

THESIS

HYDROLOGIC CHARACTERIZATION OF UPPER PERMIAN-CENOZOIC
SEDIMENTARY STRATA OF LARIMER COUNTY: PROSPECTIVE AQUIFER STORAGE
AND RECOVERY TARGETS

Submitted by

Adam Adam

Department of Geosciences

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Colorado State University

Fort Collins, Colorado

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Master's Committee:

Advisor: Sally Sutton

William Sanford
Thomas Sale

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ABSTRACT

HYDROLOGIC CHARACTERIZATION OF UPPER PERMIAN-CENOZOIC SEDIMENTARY STRATA OF LARIMER COUNTY: PROSPECTIVE AQUIFER STORAGE AND RECOVERY TARGETS

Providing adequate water storage is an on-going problem along the northern Colorado Front Range. This study compiles existing hydrogeological data from water wells to identify potential ASR sites in eastern Larimer County, Colorado. These water well data are used to evaluate both geographic localities and individual lithologic units. All stratigraphic units younger than the Pennsylvanian-Permian Fountain Formation and reported to host water wells in eastern Larimer County are considered here. A total of 1094 AquaMap water well reports have been mined for data, including depth, pumping level, static water level, lithology, location, date drilled, and yield. Additionally, specific capacity has been calculated for each well. The data points were plotted using ArcGIS and geological maps from US Geological Survey as base maps. The main parameters considered are water well yields and specific capacities. Yield is an indication of the ability of an aquifer to permit movement of water, but the yield data available may not reflect the maximum ability of a well to produce or store water. This is because water is pumped out according to the usage or purpose of the well, with irrigation and livestock wells typically yielding more than household wells. In some locations the aquifers considered can likely produce more than indicated by reported yields. Based on both hydrogeological properties and widespread occurrence in the study area the Pierre Shale Formation, the Lytle Formation, and the Ingleside Formation appear to show the greatest promise as ASR targets. Additional

units that could be worth further consideration include the Jelm and Lykins Formations. Based solely on hydrogeological data, the White River, Laramie, and Fox Hills Formations would be the strongest candidates for ASR, but are geographically limited to the far northeast corner of the county. In addition, well data from unconsolidated alluvial deposits suggest strong potential for ASR, especially near the eastern edge of the County, but the combination of very high permeability and surface exposure would make ASR in these deposits challenging because of difficulty maintaining control of stored water. Based on well data, there are some specific localities that may merit further consideration for ASR, including the vicinity of Laporte, where several stratigraphic units host wells with high yields and high specific capacities. Similarly, there are wells in several stratigraphic units, including the Pierre Shale Formation, Carlile-Graneros-Mowry Shales, Owl Canyon Formation, Lyons Formation, and Lytle Formation, in an area to the west of Loveland that show promise for ASR. Additionally, the Pierre Shale Formation hosts several clusters of wells indicating strong potential for ASR; the best developed of these clusters are in the northern third of the Larimer County, specifically northwest of Wellington.

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TABLE OF CONTENTS

ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iv
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
Chapter 1 Introduction.....	1
Chapter 2 The Geology of the Study Area.....	3
The Study Area Location.....	3
Unconsolidated Alluvium(Quaternary):.....	5
North Park Formation (Miocene):.....	5
White River Formation (Oligocene):.....	5
Laramie Formation (Upper Cretaceous):.....	6
Fox Hills Formation (Upper Cretaceous):.....	6
Pierre Shale (Upper Cretaceous):.....	6
Niobrara Formation (Upper Cretaceous):.....	7
Carlile Graneros-Mancos Shales (Upper Cretaceous):.....	11
Benton Shale Formation (Upper Cretaceous):.....	12
Dakota Group (Lower Cretaceous):.....	12
Lytle Formation:.....	14
Morrison Formation (Upper Jurassic):.....	16
Sundance Formation (Middle and Upper Jurassic) and Jelm Formation (Upper Triassic):.....	18
Lykins Formation (Upper Permian and Lower Jurassic):.....	19
Owl Canyon Formation (Lower Permian):.....	22
Ingleside Formation (Lower Permian):.....	23
Chapter 3 Previous Work.....	25
Historical Development of Aquifer Storage and Recovery.....	25
Previous Work.....	27
Chapter 4 Methods.....	33
Chapter 5 Results.....	39
Hydrogeologic Data Summary.....	39
Hydrogeologic Data by Stratigraphic Unit.....	42

The Ingleside Formation:	42
The Lyons Formation:.....	47
The Lykins Formation:	49
The Jelm Formation:	52
The Morrison Formation:.....	55
The Dakota Group:	57
The Benton Shale Formation:	61
The Carlile-Graneros-Mowry Shales:.....	63
The Niobrara Formation:	66
The Pierre Shale Formation:	69
The Fox Hills Formation:.....	73
The Laramie Formation:	75
The White River Formation:.....	78
The North Park Formation:.....	80
Unconsolidated Alluvium:	82
Well and Data Variability by Geographic Distribution	84
Chapter 6 Discussion	105
Chapter 7 Conclusions	109
References.....	111

LIST OF TABLES

Table 3.1. The historical development of ASR (Pyne, 2005; Woolfenden and Kadhim, 1997; Watkins Jr, 1977; Sniegocki, 1963; Antoniou et al., 2012; Hutchinson, 1998; Price et al., 1965).	26
Table 5.1. The number of wells, average, and standard deviation of the yield, static water level, and specific capacity of the stratigraphic units in stratigraphic order, youngest to oldest.	41
Table 5.2. The highest yields for wells on the Greeley and Fort Collins map, with locations and usage of the wells.....	104

LIST OF FIGURES

Figure 2.1 The location of the study area.....3

Figure 2.2 Regional stratigraphic columns.....4

Figure 2.3 The Niobrara Formation.....8

Figure 2.4 The Smoky Hill Shale.....9

Figure 2.5 The Smoky Hill Shale Member.....9

Figure 2.6 The Fort Hays Limestone Member.....10

Figure 2.7 The Carlile Shale.....12

Figure 2.8 Dakota Group-South Platte Formation-First Sandstone Member (Muddy Sandstone)
.....14

Figure 2.9 Dakota Group-South Platte Formation-Middle Shale (Skull Creek Shale)
Member.....15

Figure 2.10 Dakota Group-South Platte Formation-Plainview Sandstone Member..... 15

Figure 2.11 Dakota Group-Lytle Formation.....16

Figure 2.12 (a, b) The Morrison Formation.....17

Figure 2.13 The Sundance and Jelm Formation.....18

Figure 2.14 The Lykins Formation.....20

Figure 2.15 (a, b) The Lyons Sandstone.....22

Figure 2.16 The Owl Canyon Formation.....23

Figure 2.17 The Ingleside Formation.....24

Figure 4.1 An example well report for a well drilled into an unspecified sandstone.....35

Figure 4.2 An example well report for a well drilled into the Lykins Formation.....	36
Figure 4.3 An example well report for a well drilled into alluvium.....	34
Figure 5.1 Yield (GPM) of 35 wells in the Ingleside Formation.....	42
Figure 5.2 Static water level (ft) of Ingleside Formation wells.....	43
Figure 5.3 Specific capacity (g ft/min) of Ingleside Formation wells	45
Figure 5.4 Yield (GPM) of the 12 wells in the Owl Canyon Formation.....	45
Figure 5.5 Static water level (ft) of Owl Canyon Formation wells	46
Figure 5.6 Yield (GPM) of the 38 wells in the Lyons Formation.....	47
Figure 5.7 Static Water Level (ft) of Lyons Formation wells.....	48
Figure 5.8 Specific capacity (g ft/min) of the Lyons Formation wells	49
Figure 5.9 Yield (GPM) of 99 wells in the Lykins Formation	50
Figure 5.10 Static water level (ft) of Lykins Formation wells.....	51
Figure 5.11 Specific capacity (g ft/min) of Lykins Formation wells	52
Figure 5.12 Yield (GPM) of the 25 wells in the Jelm Formation.....	53
Figure 5.13 Static Water Level (ft) of Jelm Formation wells.....	54
Figure 5.14 Specific capacity (g ft/min) of Jelm Formation wells.....	55
Figure 5.15 Yield (GPM) of the 35 wells in Morrison Formation.....	56
Figure 5.16 Static water level (ft) of Morrison Formation wells.....	57
Figure 5.17 Yield (GPM) of the 59 wells in the Dakota Group	58
Figure 5.18 Static water level (ft) of Dakota Group wells.....	60
Figure 5.19 Specific Capacity (g ft/min) of Dakota Group wells	61
Figure 5.20 Static water level (ft) of Benton Shale Formation wells.....	62
Figure 5.21 Yield (GPM) of the 45 wells in the Carlile-Graneros-Mowry Shales.....	64

Figure 5.22 Static water level (ft) of Carlile-Graneros-Mowry Shales	65
Figure 5.23 Specific capacity (g ft/min) of Carlile-Graneros-Mowry Shales wells	66
Figure 5.24 Yield (GPM) of the 17 wells in the Niobrara Formation.	67
Figure 5.25 Static water level (ft) of Niobrara Formation wells.....	68
Figure 5.26 Specific capacity (g ft/min) of Niobrara Formation wells.....	69
Figure 5.27 Yield (GPM) of the 298 wells in the Pierre Shale Formation	70
Figure 5.28 Static water level (ft) of Pierre Shale Formation wells	71
Figure 5.29 Specific capacity (g ft/min) of Pierre Shale Formation wells.....	72
Figure 5.30 Yield (GPM) of 12 wells in the Fox Hills Formation	73
Figure 5.31 Static water level (ft) of Fox Hills Formation wells.....	74
Figure 5.32 Specific capacity (g ft/min) of Fox Hills Formation wells	75
Figure 5.33 Yield (GPM) of the 17 wells in the Laramie Formation	76
Figure 5.34 Static water level (ft) of Laramie Formation wells	77
Figure 5.35 Specific capacity (g ft/min) of Laramie Formation wells.....	77
Figure 5.36 Yield (GPM) of the 11 wells in the White River Formation.....	78
Figure 5.37 Static water level (ft) of White River Formation wells	79
Figure 5.38 Specific capacity (g ft/min) of White River Formation wells.	80
Figure 5.39 Yield (GPM) of 8 wells in the North Park Formation.....	81
Figure 5.40 Static water level (ft) of North Park Formation wells.....	81
Figure 5.41 Yield (GPM) of 367 wells in the unconsolidated alluvium.....	82
Figure 5.42 Static Water Level (ft) of wells in unconsolidated alluvium.....	83
Figure 5.43 Specific capacity (g ft/min) of wells in unconsolidated alluvium	84
Figure 5.44 The Table Mountain quadrangle map with yield and depth of the wells labeled.....	85

Figure 5.45 The yields of water wells in the Table Mountain quadrangle map	86
Figure 5.46 The Table Mountain quadrangle map with specific capacity of the wells labeled....	86
Figure 5.47 The Livermore quadrangle map with yield and depth of the wells labeled.	87
Figure 5.48 The yields of water wells in the Livermore quadrangle map	88
Figure 5.49 The Livermore quadrangle map with specific capacity of the wells labeled	89
Figure 5.50 The Laporte quadrangle map with yield and depth of the wells labeled.....	90
Figure 5.51 The yields of water wells in the Laporte quadrangle map.....	91
Figure 5.52 The Laporte quadrangle map with specific capacity of the wells labeled.....	91
Figure 5.53 The Horsetooth Reservoir quadrangle map with yield and depth labeled.....	93
Figure 5.54 The yields of water wells in the Horsetooth Reservoir quadrangle map.....	94
Figure 5.55 The Horsetooth Reservoir quadrangle map with specific capacity of the wells labeled.....	95
Figure 5.56 The Masonville quadrangle map with yield and depth of the wells labeled.	96
Figure 5.57 The yields of water wells in the Masonville quadrangle map area	97
Figure 5.58 The Masonville quadrangle map with specific capacity of the wells labeled.....	98
Figure 5.59 The Carter Lake Reservoir quadrangle map with yield and depth of the wells labeled.....	99
Figure 5.60 The yields of water wells in the Carter Lake quadrangle map	100
Figure 5.61 The Carter Lake Reservoir quadrangle map with specific capacity of the wells labeled	101
Figure 5.62 The Greeley and Fort Collins map with yield and depth of the wells labeled.....	102
Figure 5.63 The yields of water wells in the Greeley and Fort Collins map	103

Chapter 1

Introduction

Increased water storage capacity is an ongoing need along the Colorado Front Range. One water storage method that has seen only modest use in Colorado is injection into aquifers for later recovery. The intent of this project is to use available data from water wells to investigate which post-Fountain Formation sedimentary strata in eastern Larimer County, Colorado are feasible targets for aquifer storage and recovery (ASR), and to contribute to a larger study aimed at siting ASR test wells. The data to be considered are from the AquaMap database of water wells maintained by the Colorado Division of Water Resources, and include well depth, pumping level, static water level, lithology, and well location. In conjunction with geologic maps, these data can be used to identify particular stratigraphic units that may be the best targets for ASR and to identify localities that appear particularly promising. The main factors for evaluating the aquifers are well yield (Q) and drawdown (S), which can be used together to calculate specific capacity (Q/S). Specific capacity characterizes a well in terms of how much water can be produced per unit of drawdown. The goals of the study are to:

1. Produce a compilation of water well data for wells drilled into stratigraphic units younger than the Pennsylvanian-Permian Fountain Formation in eastern Larimer County.
2. Produce maps of the water well data that can aid in assessment of properties of target aquifers.

3. To make recommendations of aquifers and localities that merit further consideration as ASR targets.

Chapter 2

The Geology of the Study Area

The Study Area Location

The study area is within eastern Larimer County along the western rim of the Denver-Julesburg basin in north central Colorado where the eastern plains abut the Front Range (Fig. 2.1).

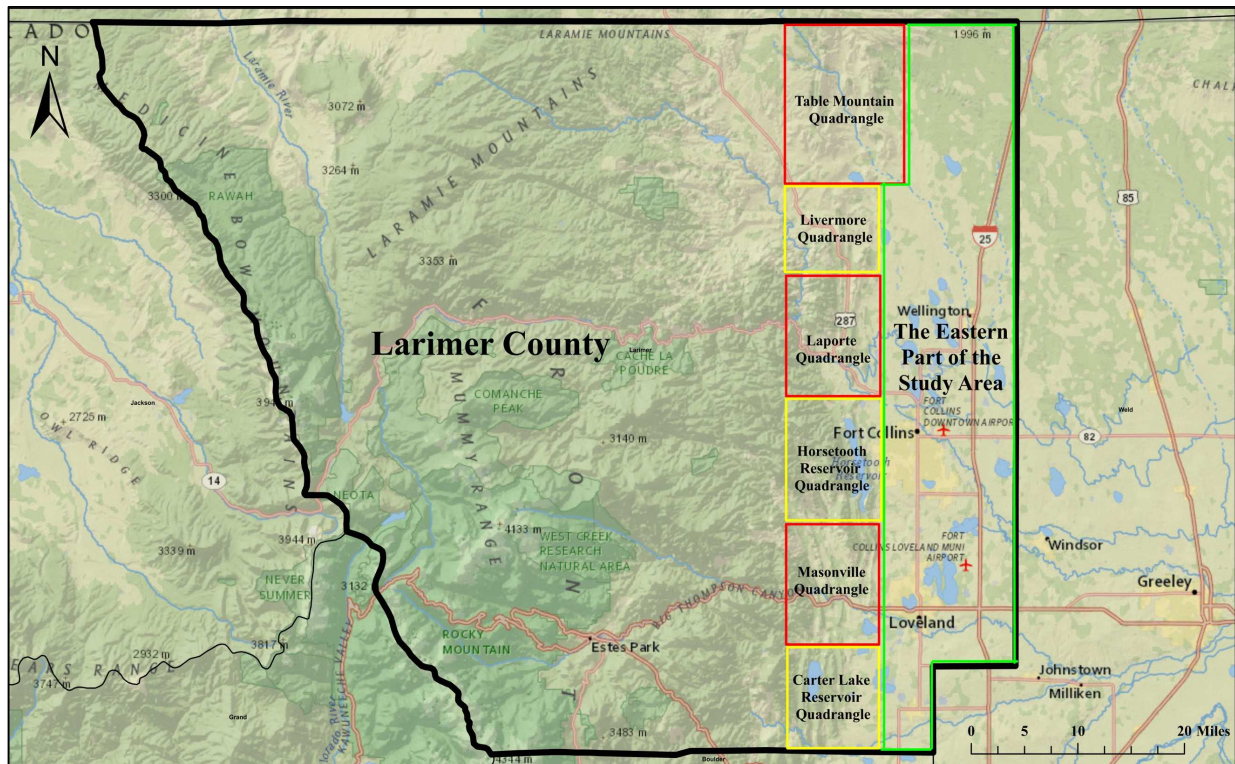


Figure 2.1. The location of the study area in eastern Larimer County.

The study focuses mainly on possible aquifers in consolidated sedimentary formations from the Permian upward (Fig. 2.2). In addition, some consideration has been given to unconsolidated alluvial deposits. The stratigraphic units generally dip about 30° to the east, with older units cropping out to the west of Fort Collins, and younger units, generally poorly exposed,

underlying areas to the east. The western extent of the study area is limited by the exposure of Precambrian rocks; to the north, east, and south the study extends to the boundaries of the county.

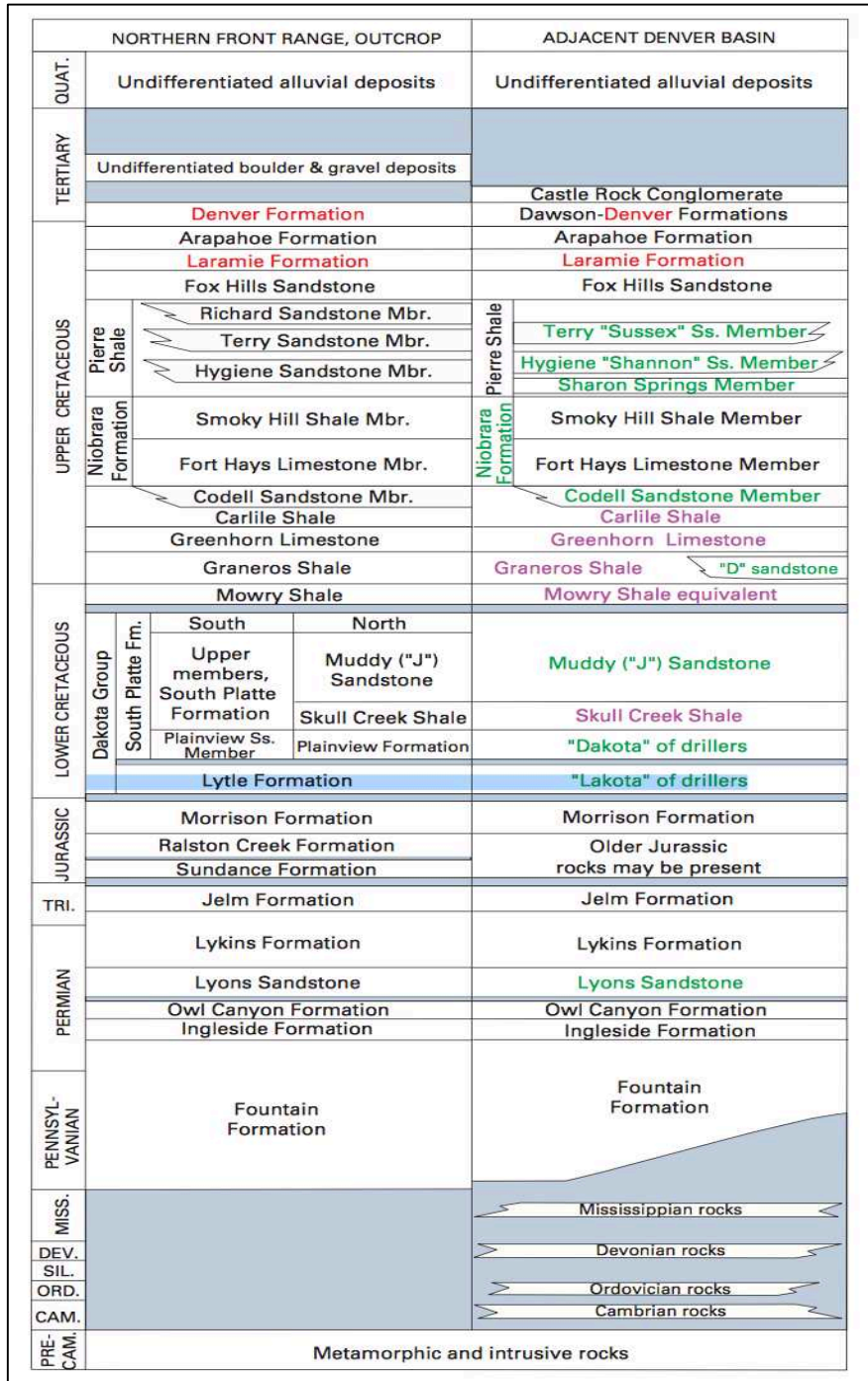


Figure 2.2. Regional stratigraphic columns. (Higley and Cox, 2007)

The units studied, from youngest to oldest, follow; note that this list omits stratigraphic units that have no water wells reported in the AquaMap database of water wells. In addition, some units are consolidated or referred to by outdated stratigraphic names, as described below, in order to comply with usage in well logs.

Unconsolidated Alluvium(Quaternary):

According to Braddock et al. (1988b) the Holocene is light-brownish-gray, silty or sandy gravel and pale-brown, clay gravel. The Pleistocene is reddish-brown or white, poorly sorted and poorly to well stratified gravel and heterogeneous deposits. The Holocene and the Pleistocene deposits have been built-up by glacial processes (Meierding and Birkeland, 1980). In general, the alluvial deposits comprise silt, sand, gravel, and boulders, and the thickness varies in the study area from 0 to about 360 ft (110 m)

North Park Formation (Miocene):

The poorly consolidated North Park Formation is continental tuffaceous sandstone, shale, and conglomerate, in addition to minor bentonitic clay near the bottom. It rests unconformably on the White River Formation only within the North Park region with thickness <820 ft (250 m) (Braddock and Cole, 1978).

White River Formation (Oligocene):

The White River Formation comprises less than 590 ft (180 m) of poorly to moderately well cemented sandstone and fluvial tuffaceous siltstone; it is deposited mainly in drainage channels (Braddock and Cole, 1978).

Laramie Formation (Upper Cretaceous):

The Laramie Formation is exposed around the edges of the Denver Basin, and the thickness in the study area ranges from 328 (100 m) to 590 ft (180 m) within the Greeley quadrangle; it is not found in the western part of the study area. The Laramie Formation is kaolinitic claystone and yellow-gray-brown non-marine carbonaceous shale with thin coal beds and minor crossbedded sandstone (Braddock and Cole, 1978). It conformably overlies the Fox Hills Formation, and hosts uranium deposits (Chenoweth, 1980).

Fox Hills Formation (Upper Cretaceous):

The Fox Hills Formation is yellow-brown calcareous marine sandstone interbedded with carbonaceous sandy shale, ranging in thickness from 49 (15 m) to 393 ft (120 m) within the Greeley quadrangle (Braddock and Cole, 1978) and not exposed in the west part of the study area.

Pierre Shale (Upper Cretaceous):

The Pierre Shale sits with gradational and conformable contact above the Niobrara Formation and is conformably overlain by the Fox Hills Formation (Scott and Cobban, 1965). In general, it is a thick, marine, dark-olive-gray shale to sandy shale with ironstone concretions, limestone, and bentonite beds (Braddock et al., 1989). The Pierre Shale is not well exposed in the study area, but it is well exposed in Niobrara County, Wyoming (Gill and Cobban, 1966). It is subdivided by Scott and Cobban (1965) into the following members:

Upper Shale Member: Within the Greeley quadrangle, this unit comprises dark-gray silty marine shale and carbonaceous shale about 3937 ft (1200 m) thick, with a *Baculites jenseni* ammonite zone at the bottom (Braddock and Cole, 1978; Braddock et al., 1988a).

Richard Sandstone Member: This unit comprises pale-brown, clayey, micaceous siltstone and sandstone.

Middle Shale Member: This Member is made up of about 715 ft (218 m) of sandy siltstone and clay with small bentonite beds (Braddock et al., 1988a). This unit is combined with the Terry Sandstone Member, in the Table Mountain quadrangle map (Courtright and Braddock, 1989).

Hygiene Sandstone Member: This unit comprises about 445 ft (136 m) within the Greeley quadrangle and is not exposed in the west part of the study area. This member is yellowish-gray to rusty-brown, glauconitic, medium-grained sandstone (Courtright and Braddock, 1989). In addition, there are uncommon claystone nodules at the top and phosphatic nodules at the bottom (Courtright and Braddock, 1989).

Lower Shale Member: This Member is about 1476 ft (450 m) thick within the Greeley quadrangle. This unit is black marine shale, including the Sharon Springs Member, a carbonaceous shale with bentonite beds (Braddock and Cole, 1978). The Sharon Springs Member is represented as a subdivision of another member, the Mitten Black Shale Member, on the Table Mountain quadrangle map (Courtright and Braddock, 1989) and is characterized by dark-gray fissile shale with interbedded yellowish-gray, sandy limestones, sandstones, and bentonitic claystones (Berman et al., 1980). From Loveland to south of Boulder, this Member is represented by non-calcareous dark-gray shale that includes dusky-red and dark yellowish-orange ironstone (Scott and Cobban, 1965).

Niobrara Formation (Upper Cretaceous):

The total thickness ranges from about 290 ft (86 m) to 350 ft (107 m) (Courtright and Braddock, 1989; Braddock et al., 1988b). The Formation is made up of two members, the Smoky Hill Shale and the Fort Hays Limestone (Fig. 2.3). The pictures of the Niobrara Formation were

taken in Boulder County (Figs. 2.3, 2.4, 2.5 and 2.6) because access to Niobrara exposures in Larimer County required permission from quarries and private-lands. The Niobrara is an unconventional oil and gas play and in the Wattenberg Field shows porosity of 10% or less, and the permeability is <0.1 millidarcy (2.73324×10^{-4} ft/day) (Higley and Cox, 2007).



Figure 2.3. The Niobrara Formation, north of Boulder (Six Mile Fold Open Space).



Figure 2.4. The Smoky Hill Shale, north of Boulder (Six Mile Fold Open Space).



Figure 2.5. The Smoky Hill Shale Member, north of Boulder (Six Mile Fold Open Space).



Figure 2.6. The Fort Hays Limestone Member, north of Boulder (Six Mile Fold Open Space).

The Niobrara Formation is subdivided as the following:

Smoky Hill Shale Member: According to Courtright and Braddock (1989) and Braddock et al. (1989), the thickness ranges from about 15 ft (5 m) to 335 ft (107 m). The Member is mostly fissile, calcareous shale, dark gray on fresh surfaces, and light grey where weathered (Fig. 2.4). The uppermost 15 ft is a distinctive yellowish-brown. Close to the middle of the Smoky Hill Member, there is a layer with abundant of *Pseudoperma congesta*, and closer to the base the member becomes less calcareous and is not fissile (Braddock et al., 1989).

Fort Hays Limestone Member: Within the study area the thickness is commonly about 15 ft (5 m) (Braddock et al., 1988 a, b, and c; Braddock et al., 1989; Courtright and Braddock, 1989,). The unit is light-gray, thick bedded micrite with *Inoceramus* and abundant *Pseudoperma congesta* (Figs. 2.3 and 2.6) (Braddock et al., 1988b).

Carlile Graneros-Mancos Shales (Upper Cretaceous):

Because the water well log information available through AquaMap does not reliably distinguish among the Carlile Shale, the Graneros Shale, the Mancos Shale, the Codell Sandstone Member of the Carlile Shale, or the D sandstone within the Graneros Shale, these units are treated as one in this study and referred to here as the Carlile-Graneros-Mancos Shales.

Furthermore, within the study area these units have previously been mapped as a single unit because poor exposures prevent distinguishing among them (e.g. Courtright and Braddock, 1989; Braddock et al. 1988c).

The total thicknesses of these shale units varies from about 410 ft (125 m) to 570 ft (174 m) (Braddock et al. 1988 a and c). These units are mainly olive-gray silty claystone and sandy siltstone (Courtright and Braddock, 1989). The Carlile-Graneros-Mancos Shales are poorly exposed and could not be photographed in Larimer county. The picture was taken in Boulder County (Fig. 2.7). The Codell Sandstone is the upper Member of the Carlile Shale, and is overlain by the Fort Hays limestone member. Its porosity and permeability were evaluated in seven core samples from southern Wyoming, with porosity generally between 8 and 15%, and the vertical and horizontal permeability between 0.1 and 1 millidarcy (2.73324×10^{-4} ft/day and 2.73323×10^{-3} ft/day) and correlating with the porosity (Anderson, 2011). According to Hively et al. (1986), the Codell sandstone in Weld and Larimer County is a well-sorted, fine to very fine-grained, medium to dark gray sandstone. In general, it comprises angular to sub-angular grains of light-colored quartz and feldspar with a light-colored clay matrix.



Figure 2.7. The Carlile Shale, north of Boulder (Six Miles Open Space).

Benton Shale Formation (Upper Cretaceous):

This formation comprises dark to light-gray shale interlayered with thin beds of bentonite and dark-gray limestone (Braddock et al., 1970). The Benton Shale Formation is not shown on the regional stratigraphic columns (Fig. 2.2), but is mapped by Braddock et al. (1970) as the only unit between the Dakota Group and the Niobrara Formation in the Masonville quadrangle.

Dakota Group (Lower Cretaceous):

The Dakota Group includes both the South Platte Formation, which is generally subdivided into three members, and the Lytle Formation (Waage, 1955). Terminology for describing the stratigraphic divisions in the Dakota Group differs between older works (e.g. Waage, 1955) and more recent works (e.g. Berman et al., 1980; Holbrook and Ethridge, 1996);

both the older and more recent terminology will be presented here because water well logs commonly reference the older terminology. This Group has seen considerable detailed stratigraphic study, and there is local variation in the identification and naming of members that will not be presented here because it is not employed in the available water well logs. The total thickness varies within the study area from 245 ft (75m) to 320 ft (98 m) (Courtright and Braddock, 1989; Braddock et al., 1988c). In addition, there are core samples from a well located in Larimer County (API 506906072) with average porosity of 11.9 % and a porosity standard deviation of 0.83. Also, the average vertical permeability is 0.18 millidarcy (4.91983×10^{-4} ft/day) with a standard deviation of 0.07, and the average horizontal permeability is 0.26 millidarcy (7.10642×10^{-4} ft/day) with a standard deviation of 0.10 (Tiger Oil, Floyd D. Wedleigh No. 34-21 unpublished report, 1977).

South Platte Formation: The South Platte Formation is subdivided into the following members, older terminology listed before newer:

First Sandstone Member or Muddy ("J") Sandstone: The thickness ranges from about 25 ft (8 m) to 70 ft (21 m) (Braddock et al., 1989; Braddock et al., 1988c). The member is well-sorted gray to light-brown sandstone, and fine to medium grained (Fig. 2.8) (Braddock et al., 1988c).



Figure 2.8. Dakota Group-South Platte Formation-First Sandstone Member (Muddy Sandstone), Horsetooth Reservoir area.

Middle Shale or Skull Creek Shale Member: The unit ranges in thickness from about 75 ft (23 m) to 190 ft (58 m) (Courtright and Braddock, 1989; Braddock et al., 1988a). The member is mainly dark gray carbonaceous shale and includes sandstone beds with thin gray siltstone and thin bentonite beds (Fig. 2.9) (Braddock et al., 1988a).

Plainview Sandstone Member: The total thickness ranges from about 20 ft (6 m) to 185 ft (56 m) (Courtright and Braddock, 1989; Braddock et al., 1988b). The unit is thin bedded, fine-grained, gray to light-brown, carbonaceous sandstone (Fig. 2.10) (Braddock et al., 1988a).

Lytle Formation:

The Lytle Formation has a total thickness of about 20 ft (6 m) to 120 ft (36 m) (Braddock et al., 1988a; Courtright and Braddock, 1989). The unit is gray to light-brown, coarse-grained to conglomeratic sandstone interlayered with blocky-weathered varicolored, non-carbonaceous mudstone (Fig. 2.11) (Braddock et al., 1970).



Figure 2.9. Dakota Group-South Platte Formation-Middle Shale (Skull Creek Shale) Member, Horsetooth Reservoir area.

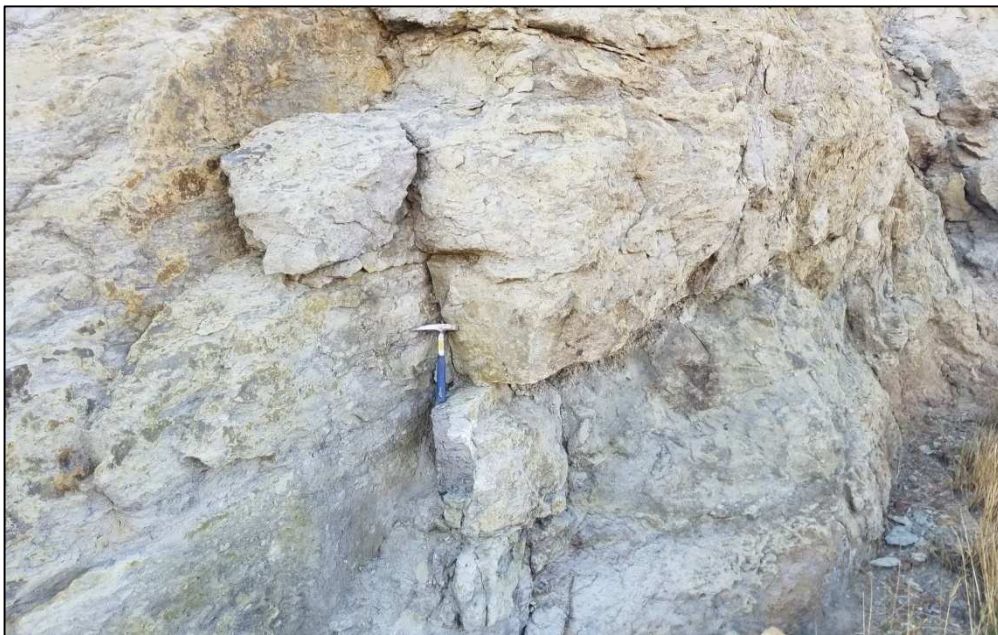


Figure 2.10. Dakota Group-South Platte Formation-Plainview Sandstone Member, Horsetooth Reservoir area.



Figure 2.11. Dakota Group-Lytle Formation, Horsetooth Reservoir area.

Morrison Formation (Upper Jurassic):

The Morrison Formation thickness ranges from about 300 ft (91 m) to 330 ft (101 m) (Braddock et al., 1988c; Courtright and Braddock, 1989). The unit is yellow, green, white, and red, blocky-weathered siltstone and claystone with interbedded gray limestone and gray fine- to medium-grained sandstone (Courtright and Braddock, 1989). The Morrison Formation was deposited on an erosional surface and contains variegated siltstones, claystones, and sandstones, as well as dense limestones (Figs. 2.12 a and b) (Berman et al., 1980). These diverse lithologies are the result of diverse depositional environments, including lacustrine, lacustrine-deltaic, distributary-channel and floodplain (Jackson, 1979). Well to the south of the study area, Morrison Formation porosity was found to average 20% along the east flank of the Canon City Embayment (Gong, 2000).



(a)



(b)

Figure 2.12 (a, b). The Morrison Formation, Horsetooth Reservoir area.

Sundance Formation (Middle and Upper Jurassic) and Jelm Formation (Upper Triassic):

Within the study area, the Sundance and Jelm Formations have generally been treated as one unit because of poor exposure, according to Braddock et al. (1988 a, b, and c), Braddock et al. (1970), and Courtright and Braddock (1989). In this current study, they are also treated as one unit and will be referred to as the Jelm Formation. The combined units comprise about 100 ft (30 m) to 200 ft (61 m) (Braddock et al., 1988 a and c) of mainly fine-grained, reddish-brown or orange-pink, crossbedded calcareous sandstone (Fig. 2.13) (Braddock et al., 1988c).



Figure 2.13. The Sundance and Jelm Formation, Horsetooth Reservoir area.

Lykins Formation (Upper Permian and Lower Jurassic):

The Lykins Formation is commonly red and reddish-brown siltstone and fine sandstone with several thin carbonate beds and a gypsum bed close to the bottom (Braddock et al., 1970). The unit is not well exposed and thickness ranges from about 505 (154 m) to 800 ft (244 m) (Braddock et al., 1988a; Courtright and Braddock, 1989). According to Maughan (1980) the Lykins Formation (Fig. 2.14) is mainly bedded silty sandstone, medium reddish-brown to mild reddish-orange mudstone, and near the bottom of the formation, there are some light grey stromatolitic dolomite and gypsum beds. This Formation is commonly poorly lithified and weathers readily to form red soils. The lower Lykins deposition may have been in a shallow, hypersaline epeiric sea. The sediments of the upper Lykins, likely, were deposited within an intertidal zone during a long period of time without sea level changes (Maughan, 1980).



Figure 2.14. The Lykins Formation, Horsetooth Reservoir area.

Lyons Formation (Lower Permian):

The Lyons Formation is a well-sorted, very fine- to fine- to medium-grained sandstone, mostly, orange to pink and pinkish-gray, and the thickness is ranging from about 3 ft (1 m) to 50 ft (15 m) (Courtright and Braddock, 1989; Braddock et al., 1989). (Figs. 2.15 a and b). It is well cemented by quartz, and distinguished by large scale crossbedding of dunes (Braddock et al., 1988b). It grades into dense purplish-gray dolomite north of Table Mountain park (Courtright and Braddock, 1989). Adams and Patton (1979) describe the Lyons Sandstone depositional environment as an eolian sand dune field along the shore of a shallow sea. Xu et al. (2006)

report, without mentioning where the samples were collected, that the unfractured Lyons Formation has about 7.06% porosity and permeability of 0.014 millidarcy (3.8265×10^{-5} ft/day) and the fractured Lyons Formation has porosity of 7.61% and permeability about 0.016 millidarcy (4.3732×10^{-5} ft/day). Core samples from a well located in Larimer County gave an average porosity of 11.6 % with a standard deviation of 4.2. Also, the average vertical permeability is 89.3 millidarcy (2.44078×10^{-1} ft/day) with a standard deviation of 448, and the average horizontal permeability is 156 millidarcy (4.26385×10^{-1} ft/day) with a standard deviation of 306 (Petroleum Reservoir Engineering unpublished report for well API 506906137, 1981).



(a)



(b)

Figure 2.15 (a, b). The Lyons Sandstone, Horsetooth Reservoir area.

Owl Canyon Formation (Lower Permian):

The Owl Canyon Formation comprises red fine-grained, ripple-laminated sandstone with red siltstone; it ranges from about 200 (15 m) to 350 ft (107 m) thick (Braddock et al., 1988c; Courtright and Braddock, 1989). Sometimes referred to as the Satanka Formation (Braddock et al., 1970), the Owl Canyon Formation is dominantly moderate reddish-brown, light brown, and very fine-grained sandstone with moderate reddish-orange mudstone and siltstone (Fig. 2.16) (Maughan, 1980). According to Maughan, the depositional environment is a tidal flat complex with some estuarine sediments. Thus, tidal creeks were probably where the Owl Canyon deposits were deposited on the mudflats. The sedimentation is suggested to have been maintained during gradually increasing sea level (Maughan, 1980).



Figure 2.16. The Owl Canyon Formation, Horsetooth Reservoir area.

Ingleside Formation (Lower Permian):

The Ingleside Formation is a thick-bedded and cross-bedded reddish-pink fine-quartzose sandstone (Fig. 2.17), well cemented by quartz and calcite with thickness ranging from about 70 ft (21 m) to 240 ft (73 m) within the study area (Braddock et al., 1988 c and a). In addition, it has interbedded limestone and dolomitic limestone beds (Courtright and Braddock, 1989). Maughan (1980) represents the depositional environment of the Ingleside Formation south of Owl Canyon as a predominantly nearshore marine environment with offshore bars. West of Livermore, moreover, high angle eolian crossbeds grade laterally to littoral to neritic sandstone and limestone beds close to Owl Canyon (Maughan, 1980).



Figure 2.17. The Ingleside Formation, Horsetooth Reservoir area.

Chapter 3

Previous Work

Historical Development of Aquifer Storage and Recovery

ASR is a method of artificially recharging subsurface water. The first use of the term Aquifer Storage and Recovery (ASR) was in 1983 to describe the technique of groundwater storage by using dual-purpose wells (Pyne, 2005). ASR involves storing water in subsurface aquifers by injection in and recovery from the same well, with injection during the wet season and later recovery in the dry season. During the 1930s artificial recharge to enhance groundwater storage was developed in New York and California. Since then ASR has been widely utilized (Weeks, 2002). According to Weeks (2002), spreading basins began to be used for artificial recharge of alluvial aquifers about the turn of the twentieth century, particularly in California; since 1930, ASR has been utilized widely. The operation of ASR is not dependent on specific lithologies, but instead on the hydrogeologic properties of the aquifer materials. In previous ASR work, ASR wells were installed in a variety of aquifers with sufficient porosity and permeability, including limestone, sandstone, and alluvial deposits. Table 3.1 shows just a few of the many examples of ASR development by region and year of development in some sandstone and unconsolidated units.

Table 3.1. The historical development of ASR (Pyne, 2005; Woolfenden and Kadhim, 1997; Watkins Jr, 1977; Sniegocki, 1963; Antoniou et al., 2012; Hutchinson, 1998; Price et al., 1965).

Location	Year	Lithology
Orange County, California	1950s	Sandstone
Los Angeles County, California	1950s	Sandstone
El Paso, Texas	1986	Sandstone
Wildwood, New Jersey	1968	Sandstone
Gordons Corner, New Jersey	1972	Clay Sand
Goleta, California	1978	Silty, Clay Sand
Oxnard, California	1989	Sandstone
Chesapeake, Virginia	1990	Sandstone
Kerrville, Texas	1991	Sandstone
Calleguas, California	1992	Sandstone
Pasadena, California	1992	Sandstone
Highlands Ranch, Colorado	1993	Sandstone
Swimming River, New Jersey	1993	Clay Sand
Murray Avenue, New Jersey	1994	Clay Sand
Marathon, Florida	1994	Sandstone
San Bernardino County, California	1982	Gravel, Clay, Sand
Western Orange County, Florida	1970	Sandstone
Grand Prairie Region, Arkansas	1953	Alluvium, Clay Sand
Herten, Netherlands	2000s	Sandstone
Kuwait	1964	Sandstone
Fountain Valley, El Paso County Colorado	1970s	Alluvium and Sandstone
Oregon and Washington	1963	Basalt, Alluvium, Sandstone

Previous Work

ASR is an important water management technique, especially in water-scarce areas, where surface water is injected artificially into an aquifer in order to store it for later use (Deng et al., 2014). ASR success is, however, affected by many factors, most importantly the continuing porosity and permeability of the aquifer. For example, clogging by particulate matter, may occur by pumping in unconsolidated units, which would make recharging unfeasible (Edwin et al., 1980). The chemical composition of the water also matters; a difference in pH between native and injected water, for example, could make some minerals more soluble, especially in aquifers that are mostly limestone. In addition to pH, the oxidation-reduction potential (Eh), total dissolved solids (TDS), and temperature matter.

According to Edwin et al. (1980), a well under ideal conditions will usually accept recharge equivalent to its pumping yield. For example, if a well yields 1000 gallons per minute (GPM) with a drawdown of 30 ft, the well should recover 30 ft with a recharge of 1000 GPM. Ideal conditions include the chemical stability of the minerals in the aquifers during and after the pumping; an incompatible chemical environment may cause contamination by dissolving minerals such as hematite and calcite and putting arsenic, or other problematic elements into solution.

In 1965 Price et al. summarized the main characteristics of all sub-surface water storage projects conducted in the states of Oregon and Washington through 1962. The artificial recharge of sand and gravel aquifers had been successful so they recommended recharging basalt aquifers. Furthermore, scarifying and frequent cleaning of the recharge basins was required to maintain adequate infiltration rates, as was chemical treatment to control the growth of slime-forming organisms. The study concludes that to maintain a successful artificial recharge requires a

periodic update of background data. This includes information about conditions of groundwater occurrence, aquifer properties, the physical, chemical, and biological character of the native water and the injecting water, as well as the existing uses of the waters involved. The amount of water recharged and withdrawn and the fluctuations of the groundwater levels, in addition to the type and amount of treatment, would affect the success of ASR.

An important factor in ASR success is the location of the artificial recharge. There was artificial groundwater recharge on the Arikaree River near Cope, Colorado in the 1960s. Longenbaugh (1966) describes this project in terms of the cost and the feasibility of the work. During late 1964 and early 1965, artificial recharge structures were constructed on the Arikaree River, which made the project inexpensive because of the proximity of the sources of injected water. Unfortunately, a large flood on July 24th 1965 destroyed all the structures except one dam; consequently, the cost of the recharge benefits exceeded the cost of the original construction. In view of this experiment, the location does matter because floods carry fine-grained sediment. Longenbaugh concluded the article by describing how small sediment particles can seal the spreading basin. This causes reduced infiltration rates and may limit recharge, which eventually causes some maintenance problems.

Crawford and Johnson (1967) report that the accumulation of colloidal particles or suspended materials in the vicinity of the wellbore reduces the recharge rates of gravity flow. They added that colloidal or suspended materials deposited in pore spaces will increase the flow velocity of fluids through the reduced size pore spaces. So either fluid erosion will remove the deposited materials or the materials will increase the pressure, leading to fracturing of the strata. They noted that the repeated course of high velocity recharge through the remaining pore spaces moved sand away from the wellbore. To emphasize Longenbaugh's perspective about the cost,

Crawford and Johnson consider that the closer the source of surface water, the more economic artificial recharge will be.

Watkins (1977) describes an interesting pilot project used in 1970 in western Orange County, Florida using a connector well for recharging the Floridan aquifer. The artesian pressure of the Floridan aquifer increased slightly with transfer of water from the lower of two sand aquifers. Consequently, the artesian head decreased 4ft in the lower sand aquifer close to the well. The existence of an intervening impermeable layer between the sand layers is probably the reason that water levels of the upper sand aquifer did not change. After a year, the water levels of the lower sand aquifers were raised because of six holes that were drilled and filled with sand to connect the two sand aquifers. This technique could be utilized because the native water and the injected water were physically and chemically compatible. Meyer and Patrick (1980) discuss a usage similar to that described by Watkins (1977). They show a solution for the effects of the artificial recharge at the Ship Creek alluvial fan on water levels in the Spring Acres Subdivision, Anchorage, Alaska where the natural water levels usually drop during Spring and rise close to the surface in late Summer through early Winter. However, in 1975 an artificial recharge experiment in Spring Acres Subdivision, Anchorage was challenging because of the fluctuation of the water levels. The U.S. Geological Survey, in cooperation with the municipality of Anchorage, came up with two models used to simulate the unconfined aquifers, and that seemed to work because artificial recharge raised the water level in the unconfined and artesian aquifers.

High water levels are not the only issue for aquifer storage; discontinuous beds of silt and clay can decrease hydraulic capacity. Emmons (1977) addresses two issues that could make artificial recharge undependable. Emmons' report is about nine artificial recharge pits in upper Black Squirrel Creek basin, Jimmy Camp Vally, and Fountian Vally, El Paso County, Colorado.

The presence of a high water table, as well as thin discontinuous beds of silt and clay in the alluvium in upper Black Squirrel Creek basin, significantly reduced the rate of infiltration in the northern part of the Jimmy Camp valley. Therefore, the result of the test in 1975 was unsatisfactory because many areas were unsuitable. Where the water table is high, the report suggests that artificial recharge could be used to improve the quality of water, rather than for storing water, for example in regions close to the sea where brackish water intrudes. Woolfenden and Kadhim (1997) point out a factor that may affect water quality. In the beginning of the 1990s, aquifer storage was conducted in the Rialto-Colton Basin, San Bernardino County, California, a region known for the density of faults. A chemical segregation at different water levels was observed from 1992 to 1995. Varied ratios of stable-isotopes within the groundwater system indicate that the chemical segregation occurred because of an unnamed fault. Deuterium ratios in groundwater east of the unnamed fault were lighter than ratios west of the fault. The chemical variation across the fault was clearer in the lower water bearing unit than in the middle water-bearing units, suggesting the fault served as a barrier preventing water in the lower water-bearing unit from being chemically mixed across the fault, but permitted some mixing in the middle water-bearing unit.

Evaluating natural well yields for the feasibility of artificial recharge is an interesting technique used in the Aberdeen area, South Dakota as preliminary assessment for artificial recharge of the Elm and Middle James aquifers (Emmons, 1987). The potential artificial recharge of the Elm and Middle James aquifers was estimated for water spreading, not for injection, with infiltration rates in the study area estimated to range from 1.3 to 4.3 ft/day. The aquifers are unconsolidated beds of sand and gravel, with the Pierre Shale and Niobrara Formations considered to be confining beds because of the overall low yield from their wells. An

estimated potential well yield of about 200 GPM would be obtained from an aquifer 20 ft thick, 400 GPM where the aquifer thickness is 30 ft, and 750 GPM where the aquifer thickness is 40 ft. This model suggests that it may be possible to use the yields of domestic wells to predict feasibility of sub-surface water storage.

Ghayoumian et al. (2007) defined suitable areas for artificial groundwater recharge in a coastal aquifer in southern Iran by using Geographic Information System (GIS) techniques. They made thematic maps to represent land-use, slope, infiltration rate, and the thickness and other characteristics of unconsolidated alluvial deposits. Satellite data were utilized to make maps of current land-use and geomorphology. Similarly, Elewa et al. (2010) determined priority areas for the Nubian Sandstone ASR project in the Darb el-Arbain area, Western Desert, Egypt by using GIS and remote sensing. The decisive parameters that were used to build the geospatial model are depth to groundwater, hydraulic conductivity, groundwater salinity, and sodium adsorption ratio.

Parameters for assessing the feasibility of artificial recharge are not restricted to surface investigations, but can include subsurface characterization. Al-Amoush et al. (2012) used ten vertical electrical resistivity soundings to investigate subsurface hydrogeological conditions to a depth of about 100 m, in Wadi Al-Butum, Jordan for groundwater artificial recharge purposes. Geoelectrical data showed the existence of a potential layer of near-surface alluvial deposits to store and recharge the shallow limestone aquifer. Equally important, saturation of the rock with water, along with hydrochemical interactions, indicates an overall enhancement of the original groundwater quality could be expected.

Awareness of the side effects of the injecting water chemistry on the native water is required for ASR. Hydrogeochemical patterns, processes, and mass transfers during aquifer

storage and recovery were discussed by Antoniou et al. (2012) for an anoxic sandy aquifer in Herten, the Netherlands. From 2000 to 2009, monitoring wells were located at 0.1, 8 and 25 meters from ASR wells in order to observe the changes in the oxic drinking water which was injected in 14 ASR cycles. The anoxic conditions during storage caused increasing concentrations of Fe^{2+} , Mn^{2+} , and NH_4 during the recovery phase. Calcite and pyrite leached more in an upper coarse sand layer, but not in a fine sand layer on the bottom. Furthermore, a mass balance approach demonstrated that Mn-siderite in the lower fine sand layer was probably responsible for Mn^{2+} exceeding the drinking water standard (0.9 micromol/L) in the recovered water. These chemical circumstances impeded smooth ASR operation, increased costs of water treatment, and led to a decision to not pursue ASR in this aquifer.

Pyne (2005) has discussed the main aspects of ASR applications, such as development, design of ASR systems, technical and non-technical issues, geochemistry, alternative ASR applications, previous work in the U.S. and internationally, as well as the future direction of ASR. So Pyne's book is a significant resource for ASR background literature and understanding what has been done. Artificial recharge has been used in at least 26 countries worldwide, and at least 32 states in the U.S; to enumerate, Colorado had 19 active ASR operations in 2004, including the South Platte River Valley, San Luis Valley, and the Denver Basin operations (Topper, 2004).

Chapter 4

Methods

Data have been collected from the AquaMap database of water wells maintained by the Colorado Division of Water Resources. A total of 1094 AquaMap reports were found for wells in Larimer County in stratigraphic units above the Fountain Formation. The Fountain Formation is the subject of a separate study, so is not included here. The AquaMap well reports have been mined for data on depth (ft), pumping level (ft), static water level (ft), lithology, location (Township and Range system, now converted to UTM), date, and yield (gallons per minute or GPM). In some of the reports data on these characteristics are clearly presented, but a few have missing data and some others are not clear about the geologic formation into which the well was drilled. Not all the reports give formation names, and the lithology section may lack detail and give only sparse, hand-written descriptive information (e.g. Figs. 4.1, 4.2, and 4.3). To identify the likely producing formation for a given well, geological maps of the area were used, along with the given depth and the lithologic description. There is additional uncertainty for some wells related to the geographic position of the well. According to the AquaMap website, some well reports record the exact location of the well to within 200 ft, but others do not. By default, wells with uncertain locations have been plotted in the center of the quarter-quarter, quarter, or section, depending on the information available for the well. Especially for older wells, the distances from section lines are frequently inaccurate and do not plot the well on the property where the well is actually located. For wells where AquaMap does not record the stratigraphic unit hosting the well, uncertainty in either the thicknesses of geologic units or in the geographic positions of wells may have resulted in errors in identifying the host unit.

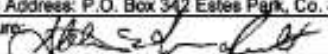
FORM NO. GWS-31 04/2005	WELL CONSTRUCTION AND TEST REPORT				For <input type="checkbox"/> Use Only	
STATE OF COLORADO, OFFICE OF THE STATE ENGINEER 1313 Sherman St., Room 818, Denver, CO 80203 Phone - Info (303) 866-3587 Main (303) 866-3581 Fax (303) 869-3589 http://www.water.state.co.us						
1. WELL PERMIT NUMBER: 295914						
2. WELL OWNER INFORMATION						
NAME OF WELL OWNER: DENNIS W ACOTT						
MAILING ADDRESS: P.O. BOX 2045						
CITY: FT COLLINS,		STATE: CO		ZIP CODE: 80522		
TELEPHONE NUMBER: () -						
3. WELL LOCATION AS DRILLED: NE1/4, NE1/4, Sec. 7, Twp. 8 <input checked="" type="checkbox"/> N or <input type="checkbox"/> S, Range 89 <input type="checkbox"/> E or <input checked="" type="checkbox"/> W						
DISTANCES FROM SEC. LINES: 1319 ft. from <input checked="" type="checkbox"/> N or <input type="checkbox"/> S section line and 497 ft. from <input checked="" type="checkbox"/> E or <input type="checkbox"/> W section line.						
SUBDIVISION: _____, LOT _____, BLOCK _____, FILING (UNIT) _____						
Optional GPS Location: GPS Unit must use the following settings: Format must be UTM, Units must be meters, Datum must be NAD83, Unit must be set to true N, <input type="checkbox"/> Zone 12 or <input checked="" type="checkbox"/> Zone 13						
STREET ADDRESS AT WELL LOCATION: _____						
DRILLING METHOD Air Percussion						
4. GROUND SURFACE ELEVATION _____ feet			DATE COMPLETED 7/24/15			
TOTAL DEPTH 100			DEPTH COMPLETED 80		feet	
5. GEOLOGIC LOG:						
Depth	Type	Grain Size	Color	Water Loc.	6. HOLE DIAM (in.)	From (ft) To (ft)
0-11	Sandstones conglomerate	crss	red/pnk		10 6.5	0 41 300
11-65	Sandstone	fine	buff		7. PLAIN CASING:	
65-189	Sandstone	fine	red		OD (in)	Kind
189-204	Sandstone	fine	Pnk		7.0	steel
204-246	Sandstone	fine	gray/pnk		4.5	PVC
246-259	Sandstone	fine	gray	XX	237	237
259-300	Sandstone	fine	red/pnk		5	240
PERFORATED CASING: Screen Slot Size (in): .032						
4.5 PVC 237 240 300						
The testing of production of water from this well, as reflected by this report, is totally dependent upon conditions existing as of the date of testing and does not reflect any projection as to future production. This is dependent on future conditions.						
8. FILTER PACK: Material N/A						
9. PACKER PLACEMENT: Type N/A						
10. GROUTING RECORD						
Material Amount Density Interval Placement						
Spec 16Bgs 15.5 0-41 Mixed						
Mix _____ Prd _____						
Cement _____ Vib _____						
Remarks: _____						
11. DISINFECTION: Type Dry HTH Amt. Used 3.5 Cups						
12. WELL TEST DATA. <input type="checkbox"/> Check box if Test Data is submitted on Form Number GWS 39 Supplemental Well Test.						
TESTING METHOD Air Lift						
Static Level Flows _____ ft. Date/Time measured: 7/24/15 Production Rate 60 gpm.						
Pumping Level 300 ft. Date/Time measured 7/24/15 Test Length (hrs) 2.						
Remarks: Flow is controlled by valve installed @ well head						
13. I have read the statements made herein and know the contents thereof, and they are true to my knowledge. This document is signed and certified in accordance with Rule 17.4 of the Water Well Construction Rules, 2 CCR 402-2. [The filing of a document that contains false statements is a violation of section 37-91-108(1)(e), C.R.S., and is punishable by fines up to \$5000 and/or revocation of the contracting license.]						
Company Name: Ingram Drilling, Inc.			Phone: (970)586-4542		License Number: 1099	
Mailing Address: P.O. Box 342 Estes Park, Co. 80517						
Signature: 			Print Name and Title: Stephen E. Ingram Pres.		Date: 8/11/2015	

Figure 4.1. An example well report for a well drilled into an unspecified sandstone.


FORM NO. GWS-31 10/94		WELL CONSTRUCTION AND TEST REPORT STATE OF COLORADO, OFFICE OF THE STATE ENGINEER		For Office Use only	
1. WELL PERMIT NUMBER <u>208573</u>				REC-114 JUL 07 1998 STATE ENGINEER	
2. OWNER NAME(S) <u>Glenn L. & Diane E. Husman</u> Mailing Address <u>4599 N. Broadway</u> City, St. Zip <u>Boulder, CO 80304</u> Phone (970) <u>532-5602</u>					
3. WELL LOCATION AS DRILLED: <u>NW 1/4 SE 1/4, Sec. 15 Twp. 4 N Range 70 W</u> DISTANCES FROM SEC. LINES: <u>2500</u> ft. from <u>South</u> Sec. line and <u>2140</u> ft. from <u>East</u> Sec. line. OR <small>(east or west)</small> SUBDIVISION: <u>Tract of land</u> LOT _____ BLOCK _____ FILING(UNIT) _____ STREET ADDRESS AT WELL LOCATION: <u>Unknown</u>					
4. GROUND SURFACE ELEVATION <u>Unknown</u> ft. DRILLING METHOD <u>Air percussion</u> DATE COMPLETED <u>6/25/98</u> TOTAL DEPTH <u>700</u> ft. DEPTH COMPLETED <u>700</u> ft.					
5. GEOLOGIC LOG: Depth Description of Material (Type, Size, Color, Water Location) <u>0 - 3 Brown clay & boulders</u> <u>3 - 13 Grey, red & brown sandstone</u> <u>13 - 470 Morrison</u> <u>470 - 700 Lykins</u>		6. HOLE DIAM. (in.) From (ft) To (ft) <u>9</u> <u>0</u> <u>20</u> <u>6 1/8</u> <u>20</u> <u>700</u>			
20 GPM @ 645'-675'		7. PLAIN CASING OD (in) Kind Wall Size From(ft) To(ft) <u>SEE ATTACHED SHEET</u>			
The testing of production of water from this well, as reflected by this report, is totally dependent upon conditions existing as of the date of testing and does not reflect any projection as to future production. This is dependent upon future conditions.		PERF. CASING: Screen Slot Size: _____			
REMARKS: _____		8. FILTER PACK: Material <u>--</u> Size _____ Interval _____		9. PACKER PLACEMENT: Type <u>--</u> Depth _____	
		10. GROUTING RECORD: Material Amount Density Interval Placement <u>Cement/Bentonite</u> <u>2.64 cu.ft. 14.5# 6'-19' poured</u>			
11. DISINFECTION: Type <u>Clorox</u> Amt. Used <u>3 gallons</u>					
12. WELL TEST DATA: <input type="checkbox"/> Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test. TESTING METHOD <u>Air</u> Static Level <u>333</u> ft. Date/Time measured <u>6/25/98 9:00am</u> Production Rate <u>20</u> gpm. Pumping level <u>700</u> ft. Date/Time measured <u>6/24/98 2:45pm</u> Test length (hrs) <u>1</u> Remarks <u>--</u>					
13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. [Pursuant to Section 24-4-104 (13)(a) C.R.S. the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.]					
CONTRACTOR <u>Ground Water Systems Drilling, LLC</u> Phone <u>(303) 443-4395</u> Lic. No. <u>716</u> Mailing Address <u>4599 N. Broadway Boulder, CO 80304</u>					
Name/Title (Please type or print) <u>Richard R. Wilson, Gen. Mgr.</u>		Signature 		Date <u>6/29/98</u>	

Figure 4.2. An example well report for a well drilled into the Lykins Formation.

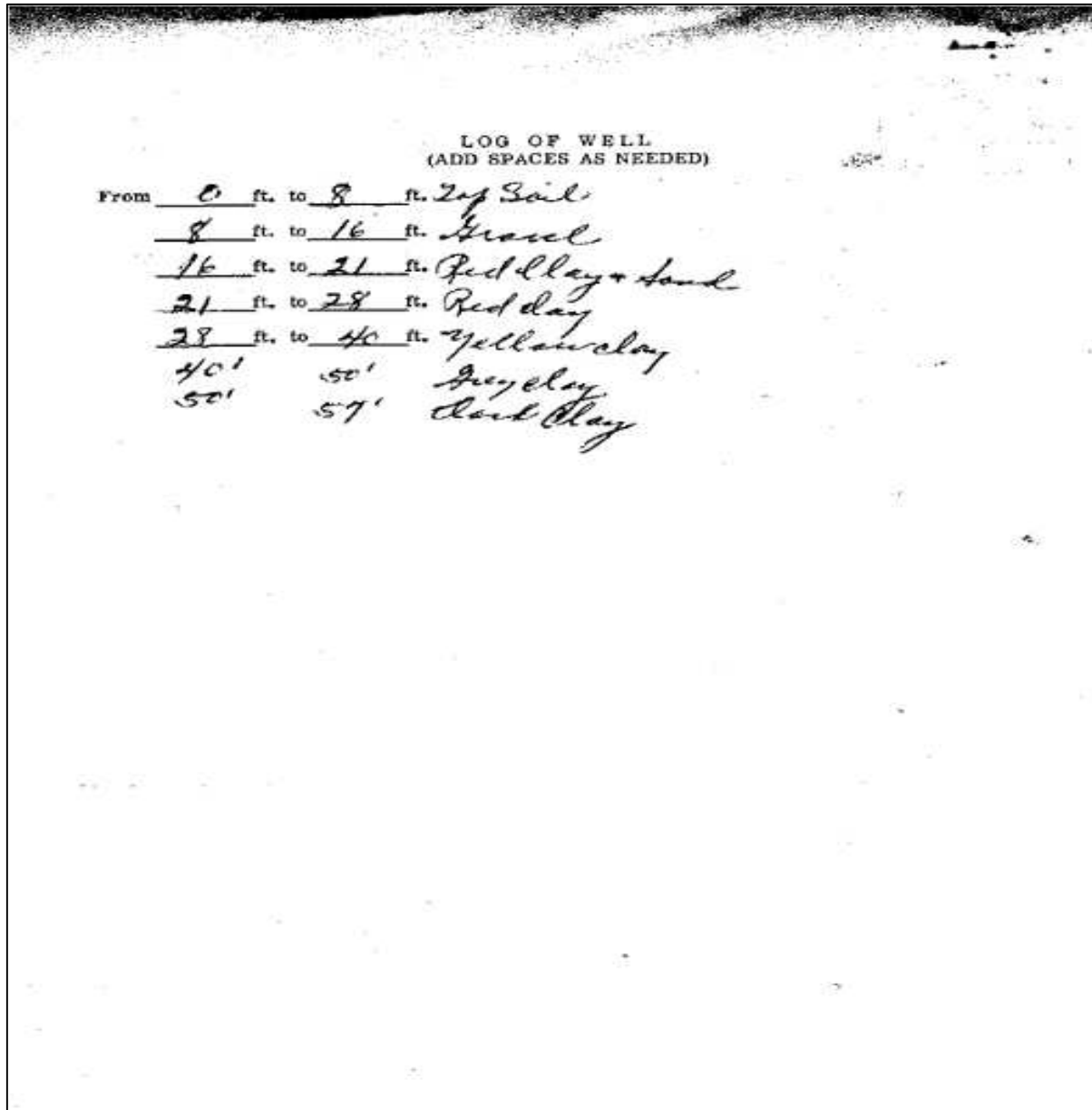


Figure 4.3. An example well report for a well drilled into alluvium.

Data were compiled in Excel and used to calculate specific capacity values and for mapping of yield, static water level, and specific capacity. The static water level is the distance between the surface and the location of the sub-surface water when the well was drilled. These data form the basis for judging whether the formations studied have good potential for aquifer storage and recovery. Specific capacities were calculated by the following equation:

$$\text{Specific capacity } Q/S = Q \text{ (GPM)} / S \text{ (ft)}$$

Where:

Q is the yield of the well.

S is the drawdown, which is the static water level minus the pumping level.

The wells with zero drawdown were excluded from the calculation.

The specific capacity values derived from the yield and drawdown data may be lower than actual specific capacities because of using short time spans to measure drawdown; test time spans may be 60 minutes and less.

To evaluate targets for ASR, both by stratigraphic unit and by geographic area, a series of maps was prepared. Data points corresponding to well locations were plotted and contoured using ArcGIS on geological maps from the US Geological Survey to generate maps of yield, static water level, and specific capacity for each stratigraphic unit considered. The data on these maps have been contoured, but the validity of the contours is limited by the distribution of the well data mainly along a south-north trend with very limited east-west geographic range for wells in a given stratigraphic unit. ArcGIS used for contouring generalized the last well located in the east, west, north, or south so that the contour maps are each displayed as a shaded rectangle. To further assess geographic variability, additional maps of yield and well depth were prepared for the Table Mountain, Livermore, Laporte, Horsetooth, Masonville, and Carter Lake Reservoir quadrangles, as well as for the eastern edge of Larimer County. On each of these maps, all stratigraphic units for which there are AquaMap well reports are included.

Reconnaissance level inspection and photography of some outcrops near Horsetooth reservoir and to the south was conducted to aid in understanding of the stratigraphic units and their heterogeneity.

Finally, the permeabilities cited in Chapter 2 were converted from millidarcies to ft/day to reflect the hydraulic conductivity. The conversion was based on the following:

Calculating hydraulic conductivity (K) in m/s from permeability (k) in m^2 :

$$K = (9.77 \times 10^6 \text{ m}^{-1}\text{s}^{-1}) \times k$$

Where k has the units of m^2

$$1 \text{ m}^2 = 1 \times 10^{12} \text{ darcy} \quad 1 \text{ darcy} = 1000 \text{ millidarcy}$$

This will give K in m/s, which can be converted to ft/day

This hydraulic conductivity is valid assuming water is at 20° C with a viscosity of $1.0 \times 10^{-3} \text{ Pa s}$ and density of 1000 kg/m^3 .

Chapter 5

Results

This chapter presents hydrogeologic data for wells in eastern Larimer County, Colorado for all stratigraphic units younger than the Pennsylvanian-Permian Fountain Formation. The data are summarized in tabular form and then displayed spatially on maps, first by stratigraphic unit, from oldest to youngest, and then by geographic area, organized north to south by quadrangle. The data reported here for each unit include well count, yield, and static water level, all harvested from AquaMap, followed by the calculated specific capacity.

Hydrogeologic Data Summary

The data summarized here (Table. 5.1), show the total number of wells, average, and standard deviation of the yield, static water level, and specific capacity of the individual stratigraphic units for which AquaMap has well data. By stratigraphic unit, average yields range from about 5 gallons per minute (GPM) or less in the Benton Shale Formation and in the Hygiene Sandstone member of the Pierre Shale Formation to 335 GPM in unconsolidated alluvium. Among the lithified units, the highest average yields are 96 GPM and 162 GPM in the Laramie and White River Formations, respectively. Several additional units, the Fox Hills Formation, Richards Sandstone Member of the Pierre Shale Formation, the Carlile-Graneros-Mowry Shales, the South Platte Formation, the Lytle Formation, and the Ingleside Formation, have average yields between 15 and 40 GPM. The standard deviation of well yields indicate yield is highly variable in all units showing intermediate and high average yields.

The average static water level ranges from 16 ft in unconsolidated alluvium to 140 ft in the North Park Formation, with the shallowest average static water level in a lithified unit being 21 ft in the Richards Sandstone Member. The White River Formation, Fox Hills Formation, Plainview Member, Morrison Formation, Lykins Formation, and Lyons Formation all have average static water levels deeper than 100 ft. In all other units, the average static water level is between 27 and 100 ft. The standard deviations of the static water levels indicate that static water level is highly variable in nearly all lithified units.

The average calculated specific capacity ranges from near zero in the Morrison Formation, Plainview Member, Hygiene Sandstone Member, and undifferentiated Niobrara Formation to 17 GAL/min/ft in the Laramie Formation, with 32 in unconsolidated alluvium, 6 in the White River Formation, and 2 in both the Fox Hills Formation and the Lytle Formation. All other units have average specific capacities of 1 or less. The units with average specific capacity values at 2 or higher all show a large degree of variability in the specific capacity demonstrated by their large standard deviations.

Table 5.1. The number of wells, average, and standard deviation of the yield, static water level, and specific capacity of the stratigraphic units in stratigraphic order, youngest to oldest.

Formations	Yield (GPM)			Static Water Level (ft)			Specific Capacity (GAL/min/ft)		
	# of Wells	Average	Standard Deviation	# of Wells	Average	Standard Deviation	# of Wells	Average	Standard Deviation
Alluvium	367	335	520	351	16	13	361	33	69
North Park Formation	8	10	4	8	140	109	8	0.17	0.18
White River Formation	11	162	341	11	111	155	11	6	13
Laramie Formation	17	96	217	17	84	73	17	17	54
Fox Hills Formation	12	40	96	12	105	96	12	2	7
Pierre Shale Formation All wells	298	10	10	295	62	109	298	1	2
Pierre Shale -Undifferentiated	15	15	16	14	28	44	15	1	2
Pierre Shale-Upper Shale Member	143	9	9	142	76	120	141	1	2
Pierre Shale-Richards Sandstone	3	17	10	3	21	14	3	1	2
Pierre Shale-Middle Shale Member	120	10	8	118	55	108	120	1	2
Pierre Shale-Hygiene Sandstone	1	3	-	1	40	-	1	0.02	-
Pierre Shale-Lower Shale Member	16	12	10	16	27	23	16	1	1
Niobrara Formation All Wells	17	9	9	17	55	54	17	0.23	1
Niobrara Formation-Undifferentiated	5	7	5	5	53	44	5	0.03	0.02
Niobrara-Smoky Hill Member	9	9	12	9	53	66	9	0.38	1
Niobrara-Fort Hays Member	3	9	6	3	63	40	3	0.11	0.14
Carlile-Graneros-Mowry Shales	45	19	24	40	46	79	43	0.23	1
Benton Shale Formation	10	5	3	10	29	23	10	0.15	0.39
Dakota Group All Wells	59	19	28	58	82	85	59	1	3
Dakota-South Platte Formation-Undifferentiated	22	16	17	22	59	86	22	1	4
Dakota-Plainview Member of South Platte Formation	23	14	12	23	112	91	23	0.09	0.1
Dakota-Lytle Formation	13	32	52	12	67	59	13	2	3
Morrison Formation	35	13	17	34	127	130	35	0.09	0.11
Jelm Formation	25	27	43	24	58	52	25	0.4	1
Lykins Formation	99	13	13	98	109	126	96	0.28	1
Lyons Formation	38	12	10	37	114	108	38	0.15	0.25
Owl Canyon Formation	12	14	11	11	81	65	12	0.17	0.19
Ingleside Formation	35	25	50	35	97	76	35	1	3

Hydrogeologic Data by Stratigraphic Unit

The Ingleside Formation:

Well count and distribution: There are a total of 35 wells producing water from the Ingleside Formation along a north-south trend that lies roughly 10 miles west of Interstate Highway 25 (Fig. 5.1). Along this trend the distribution of wells is concentrated generally in four areas, midway between Laporte and the Wyoming border, north of Horsetooth Reservoir near Laporte, west of Loveland, and around Carter Lake Reservoir.

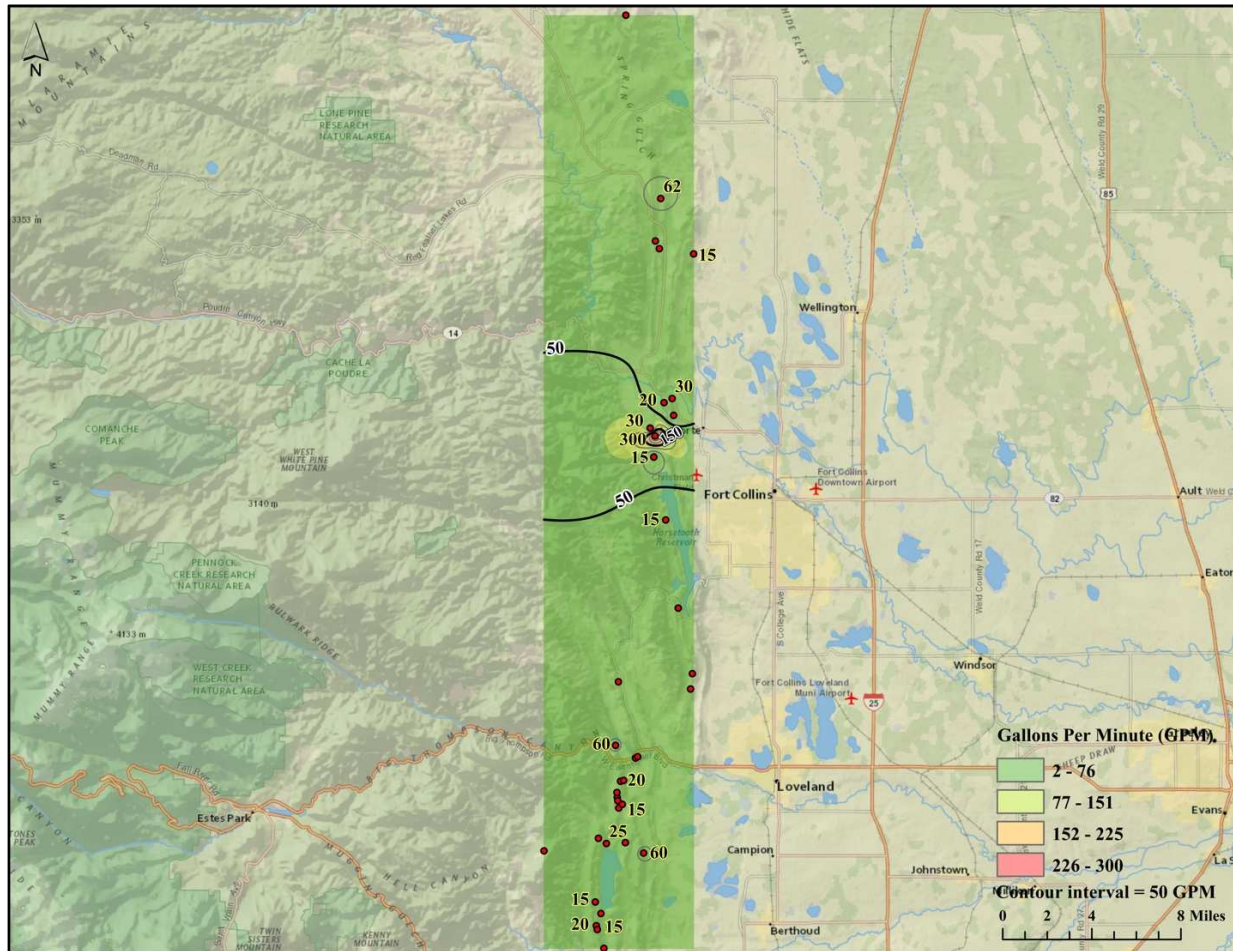


Figure 5.1. Yield (GPM) of 35 wells in the Ingleside Formation. Wells <15 GPM are not labeled.

Yield: The highest yield is 300 GPM from a well north of Horsetooth Reservoir (Fig. 5.1) and surrounded by wells mostly yielding 15 to 30 GPM. In the region midway between Laporte and the Wyoming border, yields range from 2 to 62 GPM. West of Loveland there are wells yielding 7 to 60 GPM. Near the north end of Carter Lake well yields are 3 to 60 GPM, and 10 to 20 GPM near the south end. None of the more isolated wells on the map exceeds 15 GPM.

Static Water Level: The static water level in Ingleside Formation wells (Fig. 5.2) ranges from 10 ft to 325 ft, with the deepest reading from an isolated well south of Horsetooth Reservoir. There is no clear-cut geographic pattern to the static water level measurements,

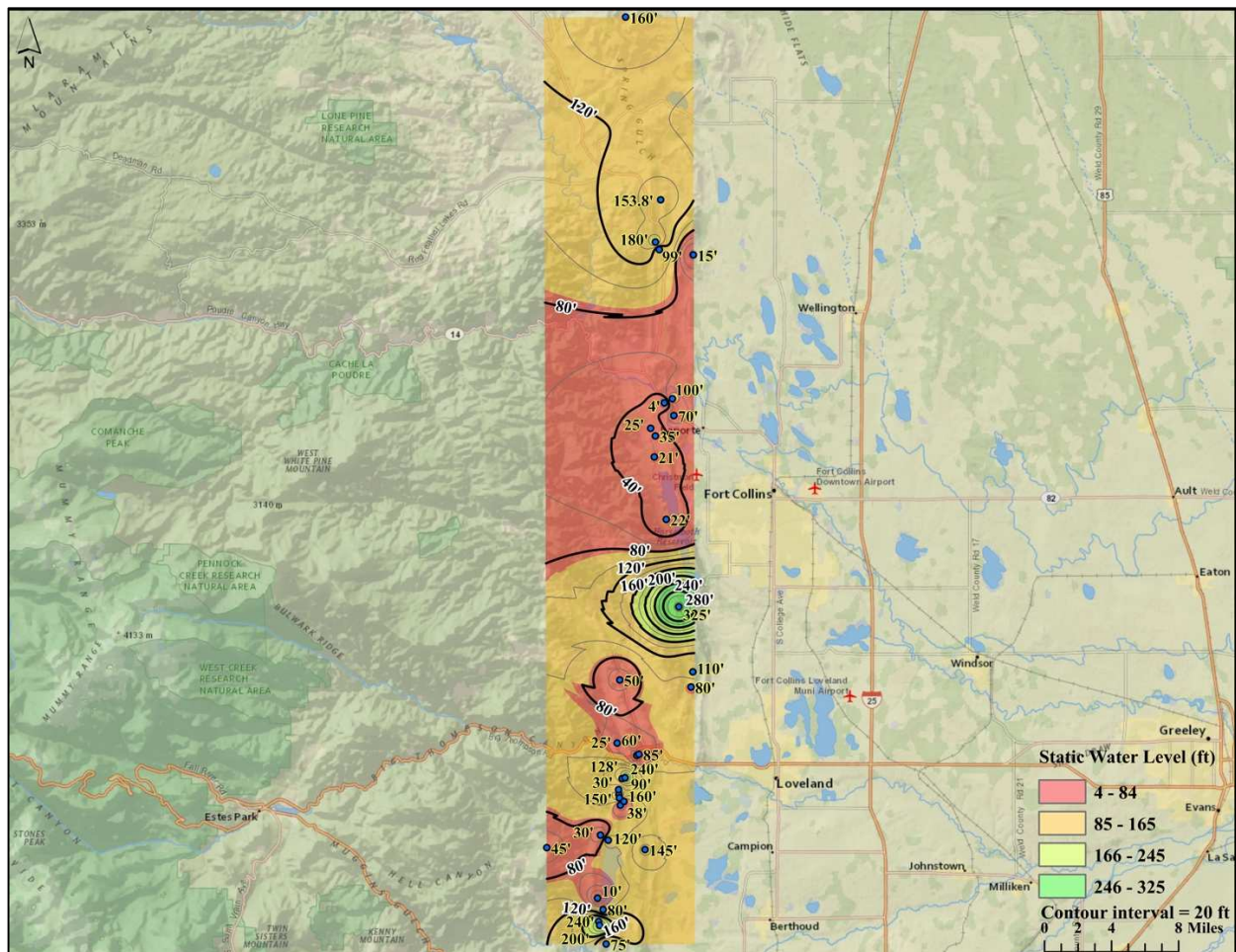


Figure 5.2. Static water level (ft) of Ingleside Formation wells.

although measurements from wells just north of Horsetooth Reservoir are generally shallower than the average for wells in other areas.

Specific Capacity: The highest specific capacity, for a well north of Horsetooth Reservoir yielding 300 GPM, is 16 GAL/min/ft (Fig. 5.3). Other specific capacity values from the cluster of wells just north of Horsetooth Reservoir include a well yielding 20 GPM that has a specific capacity of 2 GAL/min/ft and another yielding 30 GPM is at 1 GAL/min/ft. Northwest of Wellington and west of Loveland, there are two wells of 1 GAL/min/ft, yielding 62 GPM and 3 GPM. The rest of the Ingleside wells have specific capacities below 0.8 GAL/min/ft.

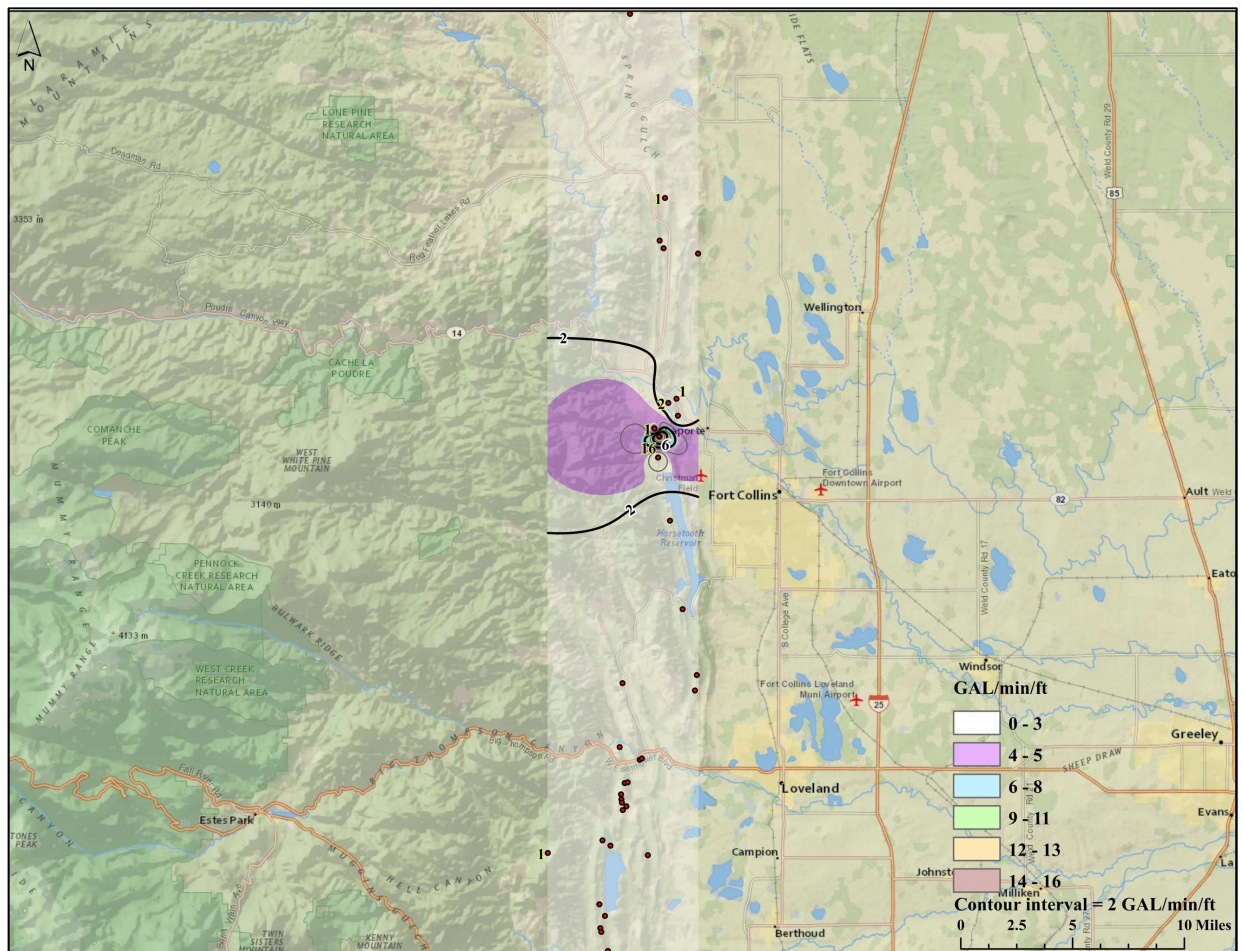


Figure 5.3. Specific capacity (GAL/min/ft) of Ingleside Formation wells. The wells at <1 GAL/min/ft are not labeled.

The Owl Canyon Formation:

Well count and distribution: There are 12 wells producing water from the Owl Canyon Formation, and these follow roughly the same north-south trend as the Ingleside Formation wells, although a majority are in the southern end of the mapped area and the central map area is barren (Fig. 5.4).

Yield: The highest well yields are 40 GPM near Owl Canyon in northern Larimer County, 25 GPM to the west-southwest of Berthoud, and 24 GPM north of Carter Lake. Wells yielding 15 GPM are located north of Horsetooth Reservoir and near Carter Lake (Fig. 5.4). The rest of the yields range from 2 to 10 GPM.

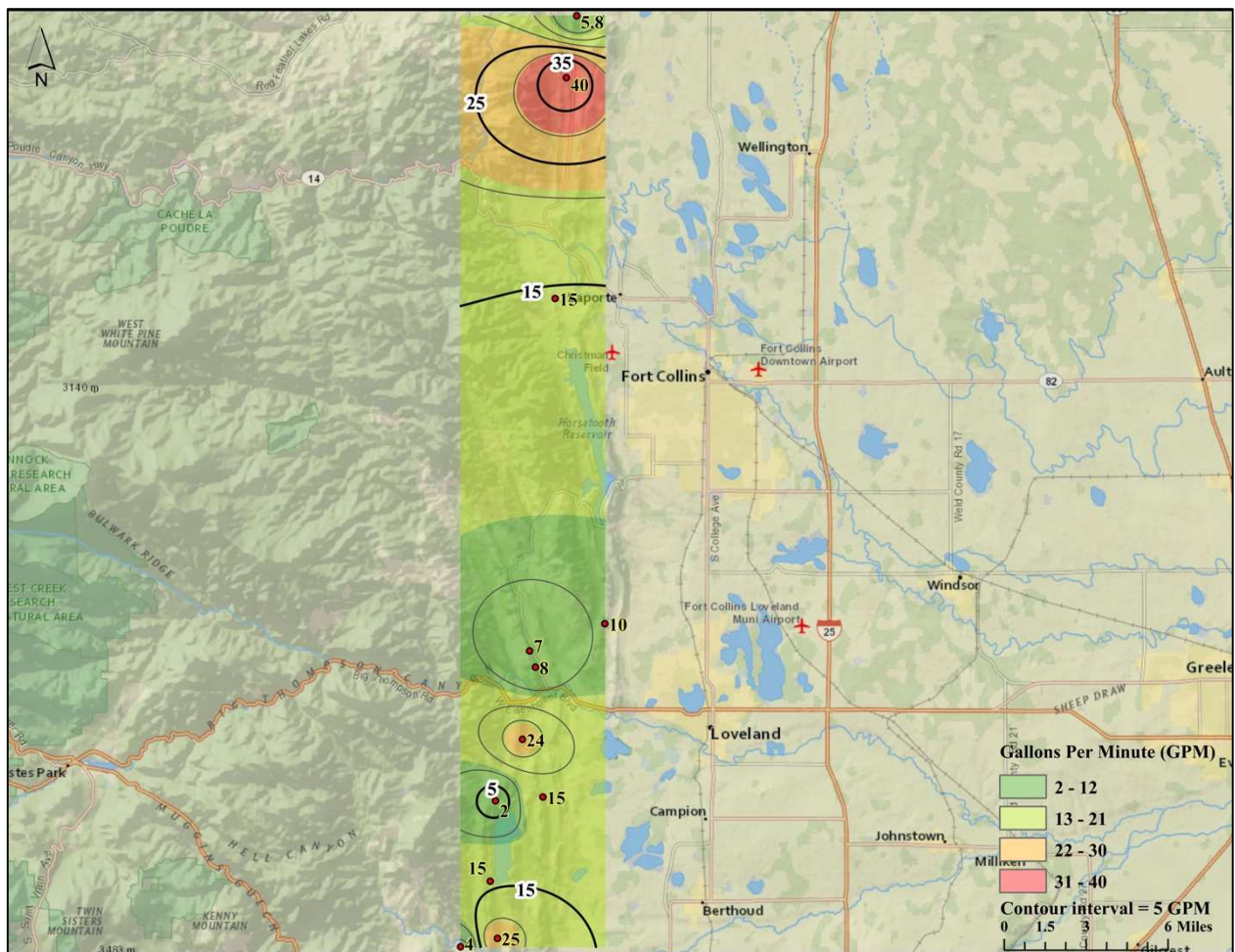


Figure 5.4. Yield (GPM) of the 12 wells in the Owl Canyon Formation.

Static Water Level: Static water levels for wells in the Owl Canyon Formation are deepest near the southern and northern ends of the study area, where levels for wells near Owl Canyon and Carter Lake range from 150 to 190 ft (Fig. 5.5). The shallowest static water level is 6 ft, northeast of Carter Lake. There is a flowing artesian well yielding 15 GPM southwest of Carter Lake Reservoir, which was not included in drawing the map contours (Fig. 5.5).

Specific Capacity: None of the 12 wells in the Owl Canyon Formation have specific capacities >1 GAL/min/ft, so these data have not been mapped. The highest specific capacity is 0.63 GAL/min/ft, for the well yielding 25 GPM south of Carter Lake Reservoir (Fig. 5.4).

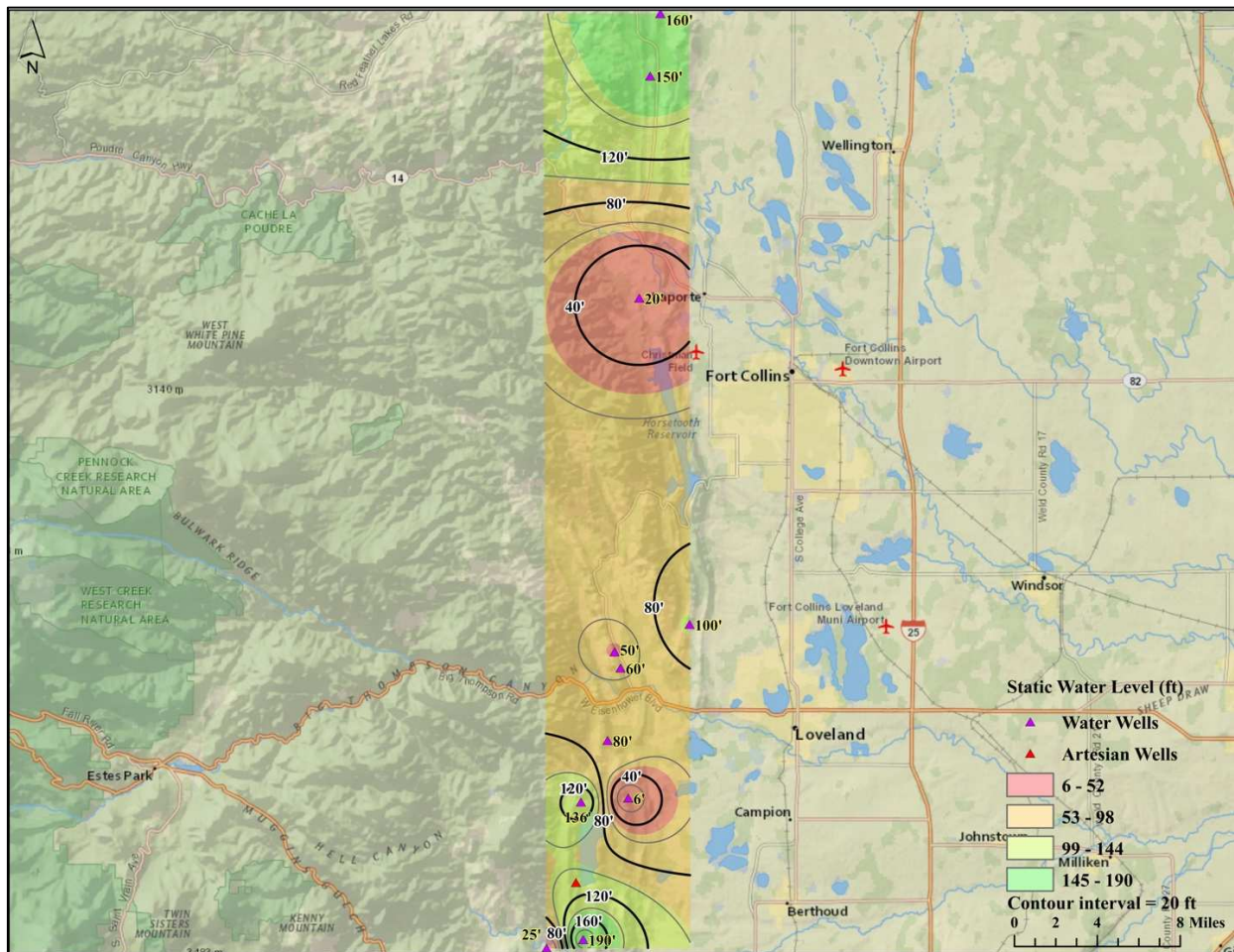


Figure 5.5. Static water level (ft) of Owl Canyon Formation wells. Note that one well is flowing artesian.

The Lyons Formation:

Well count and distribution: There are 38 wells producing water from the Lyons Formation, with over half in the southern end of the study area, particularly south of Carter Lake Reservoir, and the remainder dispersed along a roughly north-south trend (Fig. 5.6).

Yield: The highest two well yields in the Lyons Formation are 60 GPM south of Horsetooth and 35 GPM north of Laporte. There are two wells yielding 20 GPM northwest of Loveland and west of Berthoud, 6 wells yielding 15 GPM, and wells yielding <15 GPM scattered throughout the study area (Fig. 5.6).

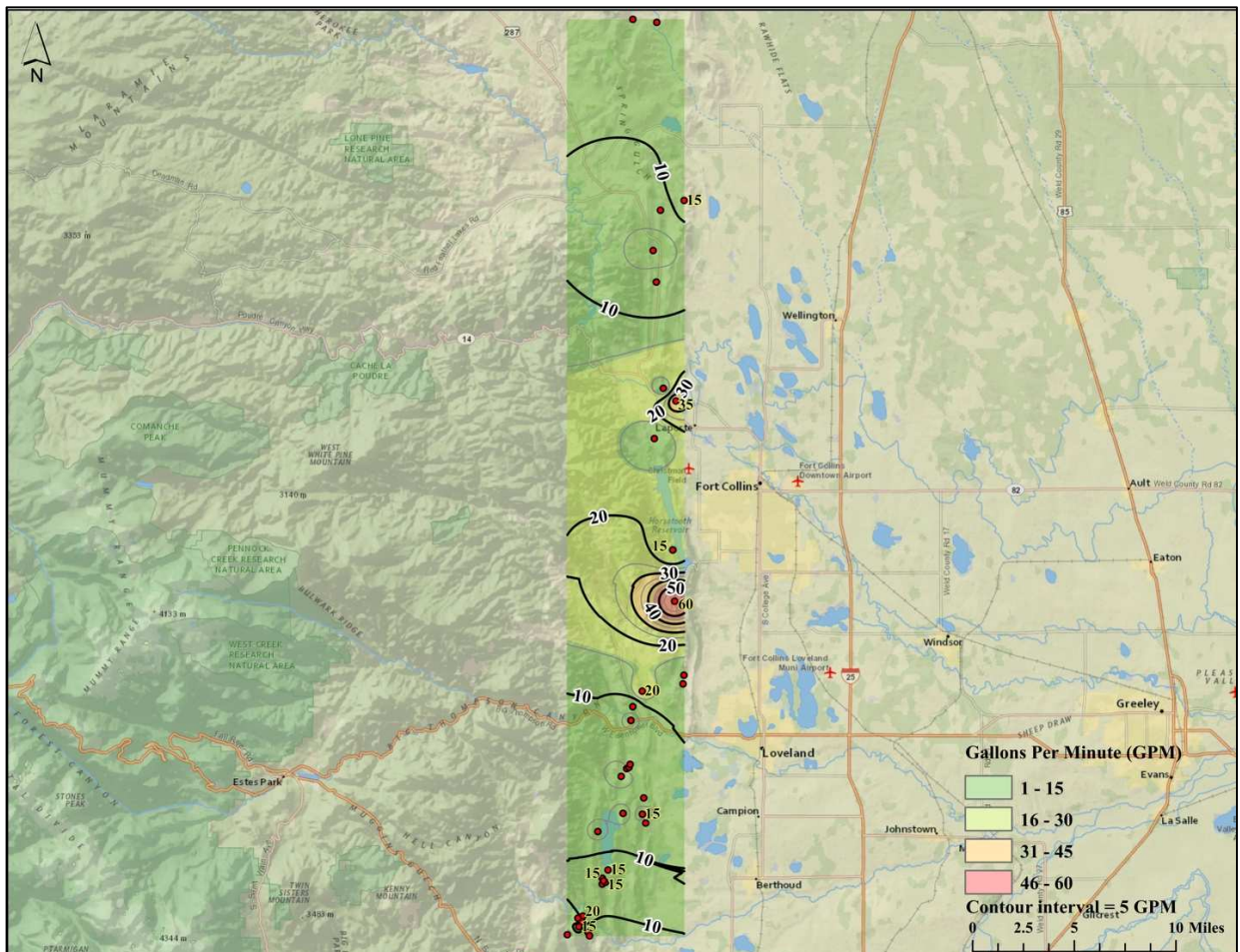


Figure 5.6. Yield (GPM) of the 38 wells in the Lyons Formation. The wells <15 GPM are not labeled.

Static Water Level: The deepest static water level reported in the Lyons Formation (Fig. 5.7) is 410 ft at the far southern end of the study area, and the shallowest is 10 ft in a well west of Loveland. There is a flowing artesian well yielding 60 GPM south of the Horsetooth Reservoir, which was not included in drawing the map contours.

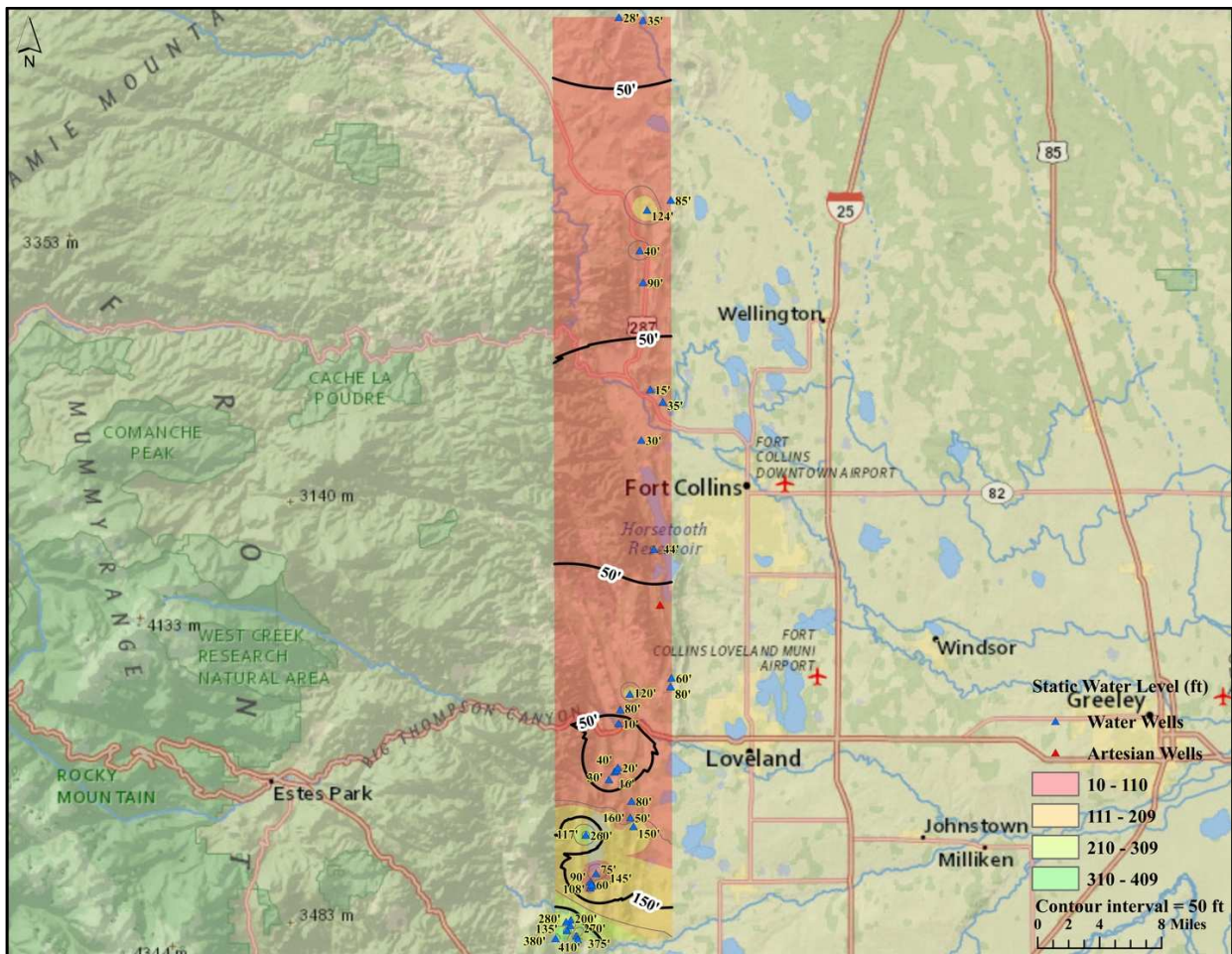


Figure 5.7. Static Water Level (ft) of Lyons Formation wells. Note that one well is flowing artesian.

Specific Capacity: Lyons Formation wells generally have low specific capacity values. One well yielding 15 GPM west of Horsetooth Reservoir is at 1 GAL/min/ft (Fig. 5.8), and another yielding 20 GPM is at 1 GAL/min/ft west of Berthoud. The rest of the wells are below 1 GAL/min/ft.

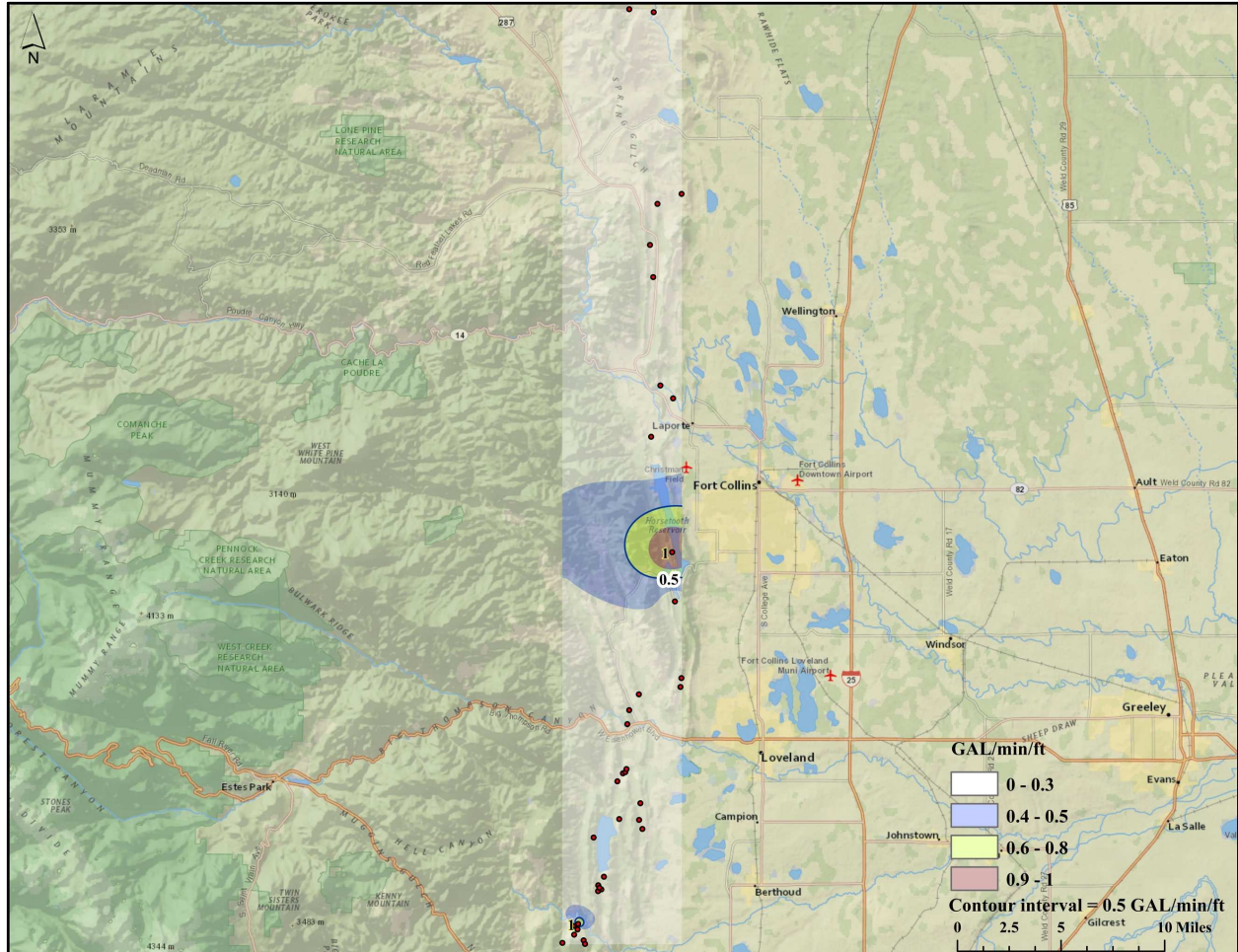


Figure 5.8. Specific capacity (GAL/min/ft) of the Lyons Formation wells. The wells <1 GAL/min/ft are not labeled.

The Lykins Formation:

Well count and distribution: There are 99 wells producing water from the Lykins Formation, with the distribution of the wells generally following a north-south trend (Fig. 5.9). This north-south trend steps a few miles to the west in the southern third of the study area. The density of wells is greater in the southern third of the study area than in the northern third.

Yield: The best yields in the Lykins Formation are 80 and 60 GPM from wells northwest of Loveland (Fig. 5.9). In the same area are wells yielding 17, 25, 35, 40, 50 GPM, and several at 15 GPM. Around Laporte are wells yielding 18, 30, 50, 75 GPM, and many yielding 15 GPM.

The area south of Horsetooth Reservoir hosts wells yielding 20 and 40 GPM. Around Carter Lake, there are wells yielding 15, 17, and 25 GPM. Several other wells scattered through these areas and most wells in the northern third of the study area yield less than 15 GPM, although one at the Wyoming border yields 15 GPM.

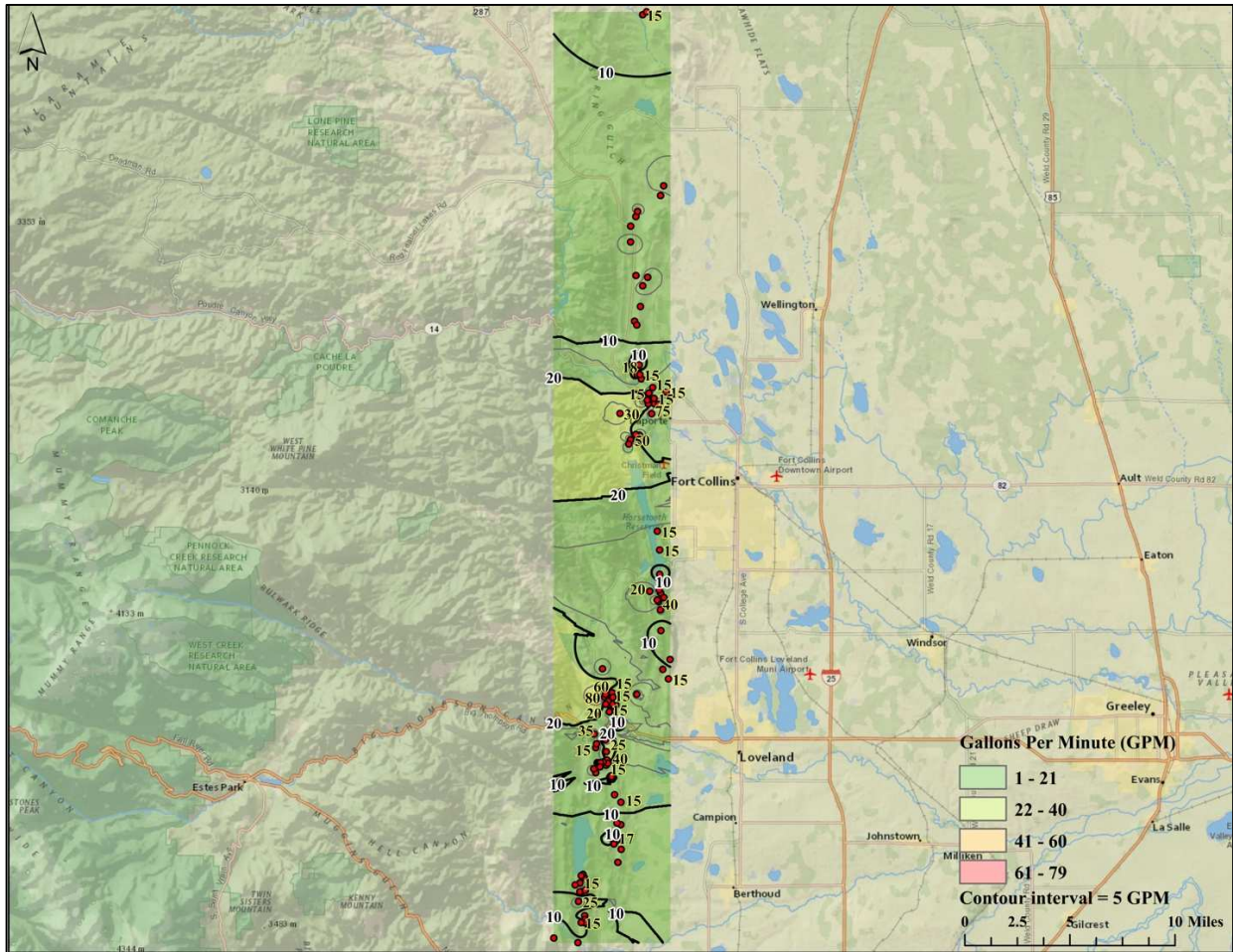


Figure 5.9. Yield (GPM) of 99 wells in the Lykins Formation. The wells <15 GPM are not labeled.

Static Water Level: The static water levels in Lykins Formation wells (Fig. 5.10), range from 1 to 599 ft, with the deepest levels in wells north of Laporte and west of Wellington. The shallowest static water levels are concentrated from the Laporte area to just north of Carter Lake. There is a flowing artesian well of 15 GPM west of Loveland, which was not included in drawing the map contours (Fig. 5.10).

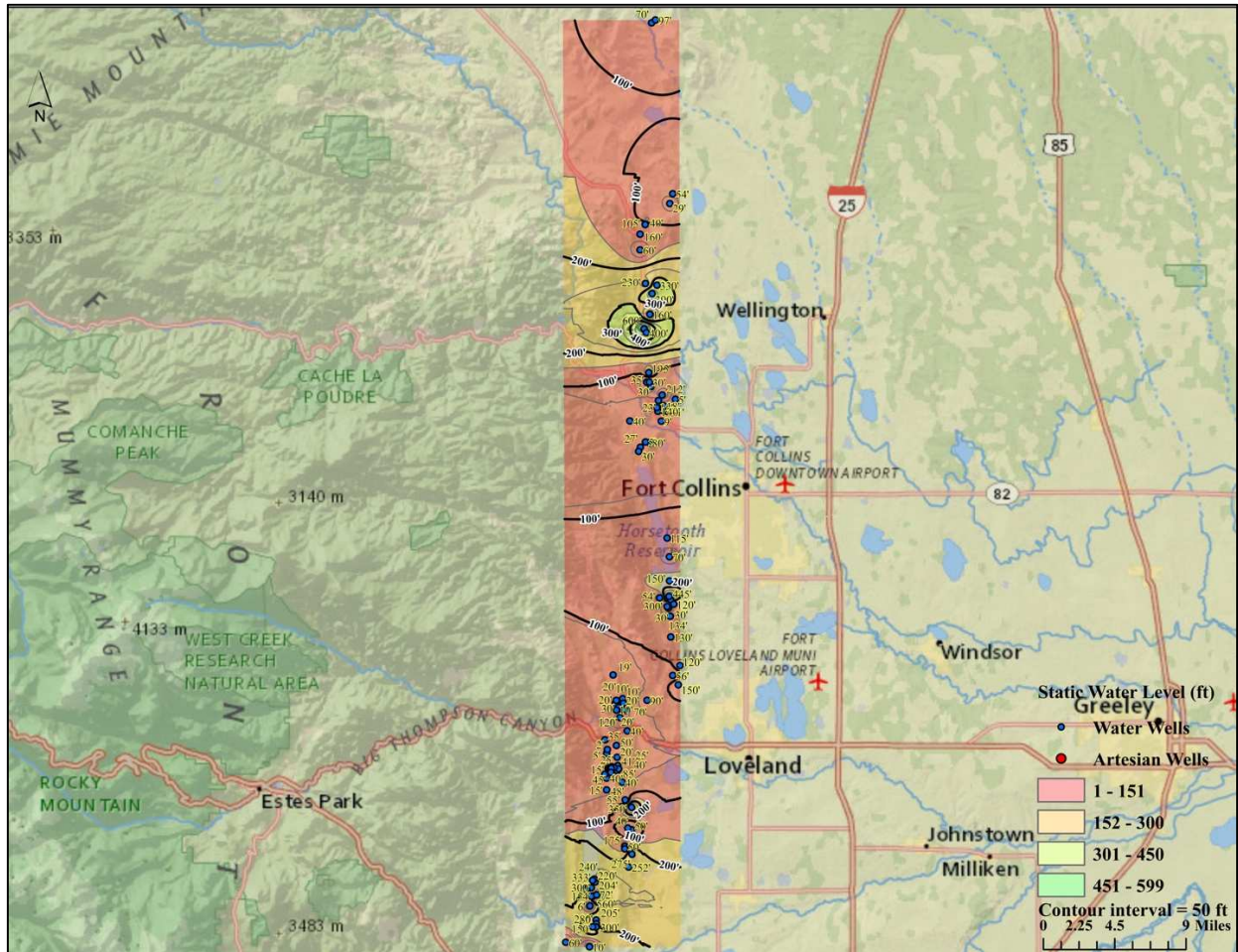


Figure 5.10. Static water level (ft) of Lykins Formation wells. Note that one well is flowing artesian.

Specific Capacity: The map of specific capacity in the Lykins Formation (Fig. 5.11) was made using 96 wells, with 3 wells omitted because the drawdown of these wells was recorded as zero. The highest values are 10 GAL/min/ft and 3 GAL/min/ft, from wells yielding 50 GPM and 12 GPM, respectively, north of the Horsetooth Reservoir (Fig. 5.11). Also, there is a well yielding 80 GPM with a specific capacity of 2 GAL/min/ft and two wells yielding 20 and 10 GPM with specific capacities of 1 GAL/min/ft, all west of Loveland. South of Horsetooth Reservoir, there is a specific capacity of 1 GAL/min/ft for a well yielding 20 GPM, and there are 4 wells with specific capacities of 1 GAL/min/ft and yielding 10, 18, 30, and 75 GPM scattered north of Horsetooth Reservoir. Wells from just north of Laporte to the Wyoming border and

from just south of Horsetooth Reservoir to the southern edge of the study area nearly all have specific capacities less than 1 GAL/min/ft.

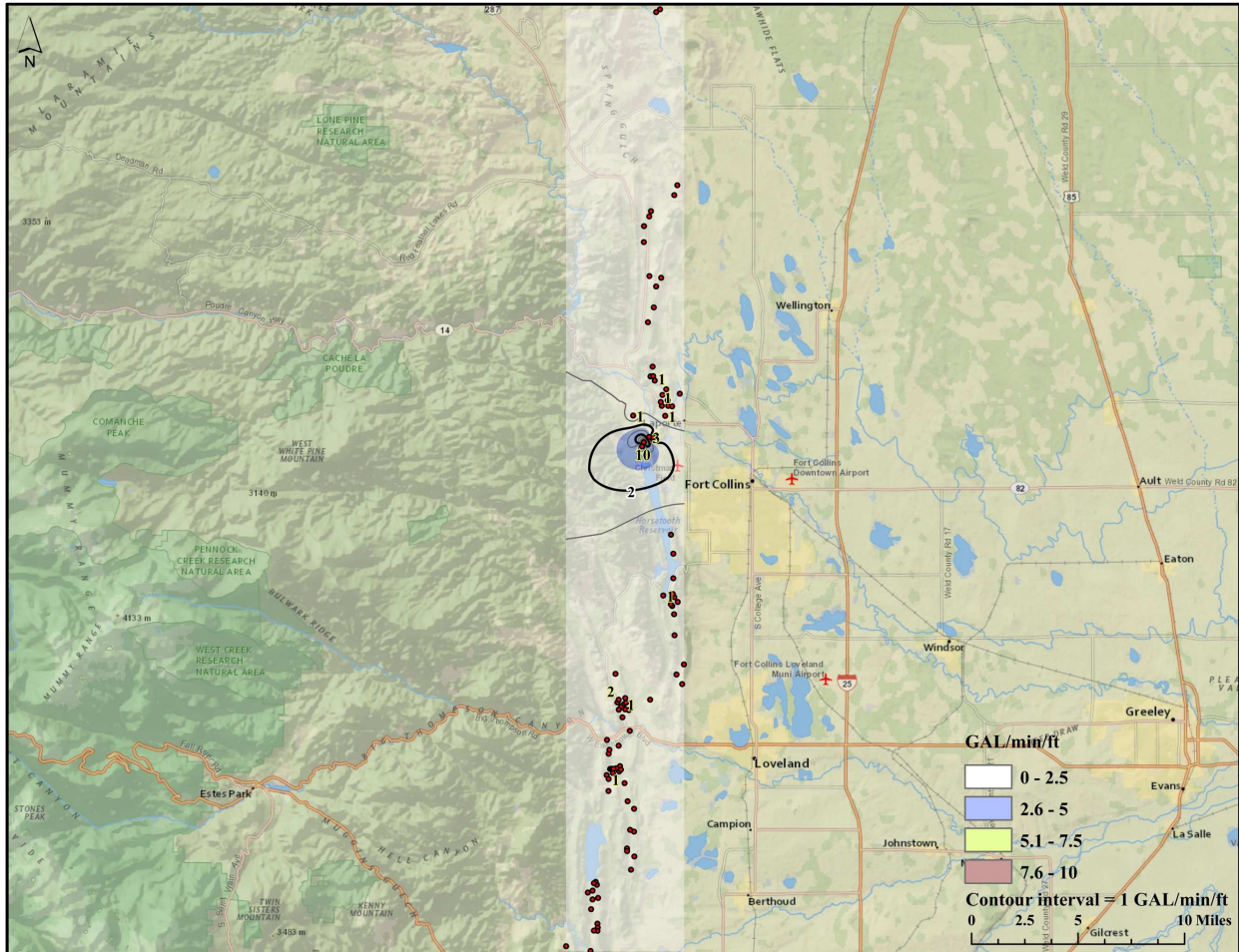


Figure 5.11. Specific capacity (GAL/min/ft) of Lykins Formation wells. Note that 3 wells were not included in drawing the map contours. Wells <1 GAL/min/ft are not labeled.

The Jelm Formation:

Well count and distribution: There are a total of 25 wells producing water from the Jelm Formation unevenly distributed along a north-south trend. Between the area just north of Laporte and the Wyoming border there is only one well, which is on the state line (Fig. 5.12).

Yield: The highest yields are 200 GPM north of Horsetooth Reservoir and 100 GPM southwest of Loveland (Fig. 5.12). The area west and northwest of Loveland hosts wells yielding 30 and 75 GPM, and several wells yielding 15 GPM. Also, there is a well yielding 15 GPM east

of Horsetooth Reservoir, and on the north side of Laporte are wells yielding 15, 40, and 47 GPM. Wells yielding less than 15 GPM are scattered throughout the study area. The tight contour lines south of Horsetooth Reservoir result from the presence of two wells, one yielding 30 GPM and one 200 GPM.

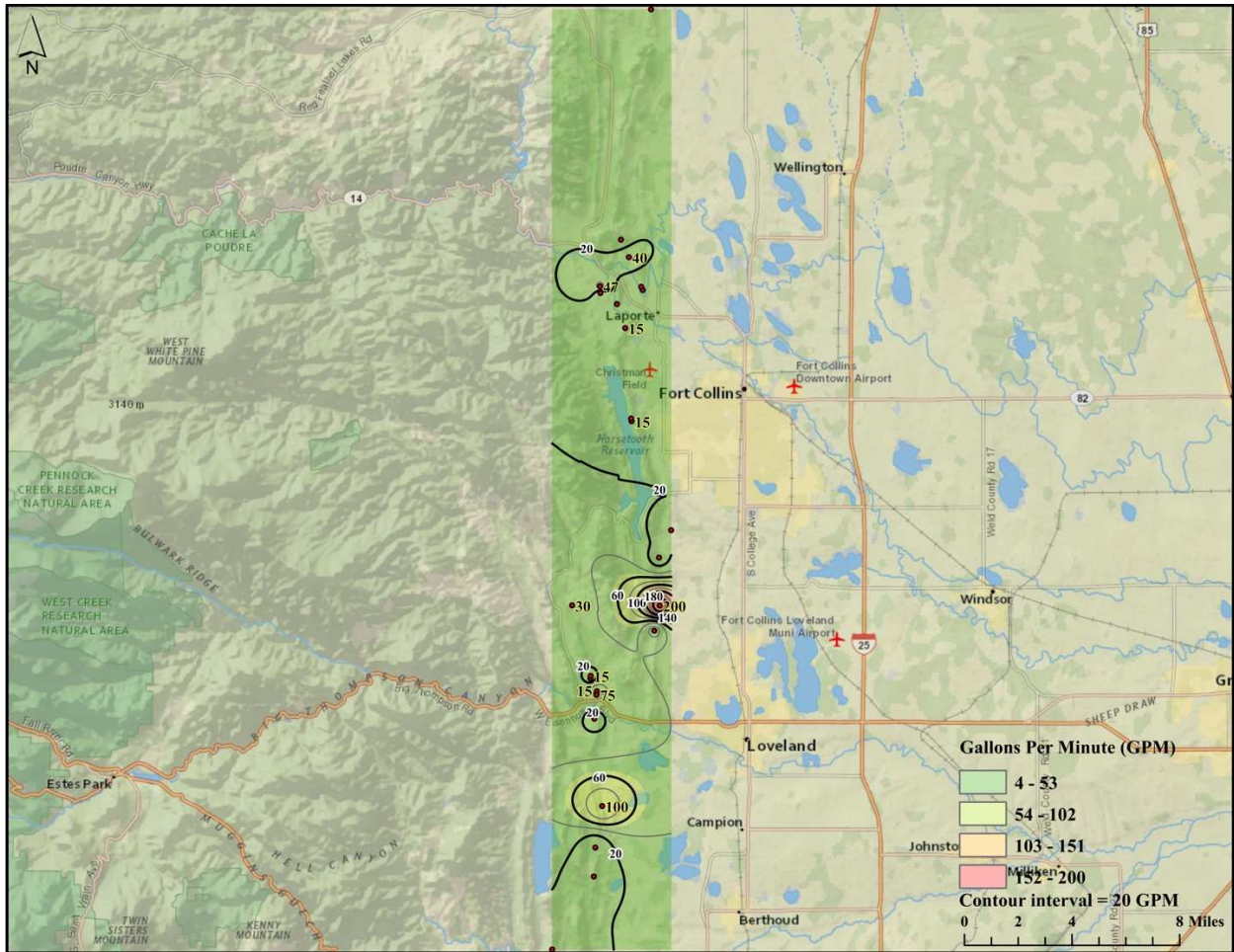


Figure 5.12. Yield (GPM) of the 25 wells in the Jelm Formation. Wells <15 GPM are not labeled.

Static Water Level: The deepest static water level for wells in the Jelm Formation is 201 ft northwest of Loveland (Fig. 5.13) and the shallowest is 3 ft in a well west of Loveland. There is a flowing artesian well yielding 100 GPM southwest of the Loveland that was not used in drawing the map contours (Fig. 5.13).

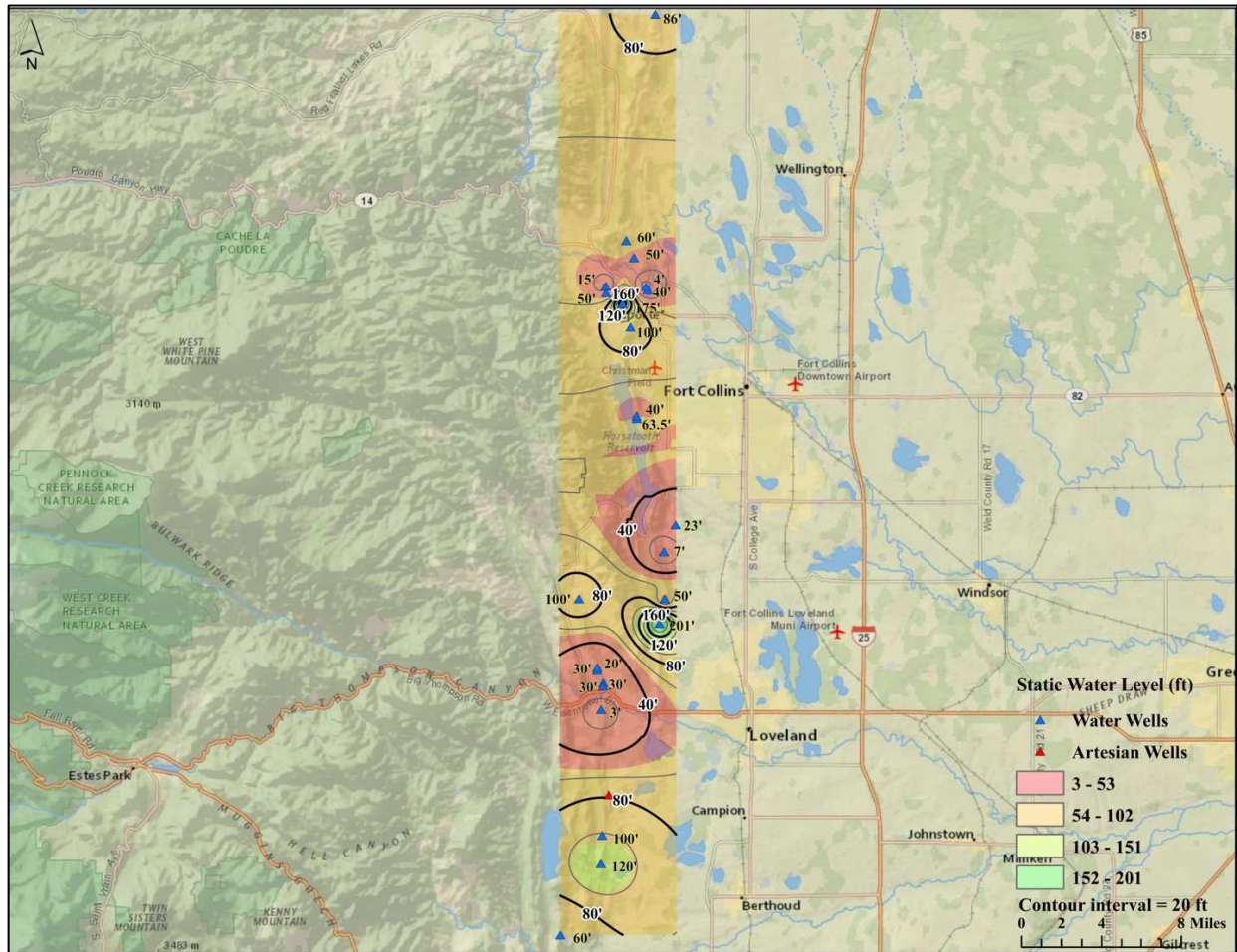


Figure 5.13 Static Water Level (ft) of Jelm Formation wells. Note that one well is artesian.

Specific Capacity: The highest specific capacities are 5 GAL/min/ft from a well yielding 47 GPM north of Laporte, 2 from a 15 GPM well east of the Horsetooth Reservoir, and 1 GAL/min/ft from a well yielding 200 GPM northwest of Loveland. The rest of the wells, including nearly all of the wells in the southern half of the study area, have specific capacities less than 1 GAL/min/ft (Fig. 5.14).

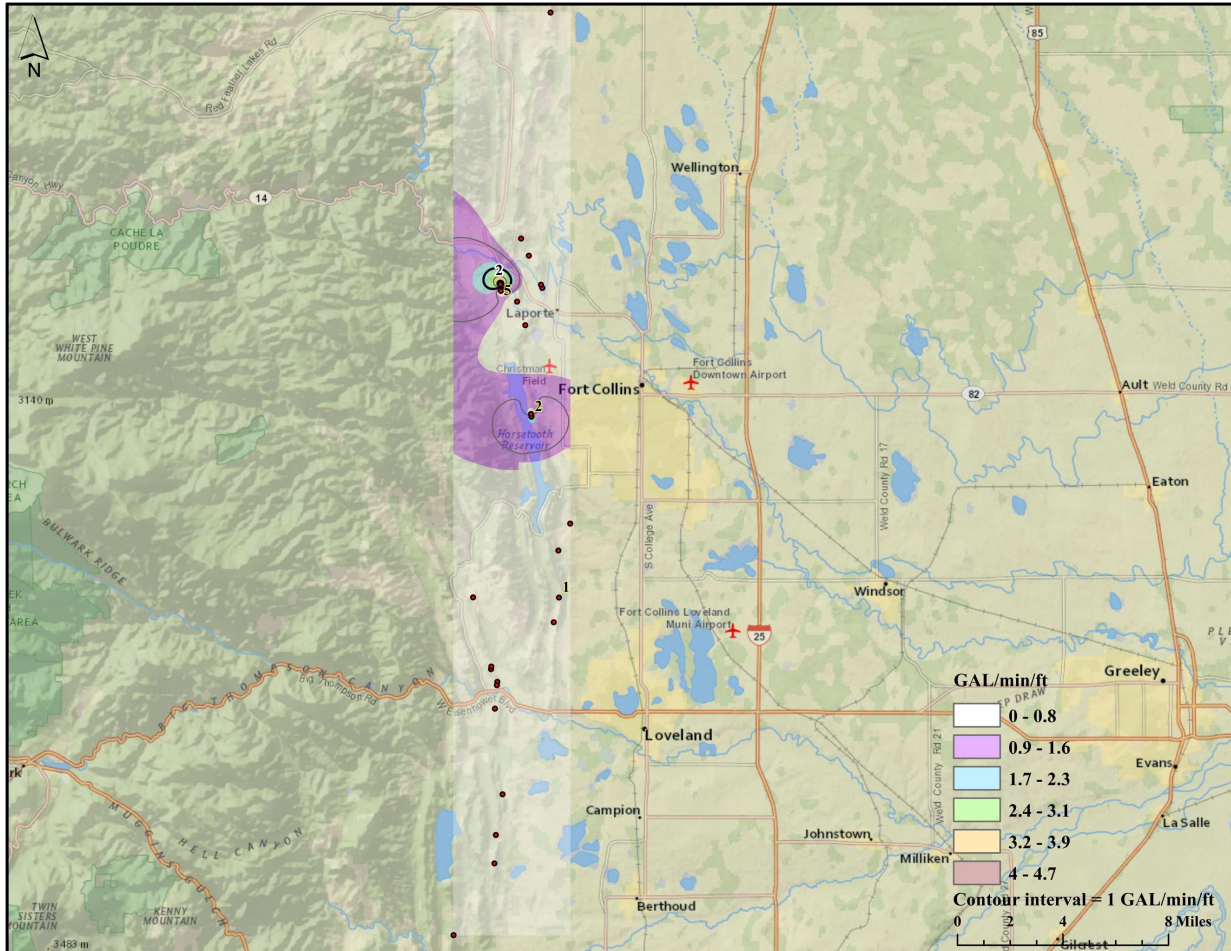


Figure 5.14. Specific capacity (GAL/min/ft) of Jelm Formation wells. The wells <1 GAL/min/ft are not labeled.

The Morrison Formation:

Well count and distribution: There are 35 wells producing water from the Morrison Formation. The distribution of the wells is along a north-south trend, with the highest concentration of wells in the southern third of the study area. There are no wells between the southern end of Horsetooth Reservoir and Laporte (Fig. 5.15).

Yield: The highest yield in the Morrison Formation is 100 GPM northwest of Loveland, and southwest of this well, there is a well yielding 15 GPM (Fig. 5.15). Near the Wyoming

border there is a well yielding 50 GPM and another at 15 GPM northwest of Laporte. Around Carter Lake, there are wells yielding 20 and 25 GPM, as well as several yielding 15 GPM. Wells yielding less than 15 GPM are scattered throughout the study area.

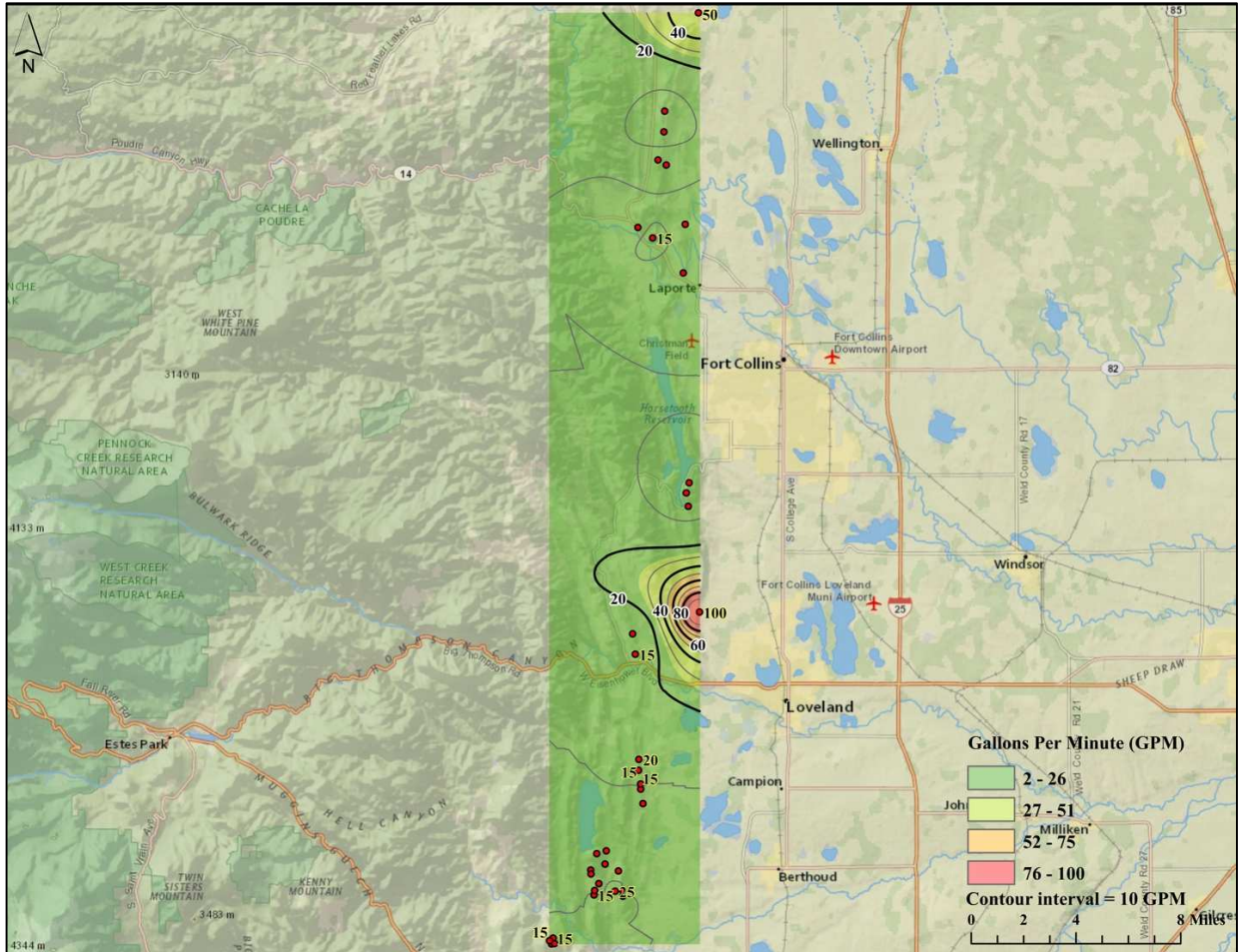


Figure 5.15. Yield (GPM) of the 35 wells in Morrison Formation. Wells <15 GPM are not labeled.

Static Water Level: The highest static water levels for wells in the Morrison Formation (Fig. 5.16) are south of Horsetooth Reservoir and range up to 448 ft. The shallowest static water levels are generally between Laporte and the Wyoming border and southwest and west of Loveland, where the shallowest is 4 ft in a well west of Berthoud. There is a flowing artesian well yielding 100 GPM northwest of Loveland, that was not used in drawing the map contours.

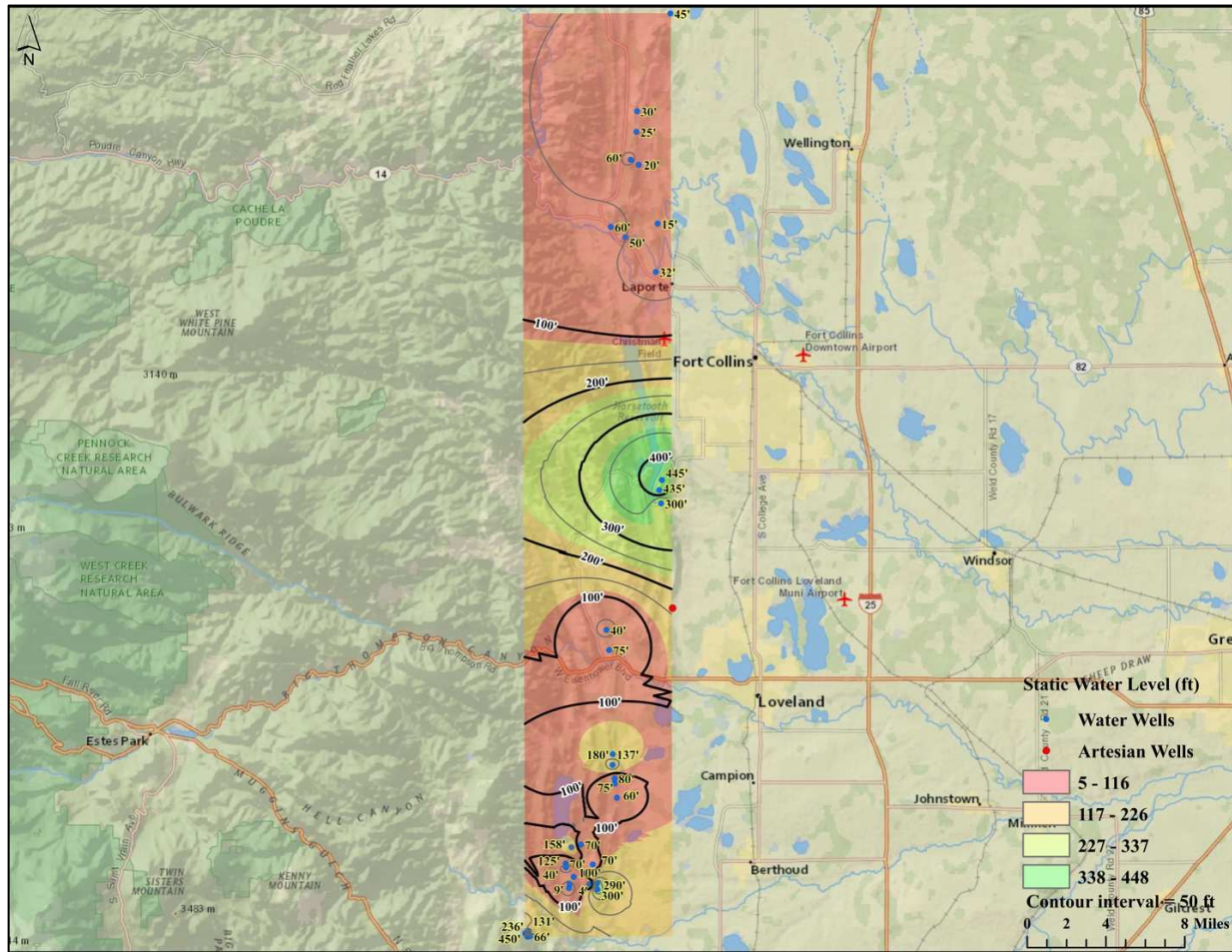


Figure 5.16. Static water level (ft) of Morrison Formation wells. Note that one well is flowing artesian.

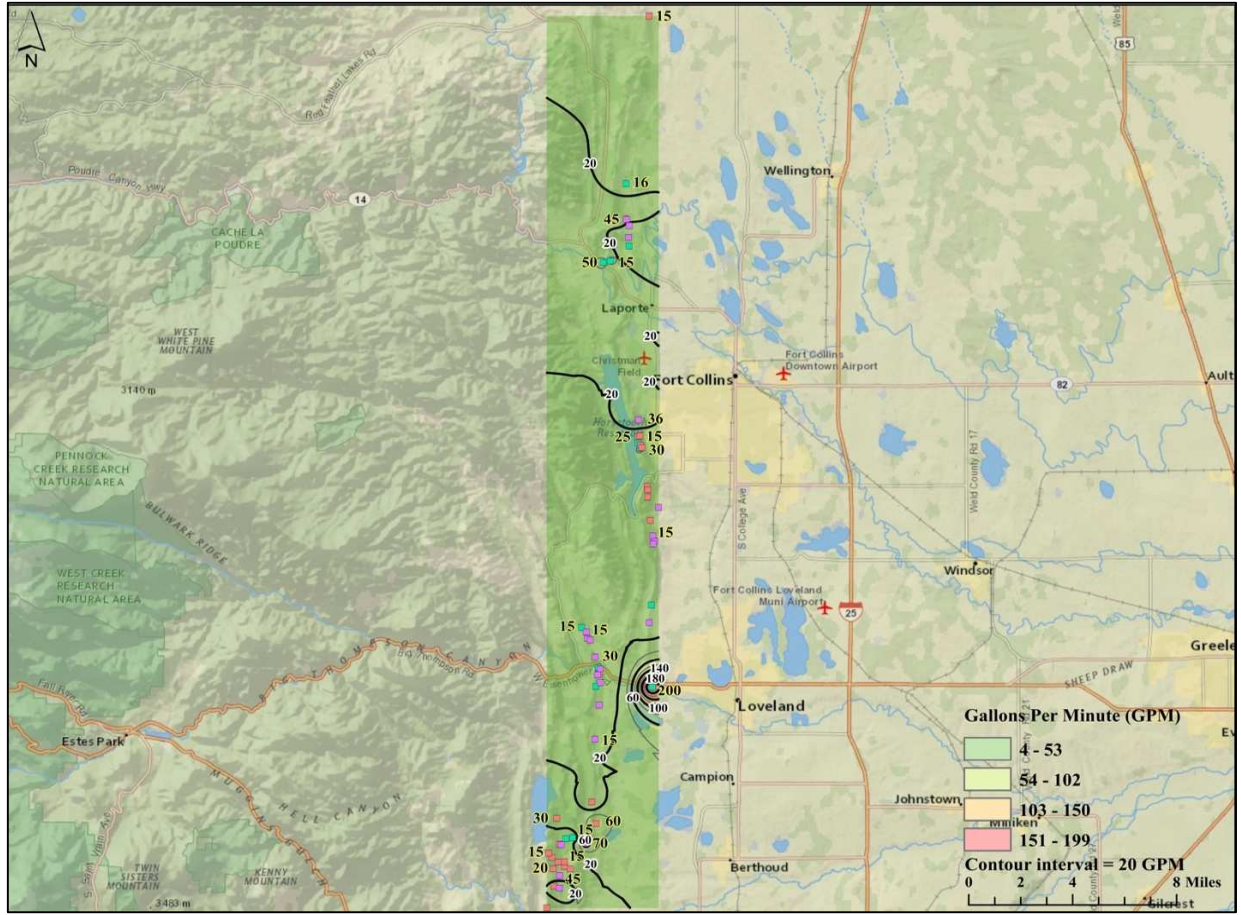
Specific Capacity: None of the 35 wells in the Morrison Formation have specific capacities >1 GAL/min/ft, so these data have not been mapped. The highest specific capacity is 0.33 GAL/min/ft, for a well yielding 15 GPM west of Loveland (Fig. 5.15).

The Dakota Group:

Well count and distribution: There are a total of 59 wells producing water from the Dakota Group, with 13 in the Lytle Formation, 23 in the Plainview Sandstone member of the South Platte Formation, and 22 more reported as being in the undifferentiated South Platte Formation. The general distribution of Dakota Group wells is north-south, with wells

concentrated north of Laporte, east and southeast of Horsetooth Reservoir, west and northwest of Loveland, and east and southeast of Carter Lake (Fig. 5.17).

Yield: The area west of Loveland hosts the highest yielding well in the Dakota group at 200 GPM from the Lytle Formation, as well as a well yielding 30 GPM from the South Platte Formation and several wells yielding 15 GPM from both formations (Fig. 5.17). Also, east and southeast of Carter Lake are wells yielding 20, 30, and 60 GPM from the Plainview Sandstone, and 70 GPM from South Platte Formation, along with several wells yielding 15 GPM from the Plainview and Lytle Formation. East and southeast of Horsetooth Reservoir yields include 20, 25, and 30 GPM from the Plainview Formation and 36 GPM and some at 15 GPM from the South Platte Formation. North of Laporte, there are wells yielding 15, 16, and 50 GPM from the Lytle Formation, and 45 GPM from the South Platte Formation. Wells yielding less than 15 GPM are scattered throughout the study area.

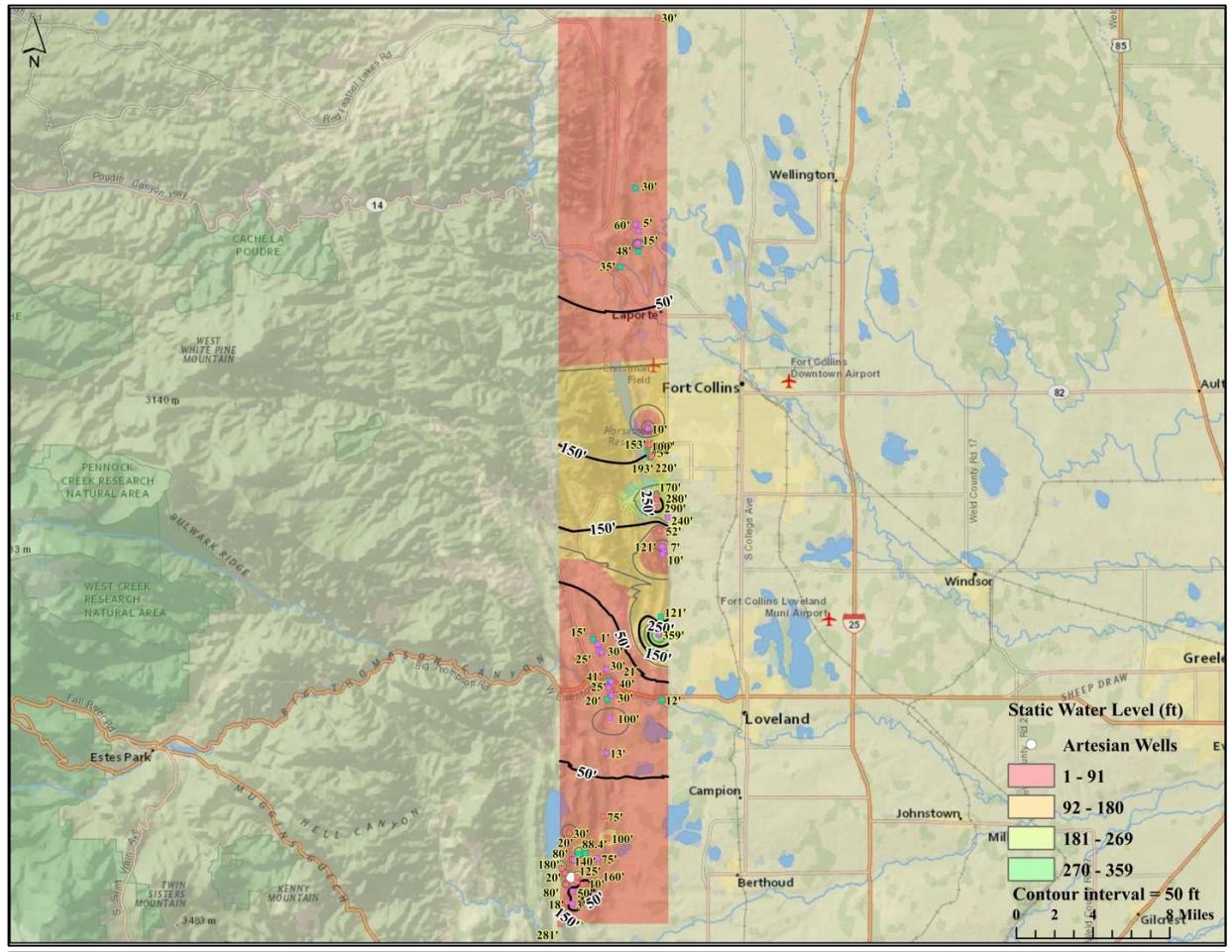


Dakota Members

- Dakota-Plainview Sandstone Member
- Dakota-South Platte Formation
- Dakota-Lytle Formation

Figure 5.17. Yield (GPM) of the 59 wells in the Dakota Group. The wells <15 GPM are not labeled.

Static Water Level: Static water levels for wells in the Dakota Group (Fig. 5.18) range from 1 to 359 ft, with the deepest northwest of Loveland and the shallowest near the southern edge of the map area. There were two wells not used to make the contour map, a flowing artesian well yielding 15 GPM west of Berthoud and a well yielding 50 GPM north of Laporte that has no static water level reported (Fig. 5.17).



Dakota Members
 ■ Dakota-Plainview Sandstone Member ■ Dakota-South Platte Formation ■ Dakota-Lytle Formation

Figure 5.18. Static water level (ft) of Dakota Group wells. Note that one well is flowing artesian.

Specific Capacity: The highest specific capacities for Dakota Group wells are 18 GAL/min/ft from a South Platte Formation well yielding 36 GPM east of Horsetooth Reservoir, and 9 GAL/min/ft from two Lytle Formation wells yielding 200 and 14 GPM west of Loveland and Berthoud, respectively (Fig. 5.19). There is 1 GAL/min/ft from a South Platte Formation well yielding 15 GPM west of Loveland. Two Lytle Formation wells of 1 GAL/min/ft yielding 15 and 50 GPM are north of Laporte, and the rest of the wells are at <1 GAL/min/ft.

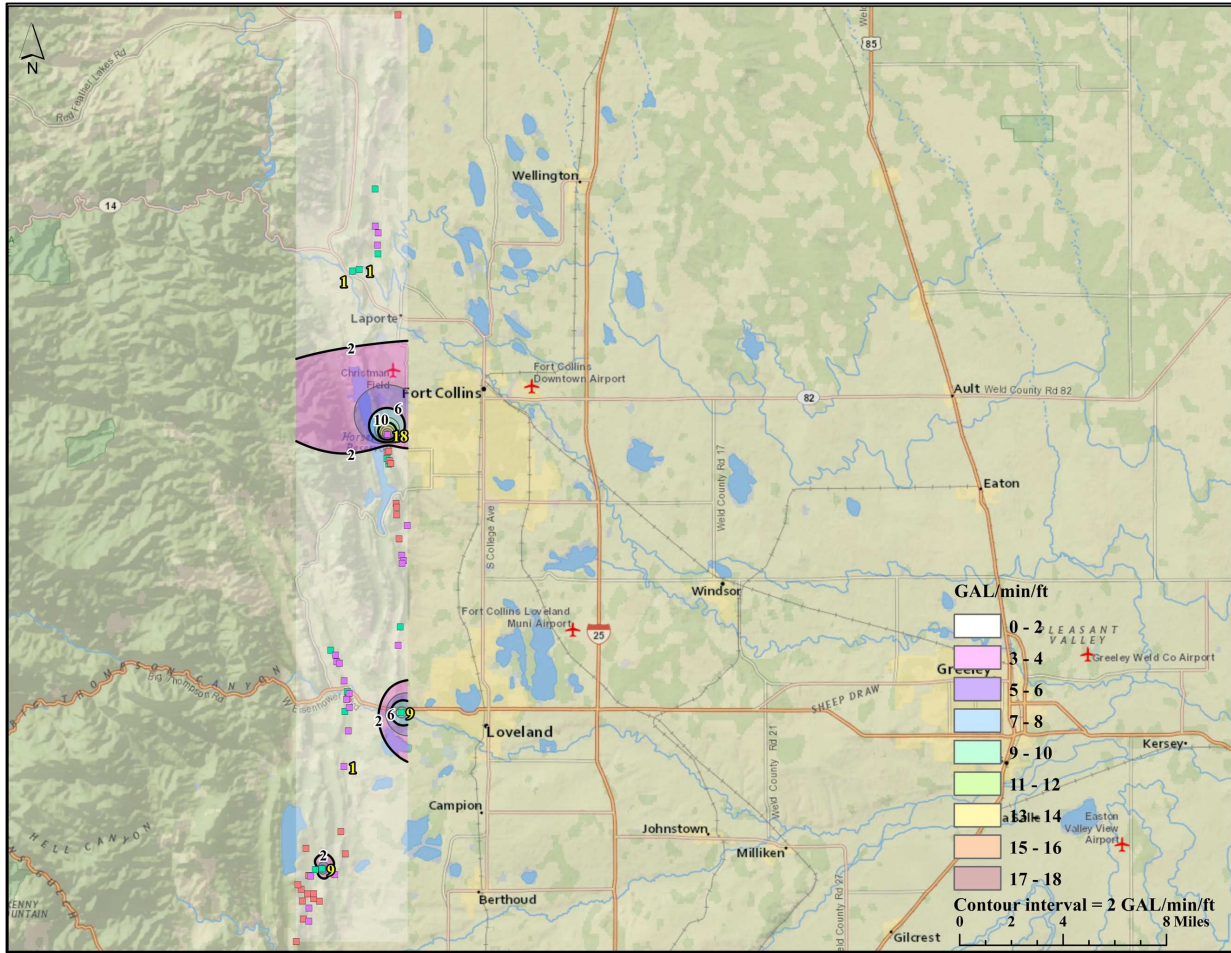


Figure 5.19. Specific Capacity (GAL/min/ft) of Dakota Group wells. The wells <1 GAL/min/ft are not labeled.

The Benton Shale Formation:

Well count and distribution: There are a total of 10 wells producing water from the Benton Shale Formation, all to the west of Loveland (Fig. 5.20).

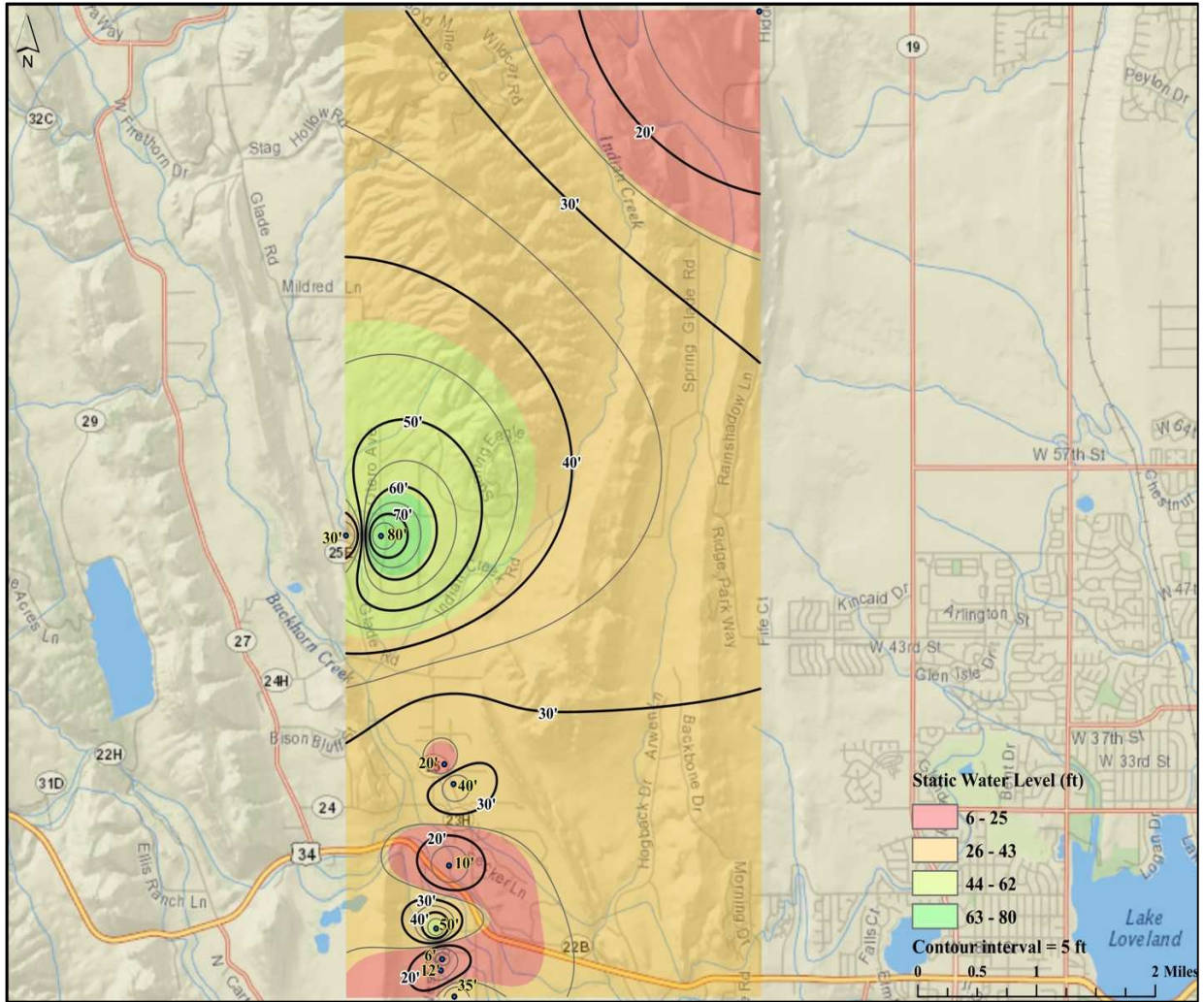


Figure 5.20. Static water level (ft) of Benton Shale Formation wells.

Yield: The yields of the Benton Shale Formation wells are less than 15 GPM, with the highest at 10 GPM.

Static Water Level: Static water levels in the Benton Shale (Fig. 5.20) range from 6 to 80 ft, with the deepest east of Green Ridge Glade Reservoir. The shallowest static water level is 6 ft west of Loveland lake.

Specific Capacity: The best specific capacity in the Benton Shale Formation is only 1 GAL/min/ft from a well yielding 10 GPM with static water level of 10 ft west of Loveland Lake; the other wells all have specific capacities less than 1 GAL/min/ft.

The Carlile-Graneros-Mowry Shales:

Well count and distribution: There are 45 wells producing water from the Carlile-Graneros-Mowry Shales in scattered groups along a north-south trend (Fig. 5.21). The wells are generally concentrated east of Livermore, north of Laporte and Horsetooth Reservoir, southeast of Horsetooth Reservoir, and northeast of Carter Lake.

Yield: The best yields are 120 and 100 GPM west of Wellington and southwest of Loveland, respectively (Fig. 5.21). Within Laporte and north of Laporte, there are wells yielding 30, 37, 45, 50, and several of 15 GPM. Also, east and southeast of Livermore there are two wells of 15 GPM. Southeast of Horsetooth Reservoir there are wells yielding 15 and 60 GPM and another yielding 15 GPM northeast of the reservoir. Finally, there is a well of 15 GPM southeast of the Carter Lake Reservoir.

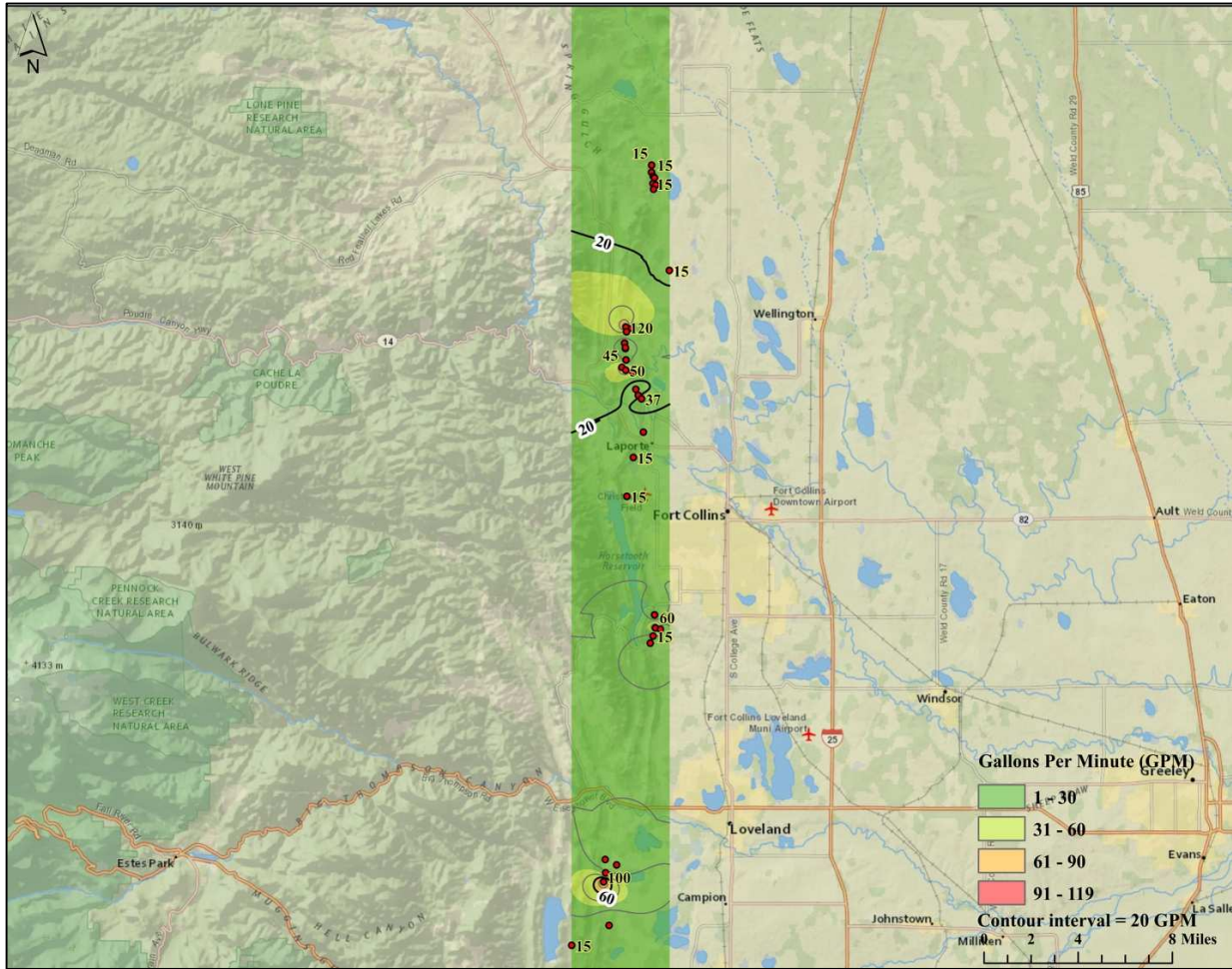


Figure 5.21. Yield (GPM) of the 45 wells in the Carlile-Graneros-Mowry Shales. The wells <15 GPM are not labeled.

Static Water Level: The static water levels in the Carlile-Graneros-Mowry Shales (Fig. 5.22), range from 3 to 381 ft. The deepest is southwest of Loveland and the shallowest southeast of Horsetooth Reservoir. The five flowing artesian wells were not use in drawing the map contours; they are located southwest of Loveland, southeast the Horsetooth Reservoir, and east of Livermore.

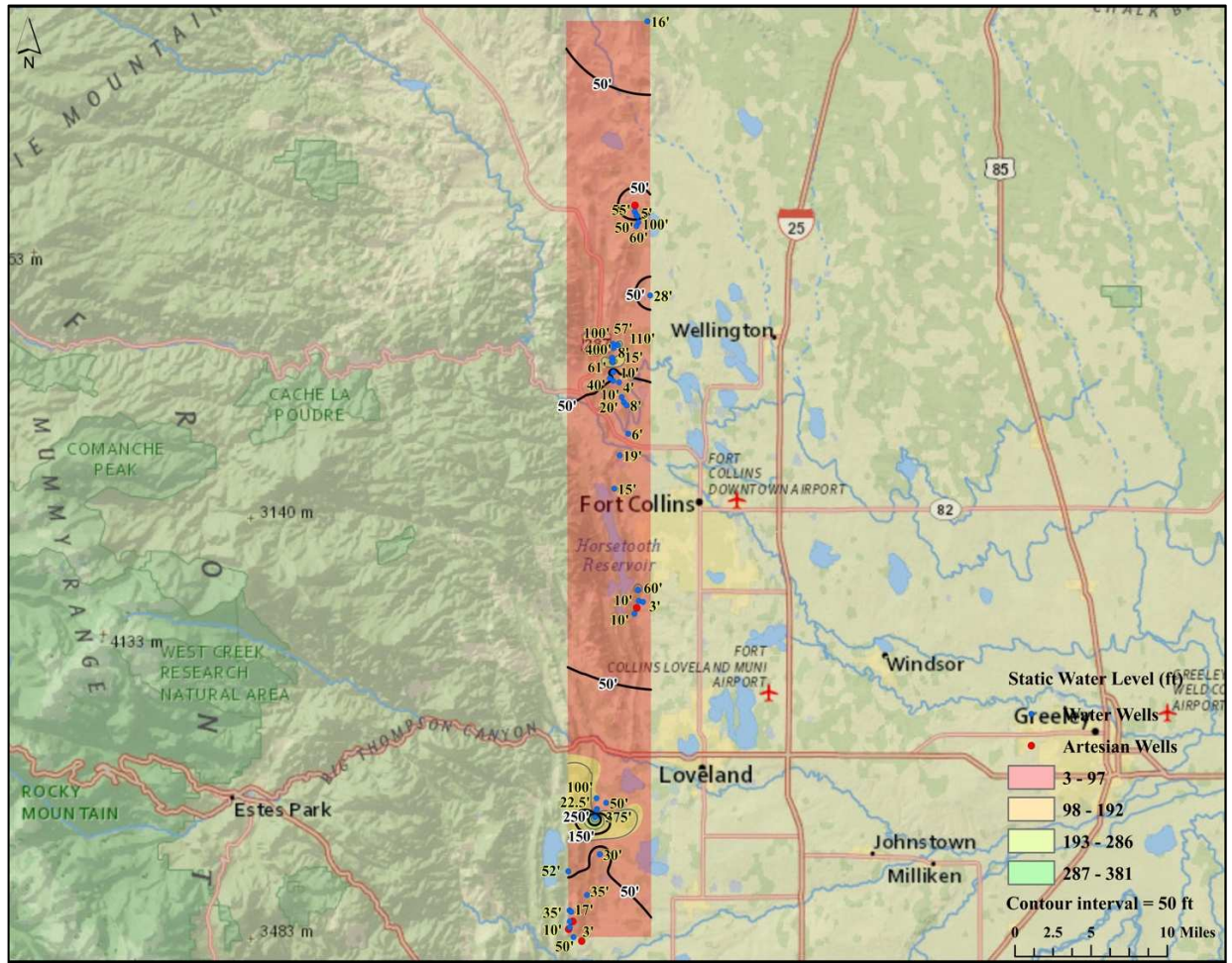


Figure 5.22. Static water level (ft) of Carlile-Graneros-Mowry Shales. Note that 5 wells are flowing artesian.

Specific Capacity: The highest specific capacities are 3 GAL/min/ft from a well yielding 15 GPM northeast of the Horsetooth and 2 GAL/min/ft from a well yielding 14.1 GPM west of Loveland (Fig. 5.23). Also, there is 2 GAL/min/ft from a well yielding 15 GPM northwest of Wellington. The rest of the wells have specific capacities <1 GAL/min/ft. Two wells were omitted from the specific capacity contour map because their drawdown is reported as zero.

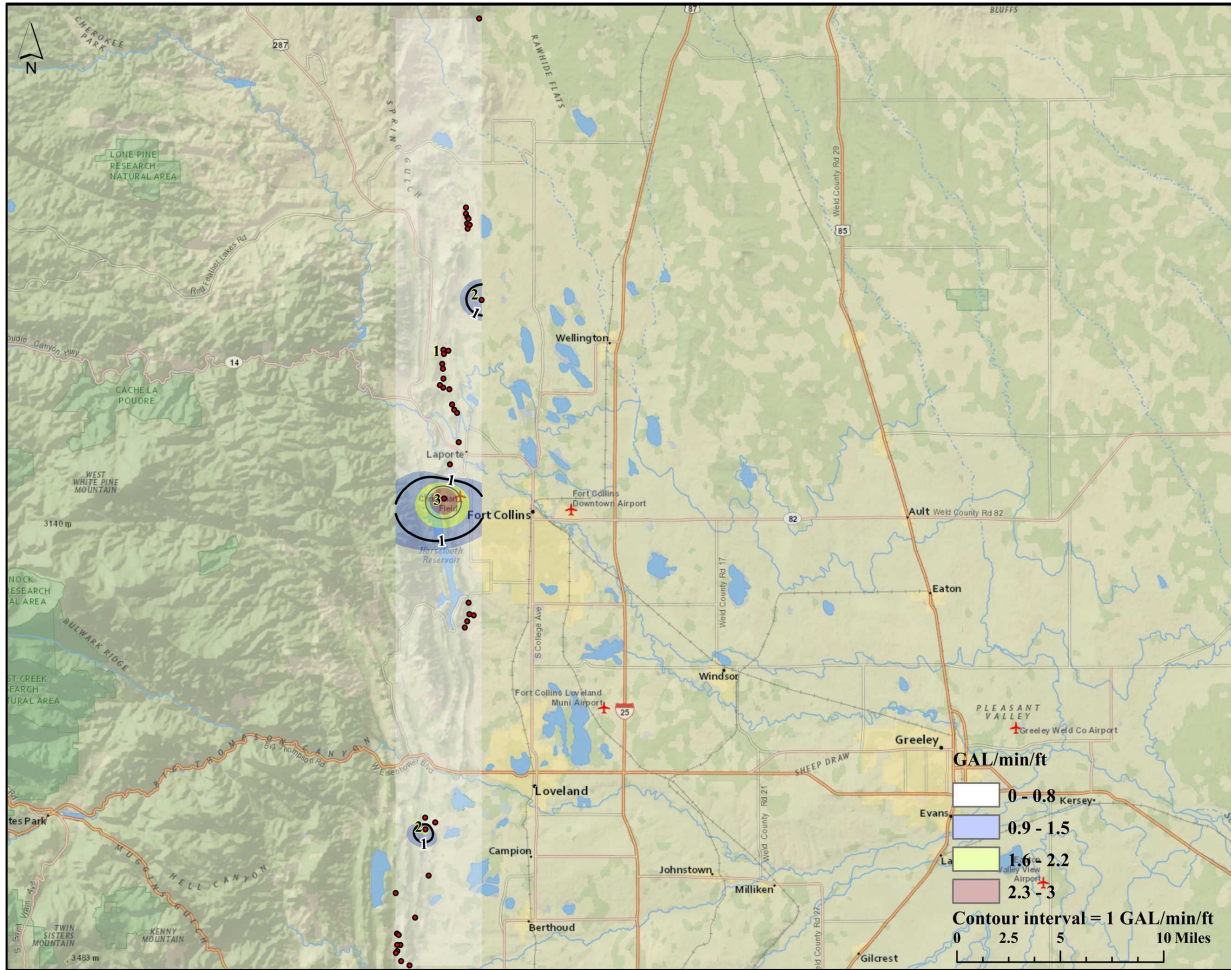


Figure 5.23. Specific capacity (GAL/min/ft) of Carlile-Graneros-Mowry Shales wells. Note that two wells are not included in the contour map. Wells <1 GAL/min/ft are not labeled.

The Niobrara Formation:

Well count and distribution: Seventeen wells (Fig. 5.24) produce water from the Niobrara Formation, with 3 in the Fort Hays Limestone Member, 9 in the Smoky Hill Member, and 5 not differentiated by member. All wells are in the southern half of the study area, mostly near Loveland, except for one near the Wyoming border and one northeast of Horsetooth Reservoir.

Yield: The highest yields in the Niobrara are 36 GPM northeast of Horsetooth Reservoir, 20 GPM west of Loveland, and 15 GPM west of Johnstown, all in the Smoky Hill Member.

There is a well yielding 15 GPM at the Wyoming border and most of the remaining wells yield less than 8 GPM (Fig. 5.24).

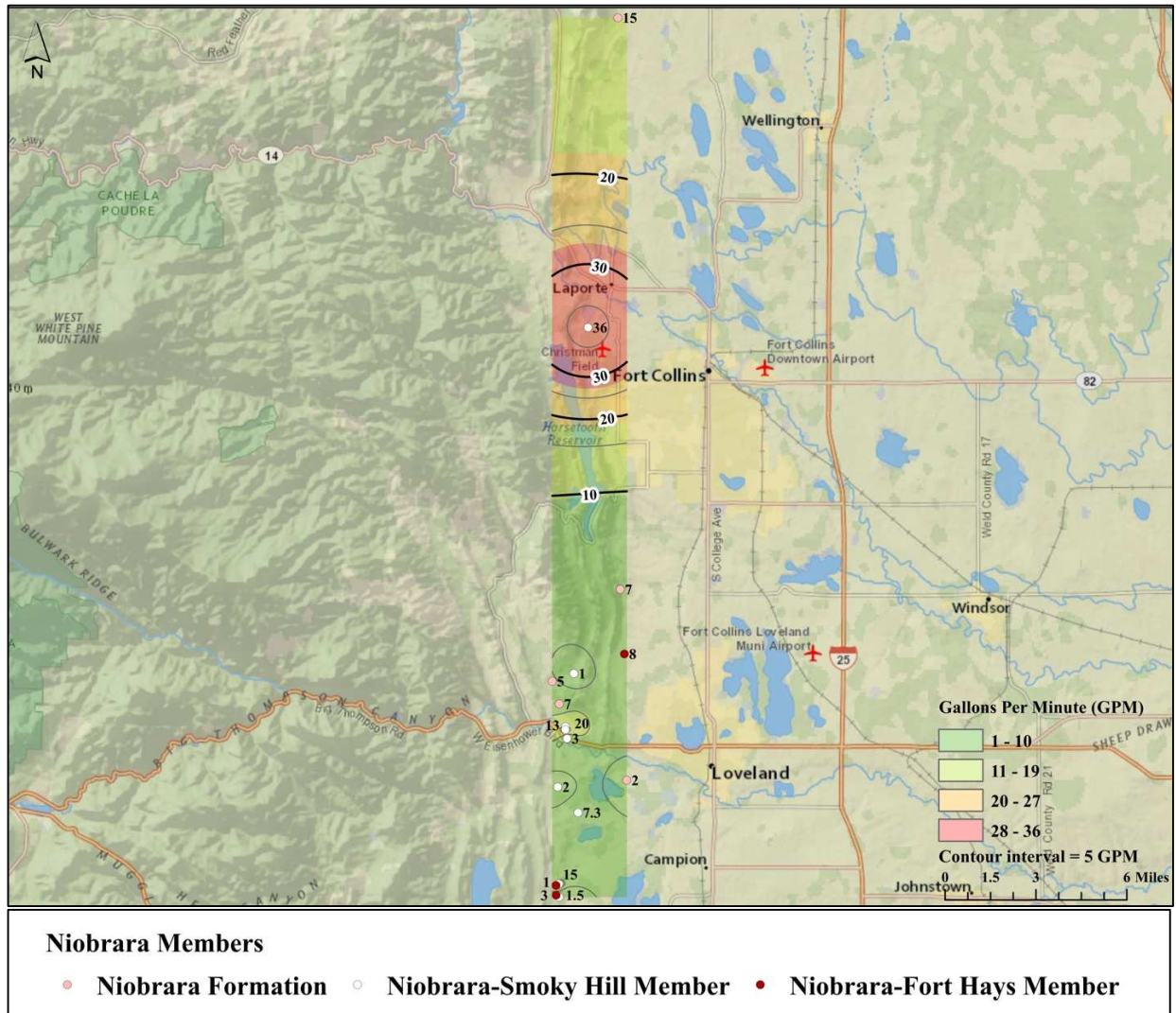
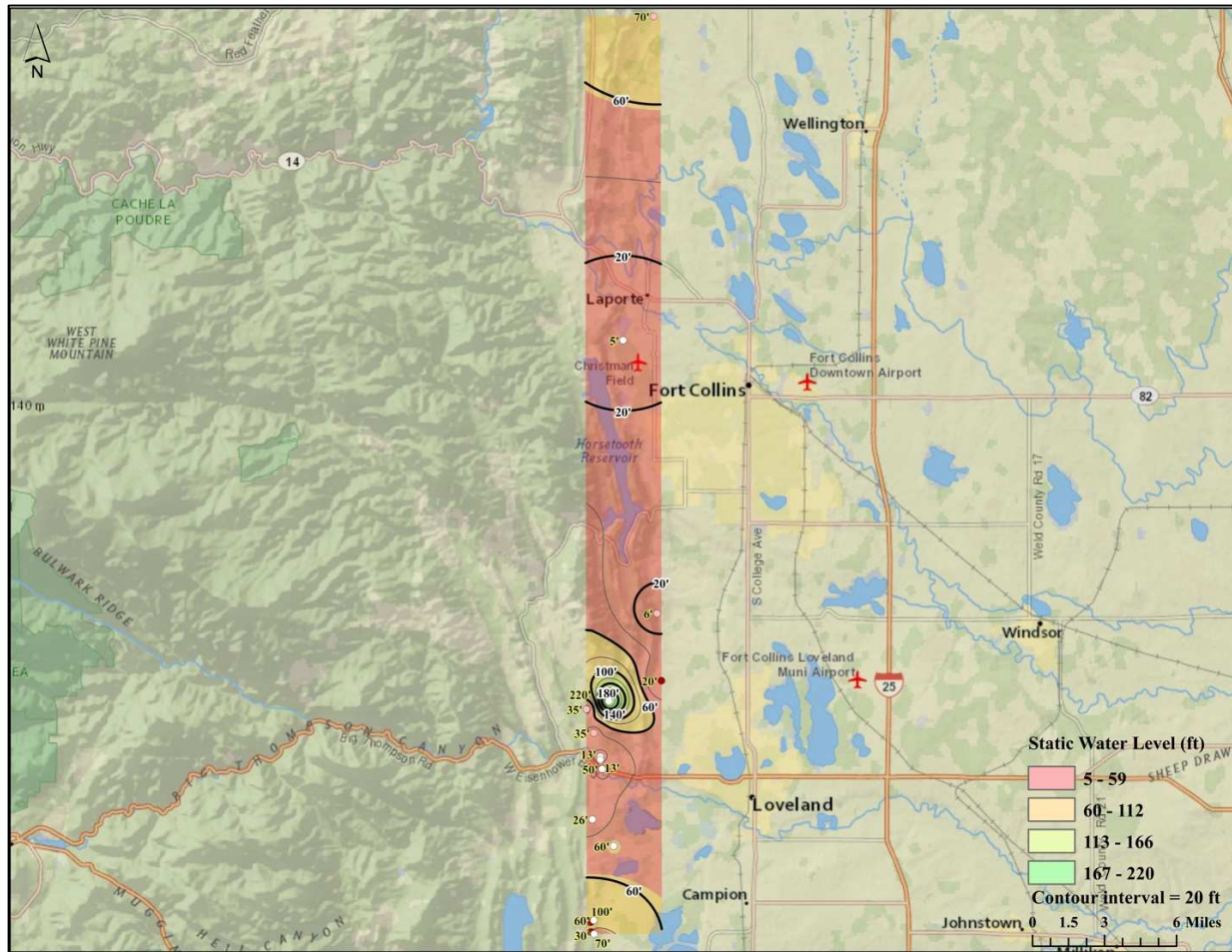


Figure 5.24. Yield (GPM) of the 17 wells in the Niobrara Formation.

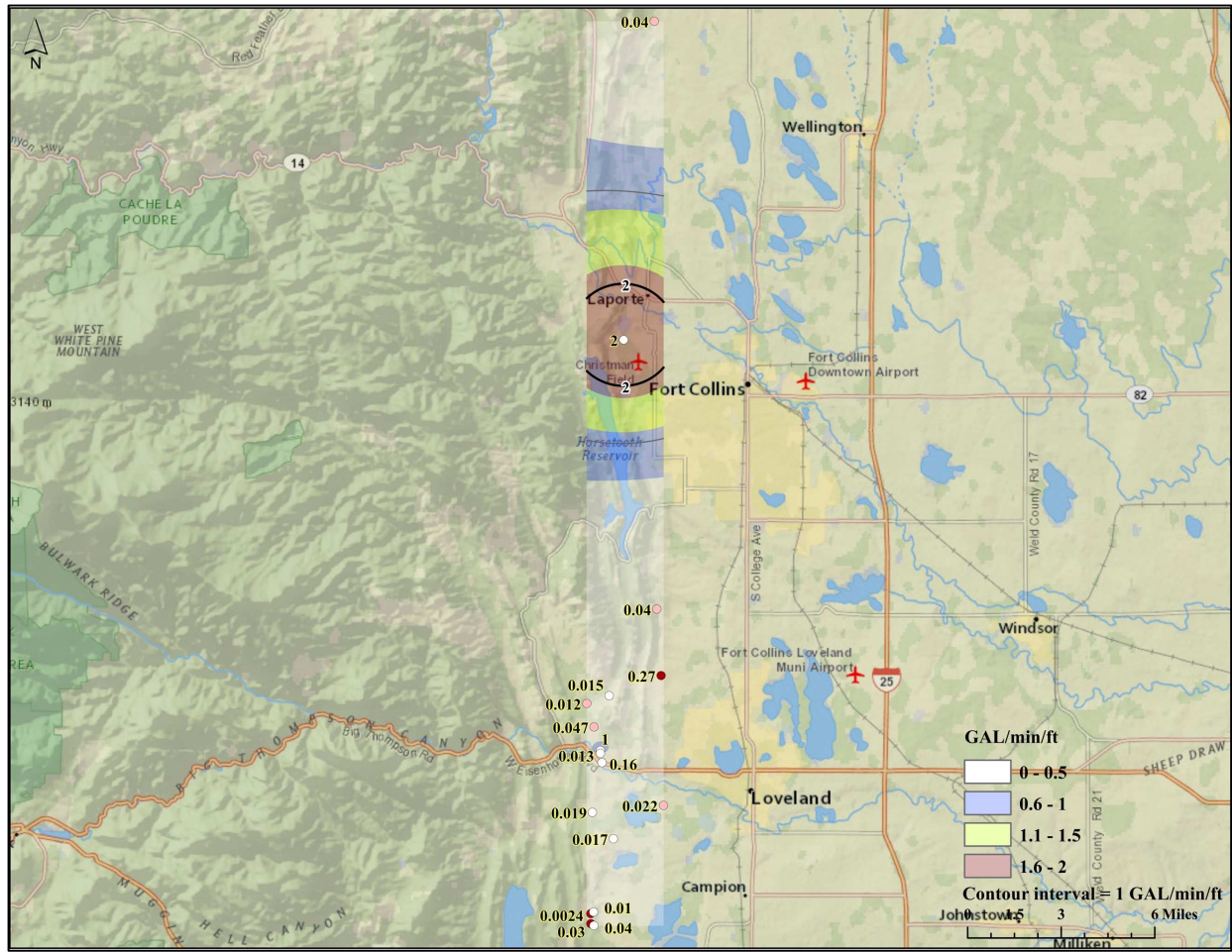
Static Water Level: Static water levels for wells in the Niobrara Formation, range from 5 to 220 ft, with the deepest northwest of Loveland, and the shallowest north of Horsetooth Reservoir (Fig. 5.25).



Niobrara Members
 • Niobrara Formation ◦ Niobrara-Smoky Hill Member • Niobrara-Fort Hays Member

Figure 5.25. Static water level (ft) of Niobrara Formation wells.

Specific Capacity: The highest specific capacities are 2 GAL/min/ft from a well yielding 36 GPM northeast of Horsetooth Reservoir and 1 GAL/min/ft from a well yielding 13 GPM west of Loveland, both in the Smoky Hill Member. The rest of the wells yield less than 1 GAL/min/ft (Fig. 5.26).

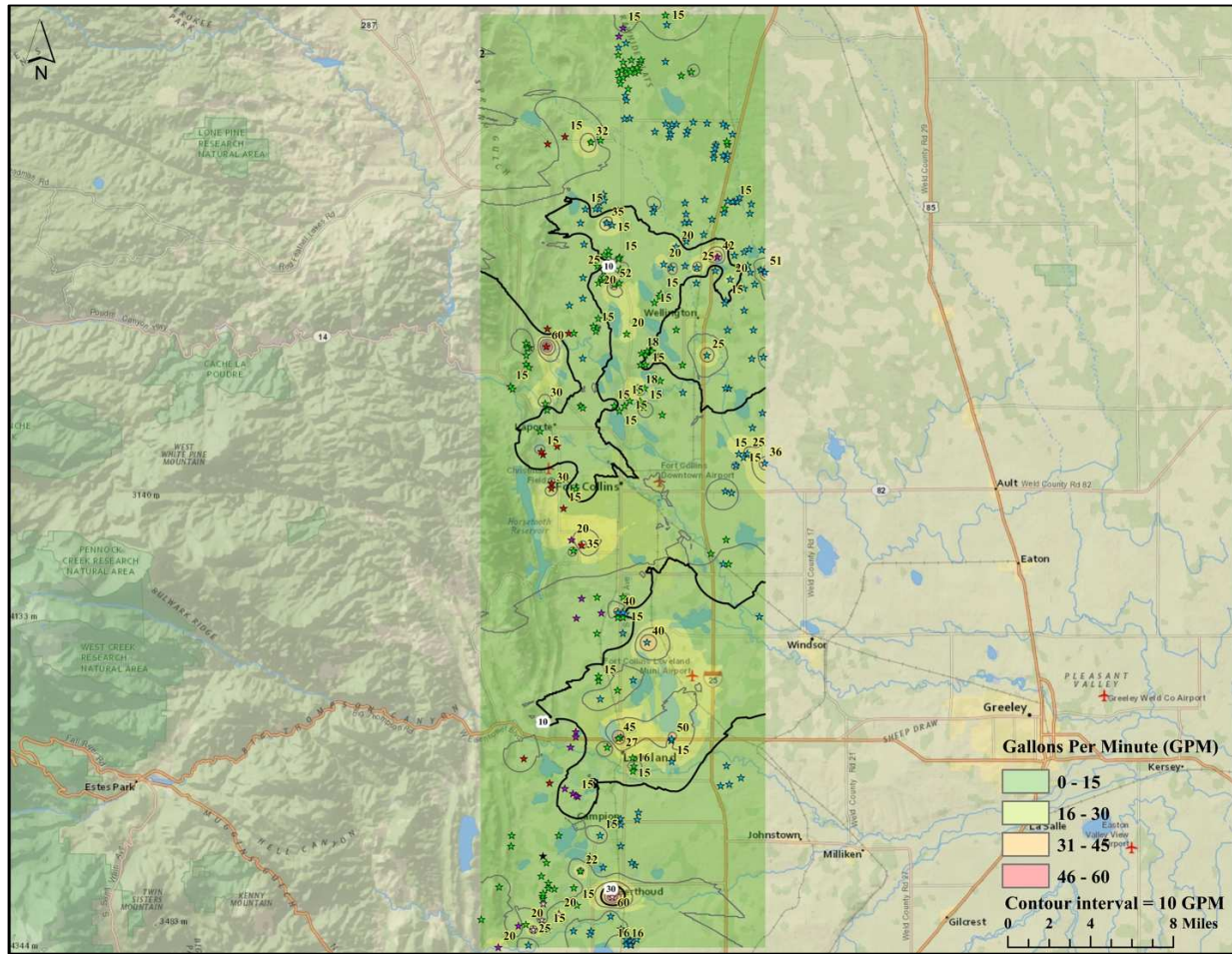


Niobrara Members
 ● Niobrara Formation ○ Niobrara-Smoky Hill Member ● Niobrara-Fort Hays Member

Figure 5.26. Specific capacity (GAL/min/ft) of Niobrara Formation wells.

The Pierre Shale Formation:

Well count and distribution: Three hundred total wells produce water from the Pierre Shale Formation, with 143 in the Upper Shale Member, 3 in the Richards Sandstone, 120 in the Middle Shale Member, 1 in the Hygiene Sandstone, 16 in the Lower Shale Member, and 15 in undifferentiated Pierre Shale Formation. The distribution is scattered broadly along a north-south trend along the eastern edge of Larimer County (Fig. 5.27).



Pierre Shale Members

- ★ Pierre Shale Formation
- ☆ Pierre Shale-Richards Sandstone
- ★ Pierre Shale-Hygiene Sandstone Member
- ★ Pierre Shale-Upper Member
- ★ Pierre Shale-Middle Member
- ★ Pierre Shale-Lower Member

Figure 5.27. Yield (GPM) of the 298 wells in the Pierre Shale Formation. Wells <15 GPM are not labeled.

Yield: The highest yielding wells in the Pierre Shale Formation (Fig. 5.27) range up to 60 GPM, with 5 wells between 50 and 60 GPM and another eleven wells between 40 and 50 GPM, with numerous wells yielding between 15 and 40 GPM. The highest yielding wells are scattered with yields of 60 GPM near Berthoud and north of Laporte, and wells yielding 50, 51, and 52 GPM near Loveland and Wellington. The wells yielding between 20 and 50 GPM, as well as lower yielding wells, are similarly broadly scattered throughout the study area. The Upper Shale Member, Richards Sandstone, and Middle Shale Member give the highest yields (Fig. 5.27).

Static Water Level: Static water levels for wells in the Pierre Shale Formation (Fig. 5.28) range from 2 ft to 846 ft, with the deepest values in the northeast corner of the study area. Over the remainder of the map there are a few scattered wells with static water levels around 200 ft, but most are much shallower. Five wells were omitted from the map, two flowing artesian wells of 60 GPM west of Berthoud and north of Laporte, and 3 wells yielding 2, 10, and 20 GPM south and northwest of Loveland and west of Berthoud with no static water level reported.

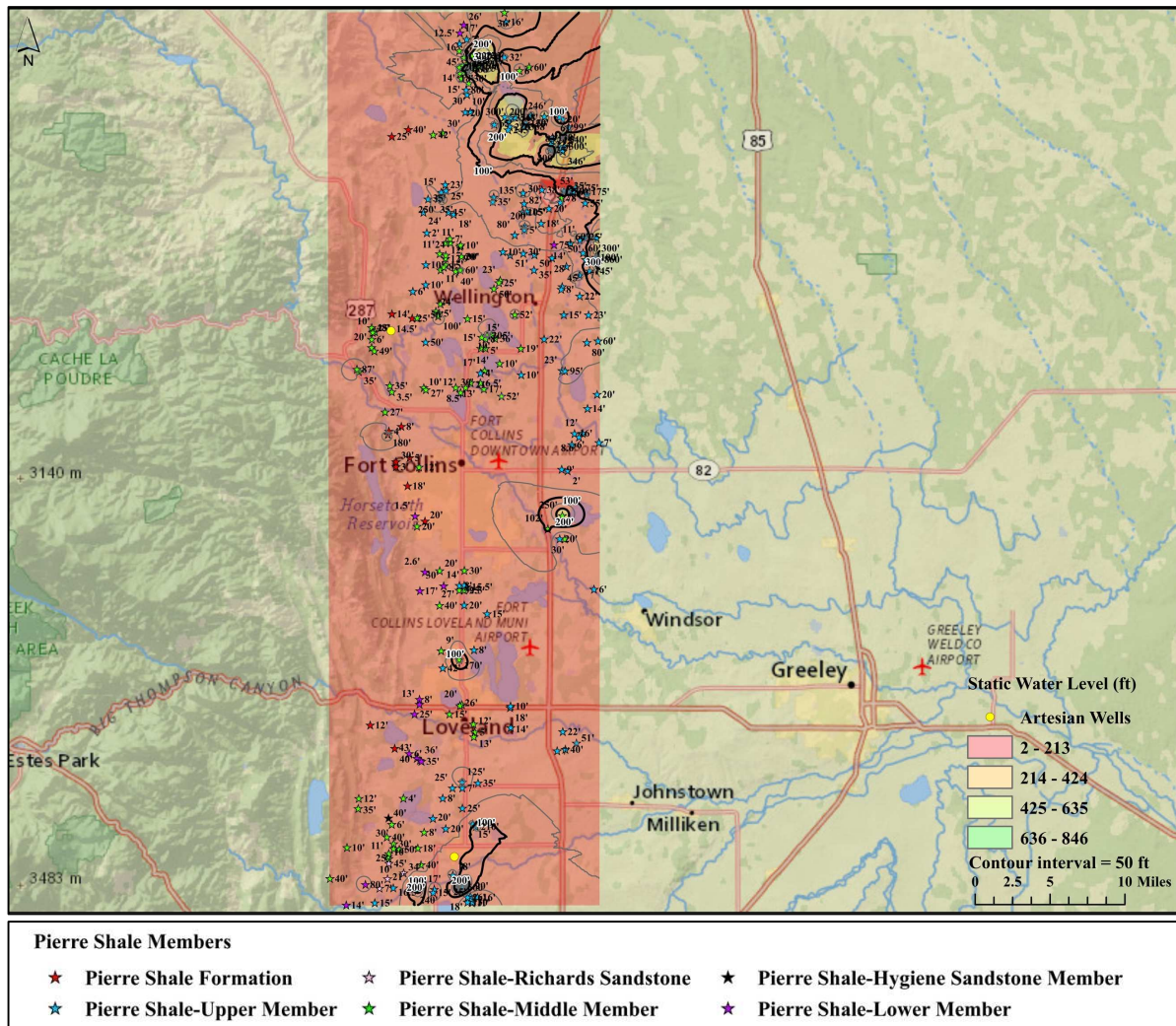


Figure 5.28. Static water level (ft) of Pierre Shale Formation wells. Note that 2 wells are flowing artesian.

Specific Capacity: In the Pierre Shale Formation specific capacity values range up to 12 GAL/min/ft, with the highest values mainly east and northeast of Livermore from the Middle

Shale Member (Fig. 5.29). Numerous wells range between 1 and 8 GAL/min/ft are in scattered pockets east of Laporte, east of Fort Collins, east of Horsetooth Reservoir, near Loveland, and near Berthoud. Overall, 72 of 298 wells show values ranging from 1 to 12 GAL/min/ft, with the rest of the wells <1 GAL/min/ft. Two wells were omitted from the specific capacity map because their drawdown is reported as zero. The highest specific capacities are mostly from wells in the Upper and Middle Shale Members (Fig. 5.29).

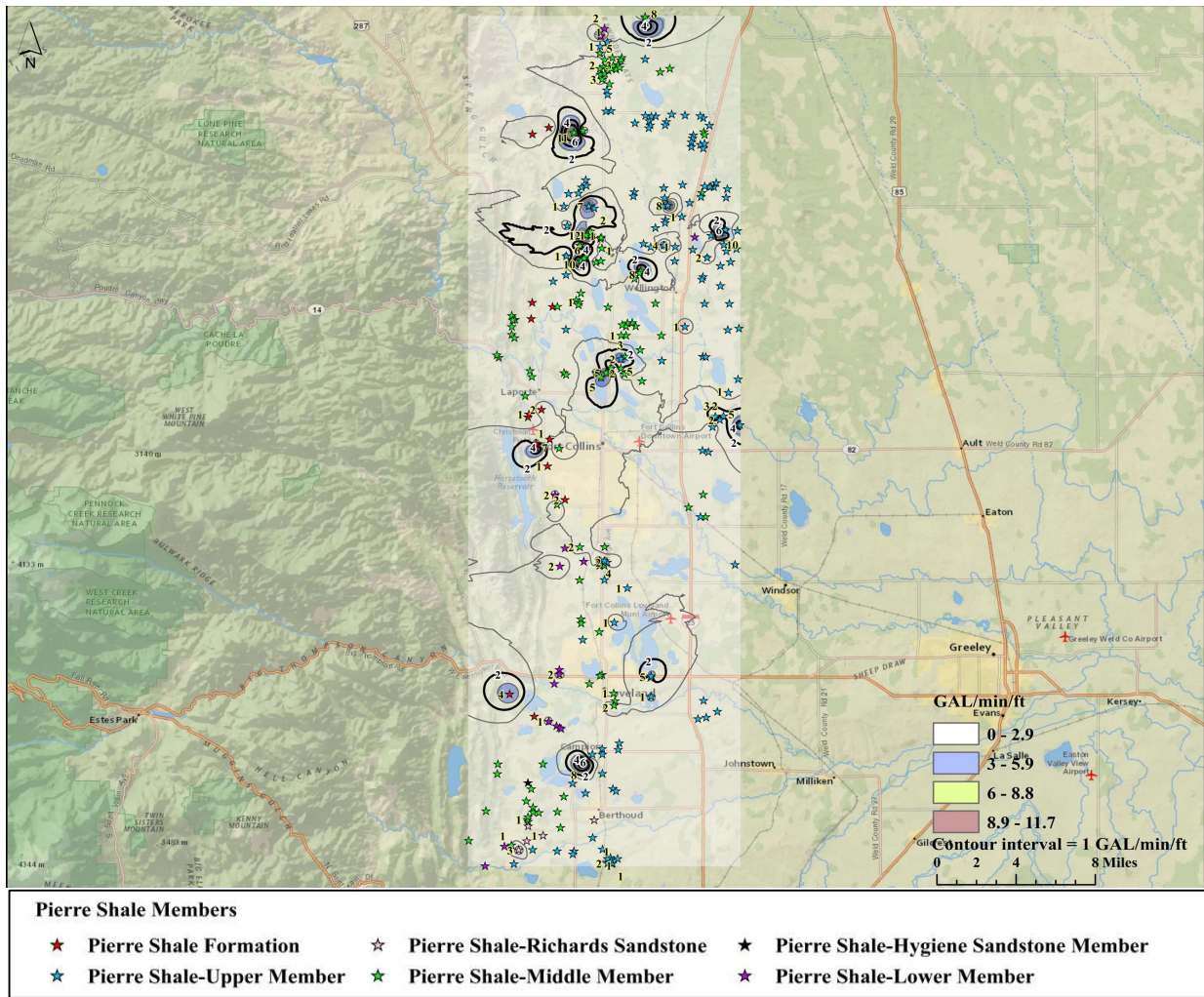


Figure 5.29. Specific capacity (GAL/min/ft) of Pierre Shale Formation wells. Wells <1 GAL/min/ft are not labeled.

The Fox Hills Formation:

Well count and distribution: There are a total of 12 wells producing water from the Fox Hills Formation, all in the northeast corner of Larimer County and defining a roughly north-south trend east of Rawhide Energy Station (Fig. 5.30).

Yield: The best yields are 15, 60, 60 and 340 GPM, with the other 8 wells each yielding less than 15 GPM (Fig. 5.30).

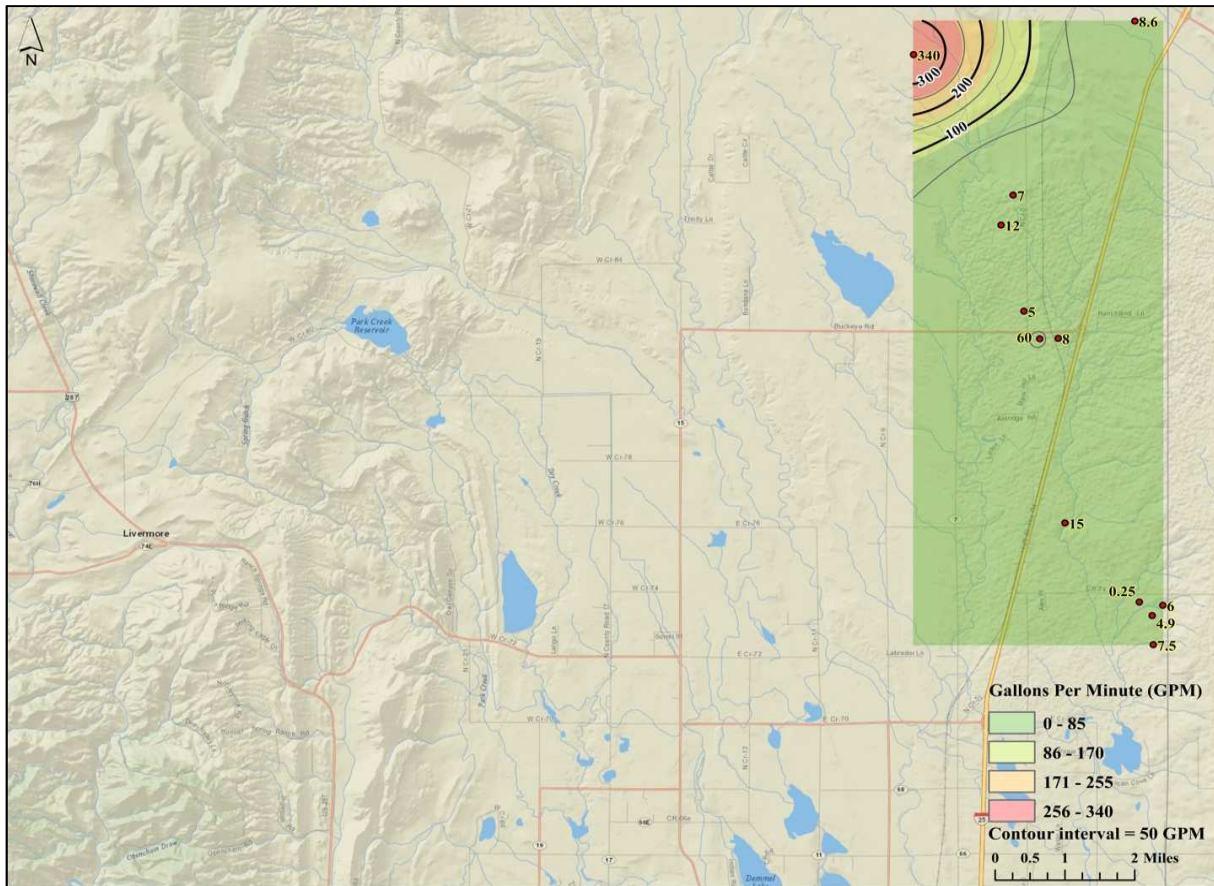


Figure 5.30. Yield (GPM) of 12 wells in the Fox Hills Formation.

Static Water Level: Static water levels for the wells in the Fox Hills Formation (Fig. 5.31) range from 8 to 280 ft, with the deepest levels in low yielding wells clustered on the southern end of the Fox Hills well trend. The well yielding 340 GPM has the shallowest static water level.

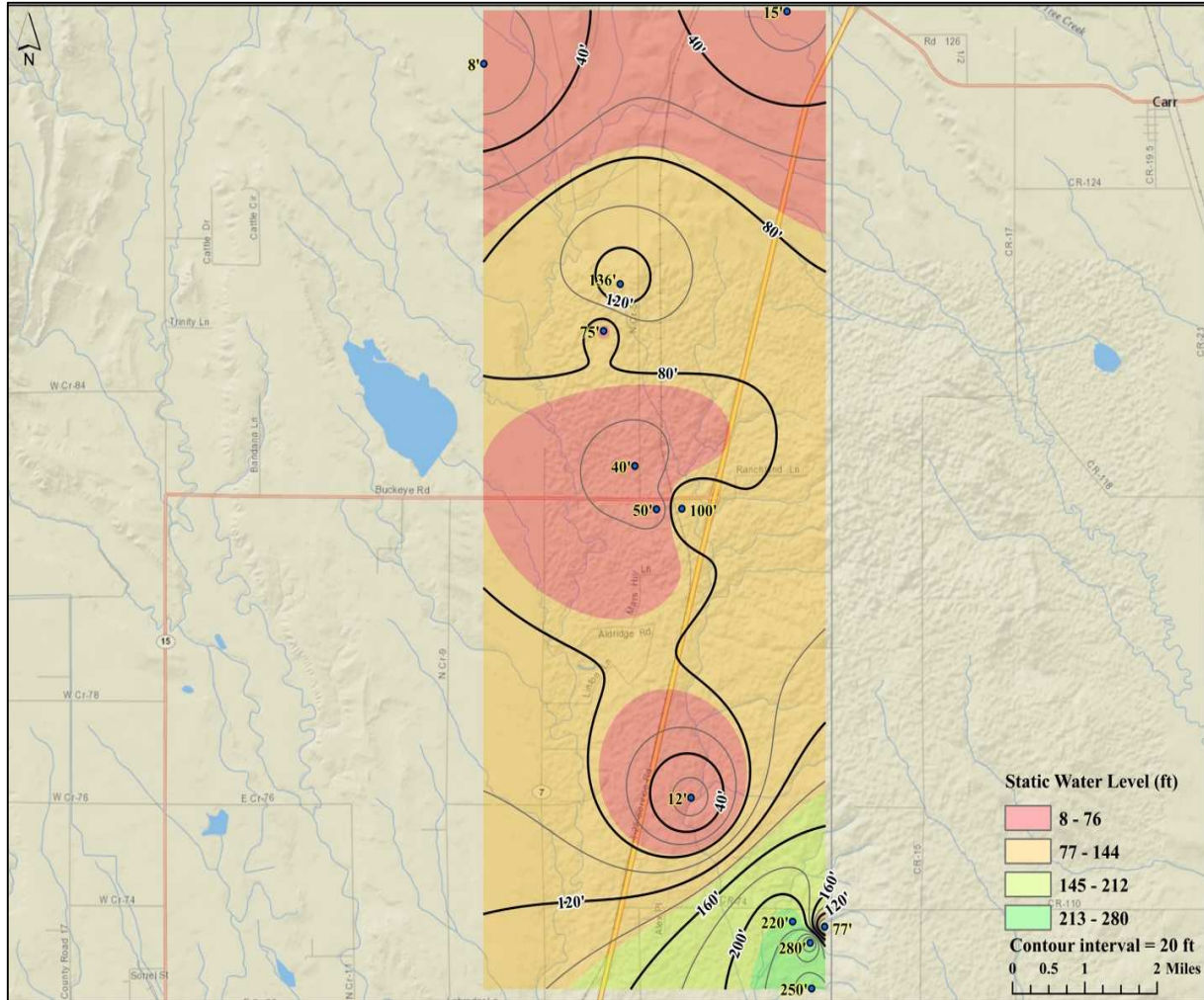


Figure 5.31. Static water level (ft) of Fox Hills Formation wells.

Specific Capacity: The highest specific capacity in the Fox Hills Formation is 24 GAL/min/ft from the well yielding 340 GPM northeast of Rawhide Energy Station. Two other wells have specific capacities of 4 GAL/min/ft and 1 GAL/min/ft, with all others <1 GAL/min/ft (Fig. 5.32).

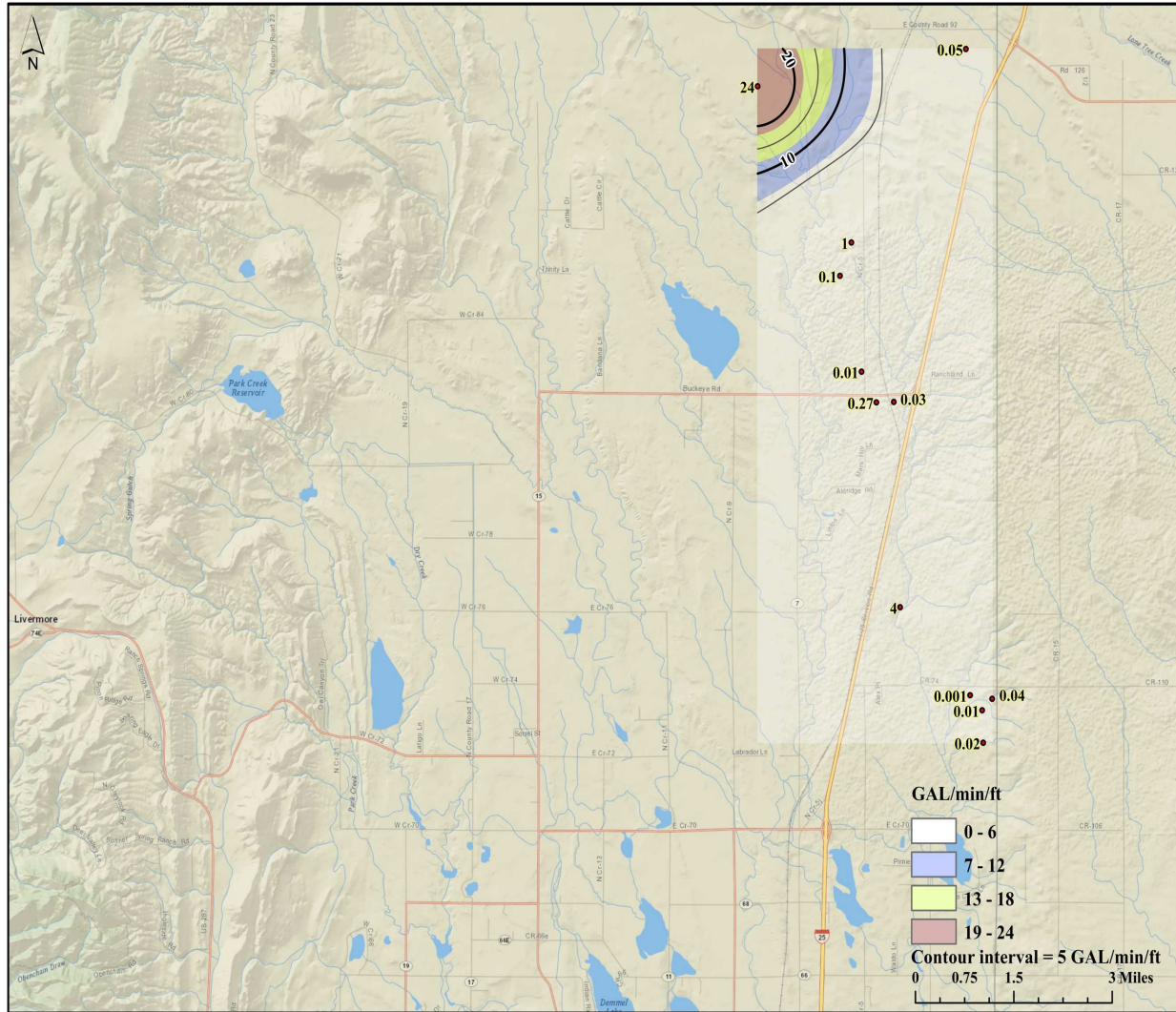


Figure 5.32. Specific capacity (GAL/min/ft) of Fox Hills Formation wells.

The Laramie Formation:

Well count and distribution: Seventeen wells produce water from the Laramie Formation, and are clustered in northeast Larimer County near the Wyoming border (Fig. 5.33).

Yield: The highest yields are 800, 450, 250, 18 GPM, with several move wells yielding 15 GPM (Fig. 5.33). The rest of the wells yield less than 15 GPM.

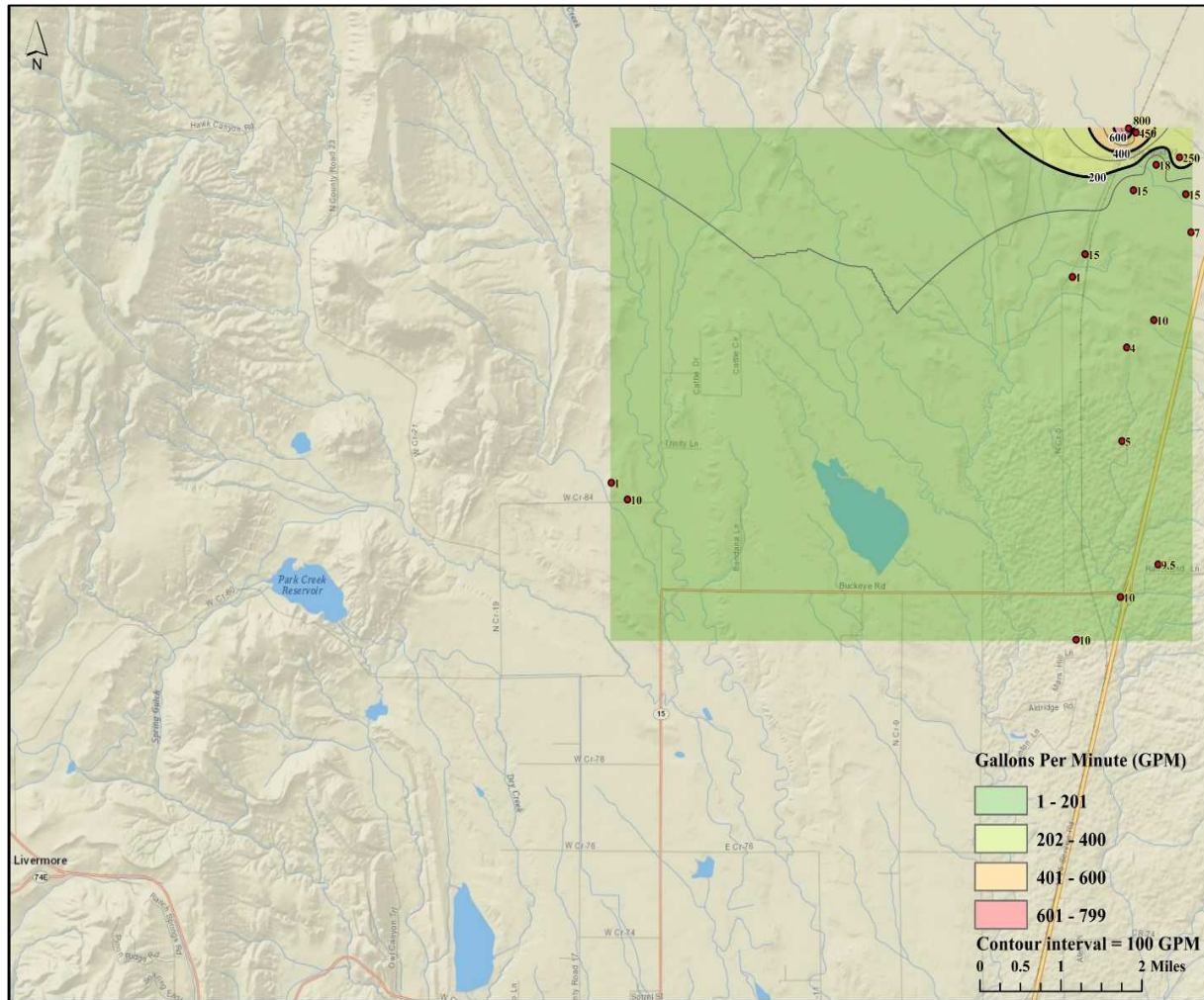


Figure 5.33. Yield (GPM) of the 17 wells in the Laramie Formation.

Static Water Level: The static water levels of the wells in the Laramie Formation range from 10 to 250 ft (Fig. 5.34).

Specific Capacity: The two highest specific capacities are 32 and 225 GAL/min/ft, with additional wells having specific capacities of 2, 3, 6, and 16 GAL/min/ft (Fig. 5.34). The rest of the wells have specific capacities <1 GAL/min/ft.

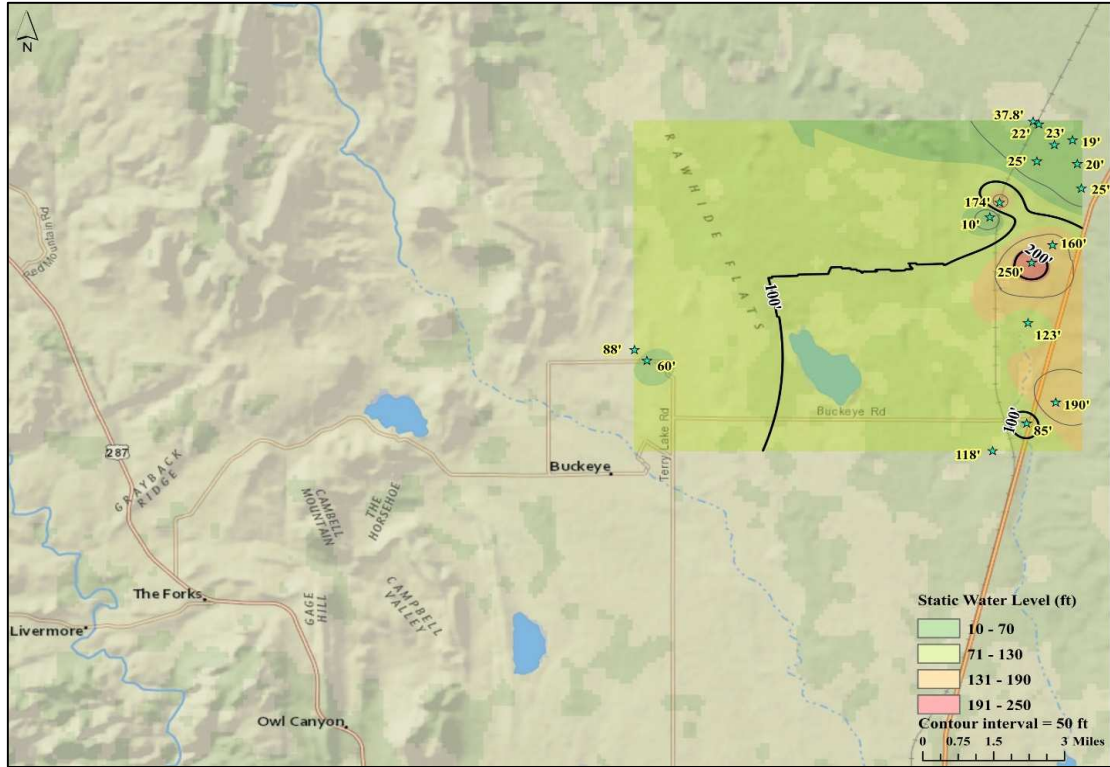


Figure 5.34. Static water level (ft) of Laramie Formation wells.

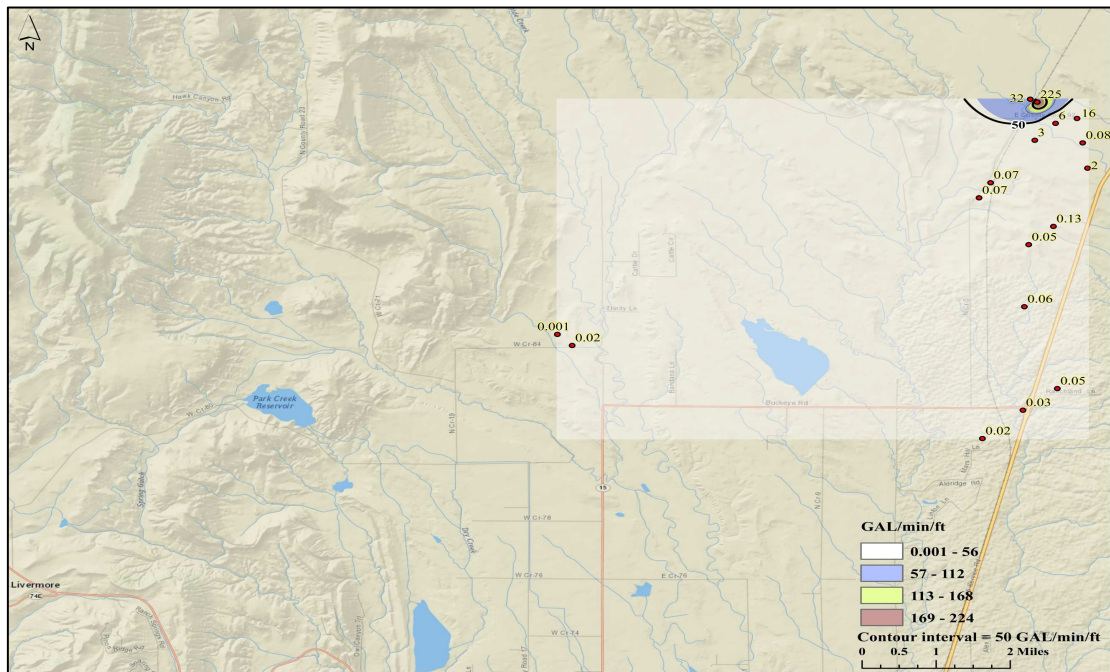


Figure 5.35. Specific capacity (GAL/min/ft) of Laramie Formation wells.

The White River Formation:

Well count and distribution: Eleven wells, all in the northeast corner of Larimer County, produce water from the White River Formation (Fig. 5.36). Eight of the wells are clustered close to the Wyoming border and the other three are in a cluster about 4 miles further south and roughly due east of the Rawhide Energy Station.

Yield: Two wells with high yields, 800 and 900 GPM, are located about 5 miles northeast of the Rawhide Energy Station. The other nine wells have yields between 2 and 15 GPM (Fig. 5.36).

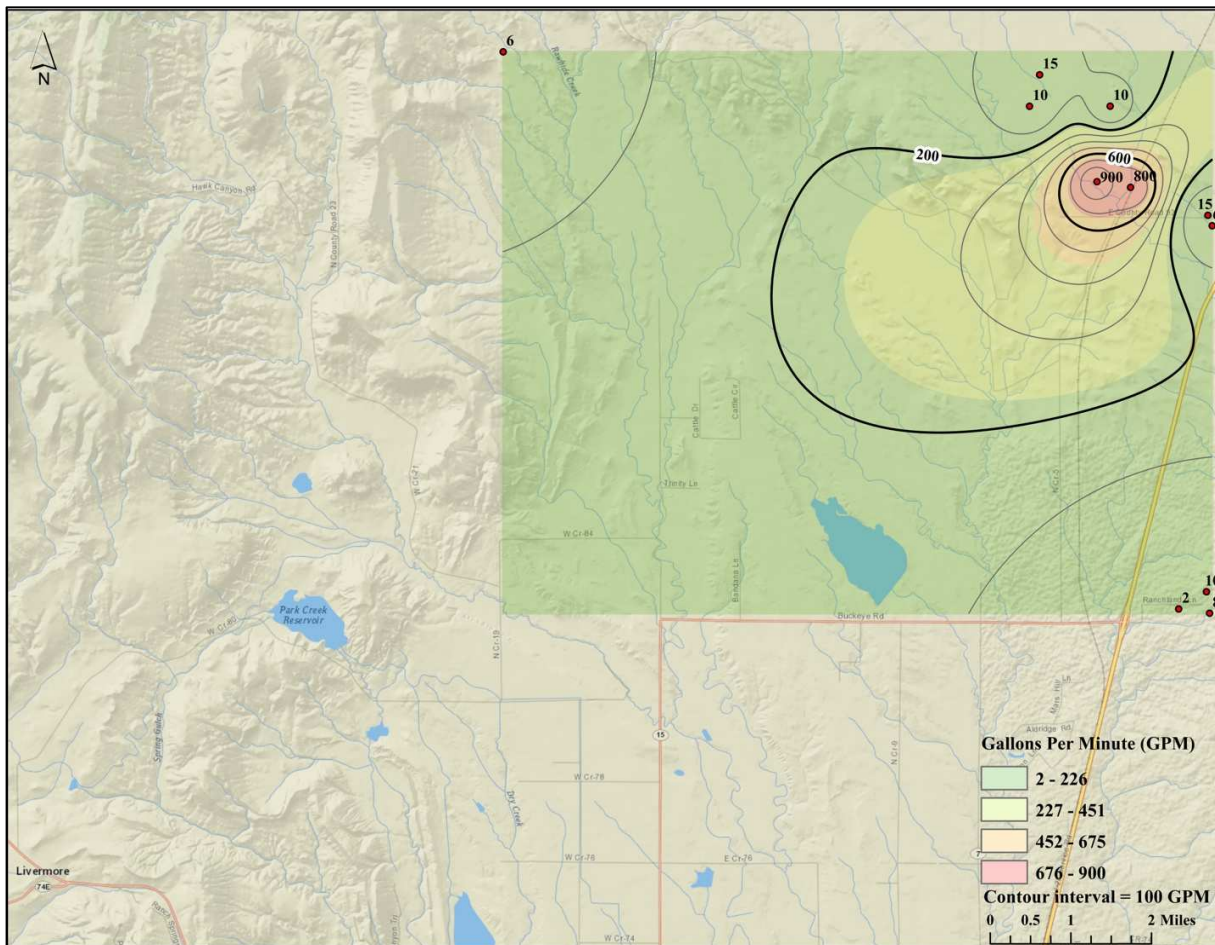


Figure 5.36. Yield (GPM) of the 11 wells in the White River Formation.

Static Water Level: The static water levels of the wells in the White River Formation (Fig. 5.37) range from 28 to 444 ft, with the deepest values belonging to the wells east of Rawhide Energy Station. Among the wells further north, the deepest static water level is 132 ft.

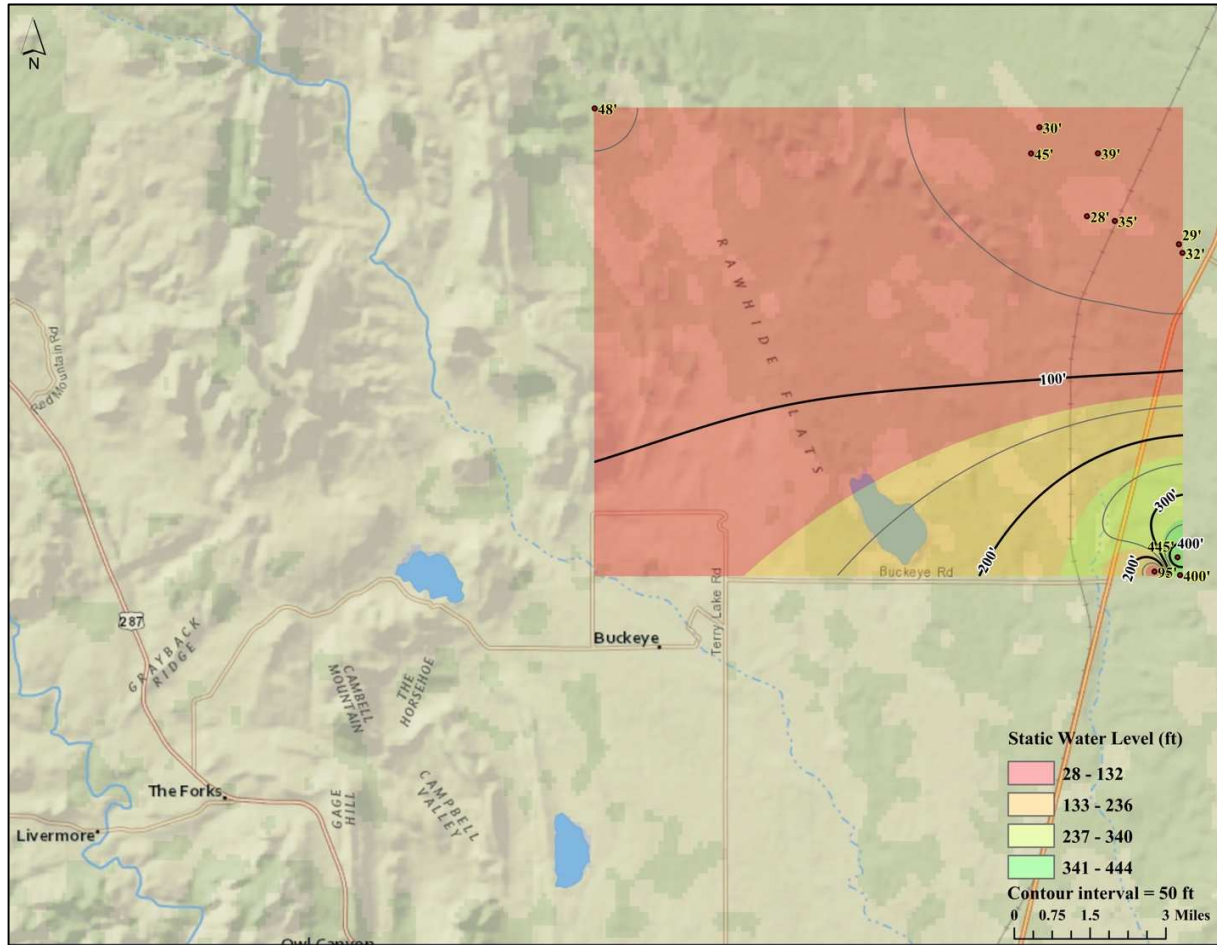


Figure 5.37. Static water level (ft) of White River Formation wells.

Specific Capacity: The highest specific capacities are 42 GAL/min/ft and 20 GAL/min/ft from the wells northeast of Rawhide Energy Station yielding 800 and 900 GPM, respectively (Fig. 5.38). In the same area, there are wells with specific capacities between 1 and 4 GAL/min/ft, as wells as wells <1 GAL/min/ft.

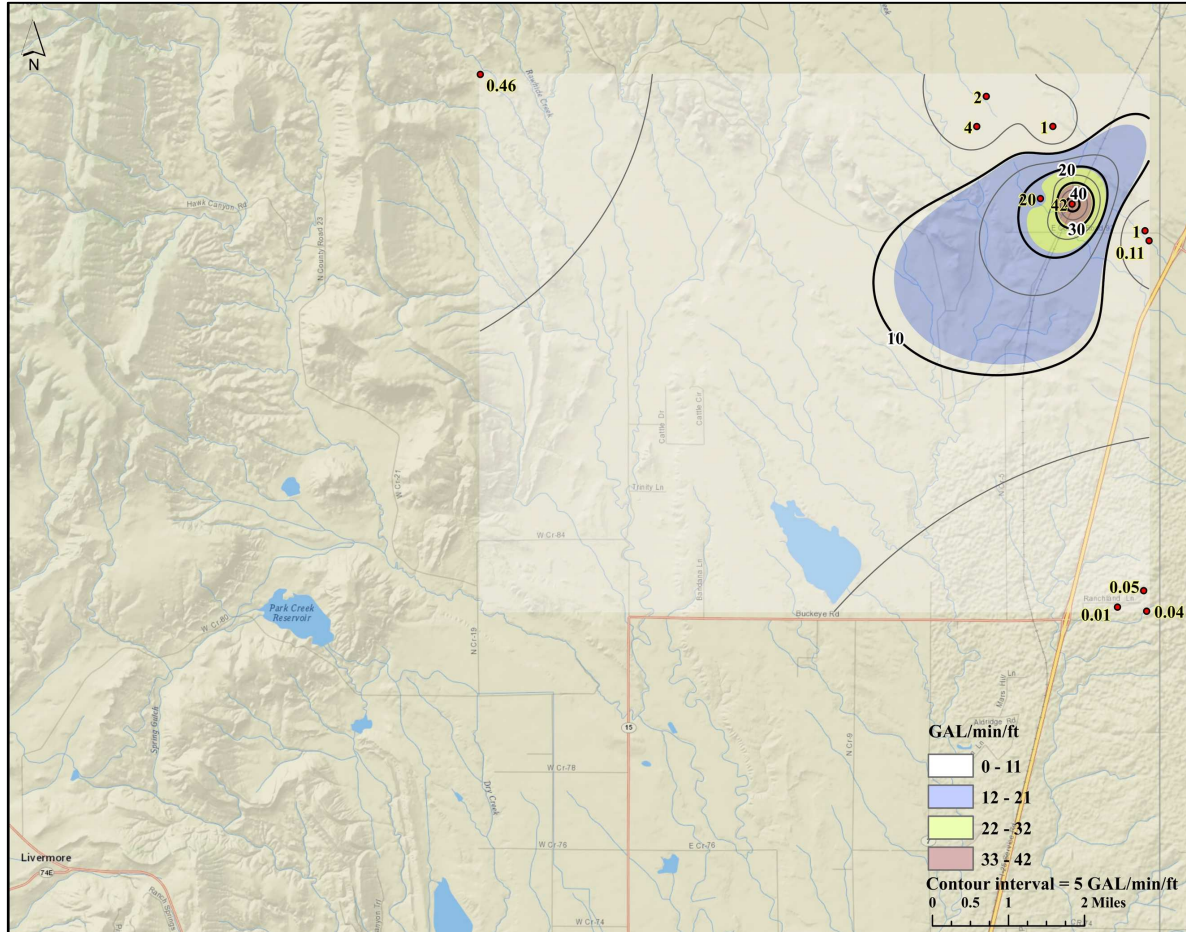


Figure 5.38. Specific capacity (GAL/min/ft) of White River Formation wells.

The North Park Formation:

Well count and distribution: Eight wells produce water from the North Park Formation, all within a few miles of one another in northeast Larimer County (Fig. 5.39).

Yield: The highest yield is 15 GPM from only two wells, and the rest of the wells yield 10 GPM or less (Fig. 5.39).

Static Water Level: The static water levels of wells in the North Park Formation (Fig. 5.40) range from 38 to 301 ft.

Specific Capacity: None of the North Park wells have specific capacities >1 GAL/min/ft. Therefore, making a contour map for the specific capacity would not be beneficial. The highest values are 0.57 GAL/min/ft and 0.25 GAL/min/ft (Fig. 5.39).

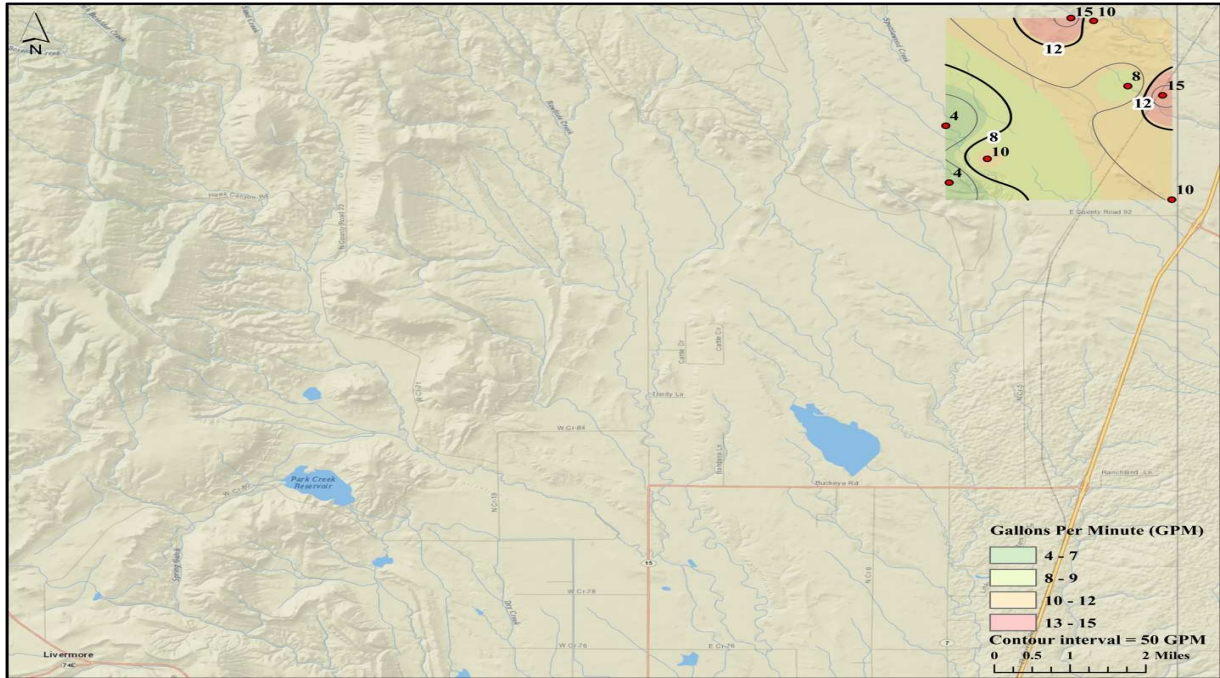


Figure 5.39. Yield (GPM) of 8 wells in the North Park Formation.

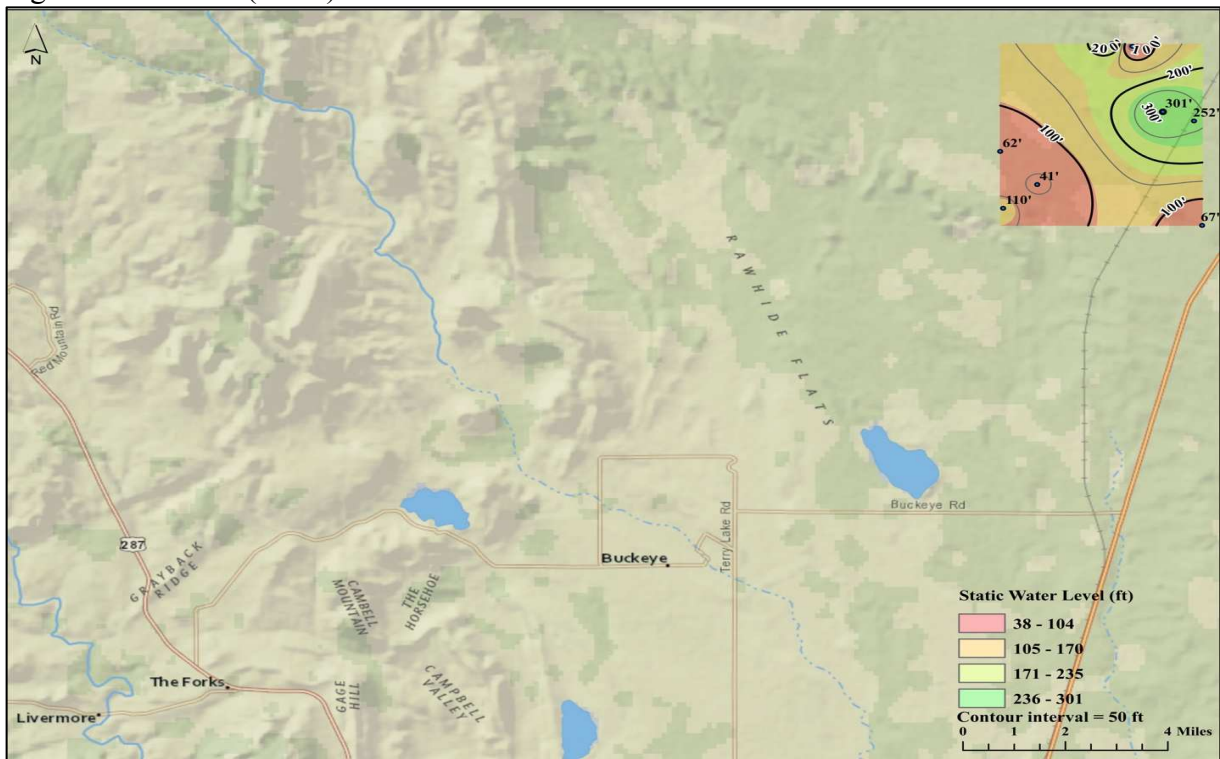


Figure 5.40. Static water level (ft) of North Park Formation wells.

Unconsolidated Alluvium:

Well count and distribution: There are 367 wells producing water from unconsolidated alluvium along a diffuse north-south trend mainly in the eastern part of the study area. Along this trend the wells are somewhat more concentrated from east of Fort Collins to north of Wellington (Fig. 5.41).

Yield: There are 161 wells yielding from 100 to 4000 GPM and 126 wells yielding 15 to 95 GPM distributed around the region (Fig. 5.41).

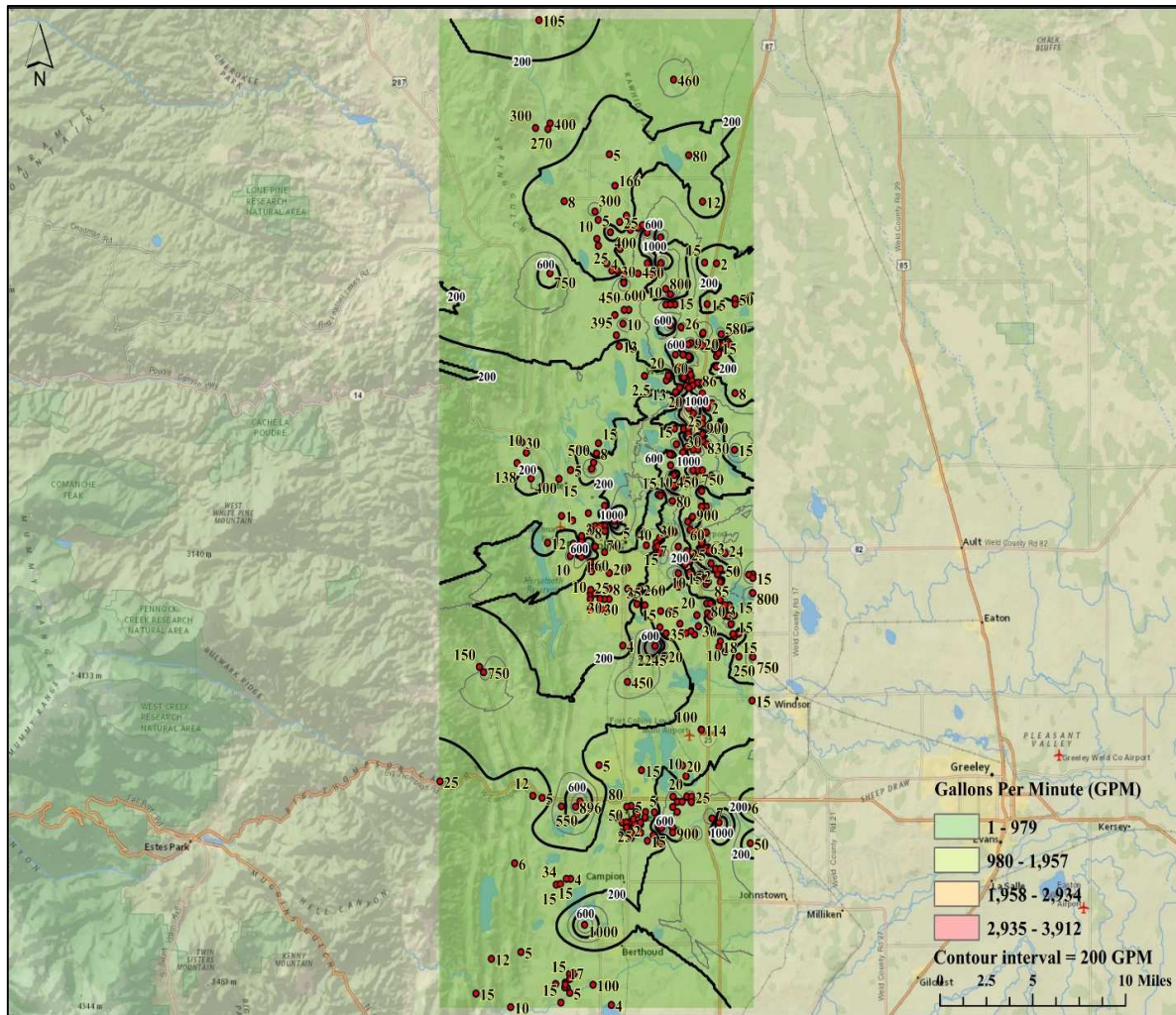


Figure 5.41. Yield (GPM) of 367 wells in the unconsolidated alluvium.

Static Water Level: The static water levels in wells in unconsolidated alluvium (Fig. 5.42) range from 1 to 114 ft, with most between 1 and 29 ft. Fifteen wells were not included on the contour map, three flowing artesian wells yielding 425, 800, and 896 GPM northeast of Loveland or east of the Horsetooth Reservoir, and 13 wells with no static water level reported.

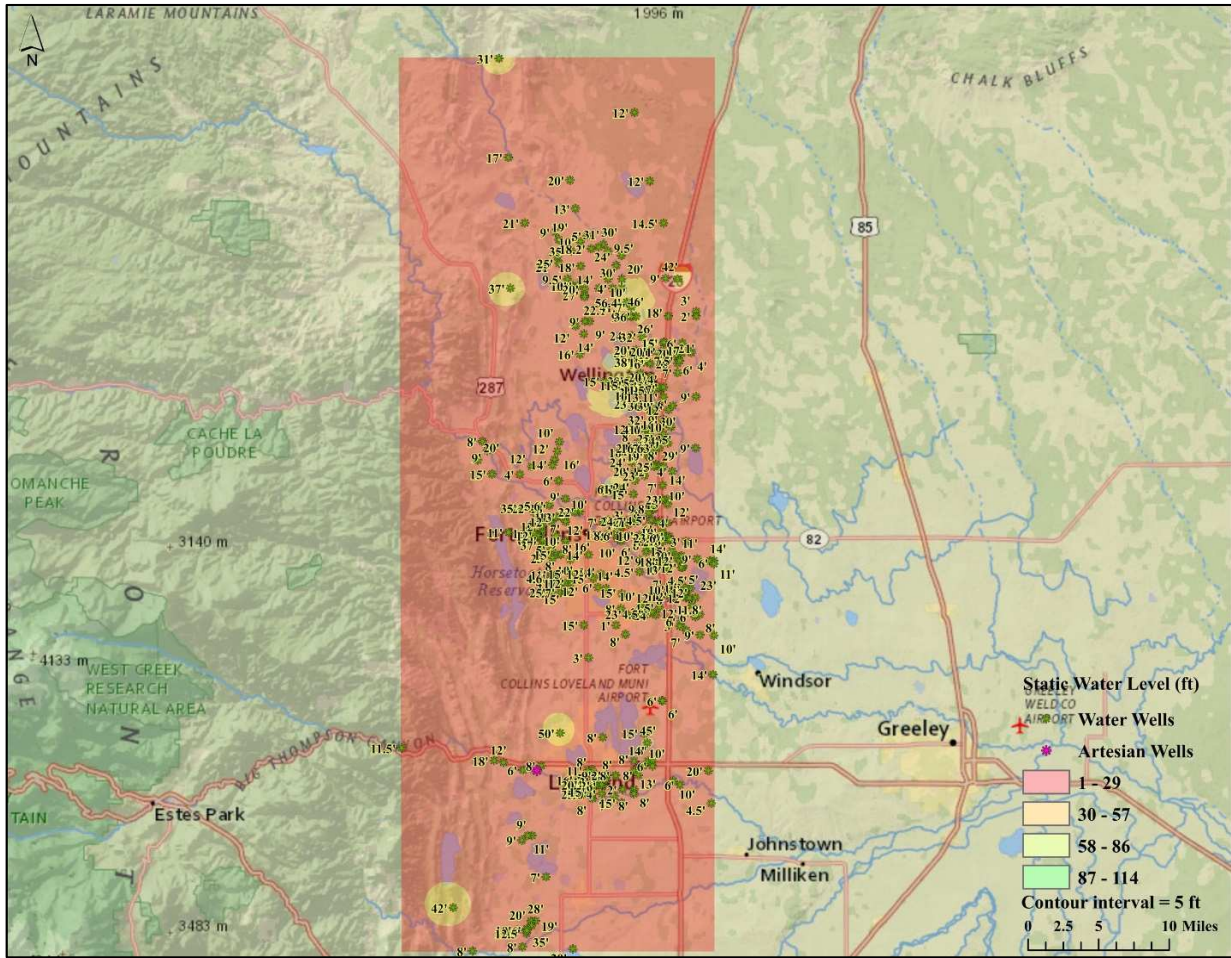


Figure 5.42. Static Water Level (ft) of wells in unconsolidated alluvium. Note that three wells are flowing artesian, and 13 other wells had no static water level data.

Specific Capacity: Specific capacities of 332 wells range from 1 to 800 GAL/min/ft, with the remaining wells at <1 GAL/min/ft (Fig. 5.43). Specific capacity is at or above 1 GAL/min/ft in 90% of the alluvium-hosted wells. Six wells were omitted from the specific capacity contour map because their drawdown is reported as zero.

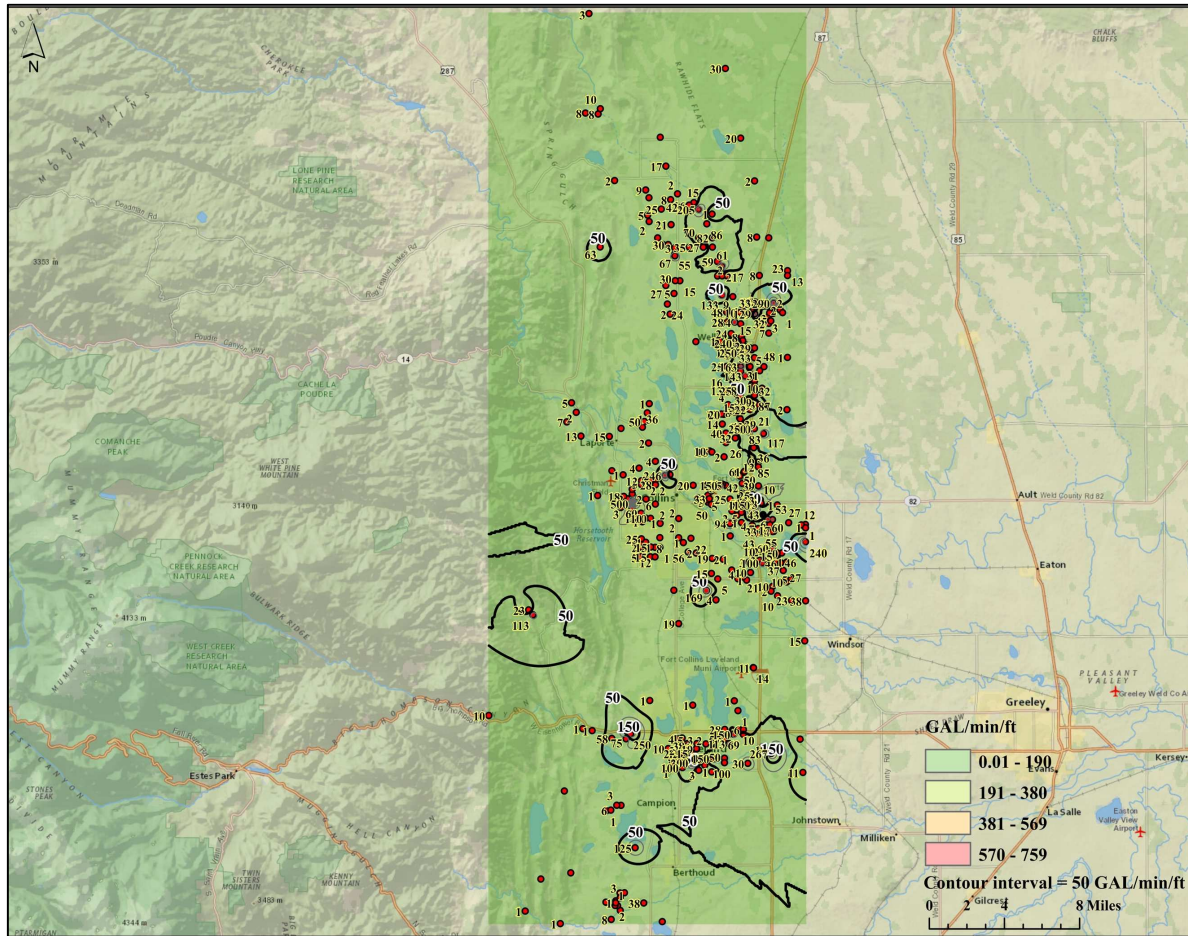


Figure 5.43. Specific capacity (GAL/min/ft) of wells in unconsolidated alluvium. Wells <1 GAL/min/ft are not labeled. Six wells were not included in drawing the map contours.

Well and Data Variability by Geographic Distribution

The wells, and hence the data, are mainly confined to the eastern side of Larimer County which is expected because sedimentary rocks are more common in this particular area. The following results are organized from north to south by geologic quadrangle, followed by consideration of the far eastern edge of Larimer County where there are no geologic quadrangle maps available.

The Table Mountain quadrangle area does not have many wells (Figs. 5.44 and 5.45). There are 14 domestic wells, with the highest yields from unconsolidated alluvium. The wells in

lithified units mainly yield less than 15 GPM, although one in the Lykins Formation near the middle of the area yields 15 GPM.

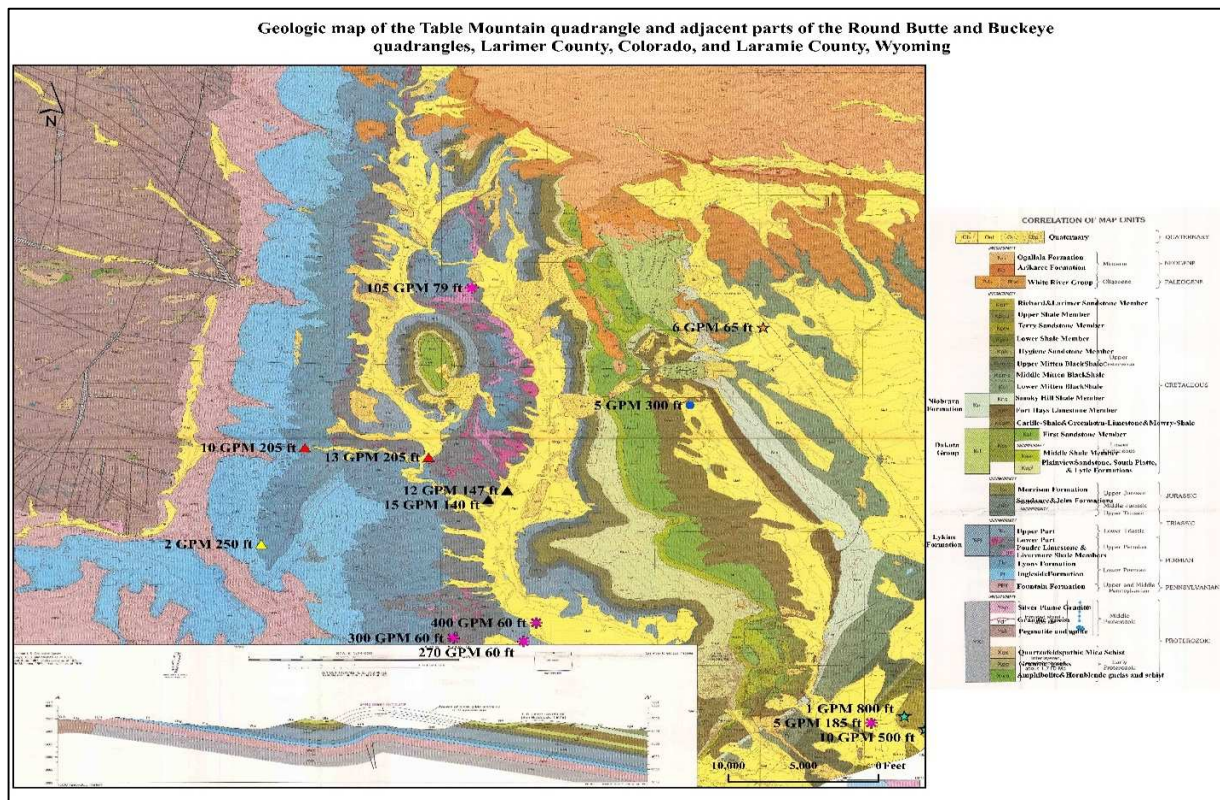


Figure 5.44. The Table Mountain quadrangle map (Courtright and Braddock, 1989) with yield and depth of the wells labeled.

None of the wells in lithified units have specific capacities above 1 GAL/min/ft. There are two wells of 8 GAL/min/ft and a well of 10 GAL/min/ft in the unconsolidated alluvium the south central part of the quadrangle (Fig. 5.46).

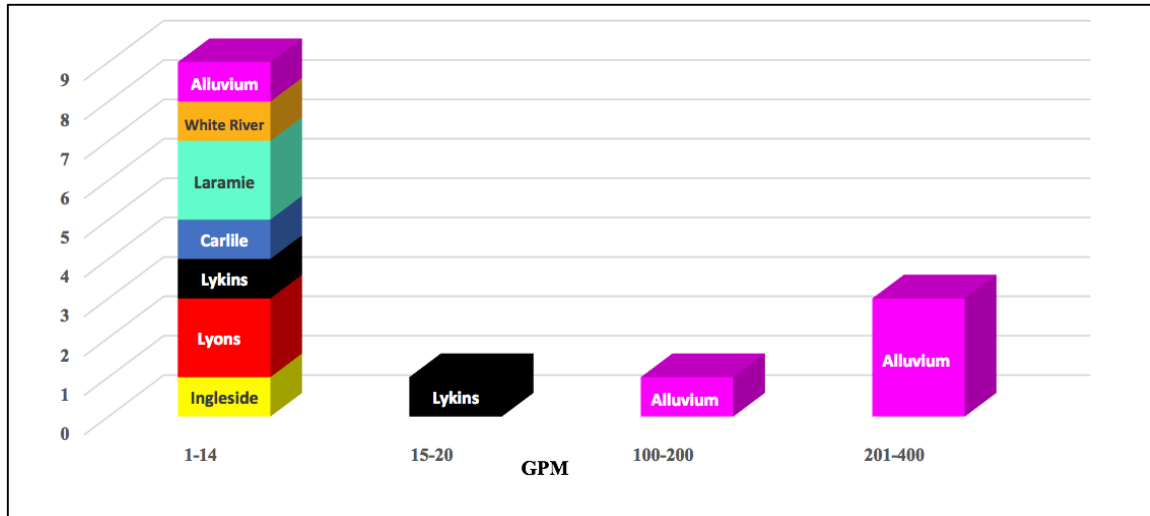


Figure 5.45. The yields of water wells in the Table Mountain quadrangle map area. The colors match the index of the map.

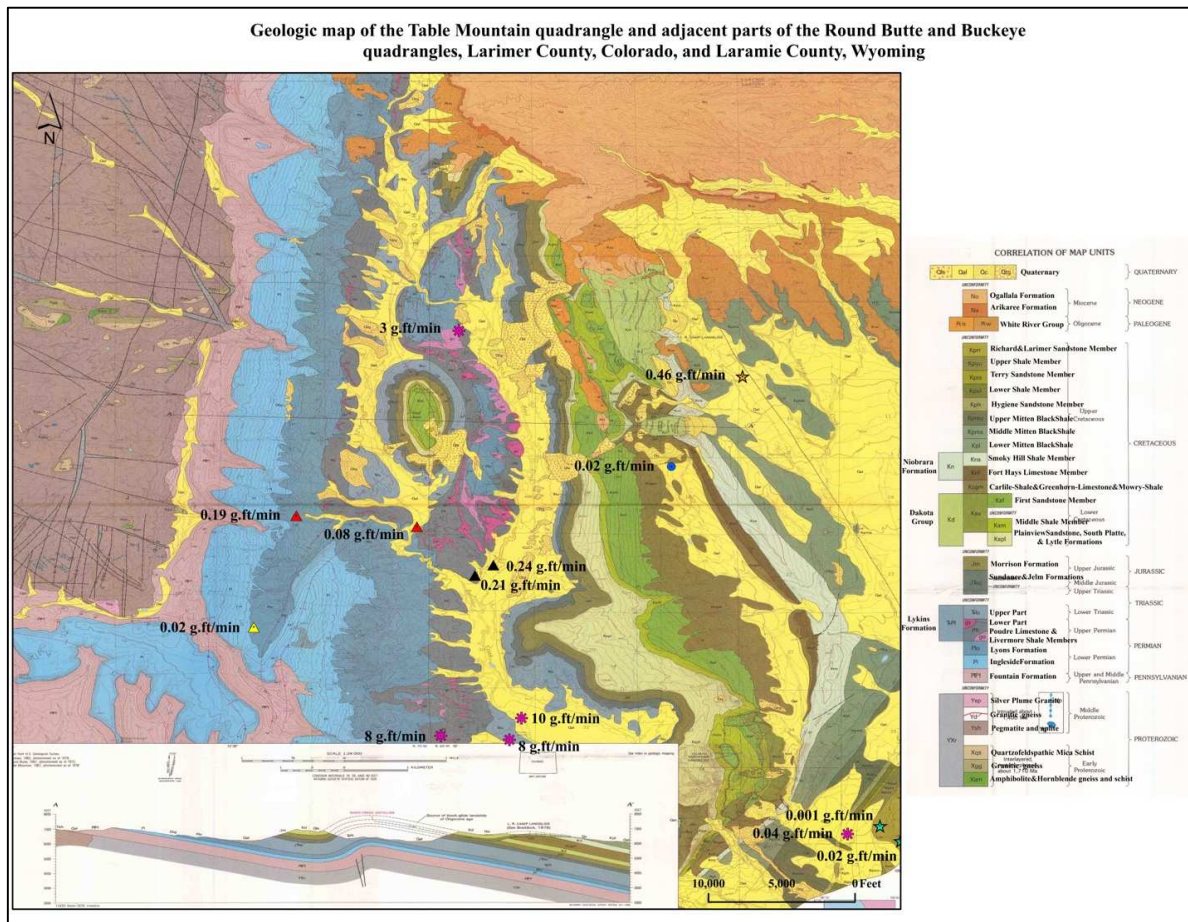


Figure 5.46. The Table Mountain quadrangle map (Courtright and Braddock, 1989) with specific capacity of the wells labeled. The index matches the index of (Fig. 5.44).

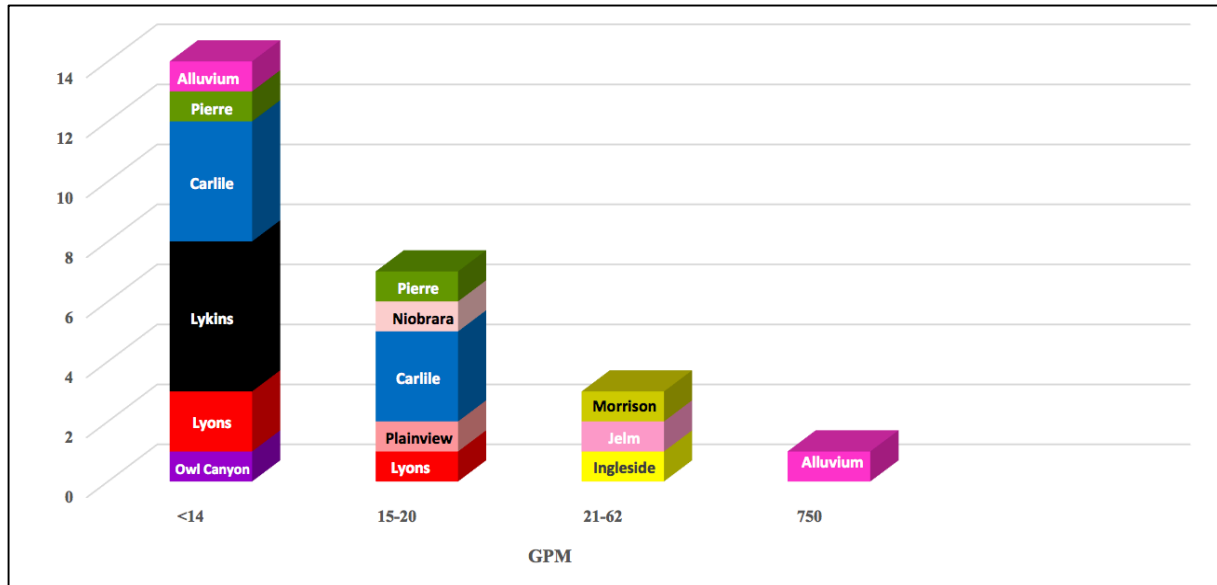


Figure 5.48. The yields of water wells in the Livermore quadrangle map area. The colors match the index of the map.

Among wells in the lithified units, there are two wells with specific capacities of 1 GAL/min/ft, one in the Ingleside Formation south of the center of the map area and one in the Carlile-Graneros-Mowry Shales. Also, there are two wells of 2 GAL/min/ft and 63 GAL/min/ft in the unconsolidated alluvium in the northeastern and middle parts of the area, respectively (Fig. 5.49).

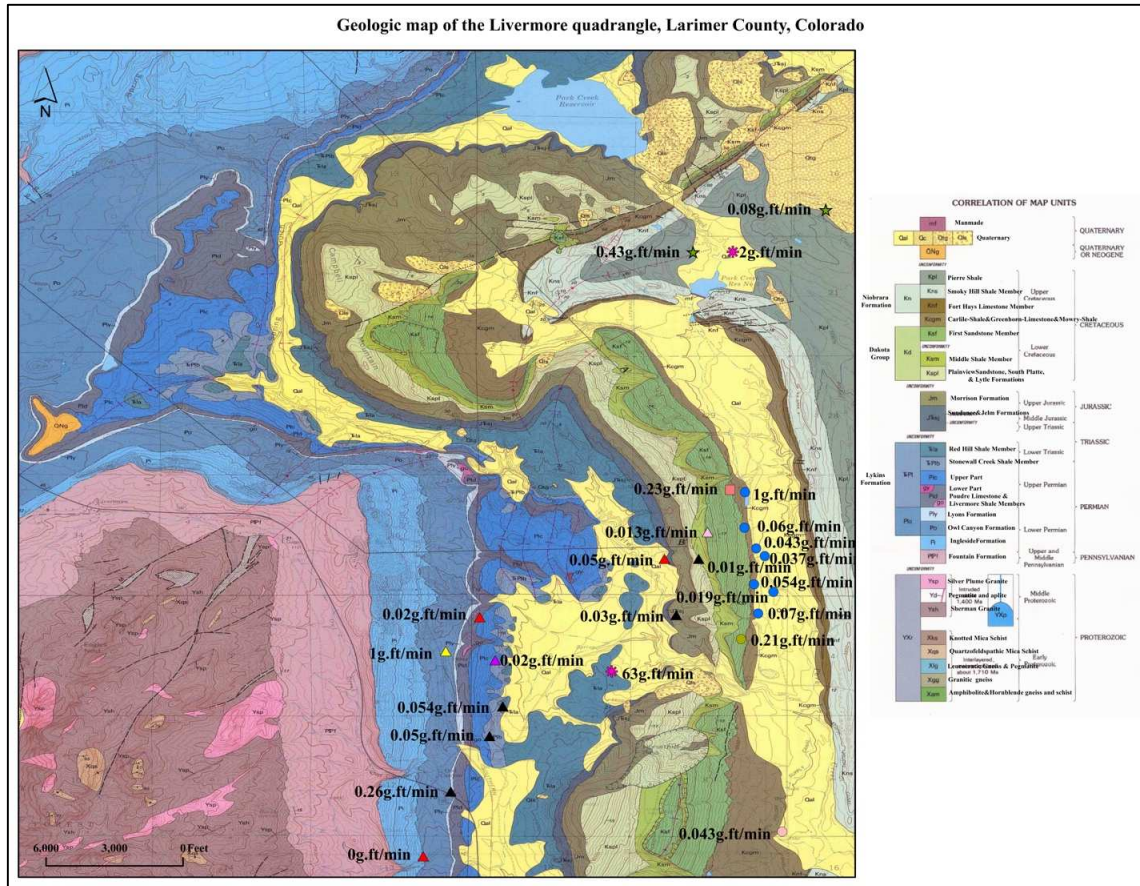


Figure 5.49. The Livermore quadrangle map (Braddock et al., 1988c) with specific capacity of the wells labeled. The index matches the index of (Fig. 5.47).

The density of wells increases dramatically further south, with 88 domestic wells in the Laporte quadrangle (Fig. 5.50), all concentrated in the southern two-thirds of the quadrangle and restricted to the eastern part of the quadrangle because the western side is mainly igneous and metamorphic rocks. Higher yielding wells are mainly in the southern half of the area, with the most notable exception a well to the north in the Owl Canyon Formation yielding 40 GPM. In the southern half of the quadrangle there is neither a clear geographic pattern nor a clear stratigraphic pattern (Fig. 5.51) to the higher yielding wells. Overall, the Lykins Formation, Pierre Shale Formation, and Carlile-Graneros-Mowry Shales host more wells than do the other lithified units.

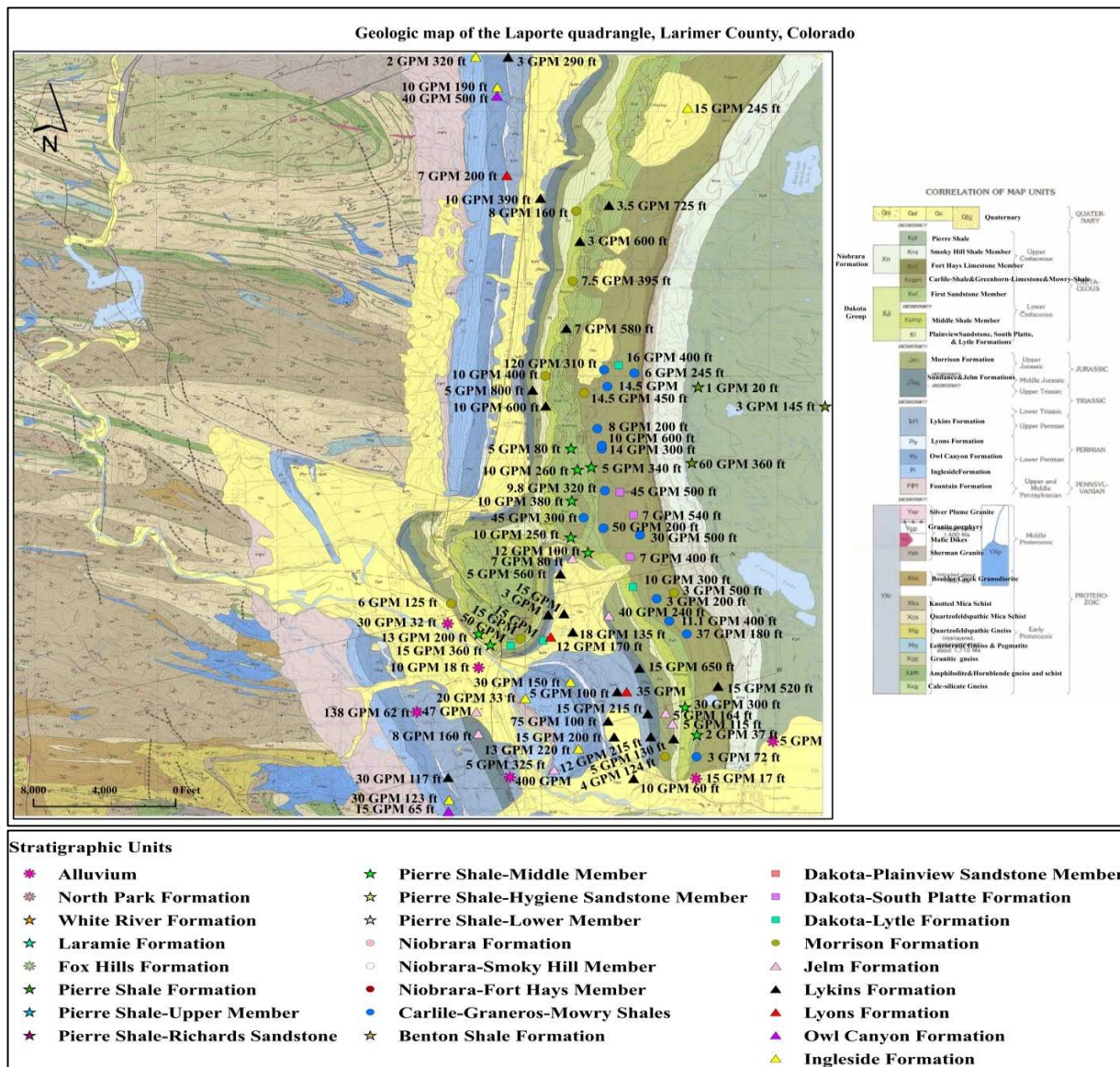


Figure 5.50. The Laporte quadrangle map (Braddock et al., 1988b) with yield and depth of the wells labeled.

The higher specific capacity wells are mainly in the southern half of the area, with the most notable exception a well near the middle of the map in the Morrison Formation at 1 GAL/min/ft. In the southern part of the quadrangle there are two wells of 1 GAL/min/ft in the Lykins Formation, as well as two in the Lytle Formation, and one in the Carlile-Graneros-Mowry Shales. Among the wells in lithified units, the highest specific capacities are in the Ingleside

Formation at 2 GAL/min/ft and the Jelm Formation at 5 GAL/min/ft. The unlithified alluvium has scattered wells of 2, 5, 7, 13, and 15 GAL/min/ft (Fig. 5.52).

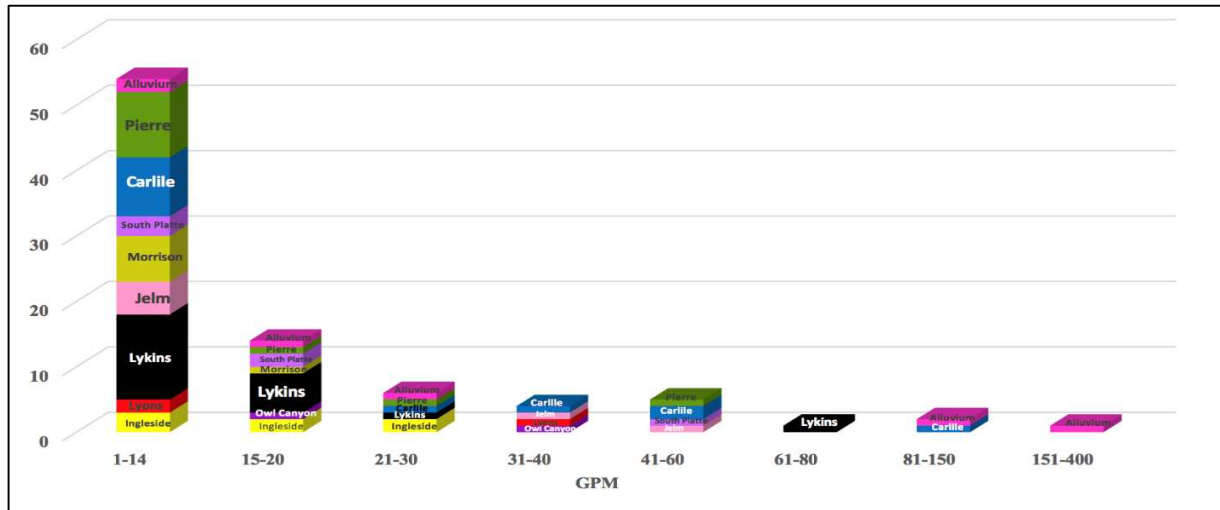


Figure 5.51. The yields of water wells in the Laporte quadrangle map area. The colors match the index of the map.

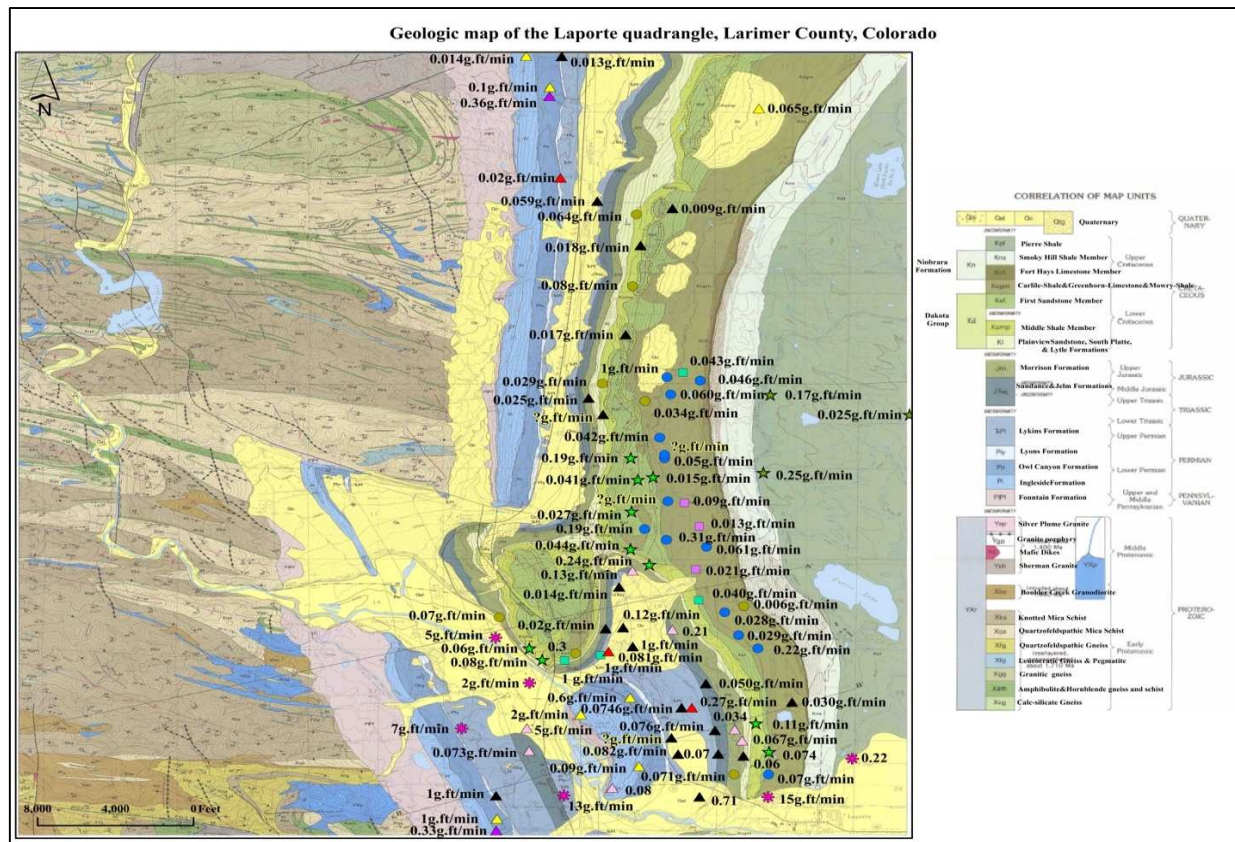


Figure 5.52. The Laporte quadrangle map (Braddock et al., 1988b) with specific capacity of the wells labeled. The four wells labeled ? g ft/min have drawdown reported as zero. The index matches the index of (Fig. 5.50).

Continuing southward, there are 64 wells in the eastern half of Horsetooth Reservoir quadrangle. The wells are more concentrated near the southern and northern ends of the quadrangle, although several are scattered to the east of Horsetooth Reservoir (Fig. 5.53).

The highest yield from a lithified unit is 300 GPM from a well in the Ingleside Formation north of Horsetooth Reservoir (Fig. 5.54), but there are no other wells in lithified units with yields exceeding 60 GPM and there is no obvious geographic or stratigraphic pattern to the high well yields. The Lykins Formation hosts a disproportionate share of wells, mainly in the southern and northern ends of the area. A relatively large number of wells are also hosted in the Carlile-Graneros-Mowry, mainly in the southeast corner of the quadrangle.

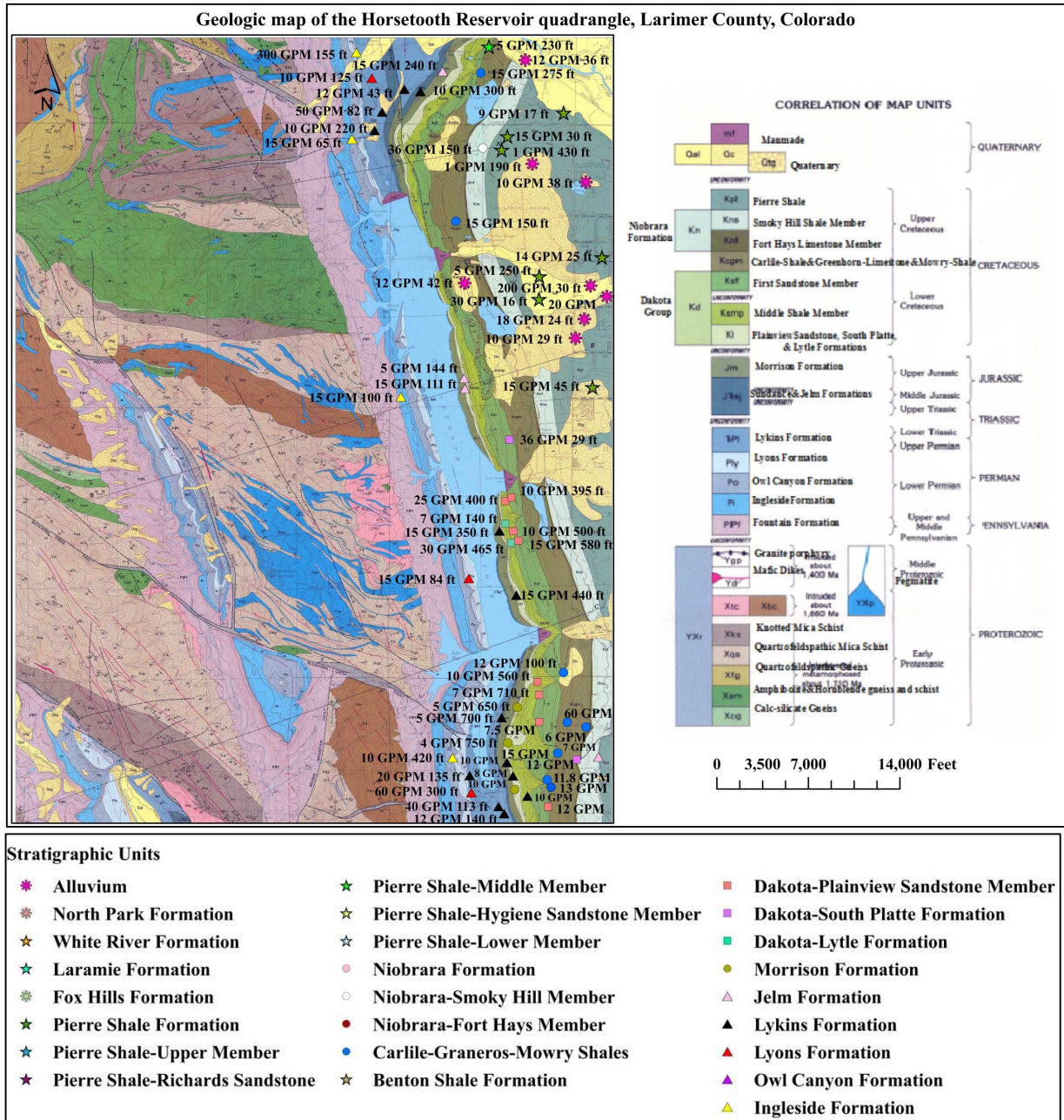


Figure 5.53. The Horsetooth Reservoir quadrangle map (Braddock et al., 1989) with yield and depth of the wells labeled.

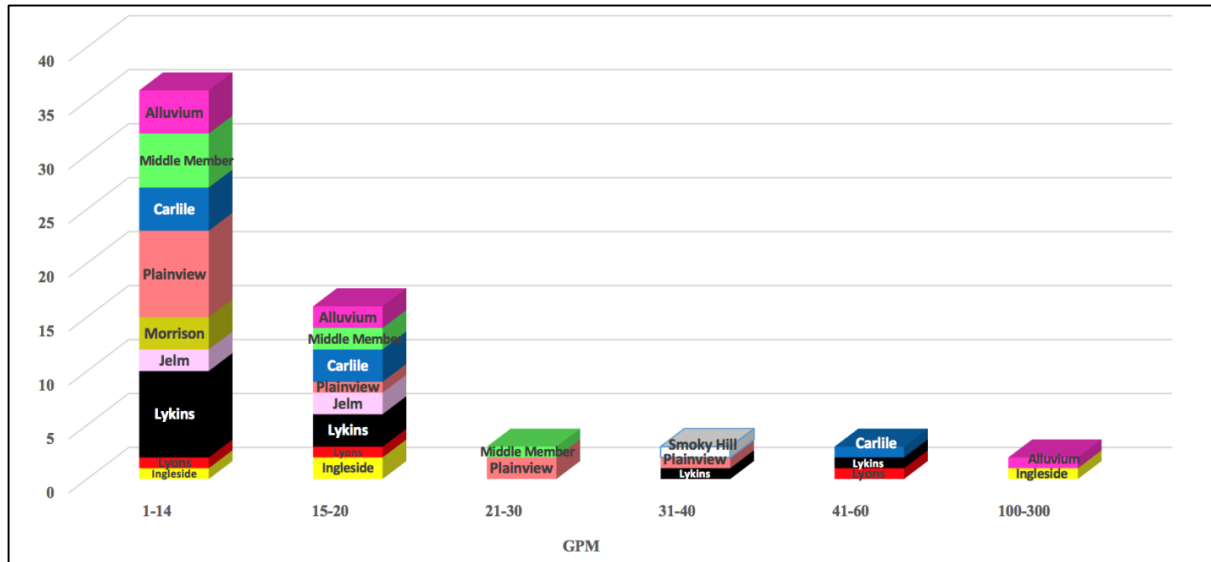


Figure 5.54. The yields of water wells in the Horsetooth Reservoir quadrangle map area. The colors match the index of the map.

The highest specific capacities in wells in the lithified units are 18 GAL/min/ft from the South Platte Formation east of Horsetooth Reservoir and 16 GAL/min/ft from the Ingleside Formation north of Horsetooth Reservoir (Fig. 5.55). There are other wells in lithified units with specific capacities of 1, 2, and 3 GAL/min/ft in the Lyons Formation, Lykins Formation, Carlile-Graneros-Mowry Shales, Smoky Hill Member, and Pierre Shale Formation scattered north, east, and south of Horsetooth Reservoir. The unconsolidated deposits have the highest specific capacities at 18 GAL/min/ft, as well as wells of 1, 2, and 3 GAL/min/ft east of Horsetooth Reservoir.

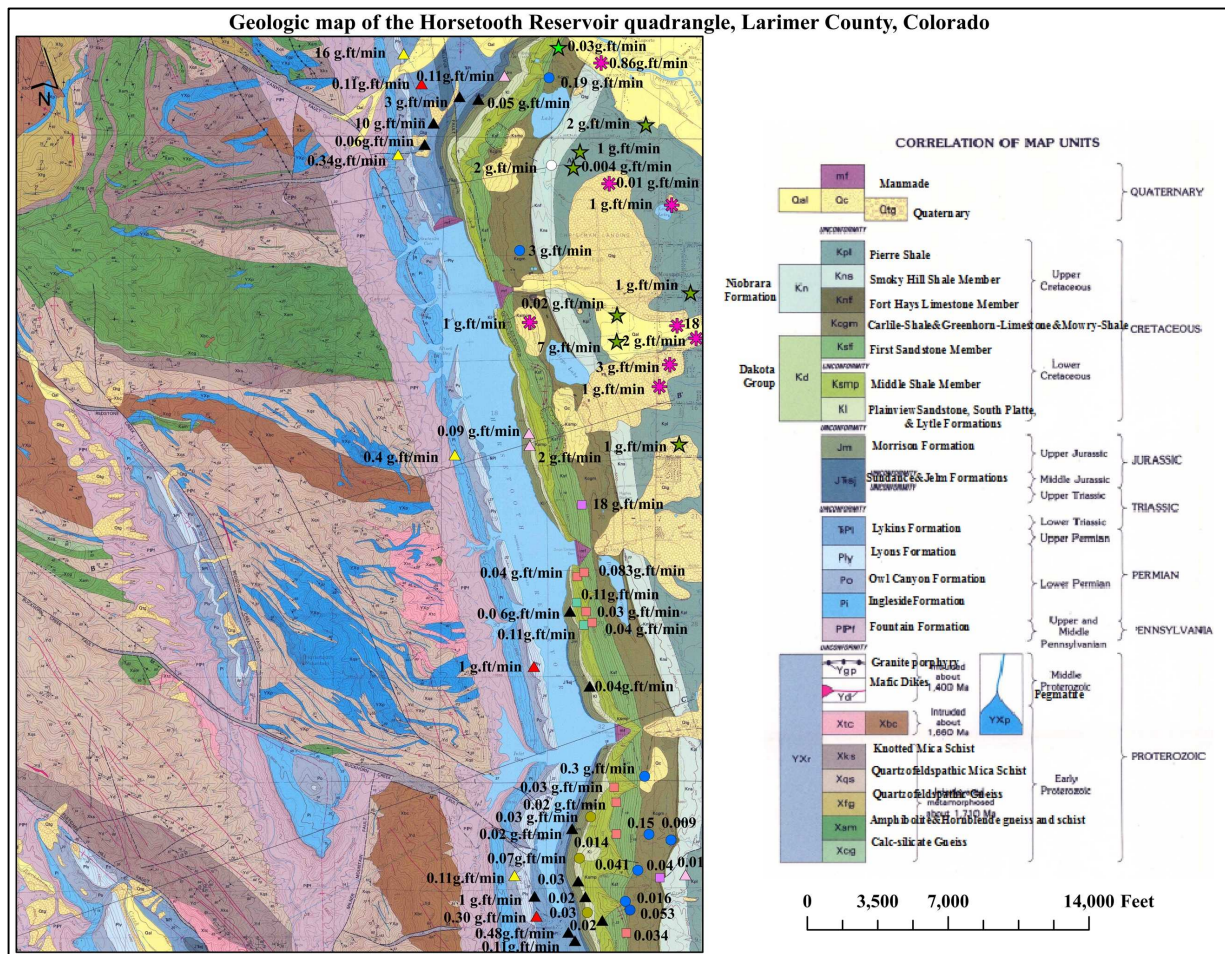
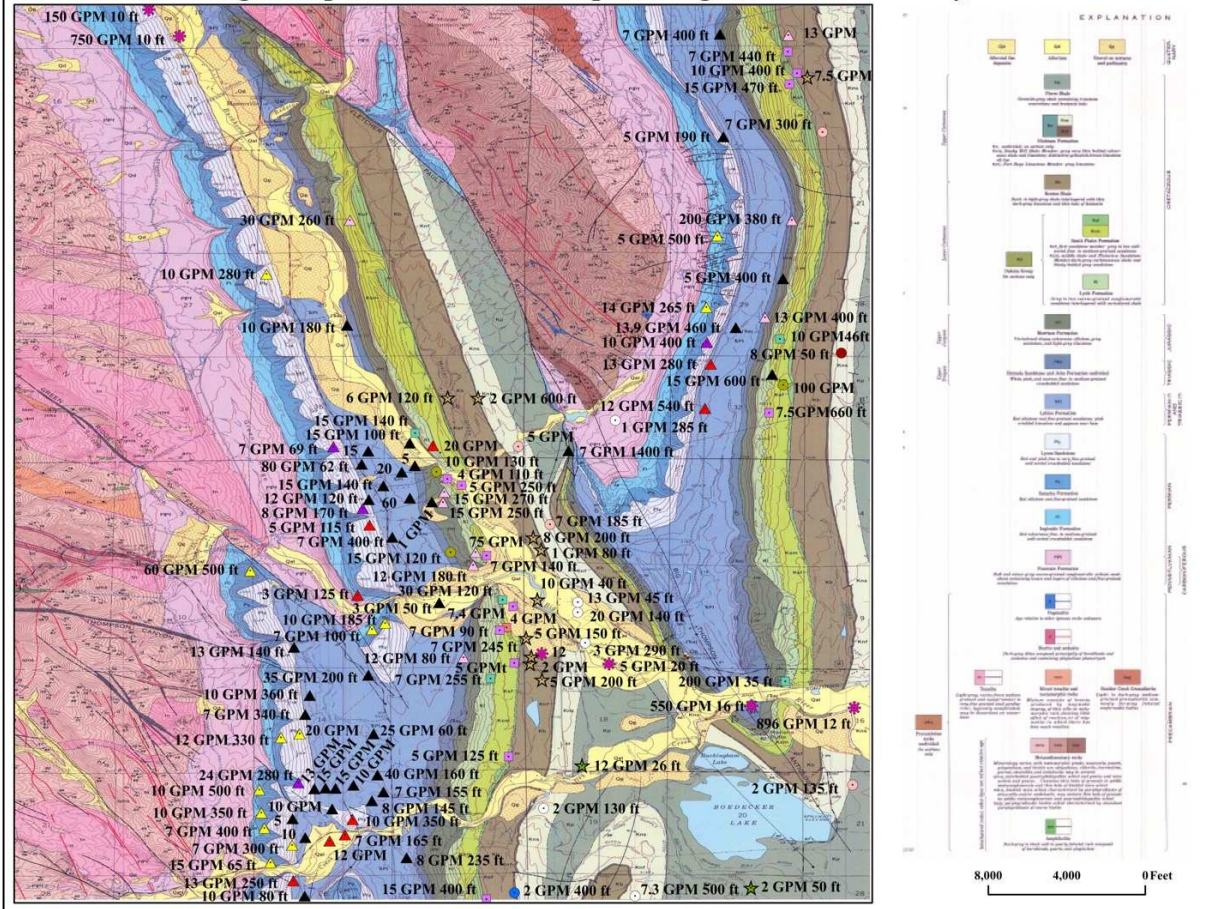


Figure 5.55. The Horsetooth Reservoir quadrangle map (Braddock et al., 1989) with specific capacity of the wells labeled. The index matches the index of (Fig. 5.53)

The area covered by the Masonville Quadrangle has a total of 121 wells (Figs. 5.56 and 5.57), with the largest concentration in the southern half of the area. Several additional wells are in the northeast and a few in the northwest. One of the four highest yielding wells in lithified units yields 200 GPM in the Lytle Formation north of Boedecker Lake in the southeast corner of the quadrangle, but there is also a well in the Jelm Formation yielding 200 GPM about 4 miles south of Horsetooth Reservoir. Wells in lithified units that show moderately high yields are broadly scattered, so there is not a clear geographic pattern in well yields. As in the Horsetooth quadrangle, the stratigraphic unit in the Masonville quadrangle hosting the largest number of wells is the Lykins Formation and several of these exceed 15 GPM.

Geologic map of the Masonville quadrangle, Larimer County, Colorado



Stratigraphic Units

✱ Alluvium	★ Pierre Shale-Middle Member	■ Dakota-Plainview Sandstone Member
✱ North Park Formation	☆ Pierre Shale-Hygiene Sandstone Member	■ Dakota-South Platte Formation
★ White River Formation	☆ Pierre Shale-Lower Member	■ Dakota-Lytle Formation
★ Laramie Formation	● Niobrara Formation	● Morrison Formation
★ Fox Hills Formation	○ Niobrara-Smoky Hill Member	▲ Jelm Formation
★ Pierre Shale Formation	● Niobrara-Fort Hays Member	▲ Lykins Formation
★ Pierre Shale-Upper Member	● Carlile-Graneros-Mowry Shales	▲ Lyons Formation
★ Pierre Shale-Richards Sandstone	★ Benton Shale Formation	▲ Owl Canyon Formation
		▲ Ingleside Formation

Figure 5.56. The Masonville quadrangle map (Braddock et al., 1970) with yield and depth of the wells labeled.

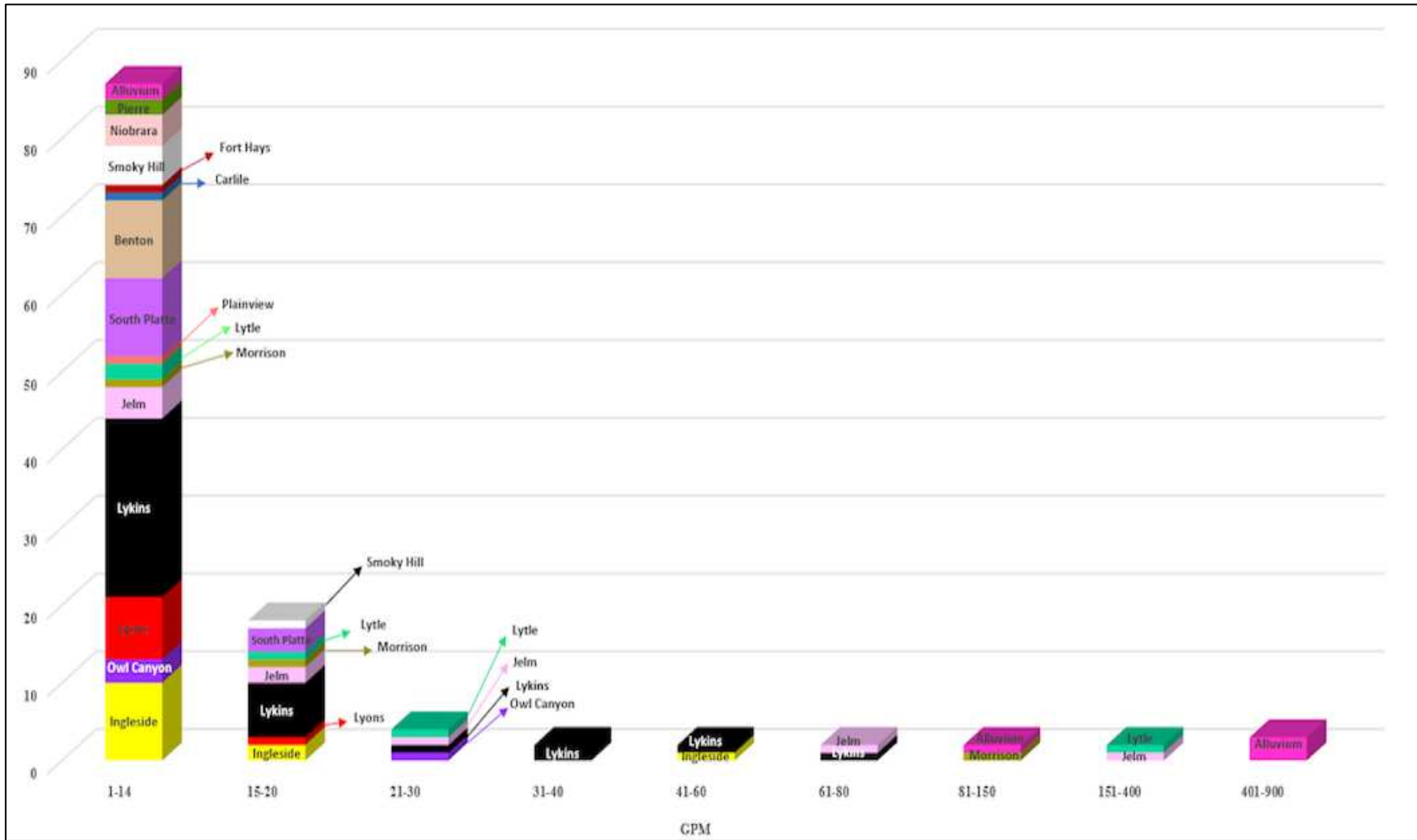


Figure 5.57. The yields of water wells in the Masonville quadrangle map area. The colors match the index of the map.

The highest specific capacities in lithified units are 9 GAL/min/ft in the Lytle Formation north of Boedecker Lake in the southeast corner of the quadrangle and a well in the Pierre Shale Formation of 4 GAL/min/ft northwest of Boedecker Lake. Other wells in lithified units that show specific capacities of 1 and 2 GAL/min/ft are broadly scattered around the area. The unlithified alluvium shows variable specific capacities of 113, 75, 58, and 23 GAL/min/ft, as well as many wells of 1 GAL/min/ft, scattered in the northwest and southeast part of the area (Fig. 5.58).

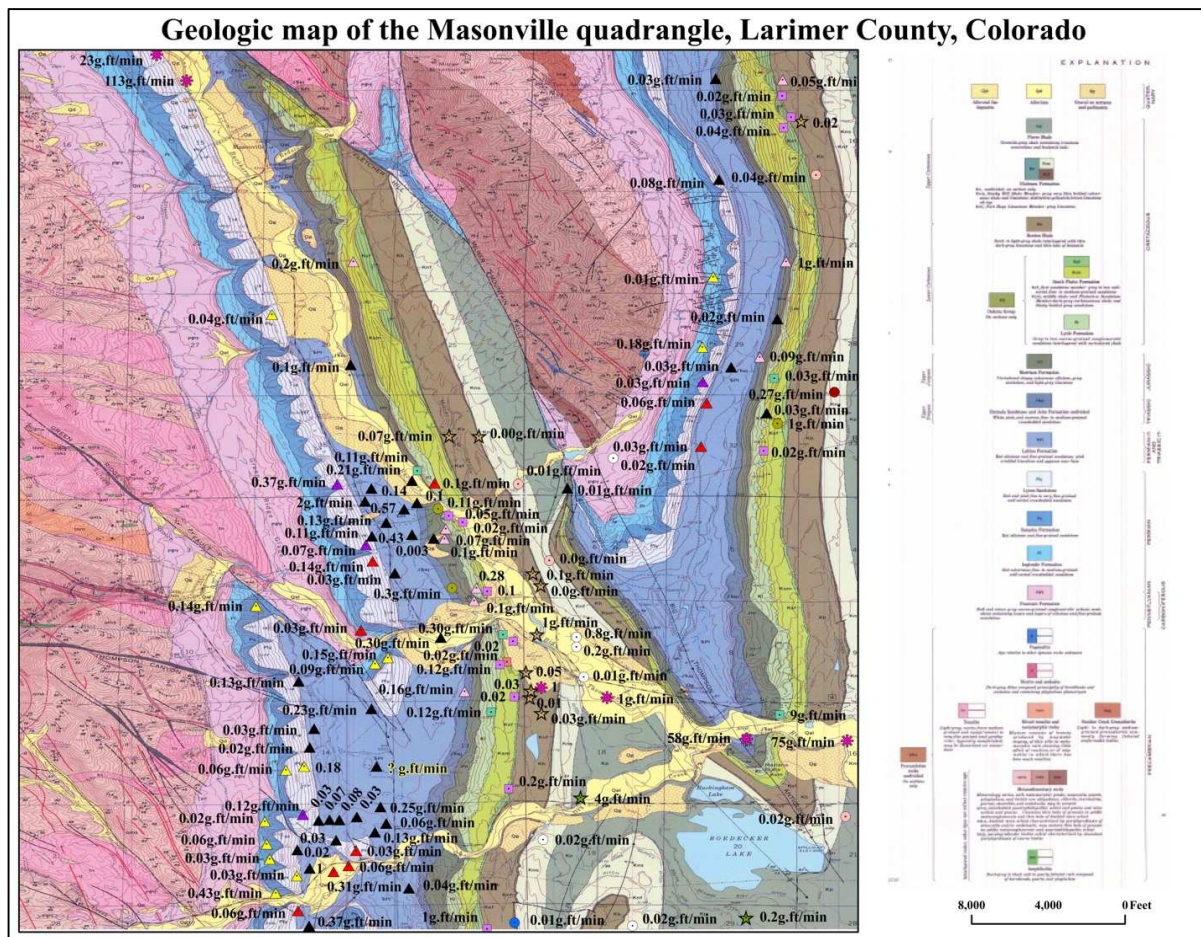


Figure 5.58. The Masonville quadrangle map (Braddock et al., 1970) with specific capacity of the wells labeled. The well labeled ? g/ft./min has drawdown reported as zero. The index matches the index of (Figure 5.56).

Carter Lake quadrangle at the southern end of Larimer County hosts 160 domestic wells (Figs. 5.59 and 5.60). Most of the wells are concentrated in a swath running from the southwest corner to the north central part of the map area. A more modest cluster of wells occurs in the

southeast corner and a few wells are scattered over the rest of the quadrangle. The two highest yielding wells in lithified units, in the Jelm Formation and the Carlile-Graneros-Mowry Shales, both yield 100 GPM and are located very close to one another near the northern end of the concentrated swath of wells. There is no other evidence of a geographic pattern in well yields within the quadrangle. Considered by unit, the Lyons Formation, Lykins Formation, Morrison Formation, and the Middle Member of the Pierre Shale each host large numbers of wells.

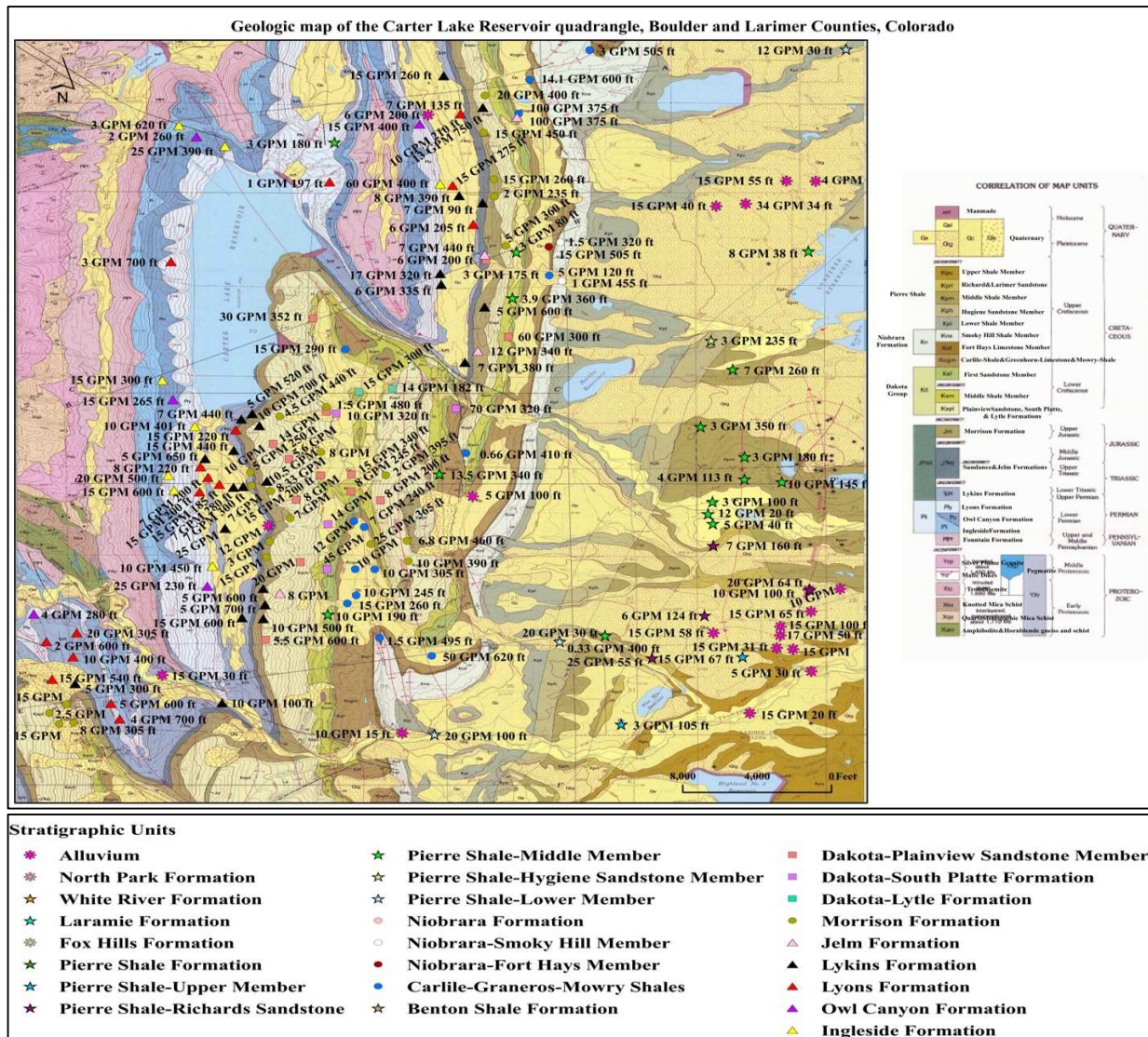


Figure 5.59. The Carter Lake Reservoir quadrangle map (Braddock et al., 1988a) with yield and depth of the wells labeled.

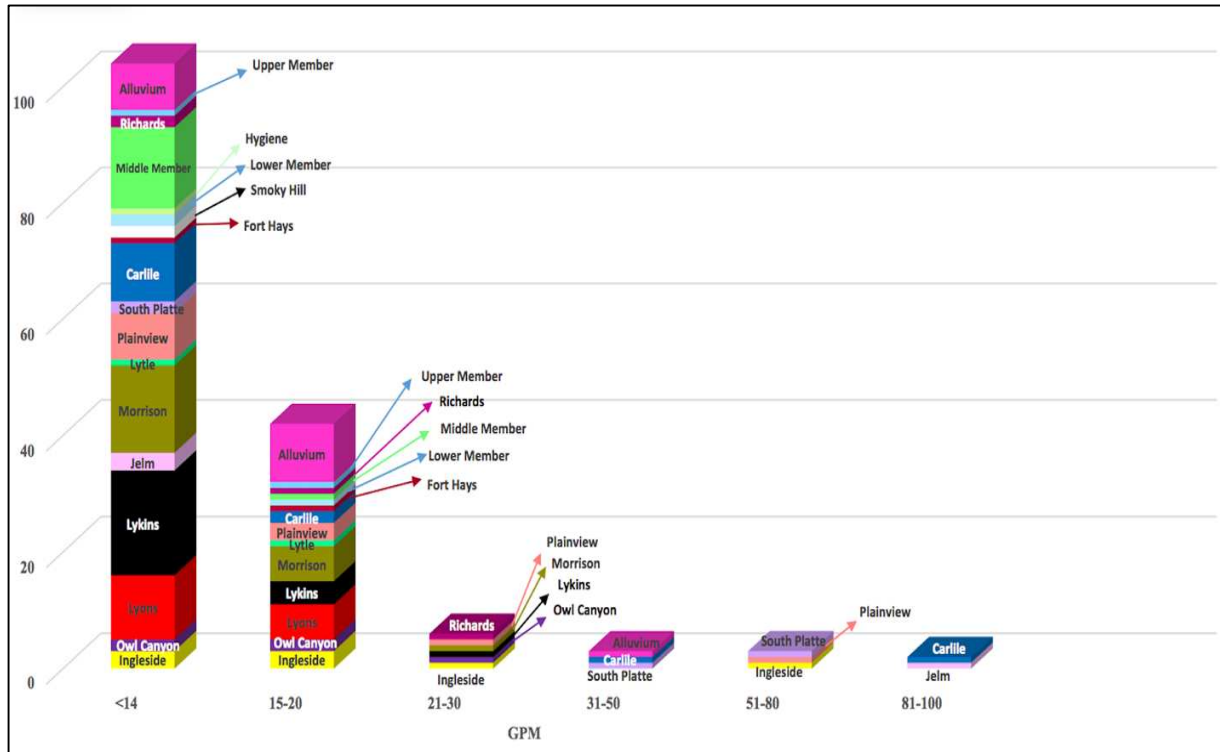


Figure 5.60. The yields of water wells in the Carter Lake quadrangle map area. The colors match the index of the map.

The highest specific capacities for wells in lithified units are 9 GAL/min/ft from the Lytle Formation east of Carter Lake, and 3 GAL/min/ft from the Richards Sandstone Member of the Pierre Shale Formation southeast of Carter Lake. In addition, there is a well of 2 GAL/min/ft in the Carlile-Graneros-Mowry Shales in the northern part of the area. Scattered around the area there are several wells in lithified units, including the Owl Canyon Formation, Lyons Formation, and the Richards Sandstone Member, Middle Shale Member, and Lower Shale Member of the Pierre Shale Formation with specific capacities of 1 GAL/min/ft. In the alluvium deposits, there are several wells with specific capacities of 1, 2, 3, 6, and 8 GAL/min/ft scattered east, south, and southeast of Carter Lake (Fig. 5.61).

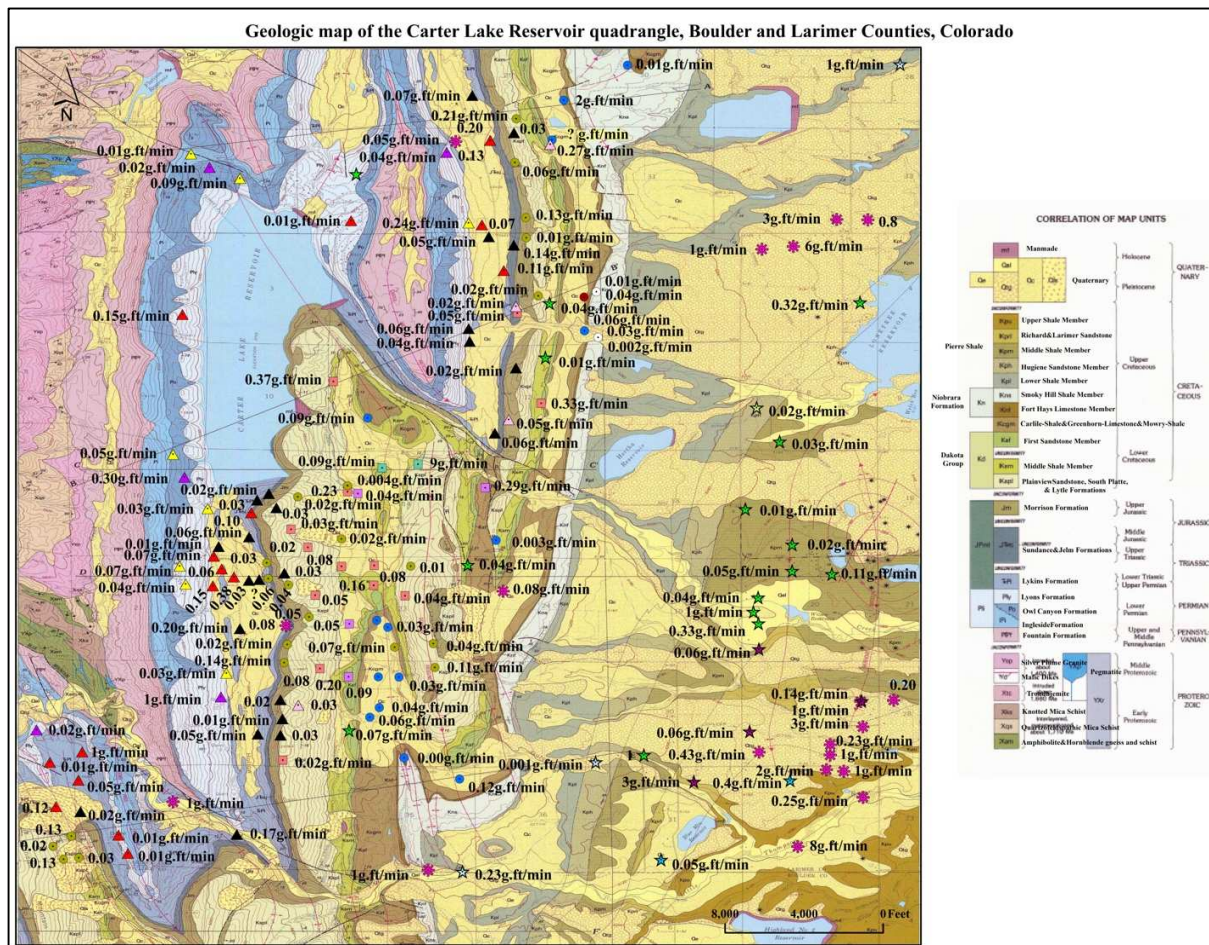
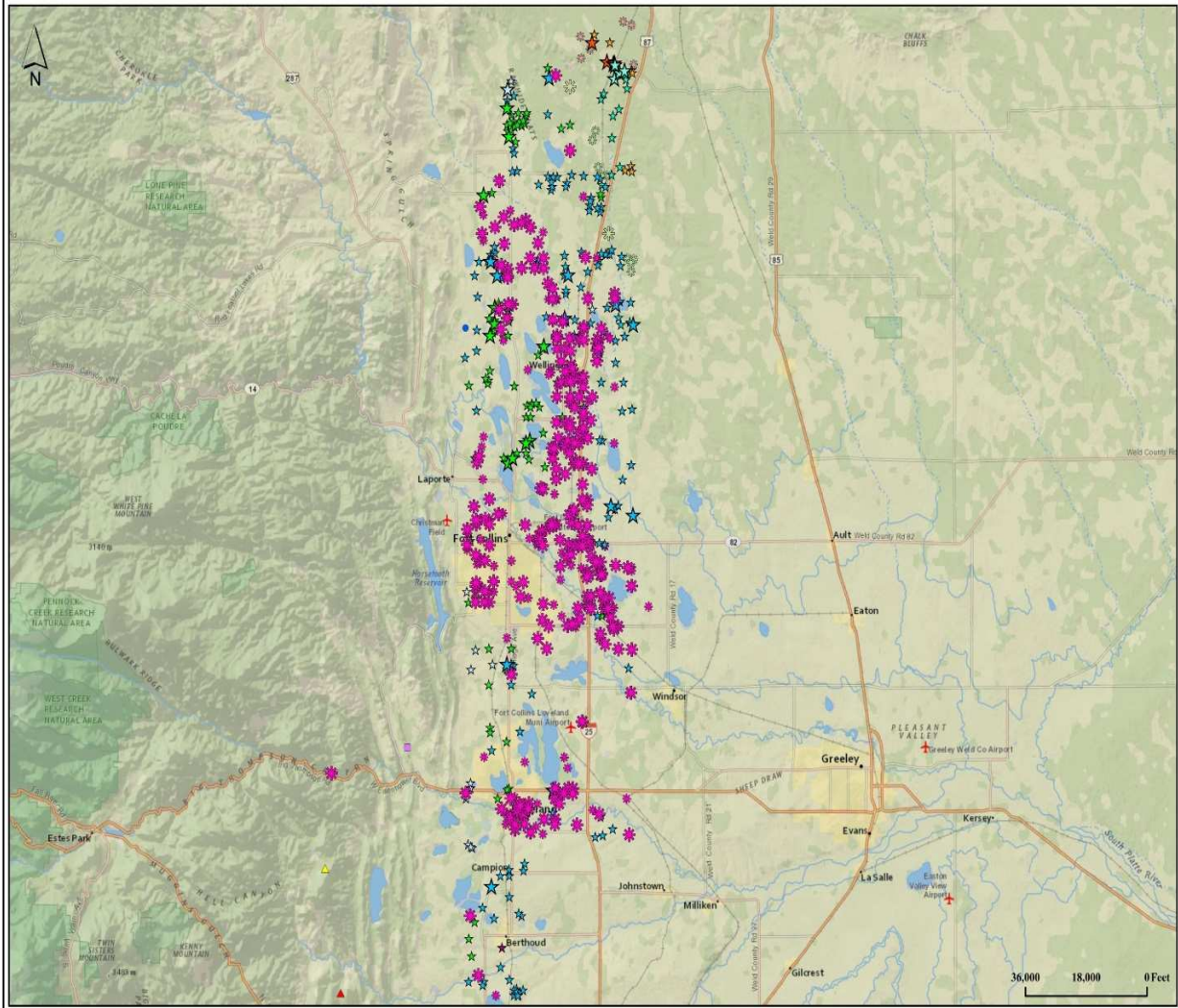


Figure 5.61. The Carter Lake Reservoir quadrangle map (Braddock et al., 1988a) with specific capacity of the wells labeled. Two wells labeled ? g ft/min and ? have drawdown reported as zero. The index matches the index of (Fig 5.59).

A total of 622 wells which account for 56% of the wells for which data have been compiled are located in the far east of Larimer County (Figs. 5.62 and 5.63), and this make the map look crowded. There are two sizes of symbols on the map, with the larger symbols indicating wells yielding 500 GPM or more; these same high yielding wells are shown by lithology, yield, usage, and location in (Table 5.2). Among these high yielding wells are two each in the White River and Laramie Formations, with the remaining wells all in unconsolidated alluvium. Among the other lithified units the Pierre Shale Formation hosts wells yielding 60 GPM from different members, including the Upper Shale, Richards Sandstone, and Middle Shale and the Fox Hills Formation hosts a few wells yielding 60 GPM.

National Geographic Map of the Greeley and Fort Collins, Colorado



Stratigraphic Units

- | | | |
|-----------------------------------|---|-------------------------------------|
| ✿ Alluvium | ★ Pierre Shale-Middle Member | ■ Dakota-Plainview Sandstone Member |
| ✿ North Park Formation | ☆ Pierre Shale-Hygiene Sandstone Member | ■ Dakota-South Platte Formation |
| ★ White River Formation | ☆ Pierre Shale-Lower Member | ■ Dakota-Lytle Formation |
| ★ Laramie Formation | ○ Niobrara Formation | ● Morrison Formation |
| ✿ Fox Hills Formation | ○ Niobrara-Smoky Hill Member | ▲ Jelm Formation |
| ★ Pierre Shale Formation | ● Niobrara-Fort Hays Member | ▲ Lykins Formation |
| ★ Pierre Shale-Upper Member | ● Carlile-Graneros-Mowry Shales | ▲ Lyons Formation |
| ★ Pierre Shale-Richards Sandstone | ★ Benton Shale Formation | ▲ Owl Canyon Formation |
| | | ▲ Ingleside Formation |

Figure 5.62. The Greeley and Fort Collins map with yield and depth of the wells labeled.

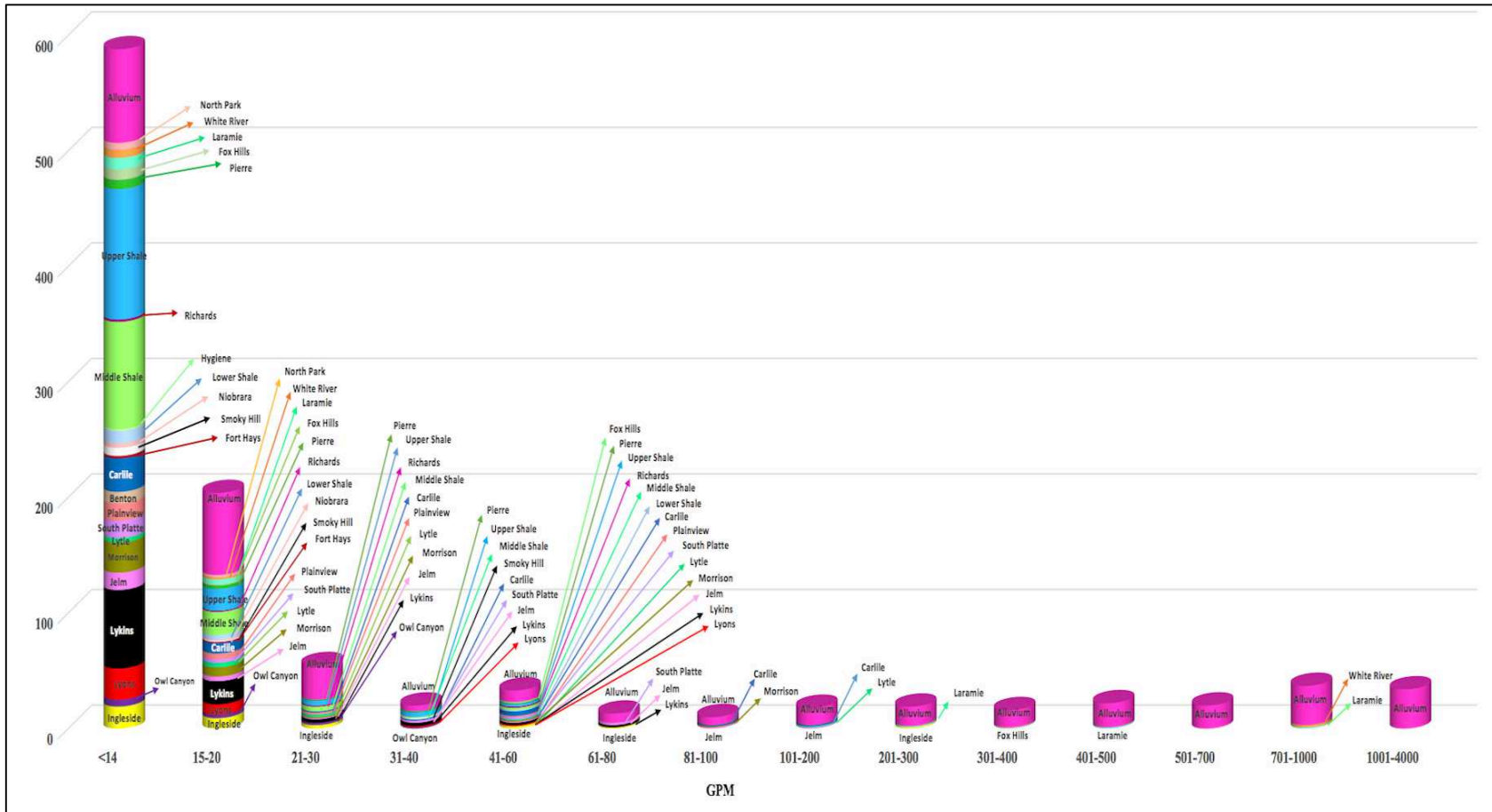


Figure 5.63. The yields of water wells in the Greeley and Fort Collins map area. The colors match the index of the map.

Table 5.2. The highest yields for wells on the Greeley and Fort Collins map, with locations and usage of the wells.

Stratigraphic Units	Yield (GPM)	Well Type	Location
Alluvium	500	Irrigation	North of Fort Collins
Alluvium	500	Irrigation	Northwest of Fort Collins
Alluvium	525	Municipal	Wellington
Alluvium	550	Irrigation	East of Fort Collins
Alluvium	550	Irrigation	Fort Collins
Alluvium	580	Irrigation	Northeast of Larimer
Alluvium	600	Irrigation	North of Fort Collins
Alluvium	600	Irrigation	East of Fort Collins
Alluvium	600	Irrigation	Northeast of Larimer
Alluvium	600	Irrigation	Northeast of Fort Collins
Alluvium	615	Irrigation	East of Fort Collins
Alluvium	630	Irrigation	East of Fort Collins
Alluvium	650	Irrigation	North of Fort Collins
Alluvium	650	Irrigation	East of Fort Collins
Alluvium	670	Irrigation	Northeast of Larimer
Alluvium	670	Irrigation	East of Wellington
Alluvium	674	Irrigation	North of Fort Collins
Alluvium	700	Irrigation	East of Fort Collins
Alluvium	700	Irrigation	Northeast of Fort Collins
Alluvium	700	Irrigation	North of Wellington
Alluvium	700	Irrigation	East of Fort Collins
Alluvium	720	Irrigation	Northeast of Wellington
Alluvium	750	Irrigation	East of Loveland
Alluvium	750	Irrigation	West of Fort Collins
Alluvium	750	Irrigation	Southeast of Fort Collins
Alluvium	750	Irrigation	North of Fort Collins
White River	800	Irrigation	Northeast of Larimer
Laramie	800	Irrigation	East of Fort Collins
Laramie	800	Livestock	Northeast of Larimer
Alluvium	800	Irrigation	North of Fort Collins
Alluvium	800	Irrigation	East of Fort Collins
Alluvium	800	Irrigation	Northeast of Larimer
Alluvium	800	Irrigation	North of Wellington
Alluvium	800	Irrigation	Northwest of Fort Collins
Alluvium	800	Irrigation	West of Loveland
Alluvium	825	Irrigation	East of Loveland
Alluvium	825	Irrigation	East of Fort Collins
Alluvium	830	Irrigation	Northeast of Fort Collins
Alluvium	835	Irrigation	East of Fort Collins
Alluvium	898	Irrigation	Fort Collins
White River	900	Irrigation	Northeast of Larimer
Alluvium	900	Irrigation	East of Loveland
Alluvium	900	Irrigation	Northeast of Larimer
Alluvium	900	Irrigation	Northeast of Fort Collins
Alluvium	900	Irrigation	Fort Collins

Alluvium	900	Irrigation	East of Fort Collins
Alluvium	990	Irrigation	North of Wellington
Laramie	1000	Irrigation	Loveland
Alluvium	1000	Irrigation	West of Loveland
Alluvium	1000	Irrigation	East of Fort Collins
Alluvium	1000	Irrigation	East of Fort Collins
Alluvium	1000	Irrigation	East of Fort Collins
Alluvium	1000	Irrigation	Fort Collins
Alluvium	1000	Irrigation	Northeast of Fort Collins
Alluvium	1000	Irrigation	Wellington
Alluvium	1000	Irrigation	Loveland
Alluvium	1072	Irrigation	North of Fort Collins
Alluvium	1100	Irrigation	Northeast of Larimer
Alluvium	1100	Irrigation	Fort Collins
Alluvium	1100	Irrigation	East of Fort Collins
Alluvium	1100	Irrigation	Northeast of Fort Collins
Alluvium	1200	Irrigation	North of Fort Collins
Alluvium	1200	Irrigation	East of Fort Collins
Alluvium	1200	Irrigation	Northeast of Larimer
Alluvium	1200	Irrigation	Northeast of Larimer
Alluvium	1200	Irrigation	Northeast of Larimer
Alluvium	1200	Irrigation	South of Wellington
Alluvium	1200	Irrigation	East of Wellington
Alluvium	1212	Irrigation	East of Fort Collins
Alluvium	1250	Irrigation	Northeast of Fort Collins
Alluvium	1300	Irrigation	Northeast of Fort Collins
Alluvium	1400	Irrigation	North of Fort Collins
Alluvium	1500	Irrigation	East of Loveland
Alluvium	1500	Irrigation	East of Fort Collins
Alluvium	1500	Irrigation	East of Fort Collins
Alluvium	1500	Irrigation	Northeast of Fort Collins
Alluvium	1540	Irrigation	Northeast of Larimer
Alluvium	1550	Irrigation	North of Fort Collins
Alluvium	1600	Irrigation	East of Loveland
Alluvium	1600	Irrigation	Northeast of Fort Collins
Alluvium	1600	Irrigation	South of Wellington
Alluvium	1700	Irrigation	North of Fort Collins
Alluvium	1800	Irrigation	Northeast of Larimer
Alluvium	1800	Irrigation	Northeast of Larimer
Alluvium	1800	Irrigation	South of Wellington
Alluvium	2000	Irrigation	North of Fort Collins
Alluvium	2000	Irrigation	North of Fort Collins
Alluvium	2000	Irrigation	South of Wellington
Alluvium	2245	Irrigation	Southeast of Fort Collins
Alluvium	3200	Irrigation	Fort Collins
Alluvium	4000	Irrigation	Northwest of Fort Collins

Chapter 6

Discussion

The compiled data set and maps should provide valuable information for assessing potential ASR targets in Larimer County. The availability and quality of data, however, have some limitations that should be considered first. First of all, not all the stratigraphic units in the study area have the same number of wells: there are relatively few wells in, and therefore limited data for, the North Park, White River, Laramie, Fox Hills, Benton Shale, and Owl Canyon Formations. In the case of the Benton Shale Formation, the relatively low number of wells is likely related to varying usage of unit names on geologic maps and among drillers; the name “Benton Shale Formation” appears to be synonymous with the names used to identify the “Carlile-Graneros-Mowry Shales” over most of the study area. So the Benton Shale Formation wells and Carlile-Graneros-Mowry wells should probably all be viewed as wells in the same broadly defined stratigraphic unit.

An additional limitation to the collected data is that the reported yield reflects what a well was producing at the time of the report filed with the Colorado Division of Water resources, but does not necessarily reflect what the well is capable of producing. This is because water is pumped out according to the usage or purpose of the well, with irrigation and livestock wells typically giving more water than household wells; in many locations the formations may be capable of producing more than is indicated by the yield. Hence, the specific capacity values derived from the yield and drawdown data may be lower than actual specific capacities because of using short time spans of 60 minutes or less to measure drawdown. A further limitation is that many of the wells included in this study were drilled several decades ago and hydrologic

conditions may have changed since the well reports were filed. Another limitation is in the presentation of the data within this study; the data contours presented on the maps were drawn on sparse well data or with well data distributed along a north-south linear trend that lacked adequate east-west data for drawing reliable contours. Perhaps the most serious potential problem related to the data or its presentation is that some wells may not be assigned to the correct stratigraphic unit because the lithologic and location information in the AquaMap well reports is vague or possibly erroneous. Projecting reported well depths and locations onto the geologic quadrangle maps is likely to have successfully determined the stratigraphic unit for most of the wells lacking specific stratigraphic information, but may have generated errors for some of the deeper wells, where variation in unit thicknesses and geologic structures may not be accurately known.

Stratigraphic units that host few water wells may lack wells because of unfavorable hydrologic conditions and therefore may be poor ASR targets. In some cases, however, units with few wells reported may have very limited geographic distribution, but favorable hydrologic properties. The White River, Laramie, and Fox Hills Formations, in particular, all show high average specific capacity values, but few wells because within the county these units are confined to a small area in the northeastern corner. Furthermore, demand for groundwater in particular areas will have affected the number of wells drilled in various stratigraphic units. In general, the density of water wells is greater in the southern part of Larimer County than in the northern part. This likely reflects the higher population density and demand for groundwater of the southern part of the county, rather than a regional difference in hydrologic properties that allowed more well development in the south. Among the stratigraphic units above the Fountain Formation, those with the largest number of reported water wells in Larimer County are the

unconsolidated alluvium deposits, the various members of the Pierre Shale Formation considered together, and the Lykins Formation (Table 5.1). Whereas high numbers of wells in particular units suggest that those units may be good ASR targets, the typical well yields and specific capacities in a given unit are more likely to predict ASR performance.

Average yield and specific capacity for wells in unconsolidated alluvium, at 331 GPM and 32 GAL/min/ft are much higher than those in most of the lithified units. The alluvium deposits, nonetheless, may not be good targets for ASR because these high permeability surficial deposits are likely to fail to retain injected water without substantial engineered barriers to flow.

Based on the average calculated specific capacity values for lithified stratigraphic units, the units that only occur in the northeast corner of the County, the White River, Laramie, and Fox Hills Formations, appear to be the best candidates for ASR. Their limited aerial distribution and remoteness from existing infrastructure, however, may reduce the feasibility of using these units for ASR. Among the more widely distributed units, the Pierre Shale Formation, the Dakota Group, especially the Lytle Formation, and the Ingleside Formation have the highest average specific capacity values (Table 5.1) and therefore merit careful consideration as ASR targets. Additional units that may be worthy of further consideration, based on relatively high average specific capacity values, include the Jelm and Lykins Formations. Several other units, for example the Lyons Formation, have isolated wells with high specific capacities suggesting that carefully sited ASR operations could be successful in those units. The five most attractive widely distributed lithified units, the Pierre Shale Formation, Dakota Group, Jelm Formation, Lykins Formation, and Ingleside Formation, all show a high degree of variability in hydrologic data and would need to be considered in the context of the particular locality under consideration for ASR. All of these units, except the Pierre Shale Formation, have particularly high specific

capacity values in the general vicinity of Laporte, suggesting that this area could have particularly good potential for ASR development. In addition to these units, the Niobrara Formation has one well with high specific capacity that is near Laporte. In contrast to these other units with high specific capacities, the Pierre Shale Formation hosts several clusters of wells with high specific capacities. The best developed of these clusters are in the northern third of the study area, especially northwest of Wellington. West of Loveland may also be a promising area for ASR, where there are high specific capacities in the Pierre Shale Formation (Richards Sandstone Member, Middle Shale Member, and Lower Shale Member), Carlile-Graneros-Mowry Shales, Owl Canyon Formation, Lyons Formation, and Lytle Formation (Figs. 5.60). This assessment of favorable localities for ASR in the broadly distributed lithified units is based entirely on well data gathered in this study and does not take into account other considerations, for example land-ownership, existing infrastructure, or state water regulations.

The study has not considered the relationship between geologic structures and hydrologic properties; faults within the study area may well influence the hydrologic properties of the adjacent aquifers. Also, the good potential of some wells within the study area may possibly reflect charging from adjacent surface water resources, for example the Cache la Poudre River in the Laporte area. Similarly, the good wells west of Loveland may be in aquifers that have been charged by the adjacent reservoirs, Carter Lake and Lake Loveland.

Chapter 7

Conclusions

This study utilizes water well data to evaluate geographic areas and stratigraphic units as possible candidates for ASR to meet the northern Front Range water storage needs. With the goal of providing a hydrogeological database that can be used to assess potential stratigraphic and geographic targets for ASR in eastern Larimer County, all available data from AquaMap water well reports for wells in units younger than the Pennsylvanian-Permian Fountain Formation have been compiled. These data include depth, pumping level, static water level, lithology, location, date drilled, and yield. Specific capacity values have been calculated from the compiled data. Yield, static water level, and specific capacity have been mapped onto existing geological maps and contoured. Based on the compiled and mapped data the following conclusions can be drawn.

1. Among the lithified units considered, the Pierre Shale Formation, the Lytle Formation, and the Ingleside Formation show the most promise as ASR targets because of their combination of favorable hydrogeologic properties and widespread geographic occurrence

2. Among the lithified units, the White River Formation, Laramie Formation, and Fox Hills Formation show the most favorable hydrogeologic properties, but they are geographically restricted, mainly to the far northeastern corner of the county.

3. Additional lithified units with data suggesting that they may merit further consideration are the Jelm and Lykins Formations.

4. Unconsolidated surficial alluvium deposits show favorable hydrogeologic properties for ASR, but would likely be challenging to develop due to issues with maintaining control of stored water.

5. Geographic areas that, based on hydrogeologic data from multiple units, may be particularly favorable for ASR development are the Laporte area and an area to the west of Loveland.

6. The database has limitations, including the number of wells for individual stratigraphic units, the accuracy of the reported yields, the geographic distribution of the data, use of short time spans to measure drawdown, and the possibility of errors in assigning individual wells to the correct stratigraphic unit.

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Appendix

The dataset of the thesis:

Doc No	Permit	Permit Suffix	Permit Replace	UTM_x	UTM_y	long	lat	Map No	County	Description	Well Type	Q Yield (GPM)
2	10611	R		499696.1	4492064.1	-104° 0' 9.4"	40° 34' 46.4"	1	Larimer	E Fort Collins	Irrigation	1500
3	6443	R		498070	4492548	-105° 1' 22.1"	40° 35' 1.4"	1	Larimer	W Fort Collins	Irrigation	750
5	10607	R	R	502416	4487189	-104° 58' 17.3"	40° 32' 7.6"	1	Larimer	E Fort Collins	Irrigation	835
67	20545	R		484088	4499041	-105° 11' 17.5"	40° 38' 31.4"	4	Larimer	W Fort Collins	Irrigation	138
100	13328	R		486946	4513773	-105° 9' 16.9"	40° 46' 29.4"	3	Larimer	N-W Fort Collins	Domestic	750
112	16155	R		487944	4472395	-105° 8' 31.5"	40° 24' 7.5"	6	Larimer	W Loveland	Irrigation	550
113	67	R		489165	4472364	-105° 7' 39.7"	40° 24' 6.5"	6	Larimer	W Loveland	Stock water	896
156	6593	F		490682	4458539	-105° 6' 46.3"	40° 16' 38.2"	1	Larimer	S-W Berthoud	Irrigation	100
176	14333	R		493665	4482058	-105° 4' 29.1"	40° 29' 21.1"	1	Larimer	S Fort Collins	Irrigation	450
191	4044	F		490447	4491361	-105° 6' 46.3"	40° 34' 22.7"	1	Larimer	W Fort Collins	Domestic	60
192	422	RN		492085	4490505	-105° 5' 36.6"	40° 33' 55.0"	1	Larimer	W Fort Collins	Domestic	20
193	41852			487948	4494932	-105° 8' 42.5"	40° 36' 24.9"	5	Larimer	W Fort Collins	Domestic	1
194	26592			490481	4493766	-105° 6' 45.0"	40° 35' 40.7"	1	Larimer	W Fort Collins	Domestic	8
195	1354			489690	4492974	-105° 7' 18.6"	40° 35' 15.0"	1	Larimer	W Fort Collins	Domestic	3
196	18365			488709	4491835	-105° 7' 35.8"	40° 34' 49.0"	5	Larimer	W Fort Collins	Domestic	10
197	19203	R		504539	4488945	-104° 56' 47.0"	40° 33' 4.5"	1	Larimer	E Fort Collins	Irrigation	800
198	3547	F	R	502637	4486539	-104° 58' 7.9"	40° 31' 46.5"	1	Larimer	E Fort Collins	Irrigation	550
199	1556	R		501717	4490822	-104° 58' 47.0"	40° 34' 5.4"	1	Larimer	E Fort Collins	Irrigation	1000
200	20271	R		500903	4491240	-104° 59' 21.6"	40° 34' 19.0"	1	Larimer	E Fort Collins	Irrigation	1212
201	12372	F		498081	4490482	-105° 1' 21.6"	40° 33' 54.4"	1	Larimer	E Fort Collins	Irrigation	1000
202	10612	R		499299	4492064	-105° 0' 29.8"	40° 34' 45.7"	1	Larimer	E Fort Collins	Irrigation	1200
203	15098	R		496488	4492096	-105° 2' 29.4"	40° 34' 46.7"	1	Larimer	E Fort Collins	Irrigation	1000
204	11424	R		500693	4489823	-104° 59' 30.5"	40° 33' 33.0"	1	Larimer	E Fort Collins	Irrigation	650
205	24154	F	R	501815	4489823	-104° 58' 42.8"	40° 33' 33.0"	1	Larimer	E Fort Collins	Irrigation	630
206	9994			504538	4490407	-104° 56' 47.0"	40° 33' 51.9"	1	Larimer	E Fort Collins	Domestic	10
207	6089			502123	4492043	-104° 58' 29.7"	40° 34' 45.0"	1	Larimer	E Fort Collins	Livestock	24
208	121472		A	498234	4491537	-105° 1' 15.1"	40° 34' 28.6"	1	Larimer	E Fort Collins	Domestic	25
209	285804			499057	4490569	-105° 0' 40.1"	40° 33' 40.1"	1	Larimer	E Fort Collins	Domestic	10
210	34476			499826	4486369	-105° 0' 7.4"	40° 31' 41.0"	1	Larimer	E Fort Collins	Domestic	30
211	28017			496478	4486287	-105° 2' 29.7"	40° 31' 38.3"	1	Larimer	E Fort Collins	Domestic	15
212	23639	F		501486	4490418	-104° 58' 56.8"	40° 33' 52.3"	1	Larimer	E Fort Collins	Domestic	10
213	18681			498090	4489443	-105° 1' 21.2"	40° 34' 20.7"	1	Larimer	E Fort Collins	Domestic	10
216	10605	R		500847	4487176	-104° 59' 24.0"	40° 32' 7.2"	1	Larimer	E Fort Collins	Irrigation	800
217	11776	R		502110	4488013	-104° 58' 30.3"	40° 32' 34.3"	1	Larimer	E Fort Collins	Irrigation	1100

218	10607	R	R	502398	4487156	-104° 58' 18.1"	40° 32' 6.5"	1	Larimer	E Fort Collins	Irrigation	825
219	13581	S	R	502826	4485781	-104° 57' 59.9"	40° 31' 21.9"	1	Larimer	E Fort Collins	Irrigation	480
220	2287	R		496049	4484846	-105° 2' 47.9"	40° 30' 51.6"	1	Larimer	S-E Fort Collins	Irrigation	2245
221	11773	R		504549	4483981	-104° 56' 46.7"	40° 30' 23.5"	1	Larimer	S-E Fort Collins	Irrigation	750
222	12100	R		501606	4471132	-104° 58' 51.9"	40° 23' 26.8"	1	Larimer	E Loveland	Irrigation	1600
223	233	R		497619	4473151	-105° 1' 41.0"	40° 24' 32.3"	1	Larimer	E Loveland	Irrigation	450
224	8208	R		498409	4472747	-105° 1' 7.5"	40° 24' 19.2"	1	Larimer	E Loveland	Irrigation	750
225	15617	R		496619	4470725	-105° 2' 23.4"	40° 23' 13.6"	1	Larimer	E Loveland	Irrigation	1500
226	8613	R		499213	4472734	-105° 0' 33.4"	40° 24' 18.8"	1	Larimer	E Loveland	Irrigation	825
227	91884		A	498751	4474732	-105° 0' 53.0"	40° 25' 23.6"	1	Larimer	E Loveland	Livestock	10
228	170537		A	504317	4469529	-104° 56' 56.9"	40° 22' 34.8"	1	Larimer	E Loveland	Domestic	50
229	7255			504078	4472329	-104° 57' 7.0"	40° 24' 5.6"	1	Larimer	E Loveland	Domestic	6
230	256	RN		496005	4471934	-105° 2' 49.5"	40° 23' 52.8"	1	Larimer	E Loveland	Domestic	18
231	79970			495907	4470142	-105° 2' 53.6"	40° 22' 54.7"	1	Larimer	E Loveland	Livestock	15
232	12149	R		495193	4471537	-105° 3' 23.9"	40° 23' 39.9"	1	Larimer	Loveland	Irrigation	150
233	7408			495236	4471965	-105° 3' 22.1"	40° 23' 53.8"	1	Larimer	Loveland	Domestic	5
234	12676	R		493600	4472361	-105° 4' 31.5"	40° 24' 6.6"	1	Larimer	Loveland	Irrigation	80
235	29913			493578	4471155	-105° 4' 32.4"	40° 23' 27.5"	1	Larimer	Loveland	Domestic	25
236	11115	R		493962	4471155	-105° 4' 16.1"	40° 23' 27.5"	1	Larimer	Loveland	Irrigation	17
237	10973	F		493589	4470758	-105° 4' 31.9"	40° 23' 14.6"	1	Larimer	Loveland	Commercial	50
238	11165	R		494808	4470353	-105° 3' 40.2"	40° 23' 1.5"	1	Larimer	Loveland	Irrigation	300
239	160	RN		492777	4471539	-105° 5' 6.4"	40° 23' 39.9"	1	Larimer	Loveland	Lawn Sprinkling	30
240	26593			488734	4466761	-105° 7' 57.6"	40° 21' 4.8"	7	Larimer	S-W Loveland	Stock	4
241	7412			487856	4466356	-105° 8' 34.8"	40° 20' 51.6"	7	Larimer	S-W Loveland	Domestic	34
242	136284		A	494818	4471010	-105° 3' 39.8"	40° 23' 22.8"	1	Larimer	Loveland	Domestic	15
243	265537			494280	4471078	-105° 4' 2.6"	40° 23' 25.0"	1	Larimer	Loveland	Household	175
244	32849	F		494181	4471408	-105° 4' 6.8"	40° 23' 35.7"	1	Larimer	Loveland	Municipal	250
245	11602			493194	4471143	-105° 4' 48.7"	40° 23' 27.1"	1	Larimer	Loveland	Domestic	10
246	126293		A	493862	4470551	-105° 4' 20.3"	40° 23' 7.9"	1	Larimer	Loveland	Household	2
247	54770			492269	4456973	-105° 5' 27.3"	40° 15' 47.5"	1	Larimer	S Berthoud	Domestic	4
248	48769			483880	4467970	-105° 11' 23.5"	40° 21' 43.7"	7	Larimer	W Loveland	Domestic	6
249	263044			484424	4461078	-105° 10' 59.8"	40° 18' 0.2"	7	Larimer	W Berthoud	Domestic	5
250	128762			481861	4460556	-105° 12' 48.3"	40° 17' 43.1"	7	Larimer	W Berthoud	Domestic	12
251	57455			480523	4457858	-105° 13' 44.7"	40° 16' 15.5"	7	Larimer	S-W Berthoud	Domestic	15
252	136559			487893	4457156	-105° 8' 32.6"	40° 15' 53.2"	7	Larimer	S-W Berthoud	Domestic	15
253	82837			487439	4458605	-105° 8' 51.9"	40° 16' 40.2"	7	Larimer	S-W Berthoud	Domestic	15
254	56851			488664	4457909	-105° 8' 0.0"	40° 16' 17.7"	7	Larimer	S-W Berthoud	Domestic	5
255	294180			488438	4458310	-105° 8' 9.6"	40° 16' 30.7"	7	Larimer	S-W Berthoud	Stock	15
256	66932			488232	4458333	-105° 8' 18.3"	40° 16' 31.4"	7	Larimer	S-W Berthoud	Household	15
257	45077			488278	4458560	-105° 8' 16.4"	40° 16' 38.8"	7	Larimer	S-W Berthoud	Domestic	17
258	59237			488278	4458718	-105° 8' 16.4"	40° 16' 43.9"	7	Larimer	S-W Berthoud	Stock	15
259	49488			488663	4458991	-105° 8' 0.1"	40° 16' 52.8"	7	Larimer	S-W Berthoud	Domestic	15
260	59792			488640	4459378	-105° 8' 1.1"	40° 17' 5.3"	7	Larimer	S-W Berthoud	Domestic	10

261	45076		489028	4459398	-105° 7' 44.7"	40° 17' 6.0"	7	Larimer	S-W Berthoud	Domestic	10
262	26557		488368	4466768	-105° 8' 13.1"	40° 21' 5.0"	7	Larimer	W Berthoud	Domestic	15
263	108310		487485	4466313	-105° 8' 50.5"	40° 20' 50.2"	7	Larimer	W Berthoud	Domestic	15
264	66699		496508	4469578	-105° 2' 28.1"	40° 22' 36.4"	1	Larimer	S-E Loveland	Household	10
265	224092		495397	4469714	-105° 3' 15.2"	40° 22' 40.8"	1	Larimer	S-E Loveland	Domestic	15
266	689	RN	494013	4470326	-105° 4' 13.9"	40° 23' 0.6"	1	Larimer	S-E Loveland	Domestic	300
267	10788	R	493992	4469941	-105° 4' 14.8"	40° 22' 48.1"	1	Larimer	S-E Loveland	Commercial	200
268	6559	R	497597	4470352	-105° 1' 41.9"	40° 23' 1.5"	1	Larimer	E Loveland	Irrigation	900
269	15619	R	497982	4471961	-105° 1' 25.6"	40° 23' 53.7"	1	Larimer	E Loveland	Irrigation	450
270	7357	R	498003	4472753	-105° 1' 24.7"	40° 24' 19.4"	1	Larimer	E Loveland	Irrigation	425
271	6115	R	497596	4472346	-105° 1' 42.0"	40° 24' 6.2"	1	Larimer	E Loveland	Irrigation	400
272	923	R	489944	4463190	-105° 7' 6.1"	40° 19' 9.0"	1	Larimer	Loveland	Irrigation	1000
273	922	R	489549	4472776	-105° 7' 23.4"	40° 24' 19.9"	1	Larimer	Loveland	Irrigation	1000
275	12148	R	495217	4471506	-105° 3' 22.9"	40° 23' 38.9"	1	Larimer	Loveland	Irrigation	75
276	15747	R	500061	4478362	-104° 59' 57.4"	40° 27' 21.3"	1	Larimer	Loveland	Irrigation	100
277	478	RN	493973	4472426	-105° 4' 15.7"	40° 24' 8.7"	1	Larimer	Loveland	Domestic	5
278	42901	F	499599	4470292	-105° 0' 17.0"	40° 22' 59.6"	1	Larimer	Loveland	Other	300
279	6558	R	497595	4470731	-105° 1' 42.0"	40° 23' 13.8"	1	Larimer	Loveland	Irrigation	450
280	28273		477403	4474326	-105° 15' 58.9"	40° 25' 9.3"	1	Larimer	W Loveland	Domestic	25
281	8430		494880	4475200	-105° 3' 37.3"	40° 25' 38.7"	1	Larimer	N Loveland	Domestic	15
282	7790		498443	4475559	-105° 1' 6.1"	40° 25' 50.4"	1	Larimer	N Loveland	Domestic	20
283	10839	R	494487	4488094	-105° 3' 54.4"	40° 32' 36.9"	1	Larimer	S Fort Collins	Irrigation	450
284	24557		491276	4488508	-105° 6' 10.9"	40° 32' 50.2"	1	Larimer	S-W Fort Collins	Domestic	30
285	5413		491660	4488480	-105° 5' 54.6"	40° 32' 49.3"	1	Larimer	S-W Fort Collins	Domestic	25
286	3115		492071	4488483	-105° 5' 37.1"	40° 32' 49.4"	1	Larimer	S-W Fort Collins	Domestic	20
287	154046	A	490480	4489199	-105° 6' 44.8"	40° 33' 12.6"	1	Larimer	S-W Fort Collins	Domestic	25
288	3605	F	480819	4483215	-105° 13' 34.9"	40° 29' 57.9"	6	Larimer	S-W Fort Collins	Irrigation	150
289	3606	F	481181	4482803	-105° 13' 19.5"	40° 29' 44.6"	6	Larimer	S-W Fort Collins	Irrigation	750
290	41693	F	497492	4487480	-105° 1' 46.6"	40° 32' 17.0"	1	Larimer	S Fort Collins	Irrigation	50
326	16241	F	497672.3	4528801.4	-105° 1' 38.4"	40° 54' 37.5"	1	Larimer	N-E Larimer	Irrigation	460
350	11868	R	486769.1	4524966.3	-105° 9' 4.0"	40° 52' 28.8"	2	Larimer	N-E Larimer	Irrigation	270
351	11870	R	485687.9	4525049.3	-105° 10' 10.9"	40° 52' 33.7"	2	Larimer	N-E Larimer	Irrigation	300
354	10397	F	485988.7	4533423.6	-105° 9' 58.4"	40° 57' 6.2"	2	Larimer	N-E Larimer	Irrigation	105
357	11869	R	486958.9	4525412.4	-105° 9' 18.3"	40° 52' 46.3"	2	Larimer	N-E Larimer	Irrigation	400
361	4314	F	498983.5	4522933.8	-105° 0' 43.5"	40° 51' 25.9"	1	Larimer	N-E Larimer	Irrigation	80
378	38535		500179	4519334.2	-104° 59' 51.9"	40° 49' 29.2"	1	Larimer	N-E Larimer	Livestock	12
394	15118	R	492578.5	4520575.7	-105° 5' 17.7"	40° 50' 9.9"	1	Larimer	N-E Larimer	Irrigation	166
397	1006607		492094.6	4523008.8	-105° 5' 37.6"	40° 51' 29.9"	2	Larimer	N-E Larimer	Livestock	5
408	34369		501393.5	4514539.5	-104° 58' 59.3"	40° 46' 53.4"	1	Larimer	N-E Larimer	Domestic	2
417	42378		503003.4	4511773.4	-104° 57' 51.4"	40° 45' 25.1"	1	Larimer	N-E Larimer	Domestic	50
418	12686	R	503003.1	4511369.9	-104° 57' 51.4"	40° 45' 11.8"	1	Larimer	N-E Larimer	Irrigation	420
419	53696		500583.9	4511372.4	-104° 59' 36.6"	40° 45' 14.3"	1	Larimer	N-E Larimer	Domestic	15
432	89692		502579.3	4508242.5	-104° 58' 10.1"	40° 43' 31.0"	1	Larimer	N-E Larimer	Domestic	15

433	229510			502380.4	4508457.9	-104° 58' 17.8"	40° 43' 36.8"	1	Larimer	N-E Larimer	Livestock	13
434	12928	F		501801.2	4509046.5	-104° 58' 40.7"	40° 43' 56.8"	1	Larimer	N-E Larimer	Irrigation	580
436	171177			501756.5	4508177.9	-104° 58' 41.9"	40° 43' 28.5"	1	Larimer	N-E Larimer	Household	15
437	161529			501463.6	4508224.4	-104° 58' 58.3"	40° 43' 29.3"	1	Larimer	N-E Larimer	Domestic	15
438	161530			501346.8	4507874.9	-104° 59' 3.8"	40° 43' 19.3"	1	Larimer	N-E Larimer	Livestock	15
442	207268			488182.7	4519362.2	-105° 8' 24.1"	40° 49' 29.8"	3	Larimer	N-E Larimer	Livestock	8
443	12688	F		490846.1	4518567.5	-105° 6' 30.0"	40° 48' 5.7"	1	Larimer	N-E Larimer	Irrigation	300
444	98039			491125.7	4517917.6	-105° 6' 19.0"	40° 48' 43.2"	1	Larimer	N-E Larimer	Livestock	5
460	287742			493571.9	4518245	-105° 4' 33.7"	40° 48' 55.0"	1	Larimer	N-E Larimer	Domestic	15
461	2078			492986.1	4517755.1	-105° 5' 0.0"	40° 48' 40.0"	1	Larimer	N-E Larimer	Livestock	25
462	6105	F		492180.2	4516959.6	-105° 5' 34.0"	40° 48' 13.3"	1	Larimer	N-E Larimer	Irrigation	400
463	153470			491013.3	4516450.1	-105° 6' 22.2"	40° 47' 56.6"	1	Larimer	N-E Larimer	Livestock	10
464	1158			496532	4516544.6	-105° 2' 26.5"	40° 47' 58.4"	1	Larimer	N-E Larimer	Livestock	6
465	7605			495379.7	4516935.6	-105° 3' 18.0"	40° 48' 12.6"	1	Larimer	N-E Larimer	Irrigation	1540
466	13762	F		494973	4517504	-105° 3' 34.5"	40° 48' 30.0"	1	Larimer	N-E Larimer	Irrigation	150
467	13762	F	R	494569.3	4517296.1	-105° 3' 47.7"	40° 48' 22.5"	1	Larimer	N-E Larimer	Irrigation	225
468	11463	F	R	493918.2	4517143	-105° 4' 18.3"	40° 48' 20.0"	1	Larimer	N-E Larimer	Irrigation	200
469	3121	F	R	496084	4515720	-105° 2' 46.2"	40° 47' 33.4"	1	Larimer	N-E Larimer	Irrigation	1200
470	12206	R		496558.2	4514547.5	-105° 2' 23.2"	40° 46' 54.3"	1	Larimer	N-E Larimer	Irrigation	1800
471	12207	R		495384.1	4514553	-105° 3' 16.9"	40° 46' 55.1"	1	Larimer	N-E Larimer	Irrigation	350
474	13330	R		496566.9	4513761.5	-105° 2' 26.5"	40° 46' 30.1"	1	Larimer	N-E Larimer	Irrigation	670
475	13329	R		495779.3	4513754	-105° 2' 59.3"	40° 46' 30.1"	1	Larimer	N-E Larimer	Irrigation	300
476	19252	R		494585.2	4513756.5	-105° 3' 53.0"	40° 46' 30.1"	1	Larimer	N-E Larimer	Irrigation	450
477	97481			493338.6	4513700	-105° 4' 44.5"	40° 46' 26.7"	1	Larimer	N-E Larimer	Household	15
478	178219			492768.8	4513976	-105° 5' 8.6"	40° 46' 35.8"	1	Larimer	N-E Larimer	Domestic	30
479	178217			492311.6	4513983.5	-105° 5' 27.3"	40° 46' 36.7"	1	Larimer	N-E Larimer	Domestic	25
484	241127		A	491872.9	4514536.5	-105° 5' 45.9"	40° 46' 54.1"	1	Larimer	N-E Larimer	Domestic	4
487	13300	F		493020.2	4515654.6	-105° 4' 57.8"	40° 47' 30.8"	1	Larimer	N-E Larimer	Irrigation	250
489	280418			491139.9	4515914	-105° 6' 18.9"	40° 47' 39.1"	1	Larimer	N-E Larimer	Domestic	7.5
491	178200			500360.5	4514604.5	-104° 59' 42.1"	40° 46' 55.1"	1	Larimer	N-E Larimer	Domestic	15
500	12456	F	R	493331.8	4513168.5	-105° 4' 44.5"	40° 46' 10.0"	1	Larimer	N-E Larimer	Irrigation	600
501	12457	F		493339.2	4513029	-105° 4' 43.4"	40° 46' 2.5"	1	Larimer	N-E Larimer	Irrigation	1100
504	6431			492942.4	4508115.4	-105° 5' 4.0"	40° 43' 28.4"	1	Larimer	N-E Larimer	Livestock	13
508	111308			492702.8	4508967	-105° 5' 10.6"	40° 43' 51.7"	1	Larimer	N-E Larimer	Irrigation	395
515	68991			493271.7	4509853.5	-105° 4' 46.6"	40° 44' 21.7"	1	Larimer	N-E Larimer	Livestock	10
518	325	RDB		493378.6	4510931.4	-105° 4' 44.4"	40° 44' 57.5"	1	Larimer	N-E Larimer	Irrigation	450
519	337	RD		493778.6	4510930.4	-105° 4' 24.7"	40° 44' 57.6"	1	Larimer	N-E Larimer	Irrigation	225
520	315	RD		492572.1	4510533.4	-105° 5' 12.9"	40° 44' 45.9"	1	Larimer	N-E Larimer	Irrigation	350
524	10079	R		500195.5	4508147.9	-104° 59' 50.8"	40° 43' 26.8"	1	Larimer	N-E Larimer	Irrigation	900
525	154012		A	499982.4	4508338.4	-104° 59' 59.6"	40° 43' 33.5"	1	Larimer	N-E Larimer	Domestic	20
526	52540			499796.1	4508141.4	-105° 0' 8.4"	40° 43' 27.7"	1	Larimer	N-E Larimer	Domestic	25
527	113725			498929.1	4508253.4	-105° 0' 46.7"	40° 43' 31.0"	1	Larimer	N-E Larimer	Domestic	10
528	97443		A	499174.1	4508359.9	-105° 0' 34.6"	40° 43' 33.5"	1	Larimer	N-E Larimer	Livestock	9

531	10080	R	500219.4	4509140.9	-104° 59' 49.7"	40° 44' 1.8"	1	Larimer	N-E Larimer	Irrigation	900
532	18339	F	500181.6	4509066.4	-104° 59' 51.9"	40° 43' 58.5"	1	Larimer	N-E Larimer	Irrigation	400
533	113	R	497781.5	4508282.4	-105° 1' 37.1"	40° 43' 31.8"	1	Larimer	N-E Larimer	Irrigation	1200
534	11322		497799.1	4508498.4	-105° 1' 32.7"	40° 44' 39.3"	1	Larimer	N-E Larimer	Domestic	9
535	152260	A	498310.2	4509588.4	-105° 1' 11.9"	40° 44' 14.3"	1	Larimer	N-E Larimer	Domestic	26
537	13097	R	497403.9	4509713.4	-105° 1' 53.5"	40° 44' 20.1"	1	Larimer	N-E Larimer	Irrigation	1200
542	56098		497788.3	4511352	-105° 1' 36.0"	40° 45' 8.5"	1	Larimer	N-E Larimer	Livestock	15
543	1910	R	497395.5	4511340	-105° 1' 51.3"	40° 45' 11.8"	1	Larimer	N-E Larimer	Irrigation	450
544	26991		497002.8	4511328	-105° 2' 7.8" -105° 1'	40° 45' 10.1"	1	Larimer	N-E Larimer	Domestic	10
545	6194	R	497388.4	4512153.5	51.4"	36.0"	1	Larimer	N-E Larimer	Irrigation	1800
546	1877	R	496985	4512557	-105° 2' 6.7" -104° 58'	47.6" 40° 43'	1	Larimer	N-E Larimer	Irrigation	800
548	11014	F	501572.8	4507543.5	49.5"	6.0"	1	Larimer	Wellington	Irrigation	720
549	19344	R	501393.5	4507333.9	-104° 58' 59.4"	40° 43' 1.0"	1	Larimer	Wellington	Irrigation	449
550	85678		501515.6	4507572.4	-104° 58' 59.4"	40° 43' 10.2"	1	Larimer	Wellington	Domestic	15
553	13408	R	501391.6	4506517.9	-104° 59' 0.5"	40° 42' 34.3"	1	Larimer	E Wellington	Irrigation	86
556	5590		502996	4504472.3	-104° 57' 52.6"	40° 41' 27.7"	1	Larimer	E Wellington	Livestock	8
558	12841	R	500174.6	4505270.9	-104° 59' 51.9"	40° 41' 56.0"	1	Larimer	E Wellington	Irrigation	400
559	34700	F	500171.8	4504447.8	-104° 59' 53.0"	40° 41' 27.7"	1	Larimer	S-E Wellington	Irrigation	130
560	5938	F	500981.1	4503696.3	-104° 59' 18.0"	40° 40' 2.7"	1	Larimer	S-E Wellington	Irrigation	480
561	235733		500614.7	4503349.8	-104° 59' 33.3"	40° 40' 51.9"	1	Larimer	N-E Fort Collins	Domestic	2
565	10993		500180.2	4502494.3	-104° 59' 51.9"	40° 40' 24.4"	1	Larimer	N-E Fort Collins	Irrigation	600
566	10995	R	500176.5	4502090.8	-104° 59' 53.0"	40° 40' 9.4"	1	Larimer	N-E Fort Collins	Irrigation	900
567	16187	R	500823.4	4501875.3	-104° 59' 23.5"	40° 40' 4.4"	1	Larimer	N-E Fort Collins	Irrigation	200
568	117	R	500174.1	4501288.3	-104° 59' 54.1"	40° 39' 45.2"	1	Larimer	N-E Fort Collins	Irrigation	1300
569	119	R	500251	4500703.3	-104° 59' 47.6"	40° 39' 26.1"	1	Larimer	N-E Fort Collins	Irrigation	830
570	144	R	500566.5	4500487.3	-104° 59' 34.4"	40° 39' 18.6"	1	Larimer	N-E Fort Collins	Irrigation	1250
573	27773		502955	4500070.2	-104° 59' 52.7"	40° 38' 6.9"	1	Larimer	N-E Fort Collins	Domestic	15
574	6522	F	500164.4	4498476.5	-104° 59' 53.0"	40° 38' 16.1"	1	Larimer	N-E Fort Collins	Irrigation	1500
575	12129	R	500164.4	4498476	-104° 59' 53.0"	40° 38' 12.7"	1	Larimer	N-E Fort Collins	Irrigation	450
576	14545	R	500940.1	4498066.2	-104° 59' 20.2"	40° 38' 1.1"	1	Larimer	N-E Fort Collins	Irrigation	700
579	14546	R	500106.4	4496870.7	-104° 59' 54.1"	40° 37' 20.3"	1	Larimer	N-E Fort Collins	Irrigation	400
580	15867	R	500104.7	4495663.7	-104° 59' 58.5"	40° 36' 46.1"	1	Larimer	N-E Fort Collins	Irrigation	1100
581	15868	R	500506.4	4495659.2	-104° 59' 38.8"	40° 36' 41.9"	1	Larimer	N-E Fort Collins	Irrigation	160
582	20270	R	500505.5	4495257.7	-104° 59' 36.6"	40° 36' 27.8"	1	Larimer	N-E Fort Collins	Irrigation	314
583	10313	R	500506.3	4493653.2	-104° 59' 37.7"	40° 35' 37.8"	1	Larimer	N-E Fort Collins	Irrigation	234
591	11203	R	500098.7	4492056.1	-104° 59' 55.2"	40° 34' 47.8"	1	Larimer	N-E Fort Collins	Irrigation	1600
592	10266	R	500100.5	4492860.7	-104° 59' 55.2"	40° 35' 12.0"	1	Larimer	N-E Fort Collins	Irrigation	1000
593	10876	F	500504.4	4492453.1	-104° 59' 39.9"	40° 34' 58.6"	1	Larimer	N-E Fort Collins	Commercial	63
619	24287		484895.3	4499847.8	-105° 10' 43.9"	40° 38' 58.9"	4	Larimer	N-W Fort Collins	Domestic	10
622	21647		484494.3	4500651.3	-105° 11' 0.3"	40° 39' 23.0"	4	Larimer	N-W Fort Collins	Domestic	30
637	13591	R	485300.7	4497848.3	-105° 10' 26.2"	40° 37' 52.3"	4	Larimer	N-W Fort Collins	Irrigation	400
642	36747		487730.1	4497817.8	-105° 8' 58.7"	40° 38' 4.9"	4	Larimer	N-W Fort Collins	Domestic	15
647	21699		486733	4492842	-105° 9' 56.5"	40° 36' 59.0"	5	Larimer	N-W Fort Collins	Domestic	12

657	20587		489279.9	4492572.7	-105° 7' 38.6"	40° 35' 5.9"	5	Larimer	N-W Fort Collins	Domestic	20
658	14339	R	489672.1	4492164.7	-105° 7' 18.9"	40° 34' 47.6"	1	Larimer	N-W Fort Collins	Irrigation	4000
659	15820	F	488966	4492772	-105° 7' 52.8"	40° 35' 14.2"	5	Larimer	N-W Fort Collins	Irrigation	200
661	277	RN	489686	4493371.7	-105° 7' 16.8"	40° 35' 28.4"	1	Larimer	Fort Collins	Domestic	30
662	23956		491676.4	4492126.2	-105° 5' 53.6"	40° 34' 47.6"	1	Larimer	Fort Collins	Domestic	10
663	23955		491676.4	4492126.2	-105° 5' 59.1"	40° 34' 45.1"	1	Larimer	Fort Collins	Domestic	12
664	5811	R	491686.9	4493753.7	-105° 5' 52.6"	40° 35' 41.0"	1	Larimer	Fort Collins	Irrigation	70
665	39014		490484.8	4494086	-105° 6' 46.2"	40° 35' 50.9"	1	Larimer	Fort Collins	Domestic	12
666	14715	R	490889.6	4494163.2	-105° 6' 27.6"	40° 35' 53.4"	1	Larimer	Fort Collins	Irrigation	30
667	31750		491290.5	4494160.2	-105° 6' 11.2"	40° 35' 56.8"	1	Larimer	Fort Collins	Domestic	16
668	13875	R	491290.5	4494160.2	-105° 6' 11.2"	40° 35' 51.8"	1	Larimer	Fort Collins	Irrigation	50
669	46611		491691.5	4494157.7	-105° 5' 55.9"	40° 35' 55.1"	1	Larimer	Fort Collins	Domestic	15
670	1762	R	492502.2	4494545.7	-105° 5' 19.9"	40° 36' 5.2"	1	Larimer	Fort Collins	Irrigation	3200
671	24065		488910.5	4494591.2	-105° 7' 55.1"	40° 36' 8.3"	5	Larimer	Fort Collins	Domestic	10
672	86281		490278.5	4495151.5	-105° 7' 52.9"	40° 36' 7.5"	1	Larimer	Fort Collins	Household	10
673	94345		491676.3	4495726	-105° 5' 52.7"	40° 36' 45.1"	1	Larimer	Fort Collins	Livestock	35
674	810	RN	492927.2	4494606.7	-105° 5' 1.3" 6.0"	40° 36' 6.0"	1	Larimer	Fort Collins	Domestic	5
675	10151	R	494912.7	4493706.7	-105° 3' 34.9"	40° 35' 37.7"	1	Larimer	Fort Collins	Industrial	100
676	99037	A	495306.2	4492654.7	-105° 3' 21.8"	40° 35' 3.6"	1	Larimer	Fort Collins	Domestic	15
677	23393	F	496163	4492846	-105° 2' 43.5"	40° 35' 9.4"	1	Larimer	Fort Collins	Other	30
678	11886	R	496303.3	4492570.2	-105° 2' 38.1"	40° 35' 2.8"	1	Larimer	Fort Collins	Municipal	425
679	50468	F	496164.7	4492291.2	-105° 2' 43.5"	40° 34' 53.6"	1	Larimer	Fort Collins	Other	7
680	119015		496450.5	4493227.7	-105° 2' 29.3"	40° 35' 24.4"	1	Larimer	Fort Collins	Domestic	15
681	48192	F	497116.6	4493528.7	-105° 2' 2.0" 34.4"	40° 35' 34.4"	1	Larimer	Fort Collins	Irrigation	100
682	19444	R	497308.1	4493713.2	-105° 1' 57.6"	40° 35' 36.9"	1	Larimer	Fort Collins	Irrigation	898
683	104877	A	497450.2	4493793.2	-105° 1' 47.8"	40° 35' 45.3"	1	Larimer	Fort Collins	Livestock	25
684	33616		497709.3	4493708.2	-105° 1' 38.0"	40° 35' 38.6"	1	Larimer	Fort Collins	Livestock	15
685	121920		498847.1	4492195.2	-105° 0' 45.5"	40° 34' 50.3"	1	Larimer	Fort Collins	Domestic	25
686	39465		499848.8	4492243	-105° 0' 7.3" 51.1"	40° 34' 51.1"	1	Larimer	Fort Collins	Domestic	12
687	117856		500288.3	4492378.6	-104° 59' 46.5"	40° 34' 57.0"	1	Larimer	Fort Collins	Livestock	30
688	10130	R	500754.4	4492137.1	-104° 59' 29.0"	40° 34' 49.5"	1	Larimer	Fort Collins	Irrigation	550
689	23049	F	500679.1	4492487.1	-104° 59' 31.2"	40° 35' 1.1"	1	Larimer	Fort Collins	Irrigation	60
690	19324	R	499704.5	4493669.7	-105° 0' 16.0"	40° 35' 41.9"	1	Larimer	Fort Collins	Irrigation	375
691	19324	U	499113.5	4493867.7	-105° 0' 37.9"	40° 35' 44.4"	1	Larimer	Fort Collins	Irrigation	1000
692	14395	R	498911.2	4494483.7	-105° 0' 48.8"	40° 36' 6.9"	1	Larimer	Fort Collins	Irrigation	1100
693	18057	R	499309.2	4494874.2	-105° 0' 32.4"	40° 36' 21.9"	1	Larimer	Fort Collins	Irrigation	900
694	55817	F	499245.7	4494789.7	-105° 0' 33.5"	40° 36' 16.1"	1	Larimer	Fort Collins	Irrigation	400
695	19196	S	497562.1	4496101.7	-105° 1' 43.5"	40° 36' 56.1"	1	Larimer	Fort Collins	Irrigation	80
696	23982		496329.1	4496592.7	-105° 2' 36.0"	40° 37' 13.6"	1	Larimer	Fort Collins	Domestic	10
697	24631		496522.6	4496506.2	-105° 2' 27.2"	40° 37' 8.6"	1	Larimer	Fort Collins	Domestic	15
698	12378	R	497716.4	4497296.7	-105° 1' 36.9"	40° 37' 33.6"	1	Larimer	N Fort Collins	Irrigation	1200
699	19280	S	497724.5	4498097.7	-105° 1' 36.9"	40° 38' 1.1"	1	Larimer	N Fort Collins	Irrigation	1400
700	17622	R	499354.6	4498481.7	-105° 0' 26.9"	40° 38' 13.6"	1	Larimer	N Fort Collins	Irrigation	2000

701	19378	R	R	499526.7	4498671	-105° 0' 20.4"	40° 38' 19.4"	1	Larimer	N Fort Collins	Irrigation	500
702	19378	S		499763.5	4498478.2	-105° 0' 10.5"	40° 38' 13.6"	1	Larimer	N Fort Collins	Irrigation	750
703	19373	T		497411.6	4498864.8	-105° 1' 50.1"	40° 38' 27.7"	1	Larimer	N Fort Collins	Irrigation	490
704	19281	R		498524.8	4497687.2	-105° 1' 3.0" 54.3"	40° 37' 49.4"	1	Larimer	N Fort Collins	Irrigation	476
705	19377	S		498952.5	4499289.3	-105° 0' 44.4"	40° 38' 39.4"	1	Larimer	N Fort Collins	Irrigation	1700
706	96979		A	498889.9	4499381.5	-105° 0' 46.6"	40° 38' 57.7"	1	Larimer	N Fort Collins	Domestic	20
707	183716		A	498478.5	4499869.8	-105° 1' 5.2" 54.3"	40° 38' 58.6"	1	Larimer	N Fort Collins	Livestock	30
709	19380	S		497336.5	4499704	-105° 1' 54.5"	40° 38' 52.7"	1	Larimer	N Fort Collins	Irrigation	674
710	19380	S	R	497534.2	4499683.8	-105° 1' 39.1"	40° 38' 53.6"	1	Larimer	N Fort Collins	Irrigation	650
711	194907			497913.2	4500498.3	-105° 1' 27.1"	40° 39' 18.5"	1	Larimer	N Fort Collins	Domestic	15
712	10889	R		498812	4500277	-105° 0' 49.9"	40° 39' 11.1"	1	Larimer	N Fort Collins	Irrigation	800
713	6737	R		499364	4500091.8	-105° 0' 27.0"	40° 39' 6.1"	1	Larimer	N Fort Collins	Irrigation	1072
714	6736	R		499772.6	4500089.8	-105° 0' 10.5"	40° 39' 8.6"	1	Larimer	N Fort Collins	Irrigation	294
715	14271	R		499773.4	4500891.3	-105° 0' 8.4" 43.4"	40° 39' 31.9"	1	Larimer	N Fort Collins	Irrigation	600
716	12997	R		498962.8	4501296.8	-105° 0' 44.5"	40° 39' 45.2"	1	Larimer	N Fort Collins	Irrigation	2000
717	6233	R		497755.2	4501707.8	-105° 1' 37.0"	40° 40' 2.7"	1	Larimer	N Fort Collins	Irrigation	375
718	6232	R		497755.2	4501707.8	-105° 1' 37.0"	40° 40' 2.7"	1	Larimer	N Fort Collins	Irrigation	325
719	78485		A	498538.2	4501687.3	-105° 1' 2.0" 43.4"	40° 39' 58.5"	1	Larimer	N Fort Collins	Livestock	25
720	270	RD		498965.4	4501697.3	-105° 0' 43.4"	40° 39' 57.7"	1	Larimer	N Fort Collins	Irrigation	1550
722	17748	R		499382.6	4502901.3	-105° 0' 28.1"	40° 40' 41.9"	1	Larimer	S Wellington	Irrigation	2000
723	19015	R		498986.5	4503305.3	-105° 0' 42.3"	40° 40' 51.0"	1	Larimer	S Wellington	Irrigation	1800
724	15960	R		497783.9	4503714.5	-105° 1' 34.8"	40° 41' 6.0"	1	Larimer	S Wellington	Irrigation	270
725	14722	R		498989.5	4503702.3	-105° 0' 43.4"	40° 41' 2.7"	1	Larimer	S Wellington	Irrigation	1600
726	13754	R		499789.5	4503700.8	-105° 0' 7.3" 1.0"	40° 41' 1.0"	1	Larimer	S Wellington	Irrigation	1200
728	170434			497844.5	4504564.3	-105° 1' 32.6"	40° 41' 31.0"	1	Larimer	Wellington	Household	1.5
729	8225			498192.1	4504884	-105° 1' 16.2"	40° 41' 41.8"	1	Larimer	Wellington	Livestock	20
730	72423			498756.4	4505057.5	-105° 0' 52.1"	40° 41' 46.0"	1	Larimer	Wellington	Livestock	15
731	12195	R		498988.4	4504878.3	-105° 0' 42.3"	40° 41' 41.0"	1	Larimer	Wellington	Irrigation	1000
732	10939	R		499334	4505058	-105° 0' 27.0"	40° 41' 47.7"	1	Larimer	Wellington	Irrigation	450
733	20419			499772.4	4505273.9	-105° 0' 9.5" 43.4"	40° 41' 53.5"	1	Larimer	Wellington	Irrigation	25
734	52538			499951.7	4505133.9	-105° 0' 4.0" 31.3"	40° 41' 49.3"	1	Larimer	Wellington	Domestic	15
735	61413	F		499261.1	4505437.5	-105° 0' 31.3"	40° 42' 0.2"	1	Larimer	Wellington	Irrigation	60
736	14991	R		498562.4	4505680.4	-105° 0' 59.8"	40° 42' 7.7"	1	Larimer	E Wellington	Irrigation	1200
737	135073		A	499059.9	4506177	-105° 0' 37.9"	40° 42' 23.5"	1	Larimer	E Wellington	Domestic	25
738	4531	R		499162.6	4505888.4	-105° 0' 29.2"	40° 42' 15.2"	1	Larimer	Wellington	Municipal	525
739	228212			497036.1	4505454.9	-105° 2' 4.4" 1.0"	40° 42' 1.0"	1	Larimer	E Wellington	Domestic	13
740	268143			497268.4	4505602.5	-105° 1' 55.6"	40° 42' 6.0"	1	Larimer	E Wellington	Household	10
741	66438			497206.1	4505831.5	-105° 1' 58.9"	40° 42' 14.3"	1	Larimer	E Wellington	Household	20
742	138858			495146.4	4505804.5	-105° 3' 26.5"	40° 42' 11.0"	1	Larimer	E Wellington	Domestic	2.5
746	8948	F		497832.9	4507455.4	-105° 1' 32.7"	40° 43' 5.2"	1	Larimer	E Wellington	Irrigation	670
747	11854	R		498987.2	4507301.4	-105° 0' 42.3"	40° 42' 58.5"	1	Larimer	N Wellington	Irrigation	800
748	11854	R	R	498480.3	4507446.9	-105° 1' 3.1" 18.4"	40° 43' 6.0"	1	Larimer	N Wellington	Irrigation	700
749	20661	R		498170.2	4506481.4	-105° 1' 18.4"	40° 42' 34.3"	1	Larimer	N Wellington	Irrigation	990

759	81738		491151.8	4500582.3	-105° 6' 15.9"	40° 39' 21.7"	1	Larimer	N-W Fort Collins	Livestock	15
760	6533		490979.6	4499799.3	-105° 6' 23.5"	40° 38' 55.9"	1	Larimer	N-W Fort Collins	Livestock	8
761	11880	R	490730.7	4499075.8	-105° 6' 34.4"	40° 38' 32.6"	1	Larimer	N-W Fort Collins	Irrigation	500
764	1857	R	490565.7	4498597.3	-105° 7' 39.0"	40° 38' 15.9"	1	Larimer	N-W Fort Collins	Irrigation	800
765	118756		488733.2	4498495.3	-105° 7' 57.5"	40° 38' 14.1"	4	Larimer	N-W Fort Collins	Household	5
766	18621	F	491093.6	4497263.3	-105° 6' 17.9"	40° 37' 34.2"	1	Larimer	N-W Fort Collins	Irrigation	20
787	115	R	503098.3	4490553.5	-104° 57' 48.5"	40° 33' 57.8"	1	Larimer	E Fort Collins	Irrigation	700
788	101990		504186.7	4490371.5	-104° 57' 3.7"	40° 33' 50.3"	1	Larimer	E Fort Collins	Domestic	12
789	274994		504544.1	4490125	-104° 56' 46.2"	40° 33' 43.6"	1	Larimer	E Fort Collins	Livestock	15
790	30201		502505.7	4488005.5	-104° 58' 12.6"	40° 32' 34.5"	1	Larimer	E Fort Collins	Domestic	24
791	15749	R	501701.4	4488415.1	-104° 58' 48.6"	40° 32' 46.2"	1	Larimer	E Fort Collins	Irrigation	240
793	15748	R	500865	4488139.5	-104° 59' 21.4"	40° 32' 39.5"	1	Larimer	E Fort Collins	Irrigation	85
794	15745	R	500550.6	4488144	-104° 59' 37.8"	40° 32' 36.2"	1	Larimer	E Fort Collins	Irrigation	80
795	11423	R	500497.1	4489630.5	-104° 59' 38.9"	40° 33' 28.6"	1	Larimer	E Fort Collins	Irrigation	600
796	174865	A	500495.3	4490065.6	-104° 59' 39.9"	40° 33' 41.1"	1	Larimer	E Fort Collins	Domestic	50
797	110925		499976.7	4490338	-105° 0' 0.7"	40° 33' 49.5"	1	Larimer	E Fort Collins	Commercial	2
798	12130	R	501716	4489812.1	-104° 58' 50.8"	40° 33' 32.0"	1	Larimer	E Fort Collins	Irrigation	700
799	58555	F	501847.3	4489938.6	-104° 58' 42.0"	40° 33' 34.5"	1	Larimer	E Fort Collins	Irrigation	50
800	10551	R	501308.6	4490829.1	-104° 59' 1.7"	40° 34' 7.0"	1	Larimer	E Fort Collins	Irrigation	900
801	15201	F	500724.1	4492221	-104° 59' 27.9"	40° 32' 53.6"	1	Larimer	E Fort Collins	Irrigation	615
802	129076	A	502021.7	4487770	-104° 58' 33.3"	40° 32' 26.2"	1	Larimer	E Fort Collins	Domestic	15
803	129076		502110.1	4487605	-104° 58' 29.0"	40° 32' 22.8"	1	Larimer	E Fort Collins	Domestic	3
804	32352		502104.3	4487203	-104° 58' 32.2"	40° 32' 7.8"	1	Larimer	E Fort Collins	Domestic	18
805	73891		502926.6	4487231.5	-104° 57' 55.1"	40° 32' 8.6"	1	Larimer	E Fort Collins	Livestock	15
807	49435		500619.8	4487390.1	-104° 59' 31.2"	40° 32' 14.5"	1	Larimer	E Fort Collins	Domestic	15
808	84226		500984.1	4487375.6	-104° 59' 18.1"	40° 32' 13.7"	1	Larimer	E Fort Collins	Household	10
810	5777		503308.2	4485781	-104° 57' 38.8"	40° 31' 21.1"	1	Larimer	E Fort Collins	Domestic	15
811	156899		502931.1	4485572	-104° 57' 55.1"	40° 31' 15.3"	1	Larimer	E Fort Collins	Domestic	15
812	25680		501722.2	4485196.5	-104° 58' 47.6"	40° 31' 6.2"	1	Larimer	E Fort Collins	Livestock	10
813	179143	A	501591.8	4484792	-104° 58' 51.9"	40° 30' 50.3"	1	Larimer	E Fort Collins	Domestic	18
814	149513		502143.6	4484398.5	-104° 58' 29.0"	40° 30' 37.8"	1	Larimer	E Fort Collins	Domestic	10
815	15992	R	503339.8	4484014.5	-104° 57' 37.7"	40° 30' 24.5"	1	Larimer	E Fort Collins	Irrigation	250
816	154886	A	504476.5	4480608.9	-104° 56' 46.5"	40° 28' 34.5"	1	Larimer	E Fort Collins	Domestic	15
817	15746	R	500090.3	4478343	-104° 59' 54.2"	40° 27' 19.6"	1	Larimer	N Loveland	Irrigation	114
824	29231		496870.6	4484058	-105° 2' 11.7"	40° 30' 25.3"	1	Larimer	S Fort Collins	Domestic	20
825	83821		499492.1	4485724.5	-105° 0' 21.4"	40° 31' 21.2"	1	Larimer	S Fort Collins	Household	15
826	28647		498750.7	4485839.5	-105° 0' 53.1"	40° 31' 24.5"	1	Larimer	S Fort Collins	Domestic	15
827	23283	F	497019.2	4485822.6	-105° 2' 6.2"	40° 31' 23.6"	1	Larimer	S Fort Collins	Irrigation	35
828	5167		493257.1	4484867.6	-105° 4' 47.6"	40° 30' 52.7"	1	Larimer	S Fort Collins	Livestock	4
847	19733		491245.6	4487688.1	-105° 6' 13.1"	40° 32' 24.3"	1	Larimer	S Fort Collins	Domestic	15
848	26487		491647.7	4487684.6	-105° 5' 55.6"	40° 32' 24.3"	1	Larimer	S Fort Collins	Domestic	24
849	16502		490441.7	4487694.6	-105° 6' 45.8"	40° 32' 23.5"	1	Larimer	S Fort Collins	Livestock	15
850	5903		490445.6	4488504.7	-105° 6' 42.6"	40° 32' 51.0"	1	Larimer	S Fort Collins	Domestic	10

851	1294		490849.8	4488905.7	-105° 6' 29.5"	40° 33' 3.5"	1	Larimer	W Fort Collins	Domestic	30
852	20006		490447.5	4488909.7	-105° 6' 45.9"	40° 33' 2.6"	1	Larimer	W Fort Collins	Domestic	10
853	15809		492059.4	4489298.2	-105° 5' 34.9"	40° 33' 16.8"	1	Larimer	W Fort Collins	Domestic	8
854	14733		491260.6	4490929.7	-105° 6' 12.2"	40° 34' 9.3"	1	Larimer	W Fort Collins	Domestic	20
855	19026		490857	4490937.7	-105° 6' 27.4"	40° 34' 8.5"	1	Larimer	W Fort Collins	Domestic	10
856	1358		490873.8	4492547.7	-105° 6' 25.3"	40° 34' 58.4"	1	Larimer	W Fort Collins	Domestic	10
858	42502		488880.4	4492174.2	-105° 7' 51.6"	40° 34' 48.4"	5	Larimer	W Fort Collins	Domestic	18
859	1009		489669.2	4491761.7	-105° 6' 18.8"	40° 34' 31.7"	1	Larimer	W Fort Collins	Domestic	1
861	8047		490553.8	4490636	-105° 6' 40.5"	40° 34' 1.8"	1	Larimer	W Fort Collins	Domestic	13
885	92986	A	499050.7	4491425.5	-105° 0' 43.3"	40° 34' 24.5"	1	Larimer	E Fort Collins	Domestic	15
886	109476	A	498669.9	4491185.1	-105° 0' 56.4"	40° 34' 19.5"	1	Larimer	E Fort Collins	Livestock	15
887	2414	F	496096.2	4492487.2	-105° 2' 45.7"	40° 34' 58.6"	1	Larimer	E Fort Collins	Commercial	40
888	26429		493678.9	4490907.2	-105° 4' 28.4"	40° 34' 8.5"	1	Larimer	Fort Collins	Domestic	12
889	5041	F	494725.8	4489243.6	-105° 3' 45.7"	40° 34' 14.4"	1	Larimer	Fort Collins	Irrigation	260
890	16518	R	493673.7	4489288.1	-105° 4' 29.4"	40° 33' 16.9"	1	Larimer	Fort Collins	Irrigation	12
891	30588		494077.8	4488883.6	-105° 4' 11.9"	40° 33' 2.7"	1	Larimer	Fort Collins	Irrigation	30
892	159014	A	495179.7	4488004.6	-105° 3' 24.9"	40° 32' 33.6"	1	Larimer	Fort Collins	Domestic	35
893	22804	F	496548.3	4487548.6	-105° 2' 25.9"	40° 32' 17.8"	1	Larimer	Fort Collins	Irrigation	65
894	58712		498216.1	4486573.6	-105° 1' 17.1"	40° 31' 47.8"	1	Larimer	Fort Collins	Livestock	15
895	27163	F	499181.3	4485989.6	-105° 0' 33.5"	40° 31' 29.5"	1	Larimer	Fort Collins	Irrigation	125
896	43859		499689	4487231.6	-105° 0' 12.7"	40° 32' 7.8"	1	Larimer	Fort Collins	Domestic	20
897	171404		501022.8	4471454.4	-104° 59' 14.9"	40° 23' 37.9"	1	Larimer	E Loveland	Domestic	7
905	2622		498821.1	4473148.9	-105° 0' 48.7"	40° 24' 33.8"	1	Larimer	E Loveland	Domestic	20
906	2406		499222.8	4473142.4	-105° 0' 32.3"	40° 24' 32.9"	1	Larimer	E Loveland	Domestic	25
908	7762		491196.1	4475586	-105° 6' 13.6"	40° 25' 51.9"	1	Larimer	Loveland	Domestic	5
911	6077		494394.9	4471953.4	-105° 3' 57.2"	40° 23' 53.7"	1	Larimer	Loveland	Livestock	10
912	38097	F	494494.7	4471781.9	-105° 3' 52.8"	40° 23' 47.9"	1	Larimer	Loveland	Irrigation	95
913	5245		494791	4471146.9	-105° 3' 39.7"	40° 23' 28.7"	1	Larimer	Loveland	Domestic	15
916	7740		493170.5	4470347.4	-105° 4' 50.5"	40° 23' 0.4"	1	Larimer	S-E Loveland	Domestic	10
983	86127	A	486255.1	4473050.5	-105° 9' 42.7"	40° 24' 28.4"	6	Larimer	W Loveland	Domestic	5
987	8159		485456.2	4473210	-105° 10' 15.4"	40° 24' 34.1"	6	Larimer	W Loveland	Domestic	12
1044	61241	A	483531.2	4456803	-105° 11' 37.8"	40° 15' 41.6"	7	Larimer	W Berthoud	Domestic	10
291	26545		502567.8	4535016.1	-104° 58' 9.7"	40° 57' 58.2"	1	Larimer	N-E Larimer	Livestock	15
292	26545	A	503050	4534934	-104° 57' 48.8"	40° 57' 55.7"	1	Larimer	N-E Larimer	Stock	10
293	26544		503776.6	4533003.5	-104° 57' 18.1"	40° 56' 52.4"	1	Larimer	N-E Larimer	Stock	8
294	199183		504516.1	4532731.5	-104° 56' 45.1"	40° 56' 46.6"	1	Larimer	N-E Larimer	Domestic	15
296	290126		499909	4531832	-105° 0' 4.0"	40° 56' 15.0"	1	Larimer	N-E Larimer	Stock	4
299	283940		500790	4530854	-104° 59' 25.6"	40° 55' 43.3"	1	Larimer	N-E Larimer	Domestic	10
301	26542		499980	4530152	-105° 0' 0.7"	40° 55' 20.0"	1	Larimer	N-E Larimer	Livestock	4
307	251706		504711.8	4529647.9	-104° 56' 37.5"	40° 55' 4.9"	1	Larimer	N-E Larimer	Domestic	10
297	39645		500958.6	4531390	-104° 59' 17.9"	40° 56' 0.8"	1	Larimer	N-E Larimer	Stock	10
298	26543		502568.7	4531392.5	-104° 58' 10.9"	40° 56' 1.6"	1	Larimer	N-E Larimer	Stock	10
300	14262	F	502305.2	4529891.9	-104° 58' 20.8"	40° 55' 11.6"	1	Larimer	N-E Larimer	Irrigation	900

302	9383	F	502975.9	4529778.9	-104° 57' 48.9"	40° 55' 11.6"	1	Larimer	N-E Larimer	Irrigation	800
308	196630		504519.2	4529223.4	-104° 56' 45.2"	40° 54' 52.4"	1	Larimer	N-E Larimer	Livestock	15
309	187641		504605.2	4529015.9	-104° 56' 34.0"	40° 54' 43.3"	1	Larimer	N-E Larimer	Domestic	6
360	84755		490450.6	4532472.1	-105° 6' 48.3"	40° 56' 36.4"	2	Larimer	N-E Larimer	Livestock	6
364	228688		504491.1	4521744.2	-104° 56' 47.6"	40° 50' 46.7"	1	Larimer	N-E Larimer	Domestic	10
365	228967		504553.7	4521317.2	-104° 56' 44.3"	40° 50' 34.2"	1	Larimer	N-E Larimer	Domestic	8
366	229375		503936.6	4521402.2	-104° 57' 10.7"	40° 50' 35.8"	1	Larimer	N-E Larimer	Domestic	2
295	264172		501160.2	4532016	-104° 59' 12.4"	40° 56' 22.4"	1	Larimer	N-E Larimer	Stock	15
303	42164	A	502880.2	4529721.9	-104° 57' 57.7"	40° 55' 6.6"	1	Larimer	N-E Larimer	Livestock	800
304	4862	F	503028.8	4529642	-104° 57' 50.0"	40° 55' 5.8"	1	Larimer	N-E Larimer	Municipal	450
305	174814		503429.5	4529049.4	-104° 57' 31.4"	40° 54' 45.8"	1	Larimer	N-E Larimer	Domestic	18
306	15887	R	503895.8	4529185.4	-104° 57' 13.8"	40° 54' 50.8"	1	Larimer	N-E Larimer	Irrigation	250
311	191702		504019.1	4528505.4	-104° 57' 7.2"	40° 54' 25.8"	1	Larimer	N-E Larimer	Domestic	15
312	158279		504123.8	4527800.8	-104° 57' 2.8"	40° 54' 5.8"	1	Larimer	N-E Larimer	Livestock	7
313	26548		502977.7	4528577.9	-104° 58' 52.2"	40° 53' 30.0"	1	Larimer	N-E Larimer	Livestock	15
314	280724		502018	4527396	-104° 58' 32.9"	40° 53' 50.8"	1	Larimer	N-E Larimer	Household	15
315	135573		501767	4526975.9	-104° 58' 43.9"	40° 53' 38.3"	1	Larimer	N-E Larimer	Livestock	1
318	210134		502845.2	4525671.8	-104° 57' 58.9"	40° 52' 55.8"	1	Larimer	N-E Larimer	Livestock	4
319	26549		503382.7	4526178.8	-104° 57' 33.6"	40° 53' 12.5"	1	Larimer	N-E Larimer	Livestock	10
320	116710		502752.3	4523942	-104° 58' 2.2"	40° 51' 59.2"	1	Larimer	N-E Larimer	Livestock	5
363	234983		503467.9	4521662.2	-104° 57' 30.4"	40° 50' 45.9"	1	Larimer	N-E Larimer	Domestic	9.5
367	206553		502719.5	4521059.7	-104° 58' 3.3"	40° 50' 26.7"	1	Larimer	N-E Larimer	Domestic	10
372	272728		501840	4520271	-104° 58' 40.6"	40° 50' 0.0"	1	Larimer	N-E Larimer	Domestic	10
398	239920		492603.5	4523172.8	-105° 5' 14.5"	40° 51' 35.7"	2	Larimer	N-E Larimer	Domestic	1
399	131306		492924.8	4522863.3	-105° 5' 5.7"	40° 51' 28.3"	2	Larimer	N-E Larimer	Domestic	10
310	203714		504071.3	4528744.4	-104° 57' 1.7"	40° 54' 33.3"	1	Larimer	N-E Larimer	Domestic	8.6
316	26539		500982.3	4523750.3	-104° 59' 19.0"	40° 51' 52.5"	1	Larimer	N-E Larimer	Livestock	12
317	116711		501261.4	4524484.3	-104° 59' 5.8"	40° 52' 15.9"	1	Larimer	N-E Larimer	Livestock	7
327	16242	F	498962.9	4527923.9	-105° 0' 43.5"	40° 54' 9.2"	1	Larimer	N-E Larimer	Irrigation	340
362	246722	v	501510.4	4521641.2	-104° 58' 54.9"	40° 50' 44.2"	1	Larimer	N-E Larimer	Domestic	5
368	204472		502301.8	4520973.7	-104° 58' 22.0"	40° 50' 24.2"	1	Larimer	N-E Larimer	Household	8
369	90811		501875.2	4520964.5	-104° 58' 34.0"	40° 50' 22.5"	1	Larimer	N-E Larimer	Domestic	60
402	245945		502458.8	4516454	-104° 58' 14.4"	40° 47' 56.7"	1	Larimer	N-E Larimer	Domestic	15
412	241850		504173.5	4514516.5	-104° 57' 1.0"	40° 46' 53.4"	1	Larimer	N-E Larimer	Domestic	0.25
413	203869		504715.5	4514437	-104° 56' 37.9"	40° 46' 51.7"	1	Larimer	N-E Larimer	Domestic	6
414	197722		504469.9	4514185	-104° 56' 47.8"	40° 46' 42.6"	1	Larimer	N-E Larimer	Domestic	4.9
416	206944		504495.5	4513470.4	-104° 56' 48.9"	40° 46' 20.1"	1	Larimer	N-E Larimer	Domestic	7.5
62	11182		488519	4495810	-105° 8' 8.6"	40° 36' 46.9"	5	Larimer	W Fort Collins	Domestic	9
90	973		487768	4504959	-105° 8' 41.2"	40° 41' 43.6"	4	Larimer	N-W Fort Collins	Domestic	1
91	296009		487684	4503575	-105° 8' 44.7"	40° 40' 58.7"	4	Larimer	N-W Fort Collins	Household	60
108	26341		487780	4519360	-105° 8' 41.7"	40° 49' 30.6"	3	Larimer	N-W Fort Collins	livestock	5
111	601		490436	4488098	-105° 6' 46.6"	40° 32' 36.9"	1	Larimer	W Fort Collins	Domestic	35
114	10165		487934	4469572	-105° 8' 31.7"	40° 22' 35.9"	6	Larimer	W Loveland	Domestic	2

172	215388	A	485931	4471474	-105° 9'	40° 23'	6	Larimer	W Loveland	Domestic	12
441	73428		489123.5	4519919.5	56.8"	37.5"					
648	30236	F	488076.7	4492526.7	-105° 7'	40° 49'	3	Larimer	N-E Larimer	Livestock	15
649	50260		488082.7	4492928.2	44.6"	49.0"			N-W Fort Collins	Other	30
651	161177		487419.1	4495160.3	-105° 8'	40° 35'	5	Larimer	N-W Fort Collins	Domestic	5
652	61407		487503	4495418	28.8"	0.8"			N-W Fort Collins	Household	1
660	280524	A	489194.6	4493262.5	-105° 8'	40° 36'	5	Larimer	N-W Fort Collins	Domestic	15
756	56907		489422.2	4504603.4	57.4"	28.2"			N-W Fort Collins	Domestic	14
860	150677	A	489022.9	4490971.2	-105° 7'	40° 41'	4	Larimer	E Wellington	Domestic	3
118	32251		491865	4465499	32.7"	30.8"					
119	59155		494716	4457403	-105° 7'	40° 34'	5	Larimer	W Fort Collins	Domestic	15
120	37613		493902	4457018	43.9"	10.9"					
121	154204		494332	4463388	-105° 5'	40° 20'	1	Larimer	W Berthoud	Domestic	15
123	19279		494581	4463185	44.8"	24.0"	1	Larimer	W Berthoud	Domestic	15
152	58009		487803	4458172	-105° 3'	40° 16'	1	Larimer	S Berthoud	Domestic	15
155	1802323		489798	4458062	43.7"	1.5"	1	Larimer	S Berthoud	Domestic	15
164	122659		494853	4467288	-105° 4'	40° 15'	1	Larimer	S Berthoud	Domestic	16
175	165086		495514	4480543	18.2"	49.0"					
177	22944		493254	4482854	-105° 4' 0.2"	40° 19'	1	Larimer	E Berthoud	Domestic	2
214	241445	A	501452	4486649	-105° 3'	40° 19'	1	Larimer	W Berthoud	Domestic	5
215	251842		504263	4482543	49.6"	9.0"					
323	50313		496952.8	4525774.9	-105° 8'	40° 16'	7	Larimer	S-W Berthoud	Stock	15
325	79824		497065.9	4528640.4	36.5"	26.2"					
330	210824	A	493882.7	4527225.4	-105° 7'	40° 16'	1	Larimer	S-W Berthoud	livestock	7
331	187667		493291.3	4526876.4	12.0"	22.7"					
370	90810	A	501675.6	4520746.5	-105° 3'	40° 21'	1	Larimer	S Loveland	Domestic	2
371	289591		501436	4520916	38.2"	22.1"					
373	270201		502174	4520113	-105° 3'	40° 28'	1	Larimer	N Loveland	Domestic	40
376	292006		500867.1	4519272	10.5"	32.0"	1	Larimer	S Fort Collins	Domestic	40
377	266346		500807.7	4519018.5	-105° 4'	40° 29'	1	Larimer	S Fort Collins	Domestic	40
379	299242		500720	4518692	46.6"	46.9"					
380	258315		500711.7	4518274	-104° 58'	40° 31'	1	Larimer	E Fort Collins	Domestic	5
381	258449		501442	4518469.5	58.3"	50.1"					
382	96130		501682.3	4518147.5	-104° 56'	40° 29'	1	Larimer	E Fort Collins	Domestic	12
383	256118		501785.9	4518558.5	58.9"	36.9"					
384	274756		500197	4520973	-105° 2'	40° 52'	1	Larimer	N-E Larimer	Livestock	8
385	217536		499116.7	4521060.7	10.2"	58.3"					
386	224847	A	498671.1	4520417	-105° 2' 5.9"	40° 54'	1	Larimer	N-E Larimer	Domestic	15
387	263658		498589	4520141	-105° 4'	40° 53'	1	Larimer	N-E Larimer	Livestock	4
388	274602		497812	4520900	-105° 4'	40° 53'	1	Larimer	N-E Larimer	Livestock	10
389	240658		497456.4	4520876.7	-104° 58'	40° 50'	1	Larimer	N-E Larimer	Domestic	5
390	265546		497289.8	4520493.5	50.5"	20.0"					
391	238266		497370.2	4520131.2	-104° 58'	40° 50'	1	Larimer	N-E Larimer	Domestic	5
					50.5"	20.0"					
					-104° 58'	40° 50'	1	Larimer	N-E Larimer	Domestic	7.5
					48.3"	52.6"					
					-104° 58'	40° 49'	1	Larimer	N-E Larimer	Livestock	10.2
					43.9"	5.1"					
					-104° 59'	40° 50'	1	Larimer	N-E Larimer	Domestic	5
					15.9"	23.4"					
					-105° 0'	40° 50'	1	Larimer	N-E Larimer	Domestic	7.5
					36.9"	26.7"					
					-105° 0'	40° 50'	1	Larimer	N-E Larimer	Domestic	5
					55.5"	5.0"					
					-105° 1' 1.0"	40° 49'	1	Larimer	N-E Larimer	Domestic	7
					-105° 1'	40° 50'	1	Larimer	N-E Larimer	Domestic	10
					32.8"	20.9"					
					-105° 1'	40° 50'	1	Larimer	N-E Larimer	Domestic	7
					49.3"	19.2"					
					-105° 1'	40° 50'	1	Larimer	N-E Larimer	Domestic	10
					55.9"	7.5"					
					-105° 1'	40° 49'	1	Larimer	N-E Larimer	Livestock	10
					51.5"	55.9"					
							1	Larimer	N-E Larimer	Domestic	7.5

392	239457		496969.6	4520943.2	-105° 2' 7.9"	40° 50'	1	Larimer	N-E Larimer	Domestic	5
					-105° 2'	22.5"					
					46.3"	40° 50'					
392	197353		496123	4520315.2	-105° 1'	1.7"	1	Larimer	N-E Larimer	Domestic	4.5
					58.1"	40° 49'					
393	235863		497245.1	4519888.2		47.5"	1	Larimer	N-E Larimer	Domestic	5
						40° 50'					
395	139210		494169.9	4521358.5	-105° 4' 8.6"	35.0"	1	Larimer	N-E Larimer	Domestic	1.5
						40° 50'					
396	192091		493764.5	4521323.5	-105° 4'	27.3"	1	Larimer	N-E Larimer	Domestic	3.5
					-105° 4'	34.1"					
400	143012		493908.7	4522746.3	19.6"	19.9"	1	Larimer	N-E Larimer	Domestic	10
					-105° 4'	40° 51'					
401	165124		493827.9	4523131.3	24.0"	32.4"	1	Larimer	N-E Larimer	Domestic	6
					-104° 58'	40° 47'					
403	205740		502734.1	4515193	3.4"	15.1"	1	Larimer	N-E Larimer	Domestic	4.5
					-104° 58'	40° 47'					
404	199415		502548.5	4514852.5	10.0"	5.1"	1	Larimer	N-E Larimer	Domestic	0.66
					-104° 58'	40° 47'					
405	200581		502314.1	4514883.5	19.9"	5.9"	1	Larimer	N-E Larimer	Domestic	15
					-104° 58'	40° 47'					
406	205739		502182.7	4514853.5	27.5"	5.1"	1	Larimer	N-E Larimer	Domestic	2.5
					-104° 58'	40° 47'					
407	215121		501800.1	4514915.5	42.9"	5.9"	1	Larimer	N-E Larimer	Domestic	10
					-104° 58'	40° 46'					
410	56949		501495.1	4513998	54.9"	35.9"	1	Larimer	N-E Larimer	Domestic	6
					-104° 57'	40° 47'					
411	202323		503634.3	4514678	24.0"	0.1"	1	Larimer	N-E Larimer	Livestock	3.5
					-104° 57'	40° 46'					
415	235000	A	503531.6	4513946.5	28.4"	35.1"	1	Larimer	N-E Larimer	Domestic	1.5
					-104° 57'	40° 45'					
420	205476		503478.6	4511166.9	31.7"	4.3"	1	Larimer	N-E Larimer	Livestock	1.5
					-104° 57'	40° 44'					
421	74552		503083.8	4510947.5	48.1"	56.8"	1	Larimer	N-E Larimer	Livestock	10
					-104° 56'	40° 45'					
422	259834		504460.2	4511103.5	49.8"	3.4"	1	Larimer	N-E Larimer	Domestic	0.75
					-104° 58'	40° 44'					
423	229053		502321.3	4510687.9	21.0"	49.3"	1	Larimer	N-E Larimer	Domestic	1
					-104° 57'	40° 44'					
424	247949		503354.2	4509901.4	37.2"	24.3"	1	Larimer	N-E Larimer	Domestic	9
					-104° 57'	40° 44'					
425	249209		503558.2	4509354.5	28.5"	6.8"	1	Larimer	N-E Larimer	Domestic	5
					-104° 57'	40° 43'					
426	182696		503905.4	4508433.3	2.2"	27.6"	1	Larimer	N-E Larimer	Domestic	4
					-104° 56'	40° 44'					
427	299086		504377.1	4509547	53.4"	12.6"	1	Larimer	N-E Larimer	Domestic	5
					-104° 56'	40° 44'					
428	297576		504684	4509372	39.2"	6.8"	1	Larimer	N-E Larimer	Domestic	51
					-104° 59'	40° 44'					
430	94316		500825.8	4509487.5	24.6"	10.2"	1	Larimer	N-E Larimer	Domestic	0.5
					-104° 57'	40° 43'					
431	101732		503065.8	4508107.3	48.2"	26.0"	1	Larimer	N-E Larimer	Livestock	3.5
					-104° 58'	40° 43'					
435	233322		501996.2	4508803.4	34.2"	47.7"	1	Larimer	N-E Larimer	Livestock	20
					-105° 2'	40° 46'					
472	243405		496069	4514427.5	47.3"	50.9"	1	Larimer	N-E Larimer	Domestic	14.8
					-105° 2'	40° 46'					
473	88801		495997.5	4514056.5	51.7"	38.4"	1	Larimer	N-E Larimer	Livestock	2
					-105° 6'	40° 46'					
480	185711		490341.1	4513198	52.7"	10.8"	1	Larimer	N-E Larimer	Domestic	10
					-105° 6'	40° 46'					
481	216604		490722	4514275.5	35.2"	44.9"	1	Larimer	N-E Larimer	Domestic	15
						40° 46'					
482	214338		491521.7	4514308.5	-105° 6' 2.4"	47.5"	1	Larimer	N-E Larimer	Domestic	4
					-105° 5'	40° 46'					
483	233737		491793	4514305.5	50.3"	47.5"	1	Larimer	N-E Larimer	Domestic	6.9
					-105° 5'	40° 47'					
485	152539		491792.5	4514823.5	50.3"	3.3"	1	Larimer	N-E Larimer	Domestic	3
					-105° 5'	40° 47'					
486	111936		492176.2	4514961.6	33.9"	9.1"	1	Larimer	N-E Larimer	Household	0.5
					-105° 5'	40° 47'					
488	69133		492129	4515445	35.0"	24.1"	1	Larimer	N-E Larimer	Domestic	4
					-104° 59'	40° 47'					
490	149823	A	499999.4	4515029.6	59.6"	11.8"	1	Larimer	N-E Larimer	Domestic	2
					-105° 1' 5.4"	40° 47'					
492	146967		498472.5	4514758.5		2.6"	1	Larimer	N-E Larimer	Domestic	5
					-105° 1' 7.5"	40° 46'					
493	290345		498552.2	4513895	-104° 59'	34.3"	1	Larimer	N-E Larimer	Livestock	6.5
					35.5"	40° 46'					
494	108259		500575.4	4513497.5		21.8"	1	Larimer	N-E Larimer	Domestic	0.5
					-105° 1' 5.4"	40° 46'					
495	77170		498443.4	4513222		12.6"	1	Larimer	N-E Larimer	Livestock	10
					-105° 0'	40° 46'					
496	196167		498793.6	4513250.5	52.2"	13.5"	1	Larimer	N-E Larimer	Livestock	8
						40° 45'					
497	273375		499938.6	4512295	-105° 0' 1.8"	41.8"	1	Larimer	N-E Larimer	Livestock	5

498	214363		490615.6	4511538.5	-105° 6' 38.4"	40° 45' 17.4"	1	Larimer	N-E Larimer	Livestock	7
499	2141		490538.2	4508942.9	-105° 6' 42.6"	40° 43' 52.5"	1	Larimer	N-E Larimer	Domestic	5
502	78877		492811.9	4513031	-105° 5' 9.7"	40° 46' 3.3"	1	Larimer	N-E Larimer	Domestic	15
503	178218		492373.6	4513203	-105° 5' 21.8"	40° 46' 10.8"	1	Larimer	N-E Larimer	Domestic	35
529	182532		499356.5	4508513.4	-105° 0' 25.9"	40° 43' 39.3"	1	Larimer	N-E Larimer	Domestic	0.02
530	1074		499397.9	4509740.9	-105° 0' 24.8"	40° 44' 19.3"	1	Larimer	N-E Larimer	Domestic	25
536	125421		498480	4509858.4	-105° 1' 4.2"	40° 44' 23.5"	1	Larimer	N-E Larimer	Livestock	12
538	1761		497403.9	4509713.4	-105° 1' 50.2"	40° 44' 16.0"	1	Larimer	N-E Larimer	Domestic	6
539	262934		498602.2	4512039.5	-105° 1' 1.0"	40° 45' 33.5"	1	Larimer	N-E Larimer	Domestic	7
540	18206		498574.3	4511775.5	-105° 0' 59.9"	40° 45' 25.1"	1	Larimer	N-E Larimer	Domestic	2
541	29253		497788.3	4511352	-105° 1' 36.0"	40° 45' 8.5"	1	Larimer	N-E Larimer	Domestic	20
547	114363		496819.3	4509990.9	-105° 2' 16.5"	40° 44' 26.8"	1	Larimer	N-E Larimer	Domestic	20
551	102201		501655.8	4507155.4	-104° 58' 48.4"	40° 42' 56.0"	1	Larimer	Wellington N-E	Domestic	15
552	240446	A	501571.7	4506941.4	-104° 58' 52.8"	40° 42' 47.7"	1	Larimer	Wellington N-E	Domestic	2
554	168272		503076.8	4506396.8	-104° 57' 48.2"	40° 42' 31.0"	1	Larimer	E Wellington	Domestic	5
555	49667		503802.7	4504864.3	-104° 57' 16.5"	40° 41' 41.0"	1	Larimer	E Wellington	Domestic	3
557	5957		501787.6	4504870.8	-104° 58' 43.0"	40° 41' 42.7"	1	Larimer	E Wellington	Livestock	7
562	272090		503671.6	4502623	-104° 57' 23.1"	40° 40' 28.5"	1	Larimer	N-E Fort Collins	Domestic	3.59
563	254179		504580.7	4502752	-104° 56' 44.8"	40° 40' 33.5"	1	Larimer	N-E Fort Collins	Domestic	14
564	90		500183.9	4502898.3	-104° 59' 51.9"	40° 40' 36.9"	1	Larimer	N-E Fort Collins	Livestock	25
571	87458		501639.2	4500343.5	-104° 58' 49.6"	40° 39' 14.4"	1	Larimer	N-E Fort Collins	Domestic	8
572	75473		501882.6	4500311	-104° 58' 39.7"	40° 39' 13.6"	1	Larimer	N-E Fort Collins	Domestic	0.8
577	147252		504507.1	4498405.5	-104° 56' 48.2"	40° 38' 11.0"	1	Larimer	N-E Fort Collins	Domestic	12
578	3964		503726.5	4497255.2	-104° 57' 22.1"	40° 37' 33.6"	1	Larimer	N-E Fort Collins	Domestic	12
584	193850	A	502440.2	4494321	-104° 58' 15.8"	40° 35' 58.6"	1	Larimer	N-E Fort Collins	Domestic	8
585	98115	A	504663.3	4494486.5	-104° 56' 41.8"	40° 36' 4.4"	1	Larimer	N-E Fort Collins	Livestock	36
586	43545		503320.7	4495239.1	-104° 57' 38.6"	40° 36' 28.6"	1	Larimer	N-E Fort Collins	Domestic	25
587	157149	A	502664.7	4495213.6	-104° 58' 8.1"	40° 36' 30.2"	1	Larimer	N-E Fort Collins	Domestic	15
588	118880		503025.9	4494931.1	-104° 57' 51.7"	40° 36' 19.4"	1	Larimer	N-E Fort Collins	Livestock	15
589	75029		502099	4492184	-104° 58' 30.0"	40° 34' 49.5"	1	Larimer	N-E Fort Collins	Domestic	10
590	257540	A	501616	4492307.1	-104° 58' 54.0"	40° 34' 53.6"	1	Larimer	N-E Fort Collins	Domestic	5
708	201519	A	498311.6	4499992.3	-105° 1' 14.0"	40° 39' 1.9"	1	Larimer	N Fort Collins	Domestic	12.8
750	7853		490519.8	4507326.9	-105° 6' 42.5"	40° 42' 59.1"	1	Larimer	E Wellington	Livestock	2
751	72738		489474.3	4506785.5	-105° 7' 27.4"	40° 42' 43.3"	1	Larimer	E Wellington	Livestock	5
758	107408		490512	4502658.8	-105° 6' 43.4"	40° 40' 29.2"	1	Larimer	E Wellington	Domestic	0.25
774	1419		494984.6	4500136.8	-105° 3' 32.9"	40° 39' 5.2"	1	Larimer	N Fort Collins	Domestic	30
818	28376		494438.1	4477605	-105° 3' 55.2"	40° 26' 57.0"	1	Larimer	N Loveland	Domestic	8
819	6684		493644.7	4481250.5	-105° 4' 29.1"	40° 28' 52.8"	1	Larimer	N Loveland	Domestic	2
821	89693		493850.5	4482745	-105° 4' 20.4"	40° 29' 44.4"	1	Larimer	S Fort Collins	Domestic	15
822	3018		493646.2	4482870.6	-105° 4' 31.3"	40° 29' 48.6"	1	Larimer	S Fort Collins	Domestic	1
898	83849		501706.3	4470931.8	-104° 58' 46.6"	40° 23' 20.5"	1	Larimer	E Loveland	Livestock	5
899	208523		502827.5	4469987.8	-104° 57' 58.7"	40° 22' 49.6"	1	Larimer	E Loveland	Household	0.6
900	75141		501918.9	4469484	-104° 58' 39.0"	40° 22' 33.0"	1	Larimer	E Loveland	Household	0.9

901	115996	A	501248.5	4469360.8	-104° 59' 7.3"	40° 22' 28.8"	1	Larimer	E Loveland	Domestic	5
902	89124		497440.9	4471263	-105° 1' 48.6"	40° 23' 33.8"	1	Larimer	E Loveland	Household	15
903	88359		497385.8	4472890	-105° 1' 50.8"	40° 24' 22.1"	1	Larimer	E Loveland	Household	2
904	155554	A	497430.3	4473014.9	-105° 5' 50.8"	40° 26' 27.9"	1	Larimer	E Loveland	Livestock	50
907	26763		491880.9	4476124	-105° 3' 45.2"	40° 21' 8.6"	1	Larimer	N Loveland	Domestic	5
925	54769		494762.6	4466734.4	-105° 4' 43.9"	40° 21' 6.3"	1	Larimer	S Loveland	Domestic	2
926	227678	A	493461.1	4466801.9	-105° 5' 37.3"	40° 20' 8.7"	1	Larimer	S Loveland	Domestic	1.5
927	7156		492664.9	4466330.9	-105° 4' 13.2"	40° 20' 54.5"	1	Larimer	S Loveland	Domestic	8
928	41577		493473.8	4466329.4	-105° 3' 37.3"	40° 18' 49.6"	1	Larimer	S Loveland	Domestic	7
929	55140		493479.4	4464677.9	-105° 6' 54.7"	40° 19' 10.5"	1	Larimer	S Loveland	Domestic	2
930	53989		491060.1	4463844.4	-105° 5' 20.6"	40° 19' 33.7"	1	Larimer	S Loveland	Domestic	4
931	102637		492105.9	4463010.9	-105° 4' 3.2" 34.8"	40° 15' 3.7"	1	Larimer	S Loveland	Livestock	1
1028	77797		494246.6	4456957.3	-105° 4' 1.0" 47.2"	40° 15' 48.8"	1	Larimer	S Berthoud	Domestic	10
1029	54642		494300.1	4457007.3	-105° 4' 6.5" 57.2"	40° 16' 3.0"	1	Larimer	S Berthoud	Household	0.5
1030	78825		494192.5	4457276.8	-105° 4' 8.7" 16.3"	40° 15' 48.8"	1	Larimer	S Berthoud	Domestic	16
1031	69751		494133	4457490	-105° 4' 19.6"	40° 16' 2.1"	1	Larimer	S Berthoud	Domestic	15
1032	36173		493898.4	4457003.3	-105° 4' 33.8"	40° 16' 54.6"	1	Larimer	S Berthoud	Household	5
1033	49471		493895.9	4457407.3	-105° 5' 9.7" 59.6"	40° 16' 22.1"	1	Larimer	S Berthoud	Domestic	6
1034	247048		493488.3	4458210.3	-105° 6' 13.8"	40° 16' 22.1"	1	Larimer	S Berthoud	Domestic	6
1035	100939		492688.1	4459198.8	-105° 6' 18.1"	40° 15' 14.6"	1	Larimer	S Berthoud	Domestic	6
1036	61776		491161.7	4458049.3	-105° 9' 40.4"	40° 15' 46.0"	7	Larimer	S Berthoud	Domestic	3
1037	44461		491068.4	4457786.8	-105° 8' 52.0"	40° 17' 31.4"	7	Larimer	W Berthoud	Domestic	7
1038	4935		486278.4	4456957.4	-105° 5' 4.6" 48.7"	40° 17' 48.7"	1	Larimer	W Berthoud	Household	60
115	60783		487439	4460184	-105° 9' 24.5"	40° 16' 25.5"	7	Larimer	S-W Berthoud	Domestic	25
117	139565		492809	4460710	-105° 8' 56.7"	40° 16' 50.5"	7	Larimer	S-W Berthoud	Household	6
151	45256		486668	4458153	-105° 8' 0.5" 3.6"	40° 17' 3.6"	7	Larimer	S-W Berthoud	Domestic	20
153	90466		487327	4458922	-105° 12' 13.2"	40° 21' 27.6"	7	Larimer	W Loveland	Household	3
1040	40945		488649.3	4459386.9	-105° 8' 35.4"	40° 18' 23.4"	7	Larimer	W Berthoud	Domestic	3
17	41464		487830.8	4461787.4	-105° 9' 49.5"	40° 16' 38.7"	7	Larimer	S-W Berthoud	Stock	20
116	41464		487834	4461786	-105° 7' 0.6" 27.4"	40° 17' 27.4"	1	Larimer	S-W Berthoud	Stock	15
150	99035		486079	4458562	-105° 7' 11.3"	40° 18' 11.5"	1	Larimer	W Berthoud	Domestic	4
154	170558	A	489818	4461416	-105° 8' 41.7"	40° 19' 14.6"	7	Larimer	W Berthoud	Household	7
157	187825		487688	4463365	-105° 8' 1.5" 23.8"	40° 20' 23.8"	7	Larimer	W Berthoud	Domestic	8
158	148871		487688	4463365	-105° 5' 50.8"	40° 27' 6.1"	1	Larimer	N-W Loveland	Domestic	10
160	26768		488640	4465497	-105° 5' 55.4"	40° 30' 26.0"	1	Larimer	S Fort Collins	livestock	7
173	290785		491738	4477897	-105° 0' 43.5"	40° 52' 33.4"	1	Larimer	N-E Larimer	Livestock	12
178	26973		491636	4484061	-105° 1' 16.4"	40° 52' 21.7"	1	Larimer	N-E Larimer	Livestock	2
321	16540		498960.6	4524976.8	-105° 2' 10.3"	40° 54' 55.0"	1	Larimer	N-E Larimer	Livestock	12
322	80152		498176.5	4524683.8	-105° 4' 49.4"	40° 53' 16.6"	1	Larimer	N-E Larimer	Domestic	10
324	26541		496950.6	4529396	-105° 4' 31.8"	40° 52' 57.4"	1	Larimer	N-E Larimer	Domestic	7
332	204261		493273	4526291.4	-105° 4' 2.2" 3.3"	40° 53' 3.3"	1	Larimer	N-E Larimer	Domestic	5
333	263883		493654.5	4525734.5							
334	262340		494294.8	4525897.5							

335	247926		495054.8	4525898.9	-105° 3' 31.5"	40° 53' 3.3"	1	Larimer	N-E Larimer	Domestic	7
336	274050		494981	4525697.5	-105° 3' 34.7"	40° 52' 55.8"	1	Larimer	N-E Larimer	Domestic	10
337	262426		494736	4525302	-105° 3' 45.7"	40° 52' 43.3"	1	Larimer	N-E Larimer	Domestic	7
338	263107		494357.4	4525215.5	-105° 4' 1.1"	40° 52' 41.6"	1	Larimer	N-E Larimer	Domestic	5
339	260416		493888.6	4525226.5	-105° 4' 20.8"	40° 52' 39.9"	1	Larimer	N-E Larimer	Domestic	5
340	214565		493554.1	4525111.8	-105° 4' 37.3"	40° 52' 36.6"	1	Larimer	N-E Larimer	Domestic	1
341	214681		493281	4524964.8	-105° 4' 46.1"	40° 52' 32.4"	1	Larimer	N-E Larimer	Domestic	3
342	185753		493345.8	4524461.3	-105° 4' 44.9"	40° 52' 15.8"	1	Larimer	N-E Larimer	Livestock	12
343	184315		493445.2	4524052.3	-105° 4' 39.4"	40° 52' 3.3"	1	Larimer	N-E Larimer	Domestic	10
344	263108		493680.7	4524525	-105° 4' 28.5"	40° 52' 18.3"	1	Larimer	N-E Larimer	Domestic	5
345	267817		493952.8	4524810.5	-105° 4' 17.5"	40° 52' 27.4"	1	Larimer	N-E Larimer	Livestock	5
346	263890		494204.6	4524956	-105° 4' 7.6"	40° 52' 30.8"	1	Larimer	N-E Larimer	Domestic	5
347	259835		494593.6	4524901.5	-105° 3' 51.2"	40° 52' 30.8"	1	Larimer	N-E Larimer	Domestic	12
348	250300		494881.4	4525053.5	-105° 3' 39.1"	40° 52' 35.8"	1	Larimer	N-E Larimer	Domestic	5
349	219822		494049.9	4523651.8	-105° 4' 15.3"	40° 51' 49.1"	1	Larimer	N-E Larimer	Livestock	1
374	269757		501728	4519555	-104° 58' 46.1"	40° 49' 37.6"	1	Larimer	N-E Larimer	Livestock	7.5
375	257492		501786.5	4519312	-104° 58' 43.9"	40° 49' 30.9"	1	Larimer	N-E Larimer	Domestic	12
409	88076		501571.6	4514358	-104° 58' 51.7"	40° 46' 48.5"	1	Larimer	N-E Larimer	Livestock	3
439	155208	A	491897.8	4519649.2	-105° 5' 48.4"	40° 49' 36.6"	1	Larimer	N-E Larimer	Livestock	4
440	162405	A	491151.6	4519486.7	-105° 6' 18.0"	40° 49' 35.7"	1	Larimer	N-E Larimer	Domestic	32
505	110848		492964.6	4508408	-105° 4' 59.7"	40° 43' 35.1"	1	Larimer	N-E Larimer	Domestic	52
506	7549		493350.3	4508516.9	-105° 4' 43.2"	40° 43' 38.4"	1	Larimer	N-E Larimer	Domestic	8
507	27871		491739.9	4508523.4	-105° 5' 53.3"	40° 43' 39.2"	1	Larimer	N-E Larimer	Livestock	20
509	57808		492149.4	4508921.4	-105° 5' 32.5"	40° 43' 32.5"	1	Larimer	N-E Larimer	Domestic	5
510	96357		491990.9	4508751.9	-105° 5' 42.4"	40° 43' 46.7"	1	Larimer	N-E Larimer	Household	4
511	89452		492140.6	4509453.5	-105° 5' 36.9"	40° 44' 10.9"	1	Larimer	N-E Larimer	Domestic	25
512	86092		492163.5	4509712.5	-105° 5' 34.8"	40° 44' 17.5"	1	Larimer	N-E Larimer	Household	5
513	40265		491659.8	4509838	-105° 5' 54.5"	40° 44' 20.8"	1	Larimer	N-E Larimer	Domestic	2
514	120498		493438	4509612	-105° 4' 40.0"	40° 44' 15.1"	1	Larimer	N-E Larimer	Domestic	3
516	103999		493312.6	4510426.4	-105° 4' 45.5"	40° 44' 42.6"	1	Larimer	N-E Larimer	Livestock	8
517	46610		493377.9	4510530.9	-105° 4' 43.3"	40° 44' 45.1"	1	Larimer	N-E Larimer	Domestic	15
521	285467		492547.1	4510719	-105° 5' 19.5"	40° 44' 51.7"	1	Larimer	N-E Larimer	Livestock	10
522	215076		492509.6	4511055.4	-105° 5' 19.5"	40° 45' 0.9"	1	Larimer	N-E Larimer	Domestic	10
523	287529		492168.9	4510716	-105° 5' 32.6"	40° 44' 50.0"	1	Larimer	N-E Larimer	Livestock	12
603	9277		486107.9	4503838.9	-105° 9' 50.6"	40° 41' 8.1"	4	Larimer	N-W Fort Collins	Domestic	5
604	169634		486372.2	4503498.8	-105° 9' 41.8"	40° 40' 56.5"	4	Larimer	N-W Fort Collins	Domestic	5
605	170764		486191.1	4503453.8	-105° 9' 48.4"	40° 40' 54.8"	4	Larimer	N-W Fort Collins	Domestic	10
607	173466		486115.4	4502890.3	-105° 9' 51.6"	40° 40' 36.5"	4	Larimer	N-W Fort Collins	Domestic	10
609	202634		486101.5	4502221.8	-105° 9' 51.5"	40° 40' 14.8"	4	Larimer	N-W Fort Collins	Domestic	10
611	178589		486324.4	4501943.8	-105° 9' 13.3"	40° 40' 16.5"	4	Larimer	N-W Fort Collins	Domestic	12
620	220908	A	485047.8	4500261.8	-105° 10' 36.2"	40° 39' 11.4"	4	Larimer	N-W Fort Collins	Livestock	13
621	286460		484895.2	4500464	-105° 10' 43.9"	40° 39' 18.1"	4	Larimer	N-W Fort Collins	Commercial	15
627	252724		487587	4499124.8	-105° 8' 47.9"	40° 38' 34.1"	4	Larimer	N-W Fort Collins	Livestock	30

633	29947		487741.7	4498619.3	-105° 8' 42.4"	40° 38' 19.1"	4	Larimer	N-W Fort Collins	Domestic	2
645	78730		487195.6	4496980.3	-105° 9' 10.6"	40° 37' 9.1"	5	Larimer	N-W Fort Collins	Household	5
721	277715	A	498273.6	4502138.5	-105° 1' 12.9"	40° 40' 11.9"	1	Larimer	S Wellington	Domestic	1.5
727	846		497788	4504887.4	-105° 1' 33.7"	40° 41' 41.8"	1	Larimer	Wellington	Livestock	5
743	290136		496086.9	4506996	-105° 2' 46.0"	40° 42' 50.1"	1	Larimer	E Wellington	Domestic	15
744	223852		496596.7	4507678.4	-105° 2' 25.2"	40° 43' 11.8"	1	Larimer	E Wellington	Domestic	15
745	121677		496494.3	4507479	-105° 2' 29.6"	40° 43' 5.1"	1	Larimer	E Wellington	Domestic	8
752	102753		491725.9	4505766.4	-105° 5' 53.2"	40° 42' 10.0"	1	Larimer	E Wellington	Domestic	10
753	116162		491343.3	4505164	-105° 6' 9.6" 13.0"	40° 41' 50.8"	1	Larimer	E Wellington	Domestic	1
754	108274		491588.7	4505007.4	-105° 5' 57.5"	40° 41' 45.0"	1	Larimer	E Wellington	Domestic	15
755	144689		491530.4	4504764.5	-105° 5' 59.7"	40° 41' 37.5"	1	Larimer	E Wellington	Domestic	5
757	40113		489824	4504615.4	-105° 7' 13.0"	40° 41' 32.5"	1	Larimer	E Wellington	Domestic	1
762	35529	A	490355.8	4498951.5	-105° 6' 48.6"	40° 38' 25.9"	1	Larimer	N-W Fort Collins	Domestic	12
763	49992	F	490521.8	4498787.8	-105° 10' 53.7"	40° 38' 22.5"	1	Larimer	N-W Fort Collins	Household	1.5
767	4866		492967.3	4498964.8	-105° 4' 59.3"	40° 38' 30.1"	1	Larimer	N-W Fort Collins	Domestic	6
768	37411		493364	4498556.8	-105° 4' 41.8"	40° 38' 15.2"	1	Larimer	N-W Fort Collins	Domestic	15
769	27839		493771.1	4498952.8	-105° 4' 27.6"	40° 38' 32.7"	1	Larimer	N-W Fort Collins	Domestic	15
770	25197		494175.1	4499347.8	-105° 4' 6.8" 42.7"	40° 38' 42.7"	1	Larimer	N-W Fort Collins	Domestic	15
771	24777		494175.1	4499347.8	-105° 4' 6.8" 42.7"	40° 38' 42.7"	1	Larimer	N-W Fort Collins	Domestic	8
772	24066		494975.9	4499333.3	-105° 3' 34.0"	40° 38' 41.9"	1	Larimer	N Fort Collins	Domestic	15
773	149027	A	495262.1	4498841.3	-105° 3' 20.8"	40° 38' 25.2"	1	Larimer	N Fort Collins	Livestock	2
775	34315		495328.3	4500324	-105° 3' 17.6"	40° 39' 13.5"	1	Larimer	N Fort Collins	Domestic	15
776	6975		494984.6	4500136.8	-105° 3' 35.1"	40° 39' 7.7"	1	Larimer	N Fort Collins	Domestic	18
777	212346	A	496695.6	4498253.8	-105° 2' 20.7"	40° 38' 6.9"	1	Larimer	N Fort Collins	Domestic	10
778	61272		496550.3	4500915.8	-105° 2' 26.2"	40° 39' 32.7"	1	Larimer	N Fort Collins	Livestock	14
779	3085		495397.4	4502150.3	-105° 3' 14.4"	40° 40' 14.3"	1	Larimer	N Fort Collins	Domestic	8
780	6793		495006.5	4502156.8	-105° 3' 31.9"	40° 40' 12.7"	1	Larimer	N Fort Collins	Domestic	10
781	14483		496182.6	4502937.3	-105° 2' 42.7"	40° 40' 37.7"	1	Larimer	N Fort Collins	Domestic	8
782	237943		495900.5	4503236.3	-105° 2' 55.8"	40° 40' 47.7"	1	Larimer	N Fort Collins	Domestic	7
783	207094		495519.2	4503206.3	-105° 3' 11.1"	40° 40' 46.8"	1	Larimer	N Fort Collins	Domestic	15
784	182687		495398.2	4502918.8	-105° 3' 16.6"	40° 40' 37.7"	1	Larimer	N Fort Collins	Domestic	7
785	184427		495087.9	4503046.3	-105° 3' 28.6"	40° 40' 41.8"	1	Larimer	N Fort Collins	Domestic	18
786	102647		493930.5	4504562.4	-105° 4' 16.8"	40° 41' 31.8"	1	Larimer	N Fort Collins	Domestic	20
792	270048		501672.3	4488538.5	-104° 58' 47.5"	40° 32' 48.7"	1	Larimer	E Fort Collins	Commercial	12.9
806	244888		500485.7	4487455.6	-104° 59' 37.8"	40° 32' 16.2"	1	Larimer	E Fort Collins	Household	14
809	151161		501863.4	4486639	-104° 58' 42.1"	40° 31' 52.0"	1	Larimer	E Fort Collins	Household	2.75
820	584		493644.6	4482467.6	-105° 4' 28.1"	40° 29' 33.6"	1	Larimer	S Fort Collins	Domestic	4
823	3578		493655.1	4484072.6	-105° 4' 30.3"	40° 30' 26.9"	1	Larimer	S Fort Collins	Domestic	1
829	2874		493240.5	4482467.6	-105° 4' 49.9"	40° 29' 36.9"	1	Larimer	S Fort Collins	Domestic	1
830	2735		493240.5	4482467.6	-105° 4' 45.5"	40° 29' 33.6"	1	Larimer	S Fort Collins	Domestic	1
831	41376		491619.7	4481234.1	-105° 5' 55.3"	40° 28' 53.6"	1	Larimer	S Fort Collins	Domestic	7
832	193905		491748.7	4477534	-105° 5' 49.7"	40° 26' 54.4"	1	Larimer	N Loveland	Household	15
833	3454	F	493225.7	4476803	-105° 4' 47.5"	40° 26' 31.1"	1	Larimer	N Loveland	Commercial	5

857	19614		489961	4492491.2	-105° 7' 8.0"	40° 34' 55.9"	1	Larimer	W Fort Collins	Domestic	0.3
862	98117	A	489783.5	4487674	-105° 7' 14.2"	40° 32' 22.6"	1	Larimer	W Fort Collins	Domestic	5
909	92987		493447	4473139	-105° 4' 39.7"	40° 24' 23.7"	1	Larimer	Loveland	Domestic	27
910	124685	A	493278.5	4473056.5	-105° 4' 43.0"	40° 24' 30.3"	1	Larimer	Loveland	Domestic	45
914	37781	A	494497.5	4470890.4	-105° 3' 53.9"	40° 23' 19.6"	1	Larimer	Loveland	Domestic	1.5
915	188129	A	494422.5	4470507.9	-105° 3' 56.4"	40° 23' 5.4"	1	Larimer	Loveland	Livestock	15
917	3034		494391.2	4471548.9	-105° 3' 58.2"	40° 23' 40.4"	1	Larimer	S-E Loveland	Domestic	16
918	165967	A	492422.9	4472362	-105° 5' 18.9"	40° 24' 7.8"	1	Larimer	Loveland	Domestic	0.75
932	238194	A	490336.3	4462720.9	-105° 6' 48.8"	40° 18' 53.7"	1	Larimer	S Loveland	Livestock	22
933	59510		488301.2	4461333.4	-105° 8' 14.7"	40° 18' 6.1"	7	Larimer	S Loveland	Domestic	10
934	21814		487831.9	4461382.9	-105° 8' 35.4"	40° 18' 11.0"	7	Larimer	S Loveland	Domestic	4
935	103397		487282.7	4462329.9	-105° 8' 58.3"	40° 18' 41.0"	7	Larimer	S Loveland	Household	3
938	201735		484929.3	4464659.5	-105° 10' 38.7"	40° 19' 55.8"	7	Larimer	W Berthoud	Domestic	3.9
944	34023		484979.9	4465490	-105° 10' 37.7"	40° 20' 25.0"	7	Larimer	W Berthoud	Domestic	3
1041	56637		487433.9	4460579.4	-105° 8' 52.8"	40° 17' 43.5"	7	Larimer	S-W Berthoud	Domestic	5
1042	45322		487374.5	4460757.5	-105° 8' 55.0"	40° 17' 51.0"	7	Larimer	S-W Berthoud	Domestic	12
1043	44050		487430.8	4460976.4	-105° 8' 52.8"	40° 17' 57.7"	7	Larimer	S-W Berthoud	Domestic	3
1047	193968		484007.6	4461481	-105° 11' 17.6"	40° 18' 14.2"	7	Larimer	W Berthoud	Domestic	13.5
1076	65226		482601.7	4458949	-105° 12' 16.1"	40° 16' 49.9"	7	Larimer	W Berthoud	Household	10
159	50321		487418	4463887	-105° 8' 53.2"	40° 19' 31.5"	7	Larimer	W Berthoud	Domestic	3
122	2316		489117	4469147	-105° 7' 41.5"	40° 22' 22.2"	7	Larimer	W Loveland	Domestic	12
185	22957		490016	4482420	-105° 7' 4.1"	40° 29' 32.7"	1	Larimer	S-W Fort Collins	Domestic	5
186	32388		489632	4488507	-105° 7' 20.8"	40° 32' 50.1"	1	Larimer	S-W Fort Collins	Domestic	20
328	178248		493647.8	4528391.4	-105° 4' 31.9"	40° 54' 24.1"	1	Larimer	N-E Larimer	Livestock	15
329	149191		493332.8	4527742.4	-105° 4' 45.1"	40° 54' 3.2"	1	Larimer	N-E Larimer	Livestock	5
429	9575	F	500986.5	4510563.4	-104° 59' 16.9"	40° 44' 46.8"	1	Larimer	N-E Larimer	Commercial	42
846	59119		491960.7	4482821.6	-105° 5' 42.3"	40° 29' 46.1"	1	Larimer	S Fort Collins	Domestic	3.5
884	120892		490425.4	4483957.5	-105° 6' 46.7"	40° 30' 22.7"	1	Larimer	S-E Horsetooth	Other	3
919	28505		489972.2	4473572.5	-105° 7' 5.8"	40° 24' 46.1"	1	Larimer	Loveland	Domestic	10
920	9133		489968.6	4473171.5	-105° 7' 5.8"	40° 24' 33.6"	1	Larimer	Loveland	Domestic	9
921	7153		489564.4	4472367	-105° 7' 21.0"	40° 24' 6.9"	1	Larimer	Loveland	Domestic	5
922	279434		489747.8	4468759	-105° 7' 14.2"	40° 22' 9.4"	1	Larimer	Loveland	Livestock	10
923	279433		489997.3	4468593	-105° 7' 4.4"	40° 22' 5.3"	1	Larimer	S-E Loveland	Livestock	15
924	106	RN A	490118.9	4468518	-105° 6' 56.8"	40° 22' 1.1"	1	Larimer	S-E Loveland	Livestock	12
1039	135848		485509.4	4458454	-105° 10' 13.1"	40° 16' 35.1"	7	Larimer	S Berthoud	Household	0.33
1045	146029		483935.6	4456778.5	-105° 11' 20.4"	40° 15' 40.9"	7	Larimer	W Berthoud	Livestock	20
170	14654		489143	4471167	-105° 7' 40.5"	40° 23' 27.7"	6	Larimer	Loveland	Domestic	2
841	157771		488801	4481298.6	-105° 7' 56.4"	40° 28' 55.9"	6	Larimer	S-W Fort Collins	Domestic	7
949	227556		485183.2	4476424.6	-105° 10' 28.8"	40° 26' 19.1"	6	Larimer	W Loveland	Domestic	5
975	82084		485557.8	4475216.6	-105° 10' 13.4"	40° 25' 40.0"	6	Larimer	W Loveland	Household	7
458	67834		488669.7	4511635	-105° 8' 2.7"	40° 45' 19.9"	3	Larimer	N-E Larimer	Livestock	15
653	167813		487087.3	4495194.3	-105° 9' 9.5"	40° 36' 26.6"	5	Larimer	N-W Fort Collins	Household	36
940	82565		485551.8	4464965	-105° 10' 12.6"	40° 20' 5.9"	7	Larimer	W Berthoud	Household	1

943	63826		485532.6	4465664.5	-105° 10' 10.4"	40° 20' 28.4"	7	Larimer	W Berthoud	Domestic	1.5
948	10168		486335.9	4476830.6	-105° 9' 39.7"	40° 26' 30.8"	6	Larimer	W Loveland	Domestic	1
980	55378		485886.1	4474007.1	-105° 10' 0.2"	40° 25' 2.5"	6	Larimer	W Loveland	Domestic	13
981	139841		485884.6	4473851	-105° 9' 56.9"	40° 24' 53.3"	6	Larimer	W Loveland	Household	20
982	88555		485972.1	4473377.5	-105° 9' 54.7"	40° 24' 38.3"	6	Larimer	W Loveland	Household	3
994	41375		485473.7	4470809.5	-105° 10' 18.5"	40° 23' 15.0"	6	Larimer	W Loveland	Domestic	2
997	267824		486556.8	4469446.5	-105° 9' 31.5"	40° 22' 31.7"	6	Larimer	S-W Loveland	Livestock	7.3
834	82323		489018.8	4477870.6	-105° 7' 45.3"	40° 27' 5.1"	6	Larimer	N Loveland	Domestic	8
941	45542		485391.2	4465066	-105° 10' 21.3"	40° 20' 10.0"	7	Larimer	W Berthoud	Domestic	3
942	98759		485387.3	4465583.5	-105° 10' 18.1"	40° 20' 28.4"	7	Larimer	W Berthoud	Household	15
10	178578		488566	4485058	-105° 8' 5.9"	40° 30' 58.2"	5	Larimer	W Fort Collins	Domestic	60
74	95472		487220	4501100	-105° 9' 4.3"	40° 39' 38.4"	4	Larimer	N-W Fort Collins	Household	3
76	172837		486529	4502387	-105° 9' 33.8"	40° 40' 20.1"	4	Larimer	N-W Fort Collins	Domestic	50
124	230067	A	485014	4467992	-105° 10' 35.4"	40° 21' 44.5"	7	Larimer	W Loveland	Domestic	100
149	41483		483904	4458199	-105° 11' 21.6"	40° 16' 26.8"	7	Larimer	S-W Berthoud	Domestic	50
171	108410		485905	4469137	-105° 9' 57.7"	40° 22' 21.7"	7	Larimer	W Loveland	livestock	3
182	152020		488501	4485936	-105° 8' 8.7"	40° 31' 26.7"	5	Larimer	S-W Fort Collins	Domestic	12
359	204182	A	489326.7	4530609.5	-105° 7' 36.5"	40° 55' 35.6"	2	Larimer	N-E Larimer	Livestock	5
445	156081		488301.1	4516159.6	-105° 8' 19.5"	40° 47' 47.3"	3	Larimer	N-E Larimer	Domestic	15
446	155048		488294.3	4515687.1	-105° 8' 19.5"	40° 47' 31.5"	3	Larimer	N-E Larimer	Domestic	10
447	193851		488412.3	4515410.1	-105° 8' 14.0"	40° 47' 22.3"	3	Larimer	N-E Larimer	Domestic	15
448	191771		488499.2	4515308.6	-105° 8' 9.6"	40° 47' 19.8"	3	Larimer	N-E Larimer	Domestic	12
449	195329		488390.2	4514932	-105° 8' 13.9"	40° 47' 6.5"	3	Larimer	N-E Larimer	Domestic	15
450	222744		488586.9	4514831	-105° 8' 4.0"	40° 47' 4.0"	3	Larimer	N-E Larimer	Domestic	6.5
451	176714	A	488431.1	4514543	-105° 8' 15.0"	40° 46' 53.2"	3	Larimer	N-E Larimer	Domestic	14
459	67834		489515	4509088.4	-105° 8' 8.2"	40° 45' 20.7"	1	Larimer	N-E Larimer	Domestic	15
594	199829		486935.4	4505211.4	-105° 9' 16.8"	40° 41' 50.6"	4	Larimer	N-W Fort Collins	Domestic	6
595	188443		486540.4	4505272.4	-105° 9' 34.3"	40° 41' 54.0"	4	Larimer	N-W Fort Collins	Domestic	120
599	195430		486584.5	4504967.4	-105° 10' 6.0"	40° 41' 33.1"	4	Larimer	N-W Fort Collins	Domestic	14.5
600	181187		486452.6	4504199.4	-105° 9' 37.5"	40° 41' 18.1"	4	Larimer	N-W Fort Collins	Domestic	8
601	203824		486508.8	4503833.4	-105° 9' 37.5"	40° 41' 7.3"	4	Larimer	N-W Fort Collins	Domestic	14
602	173778		486509.6	4503894.4	-105° 9' 35.3"	40° 41' 12.3"	4	Larimer	N-W Fort Collins	Domestic	10
606	178577		486547.9	4503071.3	-105° 9' 33.0"	40° 40' 41.5"	4	Larimer	N-W Fort Collins	Domestic	9.8
608	179181		486268.4	4502578.8	-105° 9' 45.0"	40° 40' 26.5"	4	Larimer	N-W Fort Collins	Domestic	45
610	175572		487005.1	4502261.8	-105° 9' 13.3"	40° 40' 16.5"	4	Larimer	N-W Fort Collins	Domestic	30
614	234563	A	487384.4	4500693	-105° 8' 56.7"	40° 39' 24.9"	4	Larimer	N-W Fort Collins	Livestock	11.1
615	169125		487612.8	4500457.8	-105° 8' 46.9"	40° 39' 18.2"	4	Larimer	N-W Fort Collins	Domestic	37
635	30368		487735.9	4498218.3	-105° 8' 42.3"	40° 38' 4.9"	4	Larimer	N-W Fort Collins	Domestic	3
644	64878		487052.1	4496519.5	-105° 9' 10.6"	40° 37' 9.1"	5	Larimer	N-W Fort Collins	Household	15
650	138722		486606.6	4493903.7	-105° 9' 29.0"	40° 35' 44.9"	5	Larimer	N-W Fort Collins	Domestic	15
881	268705		488209.1	4484042	-105° 8' 18.4"	40° 30' 26.7"	5	Larimer	Horsetooth S-E	Livestock	11.8
882	158205		488398.5	4484514.1	-105° 8' 13.0"	40° 30' 40.9"	5	Larimer	Horsetooth S-E	Domestic	15
883	179049		488899.2	4484972.6	-105° 7' 51.2"	40° 30' 55.9"	5	Larimer	Horsetooth	Domestic	6

939	40663		485391.2	4465066	-105° 10' 19.1"	40° 20' 6.7"	7	Larimer	W Berthoud	Domestic	5
1026	79260		484342	4461857	-105° 11' 3.5"	40° 18' 26.6"	7	Larimer	W Berthoud	Household	0.66
1027	160534		482832.1	4463735	-105° 12' 6.8"	40° 19' 26.5"	7	Larimer	W Berthoud	Domestic	15
1046	106544		483251.2	4458525.4	-105° 11' 48.9"	40° 16' 37.5"	7	Larimer	W Berthoud	Domestic	1.5
1067	175892		482933.4	4460634	-105° 11' 59.9"	40° 17' 46.6"	7	Larimer	W Berthoud	Household	12
1068	161161		483062.3	4460526.5	-105° 11' 55.6"	40° 17' 42.4"	7	Larimer	W Berthoud	Household	7
1072	103395	A	483193.1	4459763.5	-105° 11' 53.3"	40° 17' 18.3"	7	Larimer	W Berthoud	Domestic	10
1073	103395		482949.2	4459767	-105° 12' 7.4"	40° 17' 10.8"	7	Larimer	W Berthoud	Domestic	10
1074	98587		482959.7	4459295	-105° 12' 0.9"	40° 17' 2.4"	7	Larimer	W Berthoud	Household	10
1075	45156	A	482847.2	4459148.5	-105° 12' 7.4"	40° 16' 58.3"	7	Larimer	W Berthoud	Domestic	15
1096	206550		485152.7	4468602.5	-105° 10' 29.2"	40° 22' 5.0"	7	Larimer	W Berthoud	Domestic	14.1
1097	136085		485125.4	4469500.5	-105° 10' 30.4"	40° 22' 33.4"	6	Larimer	W Berthoud	Domestic	2
55	169383		488280	4483911	-105° 8' 18.0"	40° 30' 21.0"	5	Larimer	W Fort Collins	Domestic	13
844	184443		488622.3	4482152.1	-105° 8' 4.1"	40° 29' 23.4"	6	Larimer	S-W Fort Collins	Domestic	7.5
950	156991		484709.3	4477183.1	-105° 10' 48.5"	40° 26' 43.2"	6	Larimer	W Loveland	Household	2
951	88365		484348.1	4477187.5	-105° 11' 3.7"	40° 26' 41.5"	6	Larimer	W Loveland	Household	6
973	40740		485453	4474826.6	-105° 10' 21.0"	40° 25' 32.3"	6	Larimer	W Loveland	Domestic	1
974	89393		485358.8	4475014.5	-105° 10' 19.9"	40° 25' 34.1"	6	Larimer	W Loveland	Household	8
979	90808		485405.4	4474052	-105° 10' 17.7"	40° 25' 0.8"	6	Larimer	W Loveland	Household	10
986	102635		485270.9	4473455.1	-105° 10' 24.2"	40° 24' 43.3"	6	Larimer	W Loveland	Household	5
989	73867		485318.4	4473057.5	-105° 10' 20.9"	40° 24' 29.1"	6	Larimer	W Loveland	Household	2
990	73866		485333.1	4473164	-105° 10' 18.7"	40° 24' 35.8"	6	Larimer	W Loveland	Household	7
992	55984		485458.1	4472808.5	-105° 10' 18.7"	40° 24' 20.8"	6	Larimer	W Loveland	Domestic	5
7	1967		487494	4490063	-105° 8' 54.3"	40° 33' 21.0"	5	Larimer	W Fort Collins	livestock	36
23	175118		484217	4462662	-105° 11' 8.7"	40° 18' 51.6"	7	Larimer	W Johnstown	Domestic	70
28	125612		482599	4459768	-105° 12' 17.0"	40° 17' 17.6"	7	Larimer	W Johnstown	Domestic	45
79	178355		486744	4503040	-105° 9' 24.7"	40° 40' 41.3"	1	Larimer	N-W Fort Collins	Domestic	45
83	205932		486875	4501862	-105° 9' 19.0"	40° 40' 3.1"	4	Larimer	N-W Fort Collins	Household	7
92	197177		486921	4502624	-105° 9' 17.1"	40° 40' 27.8"	4	Larimer	N-W Fort Collins	Household	7
137	102636		482610	4460579	-105° 12' 16.6"	40° 17' 43.9"	7	Larimer	W Berthoud	Domestic	14
188	190855		488732	4484398	-105° 7' 58.8"	40° 30' 36.8"	5	Larimer	S-W Fort Collins	Domestic	12
835	237325		488161.4	4476942.1	-105° 8' 21.2"	40° 26' 34.3"	6	Larimer	N Loveland	Domestic	7.5
842	162336		488392.1	4482548.6	-105° 8' 12.9"	40° 29' 37.6"	6	Larimer	S-W Fort Collins	Domestic	7
843	166323		488500.2	4482213.1	-105° 8' 8.5"	40° 29' 25.9"	6	Larimer	S-W Fort Collins	Domestic	10
845	174915		488409.4	4482045.6	-105° 8' 11.7"	40° 29' 19.2"	6	Larimer	S-W Fort Collins	Domestic	15
954	83709		484259.3	4476331.6	-105° 11' 5.8"	40° 26' 14.9"	6	Larimer	W Loveland	Domestic	15
960	68661		484340.6	4475923	-105° 11' 3.6"	40° 26' 3.2"	6	Larimer	W Loveland	Household	4
961	63411		484509	4475823.1	-105° 11' 3.6"	40° 25' 53.2"	6	Larimer	W Loveland	Household	5
972	113787		484804.2	4474731.1	-105° 10' 41.7"	40° 25' 23.3"	6	Larimer	W Loveland	Household	7
978	134504	A	485116.4	4473942.6	-105° 10' 31.8"	40° 24' 57.5"	6	Larimer	W Loveland	Household	7.4
985	160319		484958	4473573.6	-105° 10' 38.3"	40° 24' 45.8"	6	Larimer	W Loveland	Household	7
991	105709		485129.4	4473065.1	-105° 10' 29.6"	40° 24' 30.8"	6	Larimer	W Loveland	Household	5
993	7764		485058.7	4471612.5	-105° 10' 34.9"	40° 23' 45.0"	6	Larimer	W Loveland	Domestic	5

996	206549		484791.4	4469400.5	-105° 10' 45.6"	40° 22' 30.8"	6	Larimer	S-W Loveland	Domestic	15
1025	179500		482715.5	4462576.5	-105° 12' 12.1"	40° 18' 49.0"	7	Larimer	W Berthoud	Domestic	10
131	287707		482430	4464295	-105° 12' 24.6"	40° 19' 44.4"	7	Larimer	W Berthoud	Domestic	30
135	126523		482520	4461461	-105° 12' 20.5"	40° 18' 12.5"	7	Larimer	W Berthoud	Domestic	15
136	108348		483267	4461009	-105° 11' 48.8"	40° 17' 57.9"	7	Larimer	W Berthoud	Household	8
866	150626		487477	4488962	-105° 8' 52.6"	40° 33' 8.3"	5	Larimer	Horsetooth	Household	25
867	100604		487583.6	4489024.7	-105° 8' 41.7"	40° 32' 5.8"	5	Larimer	Horsetooth	Household	10
869	168081		487614.1	4488431.2	-105° 8' 50.4"	40° 32' 46.6"	5	Larimer	Horsetooth	Household	10
870	152888		487705.5	4488265.2	-105° 8' 38.4"	40° 32' 40.8"	5	Larimer	Horsetooth	Household	15
872	183098		488038.3	4485768.6	-105° 8' 28.4"	40° 31' 20.9"	5	Larimer	Horsetooth	Household	10
873	164902		488069.9	4485540.6	-105° 8' 27.3"	40° 31' 14.2"	5	Larimer	Horsetooth	Domestic	7
876	241113		488071.4	4485062.1	-105° 8' 29.4"	40° 31' 0.9"	5	Larimer	Horsetooth	Domestic	7.5
880	175569		488223.2	4483563.1	-105° 8' 20.6"	40° 30' 10.9"	5	Larimer	Horsetooth	Domestic	12
937	167897		484878.8	4463955.5	-105° 10' 45.1"	40° 19' 37.5"	7	Larimer	W Berthoud	Domestic	60
947	68883		484600.7	4465338.5	-105° 10' 50.7"	40° 20' 16.7"	7	Larimer	W Berthoud	Household	6
984	52561		485040	4473616.6	-105° 10' 30.7"	40° 24' 50.0"	6	Larimer	W Loveland	Domestic	4
1019	202635		482123.3	4461753.5	-105° 12' 38.1"	40° 18' 21.5"	7	Larimer	W Berthoud	Domestic	5.6
1020	210507		481924.6	4462030.5	-105° 12' 45.8"	40° 18' 30.6"	7	Larimer	W Berthoud	Domestic	10
1023	53112		482593.1	4462605	-105° 12' 19.7"	40° 18' 49.0"	7	Larimer	W Berthoud	Domestic	14
1060	114546		482207.4	4461018.5	-105° 12' 33.7"	40° 17' 59.0"	7	Larimer	W Berthoud	Domestic	8
1062	175893		482898.2	4461169.5	-105° 12' 2.2"	40° 18' 3.3"	7	Larimer	W Berthoud	Household	8
1063	100216		482904.2	4461474	-105° 12' 2.2"	40° 18' 13.3"	7	Larimer	W Berthoud	Domestic	15
1066	168948		482260.8	4459896	-105° 12' 31.4"	40° 17' 20.7"	7	Larimer	W Berthoud	Domestic	20
1078	191203		481820.1	4458492	-105° 12' 48.7"	40° 16' 35.7"	7	Larimer	W Berthoud	Domestic	5.5
109	64539		488150	4516192	-105° 8' 25.7"	40° 47' 47.9"	3	Larimer	N-W Fort Collins	livestock	15
8	156895		487579	4488226	-105° 8' 48.1"	40° 32' 40.9"	5	Larimer	W Fort Collins	Household	30
35	160043		483002	4462970	-105° 12' 0.2"	40° 19' 1.5"	7	Larimer	W Johnstown	Domestic	15
77	82085		485743	4500338	-105° 10' 7.1"	40° 39' 13.6"	4	Larimer	N-W Fort Collins	Household	15
81	271601	A	486910	4501313	-105° 9' 17.5"	40° 39' 45.3"	4	Larimer	N-W Fort Collins	Household	10
82	590		485314	4500244	-105° 10' 25.4"	40° 39' 10.5"	4	Larimer	N-W Fort Collins	Domestic	50
88	179115		486731	4505353	-105° 9' 25.4"	40° 41' 56.3"	4	Larimer	N-W Fort Collins	Domestic	16
130	161633		483425	4463025	-105° 11' 42.3"	40° 19' 3.3"	7	Larimer	W Berthoud	Domestic	14
165	11018	R	488347	4472774	-105° 8' 14.4"	40° 24' 19.8"	6	Larimer	Loveland	Irrigation	200
836	212318		488289.1	4478088.6	-105° 8' 15.8"	40° 27' 11.8"	6	Larimer	N-W Loveland	Domestic	10
868	89130	A	487470.8	4488568.2	-105° 8' 52.6"	40° 32' 54.1"	5	Larimer	Horsetooth	Household	7
952	82322		483960.1	4476635.6	-105° 11' 18.9"	40° 26' 26.5"	6	Larimer	W Loveland	Household	15
977	145767		484994.1	4474046.5	-105° 10' 37.3"	40° 25' 1.6"	6	Larimer	W Loveland	Household	30
988	93415		484848.2	4472825	-105° 10' 42.6"	40° 24' 21.6"	6	Larimer	W Loveland	Domestic	7
1064	67539		483335.9	4461462.5	-105° 11' 44.8"	40° 18' 13.3"	7	Larimer	W Berthoud	Livestock	2
1082	86948		479105.1	4457177.5	-105° 14' 43.8"	40° 15' 52.1"	7	Larimer	W Berthoud	Domestic	2.5
12	223856		488328	4477374	-105° 8' 15.5"	40° 26' 49.0"	6	Larimer	W Loveland	Domestic	100
31	86947		479229	4456980	-105° 14' 39.4"	40° 15' 46.9"	7	Larimer	W Johnstown	Domestic	15
72	68582		485445	4500372	-105° 10' 19.8"	40° 39' 14.7"	4	Larimer	N-W Fort Collins	livestock	15

73	96863		484540	4501015	-105° 10' 58.4"	40° 39' 35.5"	4	Larimer	N-W Fort Collins	Domestic	6
89	201504		486280	4504851	-105° 9' 44.6"	40° 41' 40.0"	4	Larimer	N-W Fort Collins	Household	14.5
93	176603		486136	4506890	-105° 9' 50.9"	40° 42' 46.1"	4	Larimer	N-W Fort Collins	Domestic	7.5
95	239456		486183	4508163	-105° 9' 49.0"	40° 43' 27.4"	4	Larimer	N-W Fort Collins	Household	8
105	187124		488257	4514203	-105° 8' 21.0"	40° 46' 43.4"	3	Larimer	N-W Fort Collins	Domestic	50
138	131585		481839	4459988	-105° 12' 49.2"	40° 17' 24.7"	7	Larimer	W Berthoud	Domestic	15
146	87098		479322	4457334	-105° 14' 35.5"	40° 15' 58.4"	7	Larimer	S-W Berthoud	Domestic	15
596	201956		485773.9	4505162.4	-105° 10' 6.0"	40° 41' 50.6"	4	Larimer	N-W Fort Collins	Domestic	10
612	198385		487447	4501206	-105° 9' 39.5"	40° 40' 7.3"	4	Larimer	N-W Fort Collins	Household	3
634	22772		487326.5	4498221.3	-105° 8' 59.8"	40° 38' 4.9"	4	Larimer	N-W Fort Collins	Domestic	4
875	176253		487681.9	4485322.6	-105° 8' 43.6"	40° 31' 6.7"	5	Larimer	Horsetooth	Domestic	5
877	150475		487512.7	4484696	-105° 8' 47.9"	40° 30' 47.5"	5	Larimer	Horsetooth	Domestic	4
878	164223	A	487632.5	4483873.1	-105° 8' 44.6"	40° 30' 20.9"	5	Larimer	Horsetooth	Domestic	10
945	107824	A	484848.2	4465602.5	-105° 10' 43.1"	40° 20' 27.5"	7	Larimer	W Berthoud	Household	5
959	40738		484211.9	4476035.1	-105° 11' 11.3"	40° 26' 7.4"	6	Larimer	W Loveland	Domestic	10
970	138052		484377.5	4474785.1	-105° 11' 1.3"	40° 25' 25.7"	6	Larimer	W Loveland	Household	15
1018	90474		481637.6	4461518	-105° 12' 55.5"	40° 18' 16.5"	7	Larimer	W Berthoud	Household	5
1024	90475		482593.3	4462698.5	-105° 12' 19.7"	40° 18' 53.2"	7	Larimer	W Berthoud	Household	1.5
1048	200554		482005.7	4462528	-105° 12' 42.6"	40° 18' 47.3"	7	Larimer	W Berthoud	Domestic	4.5
1057	215879		481654.4	4461276.5	-105° 12' 54.4"	40° 18' 6.5"	7	Larimer	W Berthoud	Household	7
1061	128761	A	482135.2	4460686.5	-105° 12' 36.9"	40° 17' 47.4"	7	Larimer	W Berthoud	Domestic	7
1065	109599		481876.2	4460265.5	-105° 12' 48.9"	40° 17' 33.2"	7	Larimer	W Berthoud	Domestic	3
1069	97196		483143.2	4460221	-105° 11' 54.5"	40° 17' 32.4"	7	Larimer	W Berthoud	Domestic	25
1070	167287		483599.5	4460275.5	-105° 11' 34.9"	40° 17' 34.1"	7	Larimer	W Berthoud	Domestic	6.8
1071	165225		483616	4459910	-105° 11' 32.7"	40° 17' 22.5"	7	Larimer	W Berthoud	Domestic	10
1083	87764		479408.3	4457001.5	-105° 14' 30.8"	40° 15' 49.7"	7	Larimer	W Berthoud	Domestic	8
1085	87166		484708.7	4466493	-105° 10' 45.4"	40° 20' 55.9"	7	Larimer	W Berthoud	Household	2
1086	85291		484702	4466803.5	-105° 10' 47.6"	40° 21' 5.8"	7	Larimer	W Berthoud	Domestic	15
1090	227012		484576.2	4467648	-105° 10' 52.0"	40° 21' 33.3"	7	Larimer	W Berthoud	Domestic	15
1095	153449		484592.6	4468318.5	-105° 10' 52.0"	40° 21' 54.2"	7	Larimer	W Berthoud	Domestic	20
11	170675		488435	4479934	-105° 8' 11.1"	40° 28' 12.0"	6	Larimer	S-W Fort Collins	Domestic	200
14	230067		484993	4467928	-105° 10' 36.3"	40° 21' 42.4"	7	Larimer	W Loveland	Domestic	100
33	190853		482003	4459337	-105° 12' 42.2"	40° 17' 3.6"	7	Larimer	W Johnstown	Domestic	8
37	64873		484527	4473154	-105° 10' 56.5"	40° 24' 31.9"	6	Larimer	W Loveland	Domestic	12
40	88166		484289	4475563	-105° 11' 6.8"	40° 25' 50.0"	6	Larimer	S Horsetooth Res	Household	15
42	113706		483194	4479944	-105° 11' 53.7"	40° 28' 12.0"	6	Larimer	S Horsetooth Res	Domestic	30
60	59441		487422	4498824	-105° 8' 55.5"	40° 38' 24.6"	4	Larimer	W Fort Collins	Domestic	5
75	30016		486124	4501839	-105° 9' 51.0"	40° 40' 2.3"	4	Larimer	N-W Fort Collins	Domestic	7
110	178463		487921	4515631	-105° 8' 35.4"	40° 47' 29.7"	3	Larimer	N-W Fort Collins	Domestic	4
179	176494		489119	4484447	-105° 7' 42.4"	40° 30' 38.4"	5	Larimer	S-W Fort Collins	Domestic	7
183	162140		488398	4482804	-105° 8' 12.9"	40° 29' 45.1"	6	Larimer	S-W Fort Collins	Domestic	13
189	88170		484674	4474788	-105° 10' 50.4"	40° 25' 24.9"	6	Larimer	N-W Loveland	Household	75
613	172936		486596.4	4500794.8	-105° 9' 28.5"	40° 39' 27.3"	4	Larimer	N-W Fort Collins	Domestic	40

617	264990	A	484862.6	4499047	-105° 10' 44.9"	40° 38' 32.2"	4	Larimer	N-W Fort Collins	Livestock	47
618	125114		484889.3	4498648	-105° 10' 43.8"	40° 38' 19.7"	4	Larimer	N-W Fort Collins	Household	8
628	31137		487335	4499020.8	-105° 8' 57.7"	40° 38' 31.6"	4	Larimer	N-W Fort Collins	Domestic	5
636	172737		485876.6	4497987.3	-105° 11' 0.3"	40° 38' 52.2"	4	Larimer	N-W Fort Collins	Domestic	5
646	107542	A	486375.8	4496550.3	-105° 9' 38.0"	40° 37' 10.7"	5	Larimer	N-W Fort Collins	Household	15
837	179429		488114.7	4478425.6	-105° 8' 24.6"	40° 27' 22.6"	6	Larimer	N-W Loveland	Domestic	13
864	33250		486755	4490968	-105° 9' 55.0"	40° 34' 7.4"	5	Larimer	Horsetooth	Domestic	15
865	30126		486730	4491135	-105° 10' 52.8"	40° 19' 3.2"	5	Larimer	Horsetooth	Domestic	5
936	185674		484495.1	4463708.5	-105° 10' 57.1"	40° 20' 22.5"	7	Larimer	W Berthoud	Domestic	12
946	49980	A	484584.1	4465444.5	-105° 10' 54.0"	40° 20' 22.5"	7	Larimer	W Berthoud	Domestic	7
962	92231		484304.2	4475722	-105° 11' 5.8"	40° 25' 55.7"	6	Larimer	W Loveland	Household	15
971	122223		484644.3	4474587.5	-105° 10' 51.5"	40° 25' 19.1"	6	Larimer	W Loveland	Household	12
13	164617	A	483397	4472882	-105° 11' 44.4"	40° 24' 23.0"	6	Larimer	W Loveland	Commercial	35
20	168416		482752	4471120	-105° 12' 11.6"	40° 23' 25.8"	6	Larimer	W Loveland	Household	13
21	98539		482884	4471132	-105° 12' 6.0"	40° 23' 26.2"	6	Larimer	W Loveland	Household	15
26	208573		481753	4462363	-105° 12' 53.1"	40° 18' 41.7"	7	Larimer	W Johnstown	Household	10
29	143710		484026	4465105	-105° 11' 17.0"	40° 20' 10.8"	7	Larimer	W Johnstown	Domestic	17
39	168276		482646	4472274	-105° 12' 16.2"	40° 24' 3.2"	6	Larimer	S Horsetooth Res	Domestic	7
41	99240		483325	4476157	-105° 11' 47.8"	40° 26' 9.2"	6	Larimer	S Horsetooth Res	Household	80
44	215648		483157	4478313	-105° 11' 55.1"	40° 27' 19.1"	6	Larimer	S Horsetooth Res	Household	10
46	242277		485780	4476359	-105° 10' 3.6"	40° 26' 15.9"	6	Larimer	S Horsetooth Res	Household	7
48	160274	A	488197	4477541	-105° 8' 21.1"	40° 26' 54.4"	6	Larimer	S Horsetooth Res	Household	15
50	151790		488328	4479027	-105° 8' 15.6"	40° 27' 42.6"	6	Larimer	S Horsetooth Res	Domestic	5
51	35727		487625	4481230	-105° 8' 45.6"	40° 28' 54.0"	6	Larimer	S Horsetooth Res	Domestic	5
54	158864		487602	4484113	-105° 8' 46.8"	40° 30' 27.5"	5	Larimer	W Fort Collins	Domestic	8
56	155550		487494	4484351	-105° 8' 51.4"	40° 30' 35.2"	5	Larimer	W Fort Collins	Domestic	10
57	106271		487445	4483447	-105° 8' 53.4"	40° 30' 5.9"	5	Larimer	W Fort Collins	Household	12
59	206309		486994	4499836	-105° 9' 13.8"	40° 38' 57.4"	4	Larimer	W Fort Collins	Household	15
63	174913		485982	4496193	-105° 9' 56.6"	40° 36' 59.2"	5	Larimer	W Fort Collins	Household	10
66	24775		485302	4495833	-105° 10' 25.5"	40° 36' 47.5"	5	Larimer	W Fort Collins	Domestic	50
70	86375		487138	4498587	-105° 9' 7.6"	40° 38' 16.9"	4	Larimer	N-W Fort Collins	Household	12
71	225615		486661	4498585	-105° 9' 27.9"	40° 38' 16.8"	4	Larimer	N-W Fort Collins	Irrigation	15
78	108267		485803	4500813	-105° 10' 4.6"	40° 39' 29.0"	4	Larimer	N-W Fort Collins	Household	3
80	233157		486052	4506030	-105° 9' 54.4"	40° 42' 18.2"	4	Larimer	N-W Fort Collins	Domestic	7
85	159704		488018	4499505	-105° 8' 30.2"	40° 38' 46.7"	4	Larimer	N-W Fort Collins	Domestic	15
86	206877		485719	4508402	-105° 10' 8.8"	40° 43' 35.1"	4	Larimer	N-W Fort Collins	Household	10
87	258168		486231	4507614	-105° 9' 46.9"	40° 43' 9.6"	4	Larimer	N-W Fort Collins	Household	3
94	184852		486612	4508270	-105° 9' 30.7"	40° 43' 30.9"	4	Larimer	N-W Fort Collins	Domestic	3.5
97	126284		485302	4510973	-105° 10' 26.8"	40° 44' 58.5"	4	Larimer	N-W Fort Collins	Domestic	3
98	30711		485313	4512177	-105° 10' 26.4"	40° 45' 37.5"	3	Larimer	N-W Fort Collins	Domestic	6
99	50554		485707	4512915	-105° 10' 9.7"	40° 46' 1.5"	3	Larimer	N-W Fort Collins	Domestic	6
104	168992		487601	4514525	-105° 8' 49.0"	40° 46' 53.8"	3	Larimer	N-W Fort Collins	Domestic	7
107	153784		487830	4515273	-105° 8' 39.3"	40° 46' 45.7"	3	Larimer	N-W Fort Collins	Domestic	1

126	34025		484560	4466383	-105° 10' 54.5"	40° 20' 52.3"	7	Larimer	W Berthoud	Domestic	7
127	63241		484038	4464908	-105° 11' 16.5"	40° 20' 4.4"	7	Larimer	W Berthoud	Domestic	6
128	298928		484582	4464500	-105° 10' 53.4"	40° 19' 51.2"	7	Larimer	W Berthoud	Stock	5
129	186270		484332	4463501	-105° 11' 3.9"	40° 19' 18.8"	7	Larimer	W Berthoud	Domestic	7
132	293165		481430	4461917	-105° 13' 6.7"	40° 18' 27.2"	7	Larimer	W Berthoud	Household	15
139	146282		481318	4460511	-105° 13' 11.3"	40° 17' 41.6"	7	Larimer	W Berthoud	Domestic	25
142	202273		481793	4459421	-105° 12' 51.1"	40° 17' 6.3"	7	Larimer	W Berthoud	Domestic	5
143	202274		481815	4459128	-105° 12' 50.1"	40° 16' 56.8"	7	Larimer	W Berthoud	Domestic	5
144	209582		481793	4458878	-105° 12' 51.0"	40° 16' 48.7"	7	Larimer	W Berthoud	Domestic	10
145	185189		481273	4457357	-105° 13' 12.9"	40° 15' 59.3"	7	Larimer	S-W Berthoud	Domestic	10
166	7229	R	483457	4471972	-105° 11' 41.8"	40° 23' 53.5"	6	Larimer	W Loveland	Irrigation	25
167	203189		483502	4471332	-105° 11' 39.8"	40° 23' 32.7"	6	Larimer	W Loveland	Household	40
168	78253		484076	4468679	-105° 11' 15.2"	40° 22' 6.7"	7	Larimer	W Loveland	Household	15
180	2504		486769	4484240	-105° 9' 3.2"	40° 30' 25.0"	5	Larimer	S-W Fort Collins	Domestic	20
181	176507		487345	4483574	-105° 8' 57.7"	40° 30' 10.0"	5	Larimer	S-W Fort Collins	Household	40
184	265839		487858	4483755	-105° 8' 35.9"	40° 30' 15.9"	5	Larimer	S-W Fort Collins	Domestic	10
187	117778		487351	4488840	-105° 9' 3.5"	40° 33' 0.8"	5	Larimer	S-W Fort Collins	Household	15
352	149986		486230.4	4528365	-105° 9' 48.2"	40° 54' 22.1"	2	Larimer	N-E Larimer	Livestock	15
358	182095		486522	4528580.4	-105° 9' 35.0"	40° 46' 29.6"	2	Larimer	N-E Larimer	Domestic	12
452	189268		485841.7	4513311	-105° 10' 3.4"	40° 46' 14.7"	3	Larimer	N-E Larimer	Domestic	13
597	209511		485609.3	4504906.4	-105° 10' 12.6"	40° 41' 41.4"	4	Larimer	N-W Fort Collins	Domestic	5
598	182862		485780.8	4504616.9	-105° 10' 6.0"	40° 41' 33.1"	4	Larimer	N-W Fort Collins	Domestic	10
616	90479		486703.8	4499408.5	-105° 9' 28.4"	40° 39' 44.8"	4	Larimer	N-W Fort Collins	Household	5
624	153440	A	486125.5	4500495.3	-105° 9' 50.3"	40° 39' 16.5"	4	Larimer	N-W Fort Collins	Domestic	18
625	106543		486011.1	4500831.8	-105° 9' 53.6"	40° 39' 30.6"	4	Larimer	N-W Fort Collins	Household	15
626	222864		485965	4501553.8	-105° 9' 57.0"	40° 39' 53.1"	4	Larimer	N-W Fort Collins	Household	5
629	80658		487099.8	4499004.3	-105° 9' 13.0"	40° 38' 29.0"	4	Larimer	N-W Fort Collins	Domestic	15
630	73340		487437.9	4498549.5	-105° 8' 57.7"	40° 38' 12.4"	4	Larimer	N-W Fort Collins	Household	5
631	125951		486582.2	4498874	-105° 9' 30.5"	40° 38' 26.5"	4	Larimer	N-W Fort Collins	Household	75
638	39415		484494.1	4497850.3	-105° 11' 2.3"	40° 37' 53.9"	4	Larimer	N-W Fort Collins	Domestic	30
641	8645		486914.5	4497826.3	-105° 10' 48.0"	40° 37' 29.7"	4	Larimer	N-W Fort Collins	Domestic	10
655	106923		485167.9	4495508.8	-105° 10' 31.5"	40° 36' 37.3"	5	Larimer	N-W Fort Collins	Household	10
656	17204		485696.2	4496234.3	-105° 10' 9.7"	40° 37' 5.1"	5	Larimer	N-W Fort Collins	Domestic	12
838	177259	A	487767.6	4478267.5	-105° 8' 39.8"	40° 27' 17.6"	6	Larimer	N-W Loveland	Domestic	13.9
871	103939		487528	4487403.7	-105° 8' 51.4"	40° 32' 18.3"	5	Larimer	Horsetooth	Household	15
874	196143		487530.1	4485545.6	-105° 8' 49.1"	40° 31' 14.2"	5	Larimer	Horsetooth	Domestic	5
879	169363		487587.5	4482823.1	-105° 8' 47.8"	40° 29' 45.0"	6	Larimer	Horsetooth	Domestic	7
953	94836		483896.3	4476483	-105° 11' 23.3"	40° 26' 19.8"	6	Larimer	W Loveland	Household	15
956	106871		483403.4	4476360.6	-105° 11' 45.1"	40° 26' 17.3"	6	Larimer	W Loveland	Household	15
957	37720		483799.9	4476033.1	-105° 11' 28.7"	40° 26' 4.0"	6	Larimer	W Loveland	Domestic	20
958	97398		483956.1	4476132.6	-105° 11' 20.0"	40° 26' 9.0"	6	Larimer	W Loveland	Household	5
963	91346		484156.5	4475569.5	-105° 11' 14.5"	40° 25' 49.9"	6	Larimer	W Loveland	Household	1
964	161887		483895.4	4475629.6	-105° 11' 22.1"	40° 25' 52.4"	6	Larimer	W Loveland	Household	60

965	79983		483581.6	4475821.1	-105° 11' 42.9"	40° 25' 59.0"	6	Larimer	W Loveland	Household	15
966	108264		483408.4	4475606.6	-105° 11' 43.9"	40° 25' 52.3"	6	Larimer	W Loveland	Household	12
969	273762	A	483685.6	4475023.5	-105° 11' 31.9"	40° 25' 33.2"	6	Larimer	W Loveland	Domestic	7
976	11148		484239.9	4474005.1	-105° 11' 8.9"	40° 24' 59.9"	6	Larimer	W Loveland	Domestic	3
995	69125		483845.4	4470047.5	-105° 11' 26.0"	40° 22' 51.6"	6	Larimer	S-W Loveland	Household	8
998	236509		482633.2	4469454.5	-105° 12' 17.1"	40° 22' 30.6"	6	Larimer	S-W Loveland	Domestic	10
1004	109865		483435.2	4470932.6	-105° 11' 42.4"	40° 23' 20.7"	6	Larimer	W Loveland	Household	8
1005	75945		483572.5	4471070.6	-105° 11' 38.0"	40° 23' 24.9"	6	Larimer	W Loveland	Household	7
1006	87087		483216.1	4471175	-105° 11' 51.1"	40° 23' 28.2"	6	Larimer	W Loveland	Household	10
1007	129960		483002.8	4471128	-105° 11' 59.9"	40° 23' 28.2"	6	Larimer	W Loveland	Household	15
1008	167386		482962.6	4470807.6	-105° 12' 5.3"	40° 23' 19.0"	6	Larimer	S-W Loveland	Household	10
1009	55055		482642	4470363.1	-105° 12' 15.0"	40° 23' 1.5"	6	Larimer	S-W Loveland	Domestic	10
1010	150364		482492.8	4470655.5	-105° 12' 22.7"	40° 23' 10.6"	6	Larimer	S-W Loveland	Household	5
1013	166779		482700.6	4472569.1	-105° 12' 13.1"	40° 24' 13.1"	6	Larimer	W Loveland	Domestic	10
1014	285601		482515.7	4473317.5	-105° 12' 22.9"	40° 24' 38.1"	6	Larimer	W Loveland	Household	13
1021	213582		481663.8	4462580	-105° 12' 57.8"	40° 18' 51.5"	7	Larimer	W Berthoud	Household	5
1049	221043		481526.4	4462481.5	-105° 13' 4.3"	40° 18' 49.0"	7	Larimer	W Berthoud	Household	7
1052	76925	F	481070.9	4461770	-105° 13' 22.7"	40° 18' 23.1"	7	Larimer	W Berthoud	Domestic	5
1055	244625		481547.9	4461264	-105° 13' 5.3"	40° 18' 2.3"	7	Larimer	W Berthoud	Household	7
1056	171273		481426.1	4461252	-105° 13' 8.5"	40° 18' 3.1"	7	Larimer	W Berthoud	Household	7
1058	259444		481844	4461362.5	-105° 12' 49.0"	40° 18' 9.8"	7	Larimer	W Berthoud	Livestock	10.5
1077	274353		481526.1	4458895	-105° 13' 2.9"	40° 16' 49.0"	7	Larimer	W Berthoud	Domestic	15
1081	162880		479431.1	4457710.5	-105° 14' 34.1"	40° 16' 13.0"	7	Larimer	W Berthoud	Domestic	5
1087	67901		484266.6	4466512.5	-105° 11' 7.1"	40° 20' 54.1"	7	Larimer	W Berthoud	Household	8
1094	227013		484565.8	4468105	-105° 10' 54.2"	40° 21' 49.2"	7	Larimer	W Berthoud	Domestic	13
9	295914		486862	4483818	-105° 9' 18.2"	40° 30' 17.9"	5	Larimer	W Fort Collins	Household	60
30	88401		479453	4458626	-105° 14' 30.1"	40° 16' 40.3"	7	Larimer	W Johnstown	Domestic	20
32	265581		479407	4458194	-105° 14' 32.0"	40° 16' 26.3"	7	Larimer	W Johnstown	Household	10
45	200593		484171	4476442	-105° 11' 11.9"	40° 26' 18.5"	6	Larimer	S Horsetooth Res	Household	20
47	184066		487400	4477015	-105° 8' 54.9"	40° 26' 37.3"	6	Larimer	S Horsetooth Res	Domestic	12
64	54144		485122	4496430	-105° 10' 33.2"	40° 37' 6.8"	5	Larimer	W Fort Collins	livestock	10
68	55074	A	486826	4499408	-105° 9' 20.9"	40° 38' 43.5"	4	Larimer	N-W Fort Collins	Domestic	35
101	203244		485611	4514500	-105° 10' 13.9"	40° 46' 52.9"	3	Larimer	N-W Fort Collins	Domestic	5.5
106	156614		487483	4515274	-105° 8' 54.1"	40° 47' 18.1"	3	Larimer	N-W Fort Collins	Domestic	15
133	79044		481001	4461169	-105° 13' 24.8"	40° 18' 2.9"	7	Larimer	W Berthoud	Domestic	15
134	121426		481249	4461304	-105° 13' 14.3"	40° 18' 7.3"	7	Larimer	W Berthoud	Household	15
147	156419		479142	4457789	-105° 14' 43.2"	40° 16' 13.1"	7	Larimer	S-W Berthoud	Domestic	15
148	137691		479072	4458469	-105° 14' 46.2"	40° 16' 35.2"	7	Larimer	S-W Berthoud	Domestic	2
161	224617		478235	4457155	-105° 15' 21.5"	40° 15' 52.5"	1	Larimer	S-W Berthoud	livestock	2
353	133824		485318.4	4529375	-105° 10' 26.7"	40° 54' 56.2"	2	Larimer	N-E Larimer	Domestic	13
355	267309		483421.3	4529607.5	-105° 11' 48.0"	40° 55' 1.9"	2	Larimer	N-E Larimer	Livestock	10
453	176251		485032.1	4511313.4	-105° 10' 38.3"	40° 45' 8.8"	3	Larimer	N-E Larimer	Domestic	0.5
456	74787		485281.7	4508817	-105° 10' 27.1"	40° 43' 49.7"	4	Larimer	N-E Larimer	Domestic	7

623	84909		485835.8	4500407.3	-105° 10' 4.5"	40° 39' 13.9"	4	Larimer	N-W Fort Collins	Household	12
840	174479		487468.8	4477700.6	-105° 8' 51.8"	40° 26' 59.2"	6	Larimer	N-W Loveland	Domestic	13
863	30494		486026.4	4491619.7	-105° 9' 54.0"	40° 34' 30.7"	5	Larimer	Horsetooth	Domestic	15
968	12039		483416.4	4475212.1	-105° 11' 43.9"	40° 25' 38.2"	6	Larimer	W Loveland	Domestic	5
999	254587		482499.2	4469693.1	-105° 12' 22.6"	40° 22' 39.0"	6	Larimer	S-W Loveland	Domestic	13
1000	67606		482931.4	4470310.5	-105° 12' 5.2"	40° 22' 59.8"	6	Larimer	S-W Loveland	Household	12
1001	122050		483114.5	4470403.5	-105° 11' 56.5"	40° 22' 59.8"	6	Larimer	S-W Loveland	Domestic	7
1003	76856		483206.2	4470641.6	-105° 11' 53.3"	40° 23' 10.7"	6	Larimer	S-W Loveland	Household	10
1017	7315	A	483271.8	4474124.1	-105° 11' 52.5"	40° 25' 6.5"	6	Larimer	W Loveland	Household	3
1050	61472		481455.8	4462287	-105° 13' 8.7"	40° 18' 44.0"	7	Larimer	W Berthoud	Domestic	15
1053	228643		481012.4	4461623	-105° 13' 26.0"	40° 18' 14.8"	7	Larimer	W Berthoud	Household	8
1054	167206		481105.1	4461428.5	-105° 13' 23.8"	40° 18' 9.8"	7	Larimer	W Berthoud	Domestic	7
1079	167575		479877.8	4457350.5	-105° 14' 12.3"	40° 16' 0.5"	7	Larimer	W Berthoud	Domestic	5
1080	125024		479988.4	4457070.5	-105° 14' 6.8"	40° 16' 49.7"	7	Larimer	W Berthoud	Domestic	4
1084	61397		484442	4465994	-105° 10' 58.4"	40° 20' 39.2"	7	Larimer	W Berthoud	Domestic	6
1088	78071		484185.2	4466696	-105° 11' 10.4"	40° 21' 0.8"	7	Larimer	W Berthoud	Domestic	15
1089	22834		482643.5	4466763.5	-105° 12' 14.7"	40° 21' 4.9"	7	Larimer	W Berthoud	Domestic	1
1091	41465		484285.8	4467989.5	-105° 11' 5.1"	40° 21' 43.3"	7	Larimer	W Berthoud	Domestic	7
1092	52295		484285.8	4467989.5	-105° 11' 7.3"	40° 21' 46.6"	7	Larimer	W Berthoud	Domestic	10
1100	226837		480652.4	4465329	-105° 13' 40.5"	40° 20' 18.1"	7	Larimer	W Berthoud	Domestic	3
22	137674		482562	4471213	-105° 12' 19.7"	40° 23' 28.8"	6	Larimer	W Loveland S Horsetooth	Household	24
49	212278		487423	4478039	-105° 8' 54.0"	40° 27' 10.5"	6	Larimer	Res	Household	10
103	224056		485767	4513926	-105° 10' 7.2"	40° 46' 34.3"	3	Larimer	N-W Fort Collins	Household	5.8
141	74779		481092	4459466	-105° 13' 20.8"	40° 17' 7.7"	7	Larimer	W Berthoud	Stock	25
162	108265		478915	4458967	-105° 14' 52.9"	40° 16' 51.3"	7	Larimer	S-W Berthoud	Domestic	4
455	170776		485155.4	4510266.4	-105° 10' 32.7"	40° 44' 33.8"	4	Larimer	N-E Larimer	Domestic	40
639	55005		484494.2	4497231.8	-105° 11' 0.0"	40° 37' 33.1"	4	Larimer	N-W Fort Collins	Livestock	15
955	9301		482989.4	4476428.6	-105° 12' 2.5"	40° 26' 18.1"	6	Larimer	W Loveland	Domestic	7
967	14653		483336.4	4475472.6	-105° 11' 46.1"	40° 25' 46.5"	6	Larimer	W Loveland	Domestic	8
1051	86970		480669.9	4462834.5	-105° 13' 38.1"	40° 18' 58.1"	7	Larimer	W Berthoud	Household	15
1093	215698		483772.3	4467807.5	-105° 11' 27.9"	40° 21' 39.1"	7	Larimer	W Berthoud	Domestic	15
1099	40568		480977.8	4467582.6	-105° 13' 23.4"	40° 21' 28.1"	7	Larimer	W Berthoud	Domestic	2
15	279452		484028	4466724	-105° 11' 17.1"	40° 21' 3.3"	7	Larimer	W Loveland	Domestic	60
16	161810		481335	4467414	-105° 13' 11.3"	40° 21' 25.5"	7	Larimer	W Loveland	Household	25
18	165932		482122	4470749	-105° 12' 38.3"	40° 23' 13.7"	6	Larimer	W Loveland	Domestic	10
19	222746		482099	4471106	-105° 12' 39.3"	40° 23' 25.3"	6	Larimer	W Loveland	Household	10
24	240442		480537	4463186	-105° 13' 44.7"	40° 19' 8.3"	7	Larimer	W Johnstown	Household	15
25	192243		480943	4462352	-105° 13' 27.4"	40° 18' 41.3"	7	Larimer	W Johnstown	Commercial	10
27	241686		480610	4461472	-105° 13' 41.4"	40° 18' 12.7"	7	Larimer	W Johnstown	Household	20
34	144543		480681	4461198	-105° 13' 38.4"	40° 18' 3.8"	7	Larimer	W Johnstown	Household	15
36	40872		482229	4469975	-105° 12' 33.7"	40° 22' 48.6"	6	Larimer	W Loveland S Horsetooth	Domestic	15
38	165931		482157	4470511	-105° 12' 36.8"	40° 23' 6.0"	6	Larimer	Res	Domestic	7
43	198110		482205	4479110	-105° 12' 35.6"	40° 27' 44.9"	6	Larimer	S Horsetooth Res	Household	10

52	200899		487553	4479694	-105° 8' 48.6"	40° 28' 4.2"	6	Larimer	S Horsetooth Res	Household	5
53	164164		486529	4484436	-105° 9' 32.4"	40° 30' 37.9"	5	Larimer	W Fort Collins	Domestic	10
58	33242		485624	4490808	-105° 10' 11.4"	40° 34' 4.5"	5	Larimer	W Fort Collins	Domestic	15
65	39585		484505	4497442	-105° 10' 59.6"	40° 37' 39.6"	4	Larimer	W Fort Collins	Domestic	30
69	33013		485504	4499290	-105° 10' 17.2"	40° 38' 39.6"	4	Larimer	N-W Fort Collins	Stock	20
84	143590		486092	4499588	-105° 9' 52.2"	40° 38' 49.3"	4	Larimer	N-W Fort Collins	Household	30
96	169174		485160	4510425	-105° 10' 32.8"	40° 44' 40.7"	4	Larimer	N-W Fort Collins	Domestic	10
102	78348	F	485266	4514048	-105° 10' 28.6"	40° 46' 38.2"	3	Larimer	N-W Fort Collins	Commercial	62
140	167664		481158	4459830	-105° 13' 18.0"	40° 17' 19.5"	7	Larimer	W Berthoud	Domestic	10
163	19278		476829	4466882	-105° 16' 22.3"	40° 21' 7.8"	1	Larimer	S-W Berthoud	Domestic	3
190	258753		482001	4474507	-105° 12' 43.8"	40° 25' 15.6"	6	Larimer	N-W Loveland	Domestic	60
356	229592		482746.5	4527304.9	-105° 12' 16.3"	40° 53' 46.9"	2	Larimer	N-E Larimer	Livestock	2
454	155303		484880.2	4510980.4	-105° 10' 45.9"	40° 44' 58.8"	4	Larimer	N-E Larimer	Domestic	2
457	67832		487641.3	4510043.5	-105° 8' 47.5"	40° 44' 28.1"	4	Larimer	N-E Larimer	Domestic	15
632	172734		486195.6	4498369.8	-105° 9' 49.1"	40° 38' 9.8"	4	Larimer	N-W Fort Collins	Domestic	13
640	51229	F	484848.6	4496884.8	-105° 10' 48.0"	40° 37' 29.7"	5	Larimer	N-W Fort Collins	Domestic	300
654	53682		484766.2	4495357.3	-105° 10' 47.8"	40° 36' 32.5"	5	Larimer	N-W Fort Collins	Livestock	15
839	158329		487419.4	4478585.1	-105° 8' 54.1"	40° 27' 28.4"	6	Larimer	N-W Loveland	Domestic	14
1002	160522		482486.3	4470245.6	-105° 12' 23.7"	40° 22' 57.3"	6	Larimer	S-W Loveland	Household	7
1011	165587		482357.7	4471916.6	-105° 12' 28.3"	40° 23' 51.4"	6	Larimer	W Loveland	Domestic	12
1012	163822		482578.6	4471974.6	-105° 12' 19.5"	40° 23' 53.1"	6	Larimer	W Loveland	Domestic	20
1015	41467		483441.7	4473593.6	-105° 11' 44.8"	40° 24' 44.0"	6	Larimer	W Loveland	Domestic	7
1016	89709	A	483597.5	4473688	-105° 11' 40.5"	40° 24' 50.7"	6	Larimer	W Loveland	Domestic	10
1098	89127		480759.8	4467790.5	-105° 13' 37.6"	40° 21' 38.9"	7	Larimer	W Berthoud	Household	3

Doc No	TD (ft)	Static Water Level (ft)	Pumping Level	Drawdown	Specific Capacity Q(yield)/Drawdown	Formation	FF Top	FF Bottom	Water Location
2	49	12	25	13	115.38	Quaternary	4	49	20-48
3	45	10	40	30	25	Quaternary	3	45	NA
5	40	12	30	18	46.39	Quaternary	3	40	NA
67	62	20	40	20	6.9	Quaternary	5	62	NA
100	67	37	49	12	62.5	Quaternary	2	67	NA
112	16	6	15.5	9.5	57.89	Quaternary	1	16	NA
113	12	0	12	12	74.67	Quaternary	0	12	NA
156	4	NA	NA	2.664	37.54	Quaternary	0	4	NA
176	35	3	NA	23.31	19.31	Quaternary	5	35	NA
191	49	5	6	1	60	Quaternary	6	49	6-20
192	37	16	36	20	1	Quaternary	5	37	NA
193	190	35	190	155	0.01	Quaternary	35	190	NA
194	20	12	13.5	1.5	5.33	Quaternary	12	19	12-19
195	32	6	30	24	0.13	Quaternary	7	32	NA
196	29	15	NA	19.31	0.52	Quaternary	5	29	NA
197	5	NA	NA	3.33	240.24	Quaternary	0	5	NA

198	35	11.8	26.6	14.8	37.16	Quaternary	8	35	NA
199	55	11	30	19	52.63	Quaternary	NA	NA	NA
200	64	15	43	28	43.29	Quaternary	9	64	NA
201	16	12	NA	10.66	93.84	Quaternary	0	16	NA
202	42	10	30	20	60	Quaternary	10	42	NA
203	30	10	NA	19.98	50.05	Quaternary	2	30	NA
204	36	13	33	20	32.50	Quaternary	3	36	NA
205	51	12	38	26	24.23	Quaternary	2	51	NA
206	43	11	20	9	1.11	Quaternary	0	43	NA
207	29	3	NA	19.314	1.24	Quaternary	3	29	NA
208	20	NA	NA	13.32	1.88	Quaternary	0	20	NA
209	17	NA	NA	11.32	0.88	Quaternary	0	17	NA
210	16	4.5	7.5	3	10	Quaternary	4	16	4.5
211	27	8	9	1	15	Quaternary	17	27	18-27
212	58	12	13.6	1.6	6.25	Quaternary	3	56	9
213	17	4.5	NA	11.32	0.88	Quaternary	6	17	8-17
216	8	0	8	8	100	Quaternary	0	8	NA
217	42	10	30	20	55	Quaternary	2	42	NA
218	40	12	30	18	45.83	Quaternary	3	40	NA
219	28	7	24.5	17.5	27.43	Quaternary	6	28	NA
220	20	1	NA	13.32	168.54	Quaternary	0	20	NA
221	30	10	NA	20	37.54	Quaternary	3	30	NA
222	15	6	12	6	266.67	Quaternary	0	15	NA
223	24	8	NA	16	28.15	Quaternary	0	24	NA
224	30	10	15	5	150	Quaternary	3	30	NA
225	16	2	12	10	150	Quaternary	0	16	NA
226	25	6	18	12	68.75	Quaternary	0	25	NA
227	100	45	65	20	0.50	Quaternary	16	100	78-100
228	9	4.5	9	4.5	11.11	Quaternary	0	9	NA
229	34	20	34	14	0.43	Quaternary	20	34	NA
230	18	8	NA	11.99	1.50	Quaternary	0	18	NA
231	50	7	NA	33.3	0.45	Quaternary	2	50	NA
232	31	7	10	3	50	Quaternary	3	31	NA
233	14	2	4	2	2.50	Quaternary	2	14	NA
234	32	11	32	21	3.81	Quaternary	2	32	NA
235	30	12	NA	19.98	1.25	Quaternary	6	30	NA
236	21	5	12	7	2.43	Quaternary	2	21	NA
237	30	16	30	14	3.57	Quaternary	2	30	NA
238	25	4	5	1	300	Quaternary	2	25	NA
239	22	16	19	3	10	Quaternary	2	22	NA
240	25	9	14	5	0.8	Quaternary	9	25	9-25
241	34	9	15	6	5.67	Quaternary	4	34	NA
242	26	6	8	2	7.50	Quaternary	2	26	11-22

243	200	32	195	163	1.07	Quaternary	2	200	17
244	31	13	25	12	20.83	Quaternary	2	31	NA
245	30	20	25	5	2	Quaternary	10	30	NA
246	100	15	100	85	0.02	Quaternary	18	100	25
247	77	20	77	57	0.07	Quaternary	40	77	55
248	200	140	NA	133.2	0.05	Quaternary	12	200	NA
249	100	NA	NA	66.6	0.08	Quaternary	3	100	NA
250	186	42	186	144	0.08	Quaternary	4	186	145-165
251	30	NA	NA	19.98	0.75	Quaternary	0	30	NA
252	20	8	10	2	7.5	Quaternary	4	20	8
253	58	10	45	35	0.43	Quaternary	12	58	NA
254	30	22	NA	19.98	0.25	Quaternary	3	30	NA
255	35	NA	NA	23.31	0.64	Quaternary	4	35	NA
256	31	12.5	20	7.5	2	Quaternary	2	30	NA
257	50	16	30	14	1.21	Quaternary	9	50	NA
258	100	35	100	65	0.23	Quaternary	20	100	51
259	65	20	25	5	3	Quaternary	14	65	30
260	100	28	100	72	0.14	Quaternary	20	100	20
261	100	19	70	51	0.20	Quaternary	10	100	30
262	55	11	17	6	2.5	Quaternary	7	55	11-34
263	40	NA	NA	26.64	0.56	Quaternary	5	40	NA
264	35	15	35	20	0.50	Quaternary	14	35	30
265	9	NA	NA	5.994	2.50	Quaternary	0	9	NA
266	13	10	10	0	#DIV/0!	Quaternary	0	13	NA
267	15	8	10	2	100	Quaternary	0	15	NA
268	18	8	17	9	100	Quaternary	0	18	NA
269	21	8	12	4	112.50	Quaternary	2	21	NA
270	26	0	22	22	19.32	Quaternary	2	26	NA
271	26	13	20	7	57.14	Quaternary	3	26	NA
272	26	7	15	8	125	Quaternary	3	26	NA
273	26	8	12	4	250	Quaternary	2	26	NA
275	30	7	11	4	18.75	Quaternary	2	30	NA
276	16	6	13	7	14.29	Quaternary	0	16	NA
277	18	8	12	4	1.25	Quaternary	0	18	NA
278	15	NA	NA	9.99	30.03	Quaternary	0	15	NA
279	18	8	17	9	50	Quaternary	0	18	NA
280	14	11.5	14	2.5	10	Quaternary	0	14	NA
281	50	8	25	17	0.88	Quaternary	10	50	NA
282	35	15	35	20	1	Quaternary	0	35	NA
283	20	6	14	8	56.25	Quaternary	0	20	NA
284	50	10	12	2	15	Quaternary	10	50	10-12
285	57	17	NA	37.96	0.66	Quaternary	8	57	NA
286	54	12	NA	35.96	0.56	Quaternary	6	54	NA

287	21	11	12	1	25	Quaternary	5	21	5-15
288	10	7	NA	6.66	22.52	Quaternary	0	10	NA
289	10	4	NA	6.66	112.61	Quaternary	0	10	NA
290	35	NA	NA	23.31	2.15	Quaternary	3	35	NA
326	23	12	NA	15.32	30.03	Quaternary	2	23	NA
350	60	17	50	33	8.18	Quaternary	3	60	NA
351	60	NA	64	39.6	7.58	Quaternary	4	60	NA
354	79	31	70	39	2.69	Quaternary	1	79	NA
357	60	NA	56	39.96	10.01	Quaternary	2	60	NA
361	18	12	16	4	20	Quaternary	2	18	NA
378	104	14.5	21.5	7	1.71	Quaternary	2	104	14.5
394	26	13	23	10	16.60	Quaternary	2	26	NA
397	185	20	145	125	0.04	Quaternary	10	185	NA
408	100	42	52	10	0.20	Quaternary	1	100	42
417	22	3	7	4	12.50	Quaternary	2	22	NA
418	25	2	20	18	23.33	Quaternary	1	20	NA
419	32	18	20	2	7.50	Quaternary	6	22	NA
432	30	4	18	14	1.07	Quaternary	11	18	NA
433	32	17	23	6	2.17	Quaternary	10	32	NA
434	14	6	8	2	290	Quaternary	1	14	8
436	40	22	31	9	1.67	Quaternary	5	40	NA
437	60	20	26	6	2.50	Quaternary	5	60	NA
438	30	6	12	6	2.50	Quaternary	2	30	NA
442	34	21	25	4	2	Quaternary	0	34	29-32
443	43	9	43	34	8.82	Quaternary	0	43	NA
444	57	19	31	12	0.42	Quaternary	5	50	NA
460	16	5	15	10	1.50	Quaternary	6	16	6
461	28	10	13	3	8.33	Quaternary	2	28	NA
462	54	35	51	16	25	Quaternary	2	54	NA
463	38	21	23	2	5	Quaternary	8	38	19
464	26	20	25	5	1.20	Quaternary	6	26	NA
465	40	9.5	17	7.5	205	Quaternary	1	40	9.5
466	43	30	40	10	15	Quaternary	2	43	NA
467	50	31	45	14	16.07	Quaternary	5	50	31
468	32	18.2	23	4.8	41.67	Quaternary	2	32	NA
469	43	24	38	14	85.71	Quaternary	10	43	NA
470	63	30	52	22	81.82	Quaternary	10	63	NA
471	16	10	15	5	70	Quaternary	0	16	NA
474	60	46	57	11	60.91	Quaternary	2	60	NA
475	17	4	15	11	27.27	Quaternary	0	17	NA
476	36	14	27	13	34.62	Quaternary	3	36	NA
477	39	20	26	6	2.50	Quaternary	3	39	22
478	35	23	24	1	30	Quaternary	5	35	NA

479	40	10	25	15	1.67	Quaternary	5	40	NA
484	36	9.5	34	24.5	0.16	Quaternary	6	36	26-35
487	34	18	30	12	20.83	Quaternary	2	34	NA
489	46	25	30	5	1.50	Quaternary	3	46	NA
491	35	9	11	2	7.50	Quaternary	1	35	NA
500	40	27	38	11	54.55	Quaternary	1	40	25
501	50	22.1	38.5	16.4	67.07	Quaternary	2	50	NA
504	63	16	24	8	1.63	Quaternary	4	63	NA
508	25	NA	NA	16.65	23.72	Quaternary	0	25	NA
515	30	14	16	2	5.00	Quaternary	11	30	NA
518	26	9	24	15	30	Quaternary	0	26	NA
519	26	9	24	15	15	Quaternary	0	26	NA
520	30	12	25	13	26.92	Quaternary	0	30	NA
524	36	27	34	7	128.57	Quaternary	4	36	16
525	40	11	20	9	2.22	Quaternary	5	40	NA
526	32	11	18	7	3.57	Quaternary	2	32	NA
527	30	17	18	1	10	Quaternary	4	30	NA
528	43	20	34	14	0.64	Quaternary	11	46	NA
531	35	15	27	12	75	Quaternary	2	28	NA
532	28	15	27	12	33.33	Quaternary	2	28	NA
533	97	35	60	25	48	Quaternary	8	97	NA
534	54	20	22	2	4.50	Quaternary	8	54	NA
535	66	32	35	3	8.67	Quaternary	20	66	NA
537	91	24	33	9	133	Quaternary	3	91	NA
542	80	36	45	9	1.67	Quaternary	6	80	22
543	91	26	26	0	#DIV/0!	Quaternary	5	91	NA
544	61	9	41	32	0.31	Quaternary	9	61	35-44
545	84	41.7	50	8.3	216.87	Quaternary	4	84	NA
546	88	56.4	70	13.6	58.82	Quaternary	2	88	NA
548	42	21	37	16	45	Quaternary	2	42	NA
549	34	20	34	14	32.07	Quaternary	4	34	NA
550	26	7.5	12	4.5	3.33	Quaternary	3	26	NA
553	21	7	19	12	7.17	Quaternary	2	21	NA
556	34	9	16	7	1.14	Quaternary	4	30	NA
558	42	26	40	14	28.57	Quaternary	2	40	NA
559	20	13.11	17	3.89	33.42	Quaternary	5	35	14
560	19	6	16	10	48	Quaternary	2	19	NA
561	620	12	620	608	0.003	Quaternary	1	620	380
565	28	9	28	19	31.58	Quaternary	2	28	NA
566	48	16	45	29	31.03	Quaternary	1	48	16
567	24	10	30	20	10	Quaternary	12	24	NA
568	55	30	45	15	86.67	Quaternary	20	55	NA
569	57	24	41	17	48.82	Quaternary	10	57	NA

570	44	20	40	20	62.50	Quaternary	4	44	NA
573	34	9	16	7	2.14	Quaternary	0	34	25-34
574	42	14	29	15	100	Quaternary	2	42	NA
575	21	8	29	21	21.43	Quaternary	1	21	NA
576	12	4	10	6	116.67	Quaternary	0	12	NA
579	30	7	18	11	36.36	Quaternary	0	30	NA
580	33	10	23	13	84.62	Quaternary	3	23	NA
581	44	23	40	17	9.41	Quaternary	4	44	NA
582	47	15	42	27	11.63	Quaternary	2	47	NA
583	18	12	18	6	39	Quaternary	0	18	NA
591	50	13	15	2	800	Quaternary	7	50	13
592	65	10	50	40	25	Quaternary	7	66	53-66
593	62	10	15	5	12.60	Quaternary	5	62	44-62
619	18	9	15	6	1.667	Quaternary	6	18	6-18
622	32	8	14	6	5	Quaternary	2	32	10
637	45	15	45	30	13.33	Quaternary	NA	NA	NA
642	17	4	5	1	15	Quaternary	3	17	4
647	42	11	22	11	1.09	Quaternary	5	42	21-34
657	32	12	22	10	2	Quaternary	15	32	20-32
658	20	10	18	8	500	Quaternary	NA	NA	NA
659	30	15	26	11	18.18	Quaternary	0	30	NA
661	20	12	12	0	#DIV/0!	Quaternary	NA	NA	NA
662	24	10	16	6	1.67	Quaternary	7	24	14-24
663	22	9	11	2	6	Quaternary	9	22	9-12
664	12	7	9.5	2.5	28	Quaternary	1	12	3
665	34	18	19	1	12	Quaternary	6	34	18
666	30	14	31	17	1.76	Quaternary	NA	NA	NA
667	28	13	16	3	5.33	Quaternary	18	28	19-25
668	30	12	25	13	3.85	Quaternary	NA	NA	NA
669	38	10	18	8	1.88	Quaternary	3	38	NA
670	25	5	18	13	246.15	Quaternary	NA	NA	NA
671	38	22	30	8	1.25	Quaternary	3	38	22-26
672	32	5.6	8	2.4	4	Quaternary	5	32	NA
673	27	9	17	8	4.38	Quaternary	1	27	NA
674	75	22	65	43	0.12	Quaternary	3	75	60
675	22	7	12	5	20	Quaternary	NA	NA	NA
676	100	12	100	88	0.17	Quaternary	8	100	27
677	20	3	9	6	5	Quaternary	0	20	NA
678	32	8.6	21.5	12.9	32.95	Quaternary	2	32	6
679	60	6	7.4	1.4	5	Quaternary	1.5	60	NA
680	20	3	7	4	3.75	Quaternary	0	20	8
681	60	10	45	35	2.86	Quaternary	5	60	NA
682	36	14	20	6	149.67	Quaternary	NA	NA	NA

683	60	24.7	27	2.3	10.87	Quaternary	0	60	NA
684	47	21	22	1	15	Quaternary	16	47	21
685	36	6	11	5	5	Quaternary	2	36	NA
686	27	6	7	1	12	Quaternary	15	27	6
687	75	23.6	31	7.4	4.05	Quaternary	7	75	NA
688	69	18	62	44	12.50	Quaternary	3	69	NA
689	75	30	36	6	10	Quaternary	5	75	NA
690	35	6	6	0	#DIV/0!	Quaternary	NA	NA	NA
691	68	4.5	28.5	24	41.67	Quaternary	7	68	4.5
692	42	8	30	22	50	Quaternary	0	46	NA
693	28	9.8	24.6	14.8	60.81	Quaternary	NA	NA	NA
694	60	4	55	51	7.84	Quaternary	3	60	25
695	59	15	55	40	2	Quaternary	3	59	21
696	72	61	62	1	10	Quaternary	65	72	65-70
697	30	18	19	1	15	Quaternary	21	30	21-24.5
698	76	24	70	46	26.09	Quaternary	NA	NA	NA
699	85	20	55	35	40	Quaternary	NA	NA	NA
700	32	12	36	24	83.33	Quaternary	NA	NA	NA
701	44	29	41	12	41.67	Quaternary	19	44	NA
702	42	25	28	3	250	Quaternary	NA	NA	NA
703	65	24	60	36	13.61	Quaternary	NA	NA	NA
704	48	23	38	15	31.73	Quaternary	2	48	NA
705	91	37	81	44	38.64	Quaternary	2	91	NA
706	48	19	30	11	1.82	Quaternary	2	48	2
707	82	18	22	4	7.50	Quaternary	3	82	37
709	65	10	65	55	12.25	Quaternary	NA	NA	NA
710	64	9	42	33	19.70	Quaternary	3	64	47
711	58	8	12	4	3.75	Quaternary	2	58	NA
712	80	10	65	55	14.55	Quaternary	8	80	NA
713	73	23.75	55.7	31.95	33.55	Quaternary	NA	NA	NA
714	43	16.63	30.15	13.52	21.75	Quaternary	NA	NA	NA
715	70	25	45	20	30	Quaternary	0	70	NA
716	92	35	56	21	95.24	Quaternary	NA	NA	NA
717	61	12	35	23	16.30	Quaternary	NA	NA	NA
718	57	12	38	26	12.50	Quaternary	0	57	37-57
719	90	41	42	1	25	Quaternary	5	90	NA
720	87	30	50	20	77.50	Quaternary	NA	NA	NA
722	90	23	37	14	142.86	Quaternary	NA	NA	NA
723	85	32	65	33	54.55	Quaternary	NA	NA	NA
724	40	23	34	11	24.55	Quaternary	NA	NA	NA
725	89	36	45.8	9.8	163.27	Quaternary	14	89	NA
726	79	39	39	0	#DIV/0!	Quaternary	NA	NA	NA
728	330	10	330	320	0.005	Quaternary	12	330	39

729	42	23	25	2	10	Quaternary	NA	NA	NA
730	90	19	20	1	15	Quaternary	2	90	NA
731	75	34	38	4	250	Quaternary	5	75	NA
732	40	11.5	35	23.5	19.15	Quaternary	2	40	NA
733	36	16	30	14	1.79	Quaternary	2	36	NA
734	55	17	20	3	5	Quaternary	2	55	NA
735	78	33	38	5	12	Quaternary	0	78	NA
736	75	50	55	5	240	Quaternary	NA	NA	NA
737	44	20	23	3	8.33	Quaternary	13	44	NA
738	60	26	60	34	15.44	Quaternary	NA	NA	NA
739	445	115	440	325	0.04	Quaternary	0	440	390-398
740	80	42	56	14	0.71	Quaternary	2	80	NA
741	60	30	46	16	1.25	Quaternary	17	60	NA
742	100	15	100	85	0.03	Quaternary	1	100	40
746	113	38	62	24	27.92	Quaternary	30	113	NA
747	32	16	16	0	#DIV/0!	Quaternary	NA	NA	NA
748	62	21	32	11	63.64	Quaternary	14	62	24
749	83	19	60	41	24.15	Quaternary	34	83	NA
759	45	10	25	15	1	Quaternary	12	45	NA
760	30	16	26	10	0.80	Quaternary	NA	NA	NA
761	25	12	22	10	50	Quaternary	7	25	NA
764	36	14	36	22	36.36	Quaternary	1	36	NA
765	35	12	35	23	0.217	Quaternary	7	35	24
766	66	6	16	10	2	Quaternary	12	66	21
787	50	9	35	26	26.92	Quaternary	NA	NA	NA
788	30	14	15	1	12	Quaternary	0	30	NA
789	40	6	35	29	0.52	Quaternary	0	40	15
790	36	4.5	7	2.5	9.60	Quaternary	6	36	26.5-35.5
791	21	6	10	4	60	Quaternary	NA	NA	NA
793	16	6	13	7	12.14	Quaternary	NA	NA	NA
794	19	7	15	8	10	Quaternary	NA	NA	NA
795	31	13	27	14	42.86	Quaternary	NA	NA	NA
796	38	8	15	7	7.14	Quaternary	2	38	NA
797	285	18	285	267	0.01	Quaternary	4	285	160
798	52	7	45	38	18.42	Quaternary	NA	NA	NA
799	60	5	8	3	16.67	Quaternary	2	60	NA
800	60	20	35	15	60	Quaternary	NA	NA	NA
801	72	14	65	51	12.06	Quaternary	2	72	NA
802	45	12	13	1	15	Quaternary	2	45	NA
803	200	10	200	190	0.02	Quaternary	8	200	28
804	20	8	11	3	6	Quaternary	5	20	11-20
805	55	23	36	13	1.15	Quaternary	6	55	22-32
807	25	14	19	5	3	Quaternary	2	25	NA

808	33	12	22	10	1	Quaternary	3	33	NA
810	27	8	11	3	5	Quaternary	1	27	5.5
811	27	6	7.5	1.5	10	Quaternary	2	27	NA
812	15	6	7	1	10	Quaternary	5	15	6-15
813	28	3	14	11	2	Quaternary	3	28	NA
814	21	7	8	1	10	Quaternary	0	21	NA
815	22	9	20	11	22.73	Quaternary	NA	NA	NA
816	35	14	15	1	15	Quaternary	3	35	17
817	18	6	16	10	11.40	Quaternary	NA	NA	NA
824	34	8	13	5	4	Quaternary	16	33	15.5-33.5
825	63	24	35	11	1.36	Quaternary	2	62	NA
826	16	4.5	8	3.5	4.29	Quaternary	7	16	7-16
827	43	23	30	7	5	Quaternary	15	43	25-43
828	75	15	55	40	0.10	Quaternary	NA	NA	NA
847	42	27	28	1	15	Quaternary	10	42	29-42
848	34	15	17	2	12	Quaternary	25	34	25-30
849	43	25	28	3	5	Quaternary	15	43	25-43
850	21	4	8.5	4.5	2.22	Quaternary	NA	NA	NA
851	45	12	38	26	1.15	Quaternary	8	45	NA
852	19	4.6	7.2	2.6	3.85	Quaternary	6	19	9.5
853	31	15	16	1	8	Quaternary	8	31	NA
854	34	8	9	1	20	Quaternary	7	34	16-18
855	36	15	16	1	10	Quaternary	16	36	24-36
856	22	8	14	6	1.67	Quaternary	14	22	NA
858	24	6	12	6	3	Quaternary	6	24	6
859	60	37	60	23	0.04	Quaternary	10	60	NA
861	62	23	45	22	0.59	Quaternary	NA	NA	NA
885	30	9	12	3	5	Quaternary	2	30	NA
886	30	5	9	4	3.75	Quaternary	0	30	NA
887	40	8	15	7	5.71	Quaternary	0	40	NA
888	30	14	21	7	1.71	Quaternary	14	30	18-30
889	32	14	26	12	21.67	Quaternary	2	32	NA
890	36	12	18	6	2	Quaternary	9	35	27-36
891	60	15	52	37	1	Quaternary	4	60	4
892	48	14	34	20	1.75	Quaternary	3	48	NA
893	30	15	18.4	3.4	19.12	Quaternary	18	31	18
894	50	10	35	25	0.60	Quaternary	18	40	35
895	34	22	28	6	20.83	Quaternary	7	34	17.5
896	31	12	20	8	2.50	Quaternary	2	31	NA
897	31	10	20	10	0.70	Quaternary	2	31	NA
905	37	14	16	2	10	Quaternary	2	37	NA
906	25	8	12	4	6.25	Quaternary	2	25	NA
908	60	50	60	10	0.50	Quaternary	NA	NA	NA

911	22	9	11	2	5	Quaternary	10	22	NA
912	20	8	10.5	2.5	38	Quaternary	2	20	NA
913	30	6	7	1	15	Quaternary	6	30	NA
916	37	25	37	12	0.83	Quaternary	NA	NA	NA
983	20	12	16	4	1.25	Quaternary	3	20	10
987	30	18	30	12	1	Quaternary	NA	NA	NA
1044	15	8	15	7	1.43	Quaternary	5	15	9-10
291	470	250	310	60	0.25	North Park Formation	140	470	310
292	240	38	240	202	0.05	North Park Formation	119	240	NA
293	391	301	315	14	0.57	North Park Formation	150	391	NA
294	500	252	340	88	0.17	North Park Formation	200	500	NA
296	220	62	220	158	0.03	North Park Formation	85	220	110
299	160	41	160	119	0.08	North Park Formation	2	160	NA
301	700	110	485	375	0.01	North Park Formation	100	700	NA
307	240	67	120	53	0.19	North Park Formation	72	240	NA
297	94	45	48	3	3.33	White River Formation	2	95	NA
298	50	39	49	10	1	White River Formation	2	50	NA
300	74	28	72	44	20.45	White River Formation	2	74	NA
302	66	35	54	19	42.11	White River Formation	2	66	NA
308	120	29	40	11	1.36	White River Formation	10	120	NA
309	100	32	85	53	0.11	White River Formation	2	100	NA
360	65	48	61	13	0.46	White River Formation	0	65	NA
364	640	445	640	195	0.05	White River Formation	30	640	585
365	580	400	580	180	0.04	White River Formation	0	580	530
366	420	95	420	325	0.01	White River Formation	35	420	305
295	48	30	40	10	1.50	White River Formation	5	48	NA
303	63	37.8	62.5	24.7	32.39	Laramie Formation	2	63	NA
304	51	23	25	2	225	Laramie Formation	3	51	NA
305	50	22	25	3	6	Laramie Formation	2	50	NA
306	51	19	35	16	15.63	Laramie Formation	3	51	NA
311	200	20	200	180	0.08	Laramie Formation	0	200	80
312	41	25	28	3	2.33	Laramie Formation	3	41	6.5
313	45	25	30	5	3	Laramie Formation	3	45	NA
314	380	174	380	206	0.07	Laramie Formation	130	380	NA
315	101	10	25	15	0.07	Laramie Formation	3	101	NA
318	460	250	330	80	0.05	Laramie Formation	95	460	NA
319	510	160	240	80	0.13	Laramie Formation	69	510	NA
320	300	123	200	77	0.06	Laramie Formation	7	300	NA
363	400	190	400	210	0.05	Laramie Formation	20	400	310
367	400	85	380	295	0.03	Laramie Formation	0	400	255
372	560	118	560	442	0.02	Laramie Formation	58	560	510
398	800	88	795	707	0.0014	Laramie Formation	35	800	650
399	500	60	500	440	0.02	Laramie Formation	4	500	220

310	200	15	180	165	0.05	Fox Hills Sandstone	15	200	28
316	430	75	195	120	0.10	Fox Hills Sandstone	60	430	NA
317	195	136	150	14	0.50	Fox Hills Sandstone	43	195	NA
327	23	8	22	14	24.29	Fox Hills Sandstone	6	23	NA
362	780	40	780	740	0.01	Fox Hills Sandstone	17	780	70
368	360	100	360	260	0.03	Fox Hills Sandstone	0	360	310
369	275	50	275	225	0.27	Fox Hills Sandstone	41	275	233
402	16	12	16	4	3.75	Fox Hills Sandstone	5	16	12
412	440	220	435	215	0.0012	Fox Hills Sandstone	50	440	NA
413	500	77	230	153	0.04	Fox Hills Sandstone	48	500	NA
414	700	280	700	420	0.01	Fox Hills Sandstone	43	700	630
416	725	250	725	475	0.02	Fox Hills Sandstone	165	725	625
62	17	8	14	6	1.5	Pierre Shale	3	17	NA
90	20	14	20	6	0.17	Pierre Shale	15	20	NA
91	360	0	360	360	0.17	Pierre Shale	326	360	326
108	44	25	36.5	11.5	0.43	Pierre Shale	28	44	28-44
111	44	20	40	20	1.75	Pierre Shale	5	44	NA
114	50	40	50	10	0.2	Pierre Shale	0	50	NA
172	26	12	15	3	4	Pierre Shale	2	26	NA
441	220	40	220	180	0.08	Pierre Shale	7	220	80
648	16	3	7.6	4.6	6.52	Pierre Shale	2	16	7
649	250	30	250	220	0.02	Pierre Shale	10	250	30
651	430	180	430	250	0.004	Pierre Shale	5	430	275
652	30	4	21	17	0.88	Pierre Shale	2	30	NA
660	25	5	20	15	0.93	Pierre Shale	0	25	14-24
756	145	25	145	120	0.025	Pierre Shale	0	145	60
860	45	18	30	12	1.25	Pierre Shale	5	45	NA
118	22	8	10	2	7.5	Pierre Shale-Upper Member	10	22	10
119	78	16	35	19	0.79	Pierre Shale-Upper Member	10	78	30-35
120	56	13	24	11	1.45	Pierre Shale-Upper Member	16	56	28
121	30	15	300	285	0.01	Pierre Shale-Upper Member	55	300	135
123	225	210	225	15	0.33	Pierre Shale-Upper Member	4	225	8
152	67	16.5	55	38.5	0.39	Pierre Shale-Upper Member	13	67	13
155	400	240	380	140	0.05	Pierre Shale-Upper Member	3	400	283
164	14	NA	NA	9.32	0.21	Pierre Shale-Upper Member	0	14	NA
175	80	15	NA	53.28	0.75	Pierre Shale-Upper Member	15	80	NA
177	105	8	18	10	4.00	Pierre Shale-Upper Member	2	105	NA
214	100	20	95	75	0.07	Pierre Shale-Upper Member	0	100	NA
215	200	6	195	189	0.06	Pierre Shale-Upper Member	6	200	195
323	40	32	NA	26.64	0.30	Pierre Shale-Upper Member	2	40	NA
325	20	16	18	2	7.50	Pierre Shale-Upper Member	2	20	NA
330	19	7	14	7	0.57	Pierre Shale-Upper Member	2	19	NA
331	26	12.5	23	10.5	0.95	Pierre Shale-Upper Member	2	26	NA

370	400	20	400	380	0.01	Pierre Shale-Upper Member	175	400	NA
371	200	61	200	139	0.06	Pierre Shale-Upper Member	6	200	62
373	460	99	460	361	0.02	Pierre Shale-Upper Member	75	460	225
376	800	130	795	665	0.02	Pierre Shale-Upper Member	24	800	24
377	740	245	740	495	0.01	Pierre Shale-Upper Member	110	740	190
379	600	224	600	376	0.01	Pierre Shale-Upper Member	31	600	527
380	800	25	230	205	0.01	Pierre Shale-Upper Member	8	800	NA
381	720	400	720	320	0.02	Pierre Shale-Upper Member	30	720	340
382	760	346	760	414	0.02	Pierre Shale-Upper Member	22	760	450
383	800	300	800	500	0.01	Pierre Shale-Upper Member	55	800	540
384	800	246	800	554	0.01	Pierre Shale-Upper Member	39	800	390
385	540	50	540	490	0.01	Pierre Shale-Upper Member	25	540	420
386	880	120	880	760	0.01	Pierre Shale-Upper Member	58	880	800
387	800	338	800	462	0.02	Pierre Shale-Upper Member	55	800	688
388	800	348	800	452	0.02	Pierre Shale-Upper Member	12	800	520
389	560	356	560	204	0.05	Pierre Shale-Upper Member	130	560	515
390	600	300	600	300	0.03	Pierre Shale-Upper Member	56	600	NA
391	440	220	440	220	0.03	Pierre Shale-Upper Member	37	440	386
392	500	200	500	300	0.02	Pierre Shale-Upper Member	47	500	390
392	415	65	415	350	0.01	Pierre Shale-Upper Member	32	415	NA
393	660	245	660	415	0.01	Pierre Shale-Upper Member	150	660	170
395	250	30	250	220	0.01	Pierre Shale-Upper Member	10	250	230
396	300	20	280	260	0.01	Pierre Shale-Upper Member	3	300	80
400	240	10	180	170	0.06	Pierre Shale-Upper Member	5	240	21
401	225	80	200	120	0.05	Pierre Shale-Upper Member	5	225	NA
403	303	175	300	125	0.04	Pierre Shale-Upper Member	7	303	120
404	530	60	530	470	0.0014	Pierre Shale-Upper Member	36	600	180-200
405	300	53	300	247	0.06	Pierre Shale-Upper Member	33	303	120-126
406	620	35	620	585	0.0043	Pierre Shale-Upper Member	31	620	415
407	490	230	458	228	0.04	Pierre Shale-Upper Member	105	500	150
410	230	27	201	174	0.03	Pierre Shale-Upper Member	30	230	NA
411	383	175	380	205	0.02	Pierre Shale-Upper Member	38	383	240
415	860	55	860	805	0.0019	Pierre Shale-Upper Member	38	860	120
420	500	25	500	475	0.0032	Pierre Shale-Upper Member	44	500	44
421	123	11	12	1	10	Pierre Shale-Upper Member	16	123	NA
422	600	300	600	300	0.0025	Pierre Shale-Upper Member	17	600	409-415
423	700	60	700	640	0.0016	Pierre Shale-Upper Member	6	700	NA
424	600	60	600	540	0.02	Pierre Shale-Upper Member	3	600	510
425	500	50	500	450	0.01	Pierre Shale-Upper Member	3	500	390
426	395	145	380	235	0.02	Pierre Shale-Upper Member	40	395	NA
427	860	100	860	760	0.01	Pierre Shale-Upper Member	16	860	459
428	860	860	860	0	#DIV/0!	Pierre Shale-Upper Member	58	860	684
430	475	28	475	447	0.0011	Pierre Shale-Upper Member	5	475	32

431	180	17	180	163	0.02	Pierre Shale-Upper Member	8	180	32
435	30	14	23	9	2.22	Pierre Shale-Upper Member	2	30	NA
472	950	135	950	815	0.02	Pierre Shale-Upper Member	41	950	520
473	395	35	395	360	0.01	Pierre Shale-Upper Member	26	395	167
480	40	24	38	14	0.71	Pierre Shale-Upper Member	5	40	NA
481	200	35	200	165	0.09	Pierre Shale-Upper Member	0	200	45
482	200	35	200	165	0.02	Pierre Shale-Upper Member	1	200	55
483	250	250	250	0	#DIV/0!	Pierre Shale-Upper Member	12	250	53
485	200	15	200	185	0.02	Pierre Shale-Upper Member	3	200	NA
486	480	25	480	455	0.0011	Pierre Shale-Upper Member	3	480	20
488	200	23	120	97	0.04	Pierre Shale-Upper Member	6	200	6
490	185	38	50	12	0.17	Pierre Shale-Upper Member	5	185	38
492	260	30	250	220	0.02	Pierre Shale-Upper Member	27	260	160
493	380	82	380	298	0.02	Pierre Shale-Upper Member	6	380	170
494	480	20	305	285	0.0018	Pierre Shale-Upper Member	10	480	NA
495	185	105	140	35	0.29	Pierre Shale-Upper Member	8	185	116-122
496	30	15	16	1	8	Pierre Shale-Upper Member	2	30	NA
497	27	18	27	9	0.56	Pierre Shale-Upper Member	7	27	18-23
498	27	2	20	18	0.39	Pierre Shale-Upper Member	5	27	NA
499	33	10	17	7	0.71	Pierre Shale-Upper Member	8	33	NA
502	49	18	25	7	2.14	Pierre Shale-Upper Member	2	49	NA
503	35	15	20	5	7	Pierre Shale-Upper Member	5	35	NA
529	300	35	300	265	0.0001	Pierre Shale-Upper Member	16	300	200
530	77	50	70	20	1.25	Pierre Shale-Upper Member	4	77	NA
536	128	30	33	3	4	Pierre Shale-Upper Member	26	128	NA
538	500	51	189	138	0.04	Pierre Shale-Upper Member	10	500	NA
539	730	200	730	530	0.01	Pierre Shale-Upper Member	0	730	216-300
540	31	5	22	17	0.12	Pierre Shale-Upper Member	4	31	6-31
541	707	80	420	340	0.06	Pierre Shale-Upper Member	50	707	80
547	135	10	105	95	0.21	Pierre Shale-Upper Member	14	135	38
551	350	45	350	305	0.05	Pierre Shale-Upper Member	3	350	70
552	400	8	395	387	0.01	Pierre Shale-Upper Member	0	400	10-34
554	565	22	480	458	0.01	Pierre Shale-Upper Member	5	565	NA
555	125	23	97	74	0.04	Pierre Shale-Upper Member	3	125	40
557	50	15	25	10	0.70	Pierre Shale-Upper Member	1	50	NA
562	600	80	400	320	0.01	Pierre Shale-Upper Member	0	600	NA
563	600	60	600	540	0.03	Pierre Shale-Upper Member	3	600	160
564	50	22	40	18	1.39	Pierre Shale-Upper Member	0	50	NA
571	52	23	40	17	0.47	Pierre Shale-Upper Member	2	52	NA
572	350	95	350	255	0.003	Pierre Shale-Upper Member	0	350	170
577	100	20	90	70	0.17	Pierre Shale-Upper Member	0	100	18
578	64	14	36	22	0.55	Pierre Shale-Upper Member	0	64	NA
584	149	6	80	74	0.11	Pierre Shale-Upper Member	6	149	65-67

585	45	7	15	8	4.50	Pierre Shale-Upper Member	0	45	NA
586	32	12	24	12	2.08	Pierre Shale-Upper Member	2	32	NA
587	58	16	21	5	3	Pierre Shale-Upper Member	0	58	NA
588	50	8.6	18	9.4	1.60	Pierre Shale-Upper Member	0	50	NA
589	30	2	26	24	0.42	Pierre Shale-Upper Member	2	30	NA
590	100	9	95	86	0.06	Pierre Shale-Upper Member	0	100	10-16
708	100	10	70	60	0.21	Pierre Shale-Upper Member	1	100	25
750	64	10	50	40	0.05	Pierre Shale-Upper Member	NA	NA	NA
751	35	6	20	14	0.36	Pierre Shale-Upper Member	5	35	5
758	720	50	720	670	0.0004	Pierre Shale-Upper Member	3	720	50-51
774	33	17	30	13	2.31	Pierre Shale-Upper Member	15	33	NA
818	34	8	14	6	1.33	Pierre Shale-Upper Member	25-34		
819	60	20	25	5	0.40	Pierre Shale-Upper Member	0	60	NA
821	105	15.5	22	6.5	2.31	Pierre Shale-Upper Member	0	105	NA
822	80	14	61	47	0.02	Pierre Shale-Upper Member	NA	NA	NA
898	120	22	120	98	0.05	Pierre Shale-Upper Member	26	120	22
899	300	51	300	249	0.0024	Pierre Shale-Upper Member	1	300	210
900	395	40	395	355	0.0025	Pierre Shale-Upper Member	9	395	150
901	300	7	290	283	0.02	Pierre Shale-Upper Member	0	300	29
902	40	14	30	16	0.94	Pierre Shale-Upper Member	3	40	19-23
903	125	18	125	107	0.02	Pierre Shale-Upper Member	7	125	NA
904	40	10	20	10	5	Pierre Shale-Upper Member	5	40	25
907	245	42	245	203	0.02	Pierre Shale-Upper Member	4	245	150
925	295	35	290	255	0.01	Pierre Shale-Upper Member	0	295	180
926	400	125	400	275	0.01	Pierre Shale-Upper Member	2	400	240
927	45	25	45	20	0.40	Pierre Shale-Upper Member	0	45	NA
928	60	7	50	43	0.16	Pierre Shale-Upper Member	8	60	8
929	120	25	120	95	0.02	Pierre Shale-Upper Member	17	120	50
930	175	20	175	155	0.03	Pierre Shale-Upper Member	0	175	70
931	430	20	430	410	0.0024	Pierre Shale-Upper Member	0	430	64
1028	28	11	28	17	0.59	Pierre Shale-Upper Member	3	28	3
1029	45	10	30	20	0.50	Pierre Shale-Upper Member	30	45	30
1030	200	25	200	175	0.0029	Pierre Shale-Upper Member	60	200	101
1031	85	20	60	40	0.38	Pierre Shale-Upper Member	0	85	39
1032	56	18	25	7	2.29	Pierre Shale-Upper Member	17	40	17
1033	96	26	66	40	0.38	Pierre Shale-Upper Member	3	96	28
1034	1030	600	1030	430	0.01	Pierre Shale-Upper Member	55	1030	800
1035	75	18	75	57	0.06	Pierre Shale-Upper Member	6	75	35
1036	88	17	80	63	0.10	Pierre Shale-Upper Member	10	88	10
1037	100	15	75	60	0.10	Pierre Shale-Upper Member	3	100	20
1038	105	15	75	60	0.05	Pierre Shale-Upper Member	3	105	NA
115	160	45	160	115	0.06	Pierre Shale-Richards Sandstone	16	160	60
117	240	0	240	240	0.25	Pierre Shale-Richards Sandstone	16	240	200

151	55	7	15	8	3.13	Pierre Shale-Richards Sandstone	10	55	10
153	124	21	118	97	0.062	Pierre Shale-Richards Sandstone	35	124	83-85
1040	64	34	54	20	1	Pierre Shale-Richards Sandstone	8	64	20
17	180	30	180	150	0.02	Pierre Shale-Middle Member	3	420	NA
116	180	30	180	150	0.02	Pierre Shale-Middle Member	15	180	60
150	30	NA	NA	20	1	Pierre Shale-Middle Member	0	30	NA
154	490	40	300	260	0.06	Pierre Shale-Middle Member	5	490	NA
157	192	18	192	174	0.02	Pierre Shale-Middle Member	27	200	50
158	260	6	240	234	0.03	Pierre Shale-Middle Member	30	300	30-40
160	38	4	29	25	0.32	Pierre Shale-Middle Member	3	38	13-22
173	50	NA	NA	33.3	0.30	Pierre Shale-Middle Member	3	50	NA
178	54	20	24	4	1.75	Pierre Shale-Middle Member	6	54	25-34
321	323	60	205	145	0.08	Pierre Shale-Middle Member	35	323	NA
322	92	6	40	34	0.06	Pierre Shale-Middle Member	4	92	NA
324	402	36	190	154	0.08	Pierre Shale-Middle Member	18	402	NA
332	30	6	10	4	2.50	Pierre Shale-Middle Member	5	30	NA
333	150	16	145	129	0.05	Pierre Shale-Middle Member	1	150	16
334	900	220	895	675	0.01	Pierre Shale-Middle Member	205	900	NA
335	700	275	700	425	0.02	Pierre Shale-Middle Member	4	700	NA
336	800	450	800	350	0.03	Pierre Shale-Middle Member	5	800	NA
337	880	590	880	290	0.02	Pierre Shale-Middle Member	33	880	549
338	900	40	875	835	0.006	Pierre Shale-Middle Member	2	900	NA
339	700	60	695	635	0.008	Pierre Shale-Middle Member	12	700	NA
340	200	16	200	184	0.005	Pierre Shale-Middle Member	12	200	NA
341	200	20	NA	133.2	0.02	Pierre Shale-Middle Member	10	200	23
342	26	14	21	7	1.71	Pierre Shale-Middle Member	2	26	NA
343	26	15	19	4	2.50	Pierre Shale-Middle Member	2	26	NA
344	490	45	485	440	0.01	Pierre Shale-Middle Member	4	500	32
345	773	668	773	105	0.05	Pierre Shale-Middle Member	0	773	NA
346	300	18	295	277	0.02	Pierre Shale-Middle Member	9	300	38
347	700	175	695	520	0.02	Pierre Shale-Middle Member	65	700	NA
348	880	200	880	680	0.01	Pierre Shale-Middle Member	20	880	494
349	760	30	700	670	0.0015	Pierre Shale-Middle Member	18	760	NA
374	800	83	800	717	0.01	Pierre Shale-Middle Member	78	800	560
375	740	540	740	200	0.06	Pierre Shale-Middle Member	67	740	410
409	1182	78	480	402	0.01	Pierre Shale-Middle Member	409	1182	806
439	195	30	195	165	0.02	Pierre Shale-Middle Member	3	195	NA
440	75	42	45	3	10.67	Pierre Shale-Middle Member	2	75	NA
505	340	40	340	300	0.17	Pierre Shale-Middle Member	0	340	110
506	100	60	85	25	0.32	Pierre Shale-Middle Member	4	100	NA
507	32	11	13	2	10	Pierre Shale-Middle Member	11	32	23-32
509	50	15	50	35	0.14	Pierre Shale-Middle Member	0	50	30-50
510	81	8	26	18	0.22	Pierre Shale-Middle Member	2	81	NA

511	32	12.9	17	4.1	6	Pierre Shale-Middle Member	10	32	NA
512	100	24	60	36	0.14	Pierre Shale-Middle Member	63	87	NA
513	64	11	64	53	0.04	Pierre Shale-Middle Member	11	4	NA
514	97	30	97	67	0.04	Pierre Shale-Middle Member	15	97	60-90
516	50	20	35	15	0.53	Pierre Shale-Middle Member	2	50	38-42
517	45	10	25	15	1	Pierre Shale-Middle Member	2	45	NA
521	33	11	18	7	1.43	Pierre Shale-Middle Member	2	33	12-25
522	100	7	83	76	0.13	Pierre Shale-Middle Member	6	100	6-24
523	35	12	13	1	12	Pierre Shale-Middle Member	10	35	18-26
603	80	48	75	27	0.19	Pierre Shale-Middle Member	5	80	NA
604	340	10	320	310	0.02	Pierre Shale-Middle Member	2	340	295
605	260	25	220	195	0.05	Pierre Shale-Middle Member	0	260	243
607	380	6	380	374	0.027	Pierre Shale-Middle Member	2	380	45
609	250	20	248	228	0.04	Pierre Shale-Middle Member	3	250	141
611	100	49	100	51	0.24	Pierre Shale-Middle Member	5	100	79
620	200	35	200	165	0.079	Pierre Shale-Middle Member	16	200	150
621	360	87	360	273	0.055	Pierre Shale-Middle Member	12	360	331
627	300	35	300	265	0.113	Pierre Shale-Middle Member	0	300	160
633	37	3.5	30.5	27	0.074	Pierre Shale-Middle Member	6	37	10-19
645	230	27	180	153	0.03	Pierre Shale-Middle Member	22	230	110
721	520	19	520	501	0.003	Pierre Shale-Middle Member	12	520	325
727	550	52	280	228	0.02	Pierre Shale-Middle Member	10	550	NA
743	600	50	600	550	0.03	Pierre Shale-Middle Member	8	600	526-552
744	50	23	25	2	7.50	Pierre Shale-Middle Member	4	50	NA
745	60	25	60	35	0.23	Pierre Shale-Middle Member	0	60	19
752	590	50	585	535	0.02	Pierre Shale-Middle Member	15	590	497
753	200	24	190	166	0.01	Pierre Shale-Middle Member	5	200	65
754	50	5	20	15	1	Pierre Shale-Middle Member	5	50	15
755	590	100	590	490	0.01	Pierre Shale-Middle Member	25	590	184
757	49	14.5	18	3.5	0.29	Pierre Shale-Middle Member	7	49	14.5
762	300	10	300	290	0.04	Pierre Shale-Middle Member	2	300	NA
763	200	27	200	173	0.01	Pierre Shale-Middle Member	3	200	27
767	100	30	70	40	0.15	Pierre Shale-Middle Member	3	100	NA
768	39	12	15	3	5	Pierre Shale-Middle Member	12	39	9
769	194	8.5	11.5	3	5.00	Pierre Shale-Middle Member	5	194	NA
770	207	13	77	64	0.23	Pierre Shale-Middle Member	6	207	108-150
771	295	21	229	208	0.04	Pierre Shale-Middle Member	3	295	NA
772	44	6.5	13.5	7	2.14	Pierre Shale-Middle Member	7	44	10-19
773	140	17	140	123	0.02	Pierre Shale-Middle Member	2	140	28
775	54	14	19.5	5.5	2.73	Pierre Shale-Middle Member	10	54	13.5
776	48	4	8	4	4.50	Pierre Shale-Middle Member	7	48	NA
777	350	52	345	293	0.03	Pierre Shale-Middle Member	0	350	295
778	75	10	70	60	0.23	Pierre Shale-Middle Member	0	75	18

779	669	5	345	340	0.02	Pierre Shale-Middle Member	NA	NA	NA
780	59	15	30	15	0.67	Pierre Shale-Middle Member	NA	NA	NA
781	123	36	74	38	0.21	Pierre Shale-Middle Member	31	123	54-123
782	600	10	595	585	0.01	Pierre Shale-Middle Member	0	600	525
783	520	205	520	315	0.05	Pierre Shale-Middle Member	14	520	340
784	600	8	580	572	0.01	Pierre Shale-Middle Member	0	600	320
785	440	15	440	425	0.04	Pierre Shale-Middle Member	1	440	45
786	60	15	55	40	0.50	Pierre Shale-Middle Member	0	60	11
792	350	250	280	30	0.43	Pierre Shale-Middle Member	18	350	NA
806	800	102	795	693	0.02	Pierre Shale-Middle Member	10	800	NA
809	385	30	350	320	0.01	Pierre Shale-Middle Member	20	385	NA
820	335	25	300	275	0.01	Pierre Shale-Middle Member	0	335	NA
823	400	30	340	310	0.003	Pierre Shale-Middle Member	15	400	NA
829	232	39.5	186	146.5	0.01	Pierre Shale-Middle Member	15	232	NA
830	385	27	223	196	0.01	Pierre Shale-Middle Member	10	385	NA
831	150	40	150	110	0.06	Pierre Shale-Middle Member	6	150	130
832	200	9	180	171	0.09	Pierre Shale-Middle Member	1	200	25-45
833	185	170	185	15	0.33	Pierre Shale-Middle Member	12	185	NA
857	100	12	100	88	0.0034	Pierre Shale-Middle Member	7	100	45
862	60	20	52	32	0.16	Pierre Shale-Middle Member	1	60	NA
909	120	20	105	85	0.32	Pierre Shale-Middle Member	10	120	NA
910	145	26	145	119	0.38	Pierre Shale-Middle Member	4	145	45
914	180	5	180	175	0.01	Pierre Shale-Middle Member	12	180	90
915	30	13	20	7	2.14	Pierre Shale-Middle Member	4.5	30	4.5
917	40	12	28	16	1	Pierre Shale-Middle Member	7	40	NA
918	240	15	240	225	0.0033	Pierre Shale-Middle Member	0	240	28
932	100	8	95	87	0.25	Pierre Shale-Middle Member	0	100	0-53
933	145	50	145	95	0.11	Pierre Shale-Middle Member	0	145	80
934	113	25	100	75	0.05	Pierre Shale-Middle Member	3	113	10-12
935	350	40	350	310	0.01	Pierre Shale-Middle Member	16	350	125
938	360	35	340	305	0.01	Pierre Shale-Middle Member	3	360	115
944	80	12	80	68	0.04	Pierre Shale-Middle Member	16	80	70
1041	40	10	25	15	0.33	Pierre Shale-Middle Member	5	40	25-30
1042	20	11	20	9	1.33	Pierre Shale-Middle Member	7	20	9
1043	100	10	80	70	0.04	Pierre Shale-Middle Member	15	100	15
1047	340	10	320	310	0.04	Pierre Shale-Middle Member	55	400	258
1076	190	40	190	150	0.07	Pierre Shale-Middle Member	11	190	180
159	235	40	235	195	0.02	Pierre Shale-Hygiene Sandstone Member	18	235	70
122	30	6	15	9	1.33	Pierre Shale-Lower Member	2	30	NA
185	70	17	20	3	1.67	Pierre Shale-Lower Member	4	70	14
186	23	1.5	10.5	9	2.22	Pierre Shale-Lower Member	8	23	18-23
328	40	26	36	10	1.50	Pierre Shale-Lower Member	10	40	33
329	30	17	18	1	5	Pierre Shale-Lower Member	8	30	NA

429	1855	75	810	735	0.06	Pierre Shale-Lower Member	900	1855	1370-1420
846	540	30	540	510	0.01	Pierre Shale-Lower Member	4	540	60
884	25	2.6	10.8	8.2	0.37	Pierre Shale-Lower Member	0	25	NA
919	60	8	50	42	0.24	Pierre Shale-Lower Member	0	60	42-60
920	34	13	19	6	1.50	Pierre Shale-Lower Member	6	34	NA
921	50	25	50	25	0.20	Pierre Shale-Lower Member	20	50	NA
922	443	43	430	387	0.03	Pierre Shale-Lower Member	20	443	185
923	310	36	300	264	0.06	Pierre Shale-Lower Member	20	310	160
924	603	35	603	568	0.02	Pierre Shale-Lower Member	20	603	420
1039	400	80	400	320	0.001	Pierre Shale-Lower Member	6	400	80
1045	100	14	100	86	0.23	Pierre Shale-Lower Member	12	100	18
170	135	120	NA	89.91	0.022	Niobrara Formation	45	135	NA
841	300	6	163	157	0.04	Niobrara Formation	2	300	64
949	460	35	460	425	0.012	Niobrara Formation	25	460	25
975	185	35	185	150	0.047	Niobrara Formation	9	185	120
458	420	70	420	350	0.04	Niobrara Formation	17	420	220
653	150	5	20	15	2.4	Niobrara-Smoky Hill Shale Member	2	150	NA
940	455	30	450	420	0.0024	Niobrara-Smoky Hill Shale Member	9	455	120
943	320	60	320	260	0.01	Niobrara-Smoky Hill Shale Member	8	320	160
948	285	220	285	65	0.015	Niobrara-Smoky Hill Shale Member	22	285	NA
980	45	13	30	17	0.765	Niobrara-Smoky Hill Shale Member	2	45	NA
981	140	13	140	127	0.157	Niobrara-Smoky Hill Shale Member	6	140	117
982	290	50	290	240	0.013	Niobrara-Smoky Hill Shale Member	17	290	110
994	130	26	130	104	0.019	Niobrara-Smoky Hill Shale Member	NA	NA	110
997	500	60	500	440	0.017	Niobrara-Smoky Hill Shale Member	11	500	270
834	50	20	50	30	0.267	Niobrara-Fort Hays Limestone Member	16	50	22
941	175	70	175	105	0.03	Niobrara-Fort Hays Limestone Member	10	175	145
942	505	100	505	405	0.04	Niobrara-Fort Hays Limestone Member	16	505	245
10	400	3	400	397	0.15	Carlile, Graneros, Nowry Shale	230	400	230-240
74	200	4	110	106	0.03	Carlile, Graneros, Nowry Shale	101	200	101
76	200	40	200	160	0.31	Carlile, Graneros, Nowry Shale	2	200	70
124	375	375	375	0	#DIV/0!	Carlile, Graneros, Nowry Shale	5	375	NA
149	620	0	NA	412.92	0.12	Carlile, Graneros, Nowry Shale	400	620	NA
171	505	50	505	455	0.01	Carlile, Graneros, Nowry Shale	12	505	480
182	100	60	100	40	0.3	Carlile, Graneros, Nowry Shale	12	100	91
359	300	16	250	234	0.02	Carlile, Graneros, Nowry Shale	2	300	NA
445	250	0	120	120	0.13	Carlile, Graneros, Nowry Shale	5	250	215
446	200	50	185	135	0.07	Carlile, Graneros, Nowry Shale	4	200	80
447	350	5	350	345	0.043	Carlile, Graneros, Nowry Shale	22	350	315
448	380	55	380	325	0.037	Carlile, Graneros, Nowry Shale	1	380	320
449	300	20	300	280	0.05	Carlile, Graneros, Nowry Shale	15	300	77
450	400	60	400	340	0.02	Carlile, Graneros, Nowry Shale	0	400	325
451	300	100	300	200	0.07	Carlile, Graneros, Nowry Shale	2	300	250

459	60	28	38	10	1.50	Carlile, Graneros, Nowry Shale	2	60	NA
594	245	110	240	130	0.05	Carlile, Graneros, Nowry Shale	5	245	NA
595	310	100	310	210	0.57	Carlile, Graneros, Nowry Shale	0	310	260
599	300	57	280	223	0.07	Carlile, Graneros, Nowry Shale	8	300	170
600	200	8	200	192	0.04	Carlile, Graneros, Nowry Shale	2	200	150
601	300	15	280	265	0.05	Carlile, Graneros, Nowry Shale	0	300	180
602	600	400	400	0	#DIV/0!	Carlile, Graneros, Nowry Shale	30	600	480
606	320	10	320	310	0.03	Carlile, Graneros, Nowry Shale	0	320	93
608	300	61	300	239	0.19	Carlile, Graneros, Nowry Shale	0	300	91
610	500	10	500	490	0.06	Carlile, Graneros, Nowry Shale	0	500	80
614	400	20	400	380	0.03	Carlile, Graneros, Nowry Shale	0	400	215
615	180	8	180	172	0.22	Carlile, Graneros, Nowry Shale	0	180	156
635	72	6	50	44	0.068	Carlile, Graneros, Nowry Shale	6	72	16-43
644	275	19	99	80	0.19	Carlile, Graneros, Nowry Shale	13	275	80
650	150	15	20	5	3	Carlile, Graneros, Nowry Shale	5	150	25
881	740	10	740	730	0.016	Carlile, Graneros, Nowry Shale	0	740	620-660
882	380	0	200	200	0.075	Carlile, Graneros, Nowry Shale	4	380	285
883	730	10	680	670	0.009	Carlile, Graneros, Nowry Shale	0	730	40
939	120	30	120	90	0.06	Carlile, Graneros, Nowry Shale	10	120	85
1026	410	35	250	215	0.003	Carlile, Graneros, Nowry Shale	12	320	50
1027	290	52	213	161	0.09	Carlile, Graneros, Nowry Shale	5	300	95
1046	495	50	490	440	0.00	Carlile, Graneros, Nowry Shale	17	495	97
1067	320	10	300	290	0.04	Carlile, Graneros, Nowry Shale	10	320	235
1068	240	17	220	203	0.03	Carlile, Graneros, Nowry Shale	3	240	118
1072	305	0	305	305	0.03	Carlile, Graneros, Nowry Shale	15	305	265-305
1073	145	35	145	110	0.09	Carlile, Graneros, Nowry Shale	17	145	38
1074	245	3	245	242	0.04	Carlile, Graneros, Nowry Shale	16	245	60
1075	260	0	246	246	0.06	Carlile, Graneros, Nowry Shale	4	260	4-221
1096	600	22.5	30	7.5	1.88	Carlile, Graneros, Nowry Shale	24	600	450
1097	400	100	400	300	0.01	Carlile, Graneros, Nowry Shale	10	400	320
55	260	15	260	245	0.053	Carlile, Graneros, Nowry Shale	25	260	75
844	440	10	420	410	0.02	Benton Shale	36	440	205
950	600	80	600	520	0.004	Benton Shale	2	600	340
951	120	30	120	90	0.067	Benton Shale	4	120	45
973	80	40	80	40	0.025	Benton Shale	13	80	60
974	200	20	175	155	0.052	Benton Shale	3	200	178-189
979	40	10	18	8	1.25	Benton Shale	7	40	20-32
986	150	50	145	95	0.053	Benton Shale	19	150	16
989	305	12	305	293	0.007	Benton Shale	14	305	170
990	245	6	225	219	0.032	Benton Shale	16	245	120
992	200	35	195	160	0.031	Benton Shale	25	200	155
7	29	10	12	2	18	Dakota-South Platte Formation	2	29	NA
23	320	75	320	245	0.29	Dakota-South Platte Formation	32	320	67

28	225	3	225	222	0.20	Dakota-South Platte Formation	45	225	185
79	500	5	500	495	0.09	Dakota-South Platte Formation	225	500	420
83	400	60	400	340	0.021	Dakota-South Platte Formation	255	400	260
92	540	15	540	525	0.01	Dakota-South Platte Formation	17	540	150
137	290	18	290	272	0.05	Dakota-South Platte Formation	4	290	70
188	560	240	560	320	0.04	Dakota-South Platte Formation	460	560	460-560
835	660	359	660	301	0.025	Dakota-South Platte Formation	0	660	463
842	440	7	422	415	0.02	Dakota-South Platte Formation	15	440	85
843	400	10	305	295	0.03	Dakota-South Platte Formation	2	400	260
845	470	121	470	349	0.04	Dakota-South Platte Formation	12	470	452-456
954	125	15	110	95	0.16	Dakota-South Platte Formation	11	125	11
960	110	30	110	80	0.050	Dakota-South Platte Formation	12	110	78
961	250	25	250	225	0.022	Dakota-South Platte Formation	16	250	90
972	140	30	140	110	0.064	Dakota-South Platte Formation	8	140	60
978	400	41	400	359	0.021	Dakota-South Platte Formation	5	400	165
985	90	25	85	60	0.12	Dakota-South Platte Formation	15	90	NA
991	250	20	250	230	0.02	Dakota-South Platte Formation	11	250	12
993	125	100	125	25	0.2	Dakota-South Platte Formation	NA	NA	NA
996	400	13	25	12	1.25	Dakota-South Platte Formation	21	400	300
1025	320	80	320	240	0.04	Dakota-South Platte Formation	1	320	165
131	352	30	111	81	0.37	Dakota-Plainview Sandstone Member	14	352	111
135	200	0	190	190	0.08	Dakota-Plainview Sandstone Member	108	200	108-200
136	200	10	200	190	0.04	Dakota-Plainview Sandstone Member	15	200	27
866	400	100	400	300	0.083	Dakota-Plainview Sandstone Member	0	400	215
867	395	130	395	265	0.038	Dakota-Plainview Sandstone Member	0	395	140
869	500	153	482	329	0.030	Dakota-Plainview Sandstone Member	0	500	450
870	580	220	580	360	0.042	Dakota-Plainview Sandstone Member	7	580	165
872	560	170	560	390	0.026	Dakota-Plainview Sandstone Member	1	560	176
873	710	290	585	295	0.024	Dakota-Plainview Sandstone Member	0	710	674
876	800	280	800	520	0.014	Dakota-Plainview Sandstone Member	0	800	800
880	480	52	400	348	0.034	Dakota-Plainview Sandstone Member	10	480	80
937	300	100	280	180	0.33	Dakota-Plainview Sandstone Member	10	300	280
947	200	75	200	125	0.048	Dakota-Plainview Sandstone Member	10	200	183
984	235	30	235	205	0.020	Dakota-Plainview Sandstone Member	0	235	185
1019	400	20	360	340	0.02	Dakota-Plainview Sandstone Member	1	400	270
1020	500	180	500	320	0.03	Dakota-Plainview Sandstone Member	6	500	430
1023	80	20	80	60	0.23	Dakota-Plainview Sandstone Member	6	80	60
1060	300	125	284	159	0.05	Dakota-Plainview Sandstone Member	3	300	220
1062	245	50	100	50	0.16	Dakota-Plainview Sandstone Member	15	245	220
1063	340	160	340	180	0.08	Dakota-Plainview Sandstone Member	223	340	240
1066	320	80	320	240	0.08	Dakota-Plainview Sandstone Member	14	320	250-265
1078	600	281	580	299	0.02	Dakota-Plainview Sandstone Member	11	600	140-170
109	95	30	95	65	0.23	Dakota-Plainview Sandstone Member	8	95	80

8	465	193	465	272	0.11	Dakota-Lytle Formation	347	465	347-352
35	300	140	300	160	0.09	Dakota-Lytle Formation	15	300	NA
77	60	35	60	25	0.6	Dakota-Lytle Formation	6	60	44
81	300	48	300	252	0.04	Dakota-Lytle Formation	20	300	NA
82	76	NA	NA	50.62	0.99	Dakota-Lytle Formation	2	76	NA
88	400	30	400	370	0.04	Dakota-Lytle Formation	345	400	345-360
130	182	88.4	90	1.6	8.75	Dakota-Lytle Formation	15	180	NA
165	35	12	35	23	8.70	Dakota-Lytle Formation	5	35	NA
836	460	121	440	319	0.03	Dakota-Lytle Formation	3	460	3
868	140	73	135	62	0.11	Dakota-Lytle Formation	29	140	72
952	140	1	140	139	0.108	Dakota-Lytle Formation	13	140	50
977	120	21	120	99	0.303	Dakota-Lytle Formation	0	120	30
988	255	40	100	60	0.12	Dakota-Lytle Formation	4	255	237
1064	395	70	395	325	0.01	Morrison Formation	20	395	60
1082	565	450	565	115	0.02	Morrison Formation	3	565	175
12	200	0	200	200	0.5	Morrison Formation	130	200	145
31	355	236	355	119	0.13	Morrison Formation	70	355	175
72	395	50	100	50	0.3	Morrison Formation	20	395	177
73	125	60	NA	83.25	0.07	Morrison Formation	5	125	NA
89	450	20	450	430	0.03	Morrison Formation	250	450	250
93	395	25	400	375	0.02	Morrison Formation	85	400	110
95	160	30	155	125	0.06	Morrison Formation	45	160	NA
105	280	45	280	235	0.21	Morrison Formation	28	280	230-280
138	120	9	120	111	0.14	Morrison Formation	18	120	22
146	245	131	245	114	0.13	Morrison Formation	80	245	180-190
596	400	60	400	340	0.03	Morrison Formation	250	400	255
612	500	15	500	485	0.01	Morrison Formation	246	500	442
634	124	32	88	56	0.071	Morrison Formation	6	124	40-124
875	650	445	620	175	0.03	Morrison Formation	0	650	624-631
877	750	435	490	55	0.07	Morrison Formation	12	750	690
878	700	300	700	400	0.025	Morrison Formation	0	700	670-700
945	360	75	360	285	0.02	Morrison Formation	4	360	200
959	130	40	130	90	0.11	Morrison Formation	20	130	90
970	120	75	120	45	0.33	Morrison Formation	3	120	96
1018	250	70	250	180	0.03	Morrison Formation	0	250	170
1024	480	70	480	410	0.004	Morrison Formation	50	480	70
1048	440	158	440	282	0.02	Morrison Formation	2	440	270
1057	260	125	240	115	0.06	Morrison Formation	10	260	170
1061	260	100	255	155	0.05	Morrison Formation	40	260	200-230
1065	220	40	220	180	0.02	Morrison Formation	15	220	90
1069	365	4	360	356	0.07	Morrison Formation	28	365	68
1070	460	290	450	160	0.04	Morrison Formation	3	450	195
1071	390	300	390	90	0.11	Morrison Formation	125	390	NA

1083	305	66	305	239	0.03	Morrison Formation	155	305	200
1085	235	60	235	175	0.01	Morrison Formation	3	235	NA
1086	260	80	200	120	0.13	Morrison Formation	50	260	150
1090	450	180	450	270	0.06	Morrison Formation	15	450	130
1095	400	137	231	94	0.21	Morrison Formation	2	400	72
11	380	50	380	330	0.61	Jelm Formation	269	380	368
14	375	0	375	375	0.27	Jelm Formation	60	375	320
33	320	60	320	260	0.03	Jelm Formation	5	320	275
37	80	3	80	77	0.16	Jelm Formation	8	80	65
40	250	30	180	150	0.1	Jelm Formation	2	250	140
42	260	100	260	160	0.19	Jelm Formation	5	260	177
60	115	40	115	75	0.067	Jelm Formation	0	115	95
75	80	60	80	20	0.35	Jelm Formation	4	80	80
110	400	86	400	314	0.01	Jelm Formation	90	400	220
179	725	23	500	477	0.01	Jelm Formation	NA	NA	NA
183	400	7	264	257	0.051	Jelm Formation	235	400	239
189	300	30	300	270	0.278	Jelm Formation	30	300	70
613	240	50	240	190	0.21	Jelm Formation	36	240	50
617	40	15	25	10	4.7	Jelm Formation	5	80	NA
618	160	50	160	110	0.073	Jelm Formation	65	160	110
628	164	4	150	146	0.034	Jelm Formation	8	164	4
636	325	175	320	145	0.034	Jelm Formation	5	325	175
646	240	100	240	140	0.11	Jelm Formation	2	240	147
837	400	201	350	149	0.09	Jelm Formation	22	400	250
864	111	63.5	70	6.5	2.31	Jelm Formation	6	111	84-111
865	144	40	95	55	0.09	Jelm Formation	10	144	117-144
936	340	120	340	220	0.05	Jelm Formation	14	340	292
946	440	100	425	325	0.02	Jelm Formation	2	440	225
962	270	20	240	220	0.068	Jelm Formation	3	270	170
971	180	30	175	145	0.083	Jelm Formation	6	180	100
13	200	50	200	150	0.23	Lykins Formation	8	200	154
20	400	25	400	375	0.035	Lykins Formation	5	400	268
21	355	40	250	210	0.071	Lykins Formation	3	355	230
26	700	333	700	367	0.03	Lykins Formation	470	700	645-675
29	320	50	320	270	0.06	Lykins Formation	220	320	NA
39	340	2	340	338	0.021	Lykins Formation	76	340	241
41	62	20	62	42	1.9	Lykins Formation	18	62	30
44	180	19	180	161	0.062	Lykins Formation	12	180	12
46	1400	90	1400	1310	0.005	Lykins Formation	1200	1400	1300
48	600	150	600	450	0.033	Lykins Formation	70	600	310
50	400	120	390	270	0.02	Lykins Formation	168	400	168
51	190	130	190	60	0.08	Lykins Formation	14	190	182-186
54	680	300	663	452.88	0.018	Lykins Formation	400	680	NA

56	780	445	770	325	0.03	Lykins Formation	260	780	720
57	140	30	140	110	0.11	Lykins Formation	18	140	65
59	650	212	510	298	0.050	Lykins Formation	15	650	NA
63	300	80	300	220	0.05	Lykins Formation	10	300	150
66	82	27	32	5	10	Lykins Formation	25	82	32
70	215	40	215	175	0.07	Lykins Formation	15	215	175
71	200	17	200	183	0.08	Lykins Formation	37	200	130
78	180	30	180	150	0.02	Lykins Formation	3	180	100
80	580	160	580	420	0.02	Lykins Formation	34	580	166
85	520	5	500	495	0.03	Lykins Formation	180	520	160
86	390	230	400	170	0.06	Lykins Formation	5	400	365-380
87	600	390	555	165	0.02	Lykins Formation	90	600	425
94	725	330	725	395	0.01	Lykins Formation	160	725	20
97	290	60	290	230	0.01	Lykins Formation	80	290	225
98	145	105	128	23	0.26	Lykins Formation	40	145	NA
99	200	160	NA	133.2	0.045	Lykins Formation	5	200	NA
104	300	29	300	271	0.03	Lykins Formation	12	300	236
107	218	54	143	89	0.01	Lykins Formation	10	218	143
126	90	40	90	50	0.14	Lykins Formation	14	90	70
127	335	175	335	160	0.04	Lykins Formation	125	335	310
128	600	275	600	325	0.02	Lykins Formation	12	600	539
129	380	252	360	108	0.06	Lykins Formation	230	380	180-200
132	440	204	440	236	0.06	Lykins Formation	236	440	236
139	130	6	130	124	0.20	Lykins Formation	2	130	62
142	600	280	600	320	0.02	Lykins Formation	17	600	290
143	700	205	645	440	0.01	Lykins Formation	135	700	490
144	500	150	500	350	0.03	Lykins Formation	30	500	225
145	100	10	70	60	0.17	Lykins Formation	2	100	23-25
166	60	20	20	0	#DIV/0!	Lykins Formation	3	60	NA
167	160	41	200	159	0.25	Lykins Formation	13	200	60
168	260	55	260	205	0.07	Lykins Formation	7	260	180
180	135	54	85	31	0.65	Lykins Formation	50	135	NA
181	113	30	113	83	0.48	Lykins Formation	0	120	30
184	760	120	760	640	0.02	Lykins Formation	554	760	554
187	350	115	257	142	0.11	Lykins Formation	40	350	257
352	140	70	140	70	0.21	Lykins Formation	0	140	90
358	147	97	147	50	0.24	Lykins Formation	2	147	NA
452	280	40	260	220	0.06	Lykins Formation	0	300	177
597	800	600	747	147	0.03	Lykins Formation	180	800	470
598	600	400	400	0	#DIV/0!	Lykins Formation	140	600	480
616	100	23	90	67	0.07	Lykins Formation	4	100	4
624	135	35	60	25	0.72	Lykins Formation	16	135	NA
625	200	30	195	165	0.0909	Lykins Formation	2	200	120

626	560	195	560	365	0.0137	Lykins Formation	0	560	250
629	215	18	215	197	0.076	Lykins Formation	18	215	170
630	130	31	90	59	0.085	Lykins Formation	0	130	90
631	100	15	100	85	0.88	Lykins Formation	5	100	80
638	117	40	95	55	0.55	Lykins Formation	0	117	NA
641	60	9	23	14	0.71	Lykins Formation	3	60	NA
655	220	30	200	170	0.06	Lykins Formation	2	220	52
656	43	5	8.5	3.5	3.43	Lykins Formation	2	43	25-43
838	460	56	460	404	0.03	Lykins Formation	9	460	162-200
871	440	70	435	365	0.04	Lykins Formation	11	440	208
874	700	150	680	530	0.01	Lykins Formation	0	300	NA
879	400	134	380	246	0.028	Lykins Formation	0	400	55
953	100	30	100	70	0.21	Lykins Formation	26	100	55
956	120	10	115	105	0.14	Lykins Formation	12	120	65
957	55	20	55	35	0.57	Lykins Formation	18	55	35
958	60	10	60	50	0.1	Lykins Formation	12	60	28
963	470	70	465	395	0.00	Lykins Formation	18	470	300
964	160	20	160	140	0.43	Lykins Formation	9	160	50
965	140	20	140	120	0.13	Lykins Formation	4	140	120
966	120	10	120	110	0.11	Lykins Formation	6	120	105
969	400	120	400	280	0.025	Lykins Formation	4	400	140
976	50	40	50	10	0.300	Lykins Formation	25	50	NA
995	235	40	235	195	0.041	Lykins Formation	15	235	100
998	80	48	75	27	0.37	Lykins Formation	5	80	NA
1004	145	85	145	60	0.13	Lykins Formation	18	145	110
1005	155	40	155	115	0.061	Lykins Formation	4	155	120
1006	395	25	395	370	0.027	Lykins Formation	10	395	NA
1007	480	0	200	200	0.075	Lykins Formation	6	480	320
1008	340	45	340	295	0.034	Lykins Formation	3	340	45
1009	33	15	33	18	0.56	Lykins Formation	12	33	25
1010	300	15	300	285	0.018	Lykins Formation	2	300	190
1013	360	5	325	320	0.031	Lykins Formation	15	360	135
1014	140	35	135	100	0.13	Lykins Formation	8	140	60-80
1021	520	240	520	280	0.02	Lykins Formation	19	520	475
1049	440	220	440	220	0.03	Lykins Formation	10	440	325-330
1052	650	154	650	496	0.01	Lykins Formation	25	650	348
1055	300	300	300	0	#DIV/0!	Lykins Formation	3	300	130
1056	280	72	280	208	0.03	Lykins Formation	6	280	264-280
1058	890	560	890	330	0.03	Lykins Formation	184	890	560-600
1077	600	300	600	300	0.05	Lykins Formation	17	600	592-594
1081	300	60	280	220	0.02	Lykins Formation	15	300	264-268
1087	390	50	200	150	0.05	Lykins Formation	15	170	110
1094	750	350	750	400	0.03	Lykins Formation	70	750	350

9	300	0	300	300	0.20	Lyons Formation	11	300	246
30	305	280	305	25	0.80	Lyons Formation	50	305	280
32	400	200	400	200	0.05	Lyons Formation	15	400	180-200
45	400	120	400	280	0.071	Lyons Formation	160	340	200
47	540	80	540	460	0.026	Lyons Formation	172	540	195
64	125	30	125	95	0.11	Lyons Formation	8	125	55
68	200	35	180	145	0.241	Lyons Formation	53	200	80
101	450	124	430	306	0.018	Lyons Formation	50	450	280
106	400	85	400	315	0.05	Lyons Formation	200	400	220
133	200	90	190	100	0.15	Lyons Formation	0	200	140
134	185	145	185	40	0.38	Lyons Formation	145	185	145-150
147	540	410	540	130	0.12	Lyons Formation	104	540	480
148	600	270	600	330	0.01	Lyons Formation	40	600	490-505
161	500	380	500	120	0.02	Lyons Formation	50	500	380-400
353	205	35	205	170	0.08	Lyons Formation	0	205	45
355	205	28	80	52	0.19	Lyons Formation	17	205	80
453	400	40	400	360	0.001	Lyons Formation	0	400	40
456	200	90	200	110	0.06	Lyons Formation	70	500	150
623	170	15	160	145	0.083	Lyons Formation	4	170	60
840	280	60	265	205	0.06	Lyons Formation	5	280	187-215
863	84	44	55	11	1.36	Lyons Formation	10	84	44
968	115	80	115	35	0.14	Lyons Formation	0	115	NA
999	250	30	245	215	0.060	Lyons Formation	0	250	NA
1000	55	16	55	39	0.308	Lyons Formation	8	55	35
1001	165	40	160	120	0.058	Lyons Formation	4	145	75
1003	350	20	350	330	0.030	Lyons Formation	4	350	300
1017	125	10	120	110	0.027	Lyons Formation	18	125	80
1050	220	75	220	145	0.10	Lyons Formation	0	220	185
1053	220	108	220	112	0.07	Lyons Formation	7	220	182
1054	200	60	185	125	0.06	Lyons Formation	65	200	165-177
1079	600	135	600	465	0.01	Lyons Formation	364	600	476-484
1080	700	375	700	325	0.01	Lyons Formation	280	700	610
1084	205	150	205	55	0.11	Lyons Formation	12	205	180
1088	275	50	275	225	0.07	Lyons Formation	6	275	200
1089	197	117	197	80	0.01	Lyons Formation	1	197	147
1091	135	80	135	55	0.13	Lyons Formation	10	135	118
1092	210	160	210	50	0.20	Lyons Formation	18	210	190
1100	700	260	280	20	0.15	Lyons Formation	0	700	280
22	280	80	280	200	0.12	Owl Canyon Formation	3	280	240
49	400	100	400	300	0.03	Owl Canyon Formation	205	400	205
103	440	160	420	260	0.02	Owl Canyon Formation	100	440	NA
141	230	190	230	40	0.63	Owl Canyon Formation	23	230	198
162	280	25	280	255	0.02	Owl Canyon Formation	15	280	64

455	500	150	500	350	0.11	Owl Canyon Formation	0	200	125
639	65	20	65	45	0.33	Owl Canyon Formation	14	65	25
955	69	50	69	19	0.37	Owl Canyon Formation	30	69	NA
967	170	60	170	110	0.073	Owl Canyon Formation	4	170	143
1051	265	0	50	50	0.30	Owl Canyon Formation	12	265	200
1093	400	6	400	394	0.04	Owl Canyon Formation	47	400	240
1099	260	136	250	114	0.02	Owl Canyon Formation	3	260	240
15	400	145	400	255	0.24	Ingleside Formation	125	400	352
16	390	120	390	270	0.09	Ingleside Formation	2	390	250
18	350	150	330	180	0.056	Ingleside Formation	2	330	135
19	500	90	500	410	0.024	Ingleside Formation	3	500	375
24	300	10	320	310	0.05	Ingleside Formation	7	325	280
25	401	80	400	320	0.03	Ingleside Formation	3	400	265
27	500	200	500	300	0.07	Ingleside Formation	250	500	465
34	600	240	600	360	0.04	Ingleside Formation	312	600	546
36	65	30	65	35	0.43	Ingleside Formation	18	65	50
38	400	160	400	240	0.029	Ingleside Formation	95	400	195
43	280	50	280	230	0.043	Ingleside Formation	205	280	205
52	500	110	500	390	0.01	Ingleside Formation	1	500	240
53	420	325	420	95	0.11	Ingleside Formation	135	420	325
58	100	22	60	38	0.39	Ingleside Formation	13	100	13-100
65	123	25	60	35	0.86	Ingleside Formation	5	123	78
69	33	4	16	12	1.7	Ingleside Formation	10	33	4
84	150	100	150	50	0.6	Ingleside Formation	3	150	127
96	190	99	202	103	0.10	Ingleside Formation	9	190	150
102	374	153.8	234	80.2	0.77	Ingleside Formation	220	374	140
140	450	75	450	375	0.03	Ingleside Formation	235	450	433-438
163	50	45	50	5	0.60	Ingleside Formation	9	50	NA
190	500	60	500	440	0.14	Ingleside Formation	5	500	90
356	250	160	248	88	0.02	Ingleside Formation	109	250	205
454	320	180	320	140	0.01	Ingleside Formation	6	320	180
457	245	15	245	230	0.07	Ingleside Formation	14	245	240
632	220	70	220	150	0.087	Ingleside Formation	6	220	167
640	155	35	54	19	15.79	Ingleside Formation	5	175	NA
654	65	21	65	44	0.34	Ingleside Formation	16	65	25
839	265	80	160	80	0.18	Ingleside Formation	4	265	215
1002	300	38	285	247	0.028	Ingleside Formation	5	300	100
1011	330	128	330	202	0.059	Ingleside Formation	145	330	273-279
1012	350	240	350	110	0.182	Ingleside Formation	234	350	329-336
1015	100	25	100	75	0.09	Ingleside Formation	25	100	55
1016	185	85	150	65	0.15	Ingleside Formation	4	185	90
1098	620	30	600	570	0.01	Ingleside Formation	50	620	200

Map No	The Name of the Map
1	East of Fort Collins Map
2	The Table Mountain Quadrangle Map
3	The Livermore Quadrangle Map
4	The Laporte Quadrangle Map
5	The Horsetooth Reservoir Quadrangle Map
6	The Masonville Quadrangle Map
7	The Carter Lake reservoir Quadrangle Map