton Road Well" location (AESI, 2013).

AESI considered the Thornton Road location to be promising from both a water quantity and quality standpoint. In addition, AESI recognized that the Thornton Road location was in the same surface water drainage basin as the existing Douglas Road, Shop, and Central City Wells, supporting the ability to withdraw from the same source of groundwater as these wells, thus aiding the addition of this location as a point of withdrawal. AESI noted that the nearby Thornton Road Water Association well has lower concentrations of sodium, chloride, conductivity, TDS, and manganese than the City's production wells.

In 2014, a test well was drilled under AESI's supervision at the Thornton Road Well location to 450 feet of depth. AESI concluded that the well could achieve a long-term yield of approximately 350 to 375 gpm. Test pumping of the well for 24 hours at 315 gpm did not produce any observable drawdown at the nearest observation well located approximately 2000 feet southwest, the Central City Well. Elevated water quality for manganese, conductivity, color, and total dissolved solids were noted, indicating that the water would require treatment to meet DOH standards for public water supply. No decision on future use of this well by the City has been made at this time, and additional locations within the proposed 'future well area' outlined on Figure 1 may be investigated for potential production well drilling and construction.

## Other Rights Appurtenant to the Place of Use

As part of this investigation, Aspect obtained water right records from Ecology's database for the area proposed for potential future wells identified in Figure 1, including a ½ mile buffer outside of this area. Note that this area also includes the City's existing points of withdrawal.

Thirteen certificated groundwater rights were identified, with the majority of these being for domestic use. The largest of these were two domestic and stockwater rights owned by F. Imhoff, with each authorized for an instantaneous withdrawal (Qi) of 50 gpm and annual quantity (Qa) of 80 ac-ft/yr. These are located approximately ½ mile southeast of the City's Douglas Well. A review of the associated well log indicates a completion depth of 195 feet, likely within the Regional Aquifer.

In addition, there are 68 claims, all for groundwater use, within the search area. It is expected that many of the water rights found in this review are not being exercised, given the availability of public water supply from the City's system in much of the search area.

## Hydrologic/Hydrogeologic Evaluation

The portions of the City of Ferndale area of interest for this investigation are located west of the Nooksack River near River Mile 6 (Figure 1), in the Fraser-Whatcom basin (additional incorporated areas of the City are located east of the Nooksack River). The western portion of the City water service area is within the Mountain View Upland, with elevations up to 360 feet near the Thornton Road Well. Areas closer to the river are lower in elevation and are part of the Nooksack River valley, with elevations as low 20 feet.

The Fraser-Whatcom basin was subject to repeated glaciation during the Pleistocene Epoch, and several hundred feet of glacial and interglacial sediments are present in the area, with bedrock found at considerable depth. The deepest well in the project area was drilled to a depth of 440 feet and did not encounter bedrock (AESI, 2013).

Overview of Groundwater Occurrence

Groundwater in the Ferndale area is found in discontinuous perched groundwater aquifers and in a single Regional Aquifer that appears to be composed of predominantly pre-Vashon deposits. Aspect (2009) conducted a study of the Mountain View Upland, which extends from the western upland portions of the City of Ferndale west to the Strait of Georgia. Seven hydrostratigraphic units were delineated:

> *The upper fine-grained unit (F1/F2) consists predominantly of glacial marine drift and potentially Sumas and Vashon age till. Shallow perched groundwater occurs above the F1 unit and within coarse-grained lenses interbedded with the F1 unit. A coarse-grained unit (C2) underlies the F1 unit and appears to be correlative with Vashon advance outwash (Mountain View Sand and Gravel). The C2 unit is generally unsaturated. Deeper units, interpreted as the Cherry Point silt and other pre-Vashon, fine-grained deposits, are found beneath the C2 units and form a lower aquitard (F3).* ***The regional aquifer in the study area is present predominantly in the coarse-grained C3 unit that is thought to be correlative with the pre-Fraser deposits, and in more permeable portions of the F3 unit (typically silty sands), as indicated by several productive wells completed within these zones.***

A review of well logs for the City's existing four wells and stratigraphic cross sections (Aspect, 2009) suggests that they are completed in the same source of water, the Regional Aquifer (see Table 4).

**Table 4. Existing City Wells and Interpreted Aquifer**

| Source | Completion Depth (feet) | Interpreted Aquifer |
|---|---|---|
| Douglas Road Well | 152 | Regional Aquifer |
| Shop Well | 160 | Regional Aquifer |
| Central City Well | 290 | Regional Aquifer |
| Thornton Road Well | 450 | Regional Aquifer |

Groundwater Flow in the Regional Aquifer

Aspect (2009) also evaluated groundwater flow directions in the Regional Aquifer in the Mountain View Upland. Based on a review of these data, mapped for both March and October of 2008, groundwater flows in the southeastern portion of the Mountain View Upland near Ferndale generally trend southeast toward the Nooksack River. All of the area of interest for this investigation appears to be in the same source of water, with the Regional Aquifer flowing toward the Nooksack River. In addition to being consistent with Aspect's previous interpretation, this is also consistent with Ecology's previous interpretation in the hydrogeologic report for changes to the City's GWC 1515 and G1-00720P water rights (Ecology, 2003).

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Key Aquifer Test Data and Potential Impairment

Ecology (2003) reviewed pumping tests conducted in 1994 on the Douglas Road Well. A step test and a 26-hour constant rate pumping test were conducted by GeoEngineers, with a well approximately 2200 feet away used as a monitoring well. This well had very limited drawdown observed during the test (0.33 feet). GeoEngineers (1994) also conducted an additional impairment analysis. This suggested that a nearby well (at Ferndale Mobile Village), would have experienced approximately 13 feet of drawdown from the 26-hour pumping test. Ecology concluded that no impairment would occur at this well, given the 120 feet of available drawdown.

As noted previously, the test well drilled into the Regional Aquifer in 2014 at the Thornton Road well location did not produce any observable drawdown at the nearest observation well located approximately 2000 feet southwest, the Central City Well, during a 24 hour pump test.

In general, based on a review of selected well logs, it appears that existing wells completed in the Regional Aquifer have sufficient available drawdown given their depths and groundwater elevations to limit any impairment issues from adding potential new points of withdrawal within the future well area proposed by the City (Figure 1).

## Impairment Considerations

***Impairment of Minimum Instream Flow Water Rights***

The term "instream flow" is used to identify a specific stream flow (typically measured in cubic feet per second, or cfs) at a specific location for a defined time, and typically following seasonal variations. Instream flows are usually defined as the stream flows needed to protect and preserve instream resources and values, such as fish, wildlife and recreation. Instream flows are most often described and established in a formal legal document, typically an adopted state rule.

Once established, a minimum flow constitutes an appropriation with a priority date as of the effective date of the rule establishing the minimum flow (RCW 90.03.345). Thus, a minimum flow set by rule is an existing right which may not be impaired (RCW 90.03.345; RCW 90.44.030).

Minimum instream flows were established for the Nooksack River Water Resource Inventory Area (WRIA 1) by WAC 173-501 in 1985. None of the four water rights involved with this project are junior to the instream flow rule, and as such, they are not subject to curtailment when instream flows are not met. No additional impacts to instream flows are expected to result from authorization of this change request, given that there is no enlargement of the water right through this consolidation process. WDFW has concurred with this opinion, as noted in their January 29, 2016, letter to Ecology.

***Impairment, Qualifying Ground Water Withdrawal Facilities, and Well Interference***

There are three concepts that are important when considering whether a withdrawal of water from a well would impair another existing water right. The concepts are defined as follows:

1. Impairment is an adverse impact on the physical availability of water for a beneficial use that is entitled to protection (i.e., water rights that are both senior and junior in priority to the right the applicant seeks to change).

2. Qualifying ground water withdrawal facilities are defined as those wells which in the opinion of the Department are adequately constructed. An adequately constructed well is one that (a) is constructed in compliance with well construction requirements; (b) fully penetrates the saturated thickness of an aquifer or withdraws water from a reasonable and feasible pumping lift (WAC 173-150); (c) the withdrawal facilities must be able to accommodate a reasonable variation in seasonal pumping water levels; and (d) the withdrawal facilities including pumping facilities must be properly sized to the ability of the aquifer to produce water.

3. Well interference may occur when several wells penetrate and withdraw ground water from the same aquifer. Each pumping well creates a drawdown cone. When several wells pump from the same aquifer, well density, aquifer characteristics, and pumping demand may result in individual drawdown cones that intersect and form a composite drawdown cone. At any point in an aquifer, the composite drawdown caused by pumping wells will be greatly influenced by the transmissivity (T) of the aquifer. In aquifers with high Ts, composite drawdown will generally be much less than in aquifers with similar properties but with low Ts. Transmissivity is related to hydraulic conductivity (K) and the saturated thickness (b) of an aquifer by the relationship T=Kb.

   An aquifer's hydraulic conductivity (K) is derived from the physical properties of both the fluid and geologic materials that form an aquifer. Once formed, an aquifer's saturated thickness (b) becomes important in evaluating its transmissivity. For regions of similar K in an aquifer, a large saturated thickness will result in a much higher T than a small saturated thickness. As a result, regions of similar K in an aquifer with a large saturated thickness will experience less composite drawdown or well interference than with a small saturated thickness.

   Some conditions, however, will increase or steepen composite drawdown in an aquifer. For instance, where characteristics (such as very fine, clay-rich, or poorly sorted sediments) of an unconfined aquifer cause significant drawdown relative to the saturated thickness, the composite drawdown will increase as saturated thickness is reduced and T becomes smaller. Additionally, in regions where negative or no-flow boundaries occur, such as near the edges of a valley fill aquifer where it is bounded by bedrock, composite drawdown will be steeper than in the central part (generally the greatest thickness region) of the aquifer. Consequently, it is commonly understood that the greatest composite drawdown or well interference is more likely to occur in regions of low transmissivities, thin saturated thicknesses and near negative or no-flow boundaries than in regions of high transmissivities, large saturated thicknesses, and away from negative or no-flow boundaries.

As noted in the review of pump test information and well log review noted previously, it appears that existing wells completed in the Regional Aquifer have sufficient available drawdown given their depths and groundwater elevations to limit any impairment issues from adding potential new points of withdrawal within the future well area proposed by the City (Figure 1). No impairment issues are anticipated based on approval of the consolidation project and this associated change request.

## Public Interest Considerations

No potential for detriment to the public interest was identified during the investigation of this water right change application.

***Consideration of Protests and Comments***
No protests were received by Ecology in response to the public notices of this change application.

## CONCLUSIONS

The full quantities (Qi and Qa) of water allocated under the subject certificate are eligible to be changed.

Tentative determination

Groundwater Certificate 3058 is in good standing with the Department of Ecology and is therefore eligible for change. In accordance with RCW 90.14.140(2)(d), rights for municipal supply purposes are not subject to relinquishment.

Potential for Enlargement

No potential for enlargement of the existing water right exists, provided the City does not withdraw more than a total of 870 gpm and 440 ac-ft/yr (additive) under this water right at the existing and potential new points of withdrawal.

Same Source Considerations

All of the existing points of withdrawal considered under this change are within the same source of water, the Regional Aquifer. In addition, all of the existing City wells and the area proposed for future new wells are all within the same surface water drainage basin (Schell) as delineated by Whatcom County. Provided any new points of withdrawal are limited to the area proposed in Figure 1 and the wells are completed in the Deep Aquifer, they can be considered to also be within the same source of water.

Potential for Impairment of Existing Rights

The change requested will not impair existing rights.

Potential for Detriment to the Public Interest

The change requested will not be detrimental to the public interest.

## RECOMMENDATIONS

Based on the above investigation and conclusions, I recommend this request for change be approved in the amounts and within the limitations listed below and subject to the provisions listed above.

### Purpose of Use and Authorized Quantities

The amount of water recommended is a maximum limit and the water user may only use that amount of water within the specified limit that is reasonable and beneficial:

$Q_i$ = 870 gpm

$Q_a$ = 440 acre-feet per year (additive)
For Municipal Use

***Points of Withdrawal***

See Figure 1, representing a portion of the area requested in the public notice for potential points of withdrawal: Section 19, S½ of Section 18, W½ of Sections 20 and 29, and N¾ of Section 30, in T39N, R2E, W.M.; and S½ of Section 13, and Sections 24 and 25, in T39N, R1E, W.M. Figure 1 prepared by AESI to support the City's water right change.

The City's existing wells also are located within this area as illustrated by Figure 1.

***Place of Use***

The place of use (POU) of this water right is the service area described in the most recent City of Ferndale Water System Plan approved by the Washington State Department of Health, so long as the water system is and remains in compliance with the criteria in RCW 90.03.386(2). RCW 90.03.386 may have the effect of revising the place of use of this water right.

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*Carl Einberger, LG, LHG, License #1100* *Date*

*Reviewed Buck Smith, LG, LHG, License #1479* *Date*

*If you need this publication in an alternate format, please call Water Resources Program at (360) 407-6600. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.*

## Selected References


Aspect Consulting, 2009. Aquifer Study of the Mountain View Upland – Lummi River Area, Whatcom County and Lummi Nation, Washington. March 2009.

Associated Earth Sciences, Inc. (AESI), 2013. City of Ferndale Hydrogeologic Evaluation, Whatcom County, Washington. December 2013.

AESI, 2014. Installation and Testing of the Thornton Road Well, Ferndale Washington. December 2014.

GeoEngineers, Inc., 2004. Installation and Testing of Production Well No. 3 Ferndale, Washington. April 1994.

Reichhardt & EBE Engineering Inc. 2010, City of Ferndale 2006 Water System Plan. Updated 2010.

Washington Department of Ecology, 2003. Hydrogeologic Report for Change to GWC 1513 and G1-00720P (City of Ferndale). November 2003.


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