Mayfield Town Park Well
Drinking Water
Source Protection Plan #6

Perry Holland
December 2000
This project, by Perry Joseph Holland, is accepted in its present form by the Department of Civil and Environmental Engineering of Brigham Young University as satisfying the project requirement for the degree Master of Science.

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1 December 2000
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MAYFIELD TOWN

DRINKING WATER SOURCE PROTECTION PLAN #6

PARK WELL

EXECUTIVE SUMMARY

In 1998, a change application (see appendix A) was submitted by Mayfield Town to the Utah State Division of Water Rights that gave the town of Mayfield the right to divert their entire decreed flow (3.246 cfs or 968.98 ac-ft) from any of their existing sources. The application included a proposal to add a new well to Mayfield Town’s system.

As a result of the change application, Mayfield Town proposed the drilling of a new 16” culinary well as an additional water source. The purpose of the well is to provide reliability and stability to Mayfield’s water sources and distribution system. The well will also provide the extra water needed to supplement the growth projected for the town of Mayfield. The new well is located on town property in the town park and will be referred to as the “Park Well” to distinguish it from the existing town well.

The location of the well near Twelve Mile Creek is an ideal location for the well as it will be able to take advantage of the underflow aquifer of the Twelve Mile Creek. The well will also draw water from a fractured limestone formation that is located underneath the underflow aquifer of Twelve Mile Creek. Drill logs as well as soil analyses indicate that the aquifer is unconfined.

A Preliminary Evaluation Report was submitted and approved by the Division of Drinking Water for the Park Well. This report defined the aquifer parameters using the best technical information available. The report also identified the potential contamination sources in the project area and the hazards associated with these sources. The 16” diameter well was constructed and included stainless steel screens and gravel pack to prevent the movement of fines into the well. The final well depth is 400 feet. The top 100 feet of the well was grouted to protect the well from surface contamination. The purpose of this source protection plan is to update the delineation report using the actual aquifer parameters and to provide a plan that the Town of Mayfield can use to protect the well.

Potential contamination sources do exist within each of the four protection zones. Despite the presence of these sources, contamination of this source would be unlikely due to the depth of the well, the care that will be taken in constructing the well and the preventative measures that will be taken to keep potential contamination sources out of zones 1 and 2 and to manage the existing sources within these zones.
1.0 INTRODUCTION

With the addition of the Park Well, Mayfield Town has a water system that uses four springs and two wells as its primary water sources. The Park Well increases the town’s source capacity and will help to stabilize the water system. The increased source capacity will also facilitate future development in the town of Mayfield.

The State requires a Source Protection Plan for all ground-water sources of drinking water that are used by public water systems. This Source Protection Plan was written to meet this requirement for the Park Well. This plan should be the primary means for the Town of Mayfield to protect the Park Well from contamination. This Source Protection Plan includes a delineation report, an inventory and assessment of potential contamination sources, a management program to control existing and future potential contamination sources, an implementation schedule, a resource evaluation, a section on record keeping and a contingency plan.

1.1 System Information

The pertinent information about the system is listed below.

Table 1-Water System Information

<table>
<thead>
<tr>
<th>Water System Name</th>
<th>Mayfield Town Water System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water System Number</td>
<td>20006</td>
</tr>
<tr>
<td>Address</td>
<td>Mayfield, Utah 84643</td>
</tr>
<tr>
<td>Type of System</td>
<td>Community-Political Subdivision</td>
</tr>
</tbody>
</table>

Mayfield’s water system is a public community system and is divided into three different pressure zones. Two pressure-reducing valves (PRV’s) are used to divide the pressure zones. The two upper concrete tanks (150,000 and 100,000 gallons) are used to supply water to the upper and middle zones. The lower zone’s water is supplied by the upper tanks and the two lower concrete tanks (two 50,000 gallons). Water that travels from the upper tanks to the lower pressure zone must pass through the two pressure-reducing valves. Static pressure in the system is maintained between 30-80 psi.

1.2 Source Information

The Park Well has a diameter of 16 inches and is 400 feet deep at the following location:

South 960 feet West 1285 feet from the northeast corner of section 32, Township 19 South, Range 2 East, SLB&M (refer to Figure 1).
The elevation of the Park Well is approximately 5,520 feet above MSL. The well is located on Mayfield Town property (refer to Figure 1).

The water right for the well is found in Application No. A22382. This change application gives the town the right to divert a total of 3.246 cfs or 968.98 ac-ft from all its sources combined or the entire capacity from any one of its sources. The change application also proposes the new well for the town.

The memorandum decision based on this application and related correspondence are included in Appendix A.

1.3 Designated Person

Mayor Doug Bjerregaard, mayor of Mayfield, is the contact person for the town. Mayor Bjerregaard is coordinating all work regarding the improvements project, including the development of this well. Technical support for matters concerning the Park Well was provided by Franson-Noble & Associates, Inc., a consulting engineering firm located in American Fork. Detailed information for the contacts is as follows:

Doug Bjerregaard, Mayfield Town Mayor
P.O. Box 541
Mayfield, UT 84643
Telephone (Home): (435) 528-3255
Fax: (435) 528-7335

J. Paul Wright, P.E., Staff Engineer
Franson-Noble & Associates, Inc.
776 East Utah Valley Drive
American Fork, Utah
Telephone: (801) 756-0309
Fax: (801) 756-0481
2.0 Delineation Report

2.1 Geologic Data-R309-113-9(5)(a)(I)

1. **Introduction:** The Town of Mayfield is located 10 miles southwest of Manti. The town lies at the mouth of Twelve-Mile Creek Canyon. The canyon is about 3500 feet wide at the mouth and runs in an east-west direction until it crosses the Arapien Valley at the mouth of the canyon. The Arapien Valley (about 4300 feet wide at Mayfield) runs in a north-south direction and separates the Wasatch Plateau mountain range from the White Hills. The Wasatch Plateau mountain range is located just east of Mayfield while the White Hills are located west of Mayfield. Twelve-Mile Creek runs in a westerly direction just north of town and across the Arapien Valley.

2. **Stratigraphy:** The town of Mayfield is dominated by three geologic units: slope wash, coalesced alluvial fan deposits, alluvium and the Green River Formation. These units are seen on the geologic map of the Manti 30' x 60' quadrangle (Figure 2).

   A. **Slope Wash (Quaternary):** The slope wash is the major geologic unit of the Arapien Valley. This formation consists mainly of unconsolidated to semi-consolidated clay, silt, sand and gravel (Witkind and Others). The unit is made up primarily of fluvial sediments and is thin in some places but can be as thick as 25 feet. The formation is faintly cross-bedded. The aquifer composition on the eastern border of the Arapien Valley may be the limestone unit of the Green River Formation. The driller's log of the town's existing well shows a broken limestone unit that is 45 feet underground and at least 250 feet thick. The well lies on the border of the Arapien Valley and the mouth of Twelve-Mile Creek. The majority of the Arapien Valley aquifer consists of the unconsolidated slope wash.

   B. **Coalesced Alluvial Fan Deposits (Quaternary):** This formation dominates Twelve-Mile Creek Canyon located east of Mayfield. It is made up primarily of silt, sand, gravel and sparse boulders. The unit is unconsolidated to semi-consolidated and is commonly cross-bedded (Witkind and Others). The thickness differs but can be as thick as 100 feet. The aquifer unit is made up mainly of the unconsolidated alluvial fan deposits and at greater depths may be composed of the Green River Formation.
DESCRIPTION OF MAP UNITS

QUATERNARY DEPOSITS

ALLUVIUM (HOLOCENE) - Dark brown to gray, fine to thick bedded, sandy, gravelly deposits, covered by plants. Unconsolidated. Contains silt, clay, sand, gravels, pebbles, and gravel cobbles. Fluvial sediments. Forms broad, wide-margined levees. Locally includes higher grades of "silt loams." Thickness ranges widely, commonly less than 15m (50 ft) thick.

COLLUVIUM (HOLOCENE) - Brown to dark brown heterogeneous mixture of fragments of many sizes and shapes which loosely coat slope lower valley walls and accumulate at the base of some steep cliffs. Unconsolidated to semi-consolidated deposits. Thickness ranges from a few centimeters (new and so on) to as much as 15 m (50 ft).

SLOPE WASH (HOLOCENE) - Light to dark gray, fine to thick bedded, terraced, gravelly, likely created from the weathering of exposed bedrock. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms broad, gently sloping sheets. Thickness ranges from a few centimeters to as much as 5 m (15 ft).

ALLUVIAL FAN DEPOSITS (HOLOCENE) - Light brown to dark brown, fine to thick bedded, terraced, gravelly, likely created from the weathering of exposed bedrock. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms broad, gently sloping sheets. Thickness ranges as much as 5 m (15 ft) locally.

LANDSLIDE DEPOSITS (HOLOCENE AND Pleistocene) - Brown to dark brown, gray limestone outwash of fragments of debris and rock. Grains. Temporarily to last three million years. Unconsolidated deposits of debris. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms broad, gently sloping sheets. Thickness ranges as much as 5 m (15 ft) locally.

EARTHFLOW DEPOSITS (HOLOCENE AND Pleistocene) - Brown to dark brown, sand, gravelly, pebbles, cobbles, and boulders. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms broad, gently sloping sheets. Thickness ranges as much as 5 m (15 ft) locally.

MUD-WASHING DEPOSITS (HOLOCENE AND Pleistocene) - Brown to dark brown, heterogeneous mixture of mud, gravel, and sand. Forms broad, gently sloping sheets. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms broad, gently sloping sheets. Thickness ranges as much as 5 m (15 ft) locally.

QUATERNARY AND TERTIARY DEPOSITS

COLLUVIAL ALLUVIAL FAN DEPOSITS (HOLOCENE TO Pleistocene) - Brown to dark brown or gray, fine to thick bedded, common to semi-consolidated, unconsolidated to semi-consolidated. Contains silt, clay, sand, gravel, pebbles, and some pebble. Fluvial sediments. Forms an association of the upper and middle terraces of alluvium.

NORMAL FAULT - Tellico fault known as near side.

SCALE 1:50,000

FROM WITSEND AND OTHERS, 1987

FIGURE 2.
C. Alluvium (Quaternary): The Twelve-Mile Creek is surrounded by this geologic unit. The unit is located on the northern side of Twelve-Mile Creek Canyon. This formation is unconsolidated, consists of clay, silt, sand and gravel and is cross-bedded in some places (Witkind and Others). This layer is typically around 50 feet thick. The aquifer unit in this area is also alluvium but may consist of gravel and boulders that extends more than 165 feet as seen from the well driller’s report (see Appendix A) in the area.

D. Green River Formation (Tertiary): The Wasatch Plateau is made up primarily of the Green River Formation. This formation consists of a limestone unit that is underlain by a shale unit (Witkind and Others). Sandstone and tuff layers are the primary constituents of the limestone unit while the shale unit is dominated by thin green shale layers. The overall thickness of the Green River Formation is reported to be 500-1200 feet.

3. Faults and Fractures: Most of the geologic formations in the area, with the exception of the Green River Formation, consist of unconsolidated material. The Green River Formation is made up of consolidated limestone and shale layers. A well driller’s report of the existing town well indicates that the limestone unit is broken up. Therefore, it is probable that fractures exist in some areas of the Green River Formation. It should be noted however that the driller’s report also indicates that water was found at 145 feet below the ground surface but the static water level was 66 feet below ground surface. This indicates an artesian situation that would also imply that the limestone layer is still semi-consolidated even in its broken-up state. This formation is not evidenced in the Park Well location.

Faulting in the area can be seen on the geologic map of the Manti 30’ x 60’ quadrangle (Figure 2). Four faults are shown in the Green River Formation that run roughly north-south and are spaced anywhere from 800’-2700’ apart. The closest fault is located approximately 1200 feet from the proposed new town well.

2.2 Well Construction Data-R309-113-9(5)(a)(ii) & (iii)

1. Well Construction: The new Mayfield well geology is similar to that found in the well driller’s report of water right 63-1018 (Appendix A). The well will be constructed in accordance with the State of Utah Administrative Rules for Water Wells. For the purpose of writing this report, the construction data will be assumed to be based on State requirements as the well has not yet been constructed.
The new Mayfield well will be 16 inches in diameter. The depth of the well will be between 300 to 500 feet. A slotted screen will be installed and its length will be the same as the aquifer thickness (approximately 250 feet). Gravel pack will be installed around the casing and the casing will be grouted to the ground surface and through the first 100 feet according to current rules and regulations. It is expected that a submersible pump will be installed at a depth of around 300 feet. The maximum desired pumping rate is 1500 gpm.

2.3 Aquifer Data-R309-113-9(5)(a)(iv):

1. Introduction: The new Mayfield town well will draw water from the underflow aquifer located beneath Twelve-Mile Creek. The Twelve-Mile Creek aquifer consists mainly of alluvium. The flow direction of the Twelve-Mile Creek aquifer is from east to west down through the canyon. Twelve-Mile Creek cuts across the Arapien Valley as it continues west. Calculation of the aquifer data was based on the alluvium aquifer that underlies Twelve-Mile Creek.

2. Aquifer Data: The aquifer data calculations were based on a pump test (see Appendix A) that was done on a well that is about 500 feet away from the proposed new well site and is located in the same underflow alluvium aquifer of Twelve-Mile Creek. The pump test reported the specific capacity and the aquifer thickness which was sufficient information to calculate the remaining aquifer characteristics. The hydraulic conductivity was calculated using the equation $k = T/b$ (see Table 1). The average velocity was calculated using the equation $V = k_i/n$ (see Table 1). In order to get the velocity, the hydraulic gradient was estimated using the existing land contours (due to the unconfined nature of the aquifer) in Twelve-Mile Canyon. Also, according to Driscoll (1986), the effective porosity in sand and gravel mixes is between 10-35%. Because of the presence of small amounts of sand, silt and clay, a value of 25% was chosen. The calculated and estimated aquifer data is shown in Table 2 on the next page. Also, a sensitivity analysis was performed to analyze the sensitivity of the protection zones to the different aquifer parameters. This analysis is found in Appendix E.
Table 2-Aquifer Data using existing well data

<table>
<thead>
<tr>
<th>Aquifer Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific Capacity</td>
<td>6.34 gpm/ft</td>
</tr>
<tr>
<td>Transmissivity, (T)</td>
<td>1571 ft²/day</td>
</tr>
<tr>
<td>Hydraulic Conductivity, (k)</td>
<td>9.61 ft/day</td>
</tr>
<tr>
<td>Hydraulic Gradient, (i)</td>
<td>0.0267</td>
</tr>
<tr>
<td>Estimated effective porosity, (n)</td>
<td>25%</td>
</tr>
<tr>
<td>Aquifer Saturated Thickness, (b)</td>
<td>164 ft</td>
</tr>
<tr>
<td>Average Velocity, (V)</td>
<td>1.03 ft/day</td>
</tr>
</tbody>
</table>

The values calculated for the new well seem to agree with the existing data available for the area surrounding Mayfield. Wilberg and Heilweil (1995) estimate the hydraulic conductivity of unconsolidated valley fill material in the Sanpete Valley that is similar to the valley fill in Mayfield to be between 2.5-10.0 feet per day. Also, the source protection plan for the existing Mayfield town well estimated the hydraulic conductivity to be between 2.0-9.6 ft/day. Because the data is similar to existing data and because the values came from a pump test of a well that is about 500 feet away, these values should be reliable.

2.4 Hydrogeologic Methods and Calculations-R309-113-9(5)(a)(vii):

1. **Hydrogeologic Methods**: A computer model called WHPA (Well Head Protection Area) was used to delineate the protection zones. WHPA was developed by the Environmental Protection Agency (EPA) to help engineers delineate well head protection areas. The RESSQC module was chosen because of its capability to model interference between two wells in determining the delineation zones. The Erval Hansen well (modeled at 200 gpm) that is used for irrigation is located about 500 feet away as seen in Figure 3. Hansen’s well has a 127’ screened interval or saturated aquifer thickness. The Park Well will have a 260’ screened interval or saturated aquifer thickness. To calculate the input aquifer properties for the WHPA model taking into account interference between the Park Well and Erval Hansen’s well, an average transmissivity was calculated by using an average saturated aquifer thickness. To be conservative, a saturated aquifer thickness of 200’ for the Park Well was used instead of 260’. The average thickness for the two wells was then calculated to be 164’. The corresponding transmissivity is 1571 ft²/day. Twelve-Mile Creek was modeled as a stream boundary in calculating the protection zones for the new well. The following
parameters are required to run the WHPA model: well discharge rate, transmissivity, hydraulic gradient, porosity, aquifer thickness and travel time. The well discharge rate was estimated to be 115,843 ft³/day (602 gpm). It was calculated by dividing the 968.98 ac-ft water right by 365 days to get a daily flow rate and then converting units to ft³/day. Travel times for zones 2, 3 and 4 are 250 days, 3 years and 15 years respectively. The other aquifer parameters are found in Table 1.

2. Calculations: As described above, the aquifer properties were calculated using the best available data. The hydraulic conductivity and the average velocity were calculated using the equations described in section 2.3.2 above. The delineated protection zones calculated by the WHPA program include the effects of drawdown and also the effects of nearby wells. The well located 500 feet away from the Park Well was modeled together with the Park Well to get the appropriate protection zones.

2.5 Map Showing Boundaries of the DWSP Zones-R309-113-9(5)(a)(viii):

1. Zone Characteristics: The zones determined from the WHPA analysis are shown in Figure 3. These delineated zones take into account the effects of drawdown and the interference from a well that is 500 feet away. The dimensions of the three protection zones can be found in Table 3 below.

<table>
<thead>
<tr>
<th>Zone</th>
<th>Width (ft)</th>
<th>Upstream Distance (ft)</th>
<th>Downstream Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>1040</td>
<td>590</td>
<td>300</td>
</tr>
<tr>
<td>3</td>
<td>1530</td>
<td>2200</td>
<td>315</td>
</tr>
<tr>
<td>4</td>
<td>2360</td>
<td>7300</td>
<td>330</td>
</tr>
</tbody>
</table>

2.6 Protected or Unprotected Aquifer Classification-R309-113-9(3) & (6):

1. Classification: The driller’s report for the well located 500 feet away from the proposed site indicates that the underground geology consists mainly of boulders and gravel. Therefore, the Park Well will have an unprotected aquifer classification.
3.0 THE INVENTORY OF POTENTIAL CONTAMINATION SOURCES

A field review was conducted throughout capture zones 1, 2, 3, and 4 to identify potential contamination sources. The main sources of contamination in the Town of Mayfield are related to agricultural practice.

3.1 List Potential Contamination Sources

Table 4 below includes a list of the potential contamination sources located within the management area.

<table>
<thead>
<tr>
<th>Source Number</th>
<th>Potential Contamination Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Town Park Septic Tank</td>
</tr>
<tr>
<td>2</td>
<td>Dairy Farm</td>
</tr>
<tr>
<td>3</td>
<td>Existing Wells</td>
</tr>
<tr>
<td>4</td>
<td>Agricultural Land</td>
</tr>
<tr>
<td>5</td>
<td>Residential Homes</td>
</tr>
<tr>
<td>6</td>
<td>Farm Equipment/Fuel Storage</td>
</tr>
<tr>
<td>7</td>
<td>Gas Station</td>
</tr>
<tr>
<td>8</td>
<td>Roads</td>
</tr>
</tbody>
</table>

3.2 Identify Hazards

The hazards located at each potential contamination source (PCS) are listed below by PCS category.

1. Town Park Septic Tank - Potential Contamination Source(s) - 1 Hazards -
   Biological: Septic System.

2. Dairy Farm - Potential Contamination Source(s) - 2 Hazards -
   Biological: Manure piles provide a source of contamination that could leach into the groundwater.
Chemical: Chlorine, acid and salts are used to clean the milk processing machinery.

3. Existing Wells (one irrigation and one culinary) - Potential Contamination Source(s) - 3
   **Hazards** -
   Biological: Could be a direct contaminant path into the ground water.

   Chemical: Submersible pumps are located in the wells and could contaminate the water if approved lubricants are not used.

4. Agricultural Lands (Alfalfa) - Potential Contamination Source(s) - 4
   **Hazards** -
   Chemical: Farm equipment is used on the land. The land is also sprayed with pesticides, herbicides, and fertilizers. Manure piles in #1 above are used as a fertilizer. (see Table B-1 in Appendix B).

5. Residential Homes - Potential Contamination Source(s) - 5
   **Hazards** -
   Biological: Septic Systems used in this area on all residential properties.

   Chemical: Use and storage of pesticides, herbicides, and fertilizers for lawn and garden use (see Table B-1 in Appendix B).

6. Farm equipment - Potential Contamination Source(s) - 6
   **Hazards** -
   Chemical: Fuel and lubricant leakage from farm equipment onto the ground surface. Storage of fuel for equipment.

7. Gas Station - Potential Contamination Source(s) - 7
   **Hazards** -
   Chemical: Potential gas spills or leakage at the gas station.

8. Roads - Potential Contamination Source(s) - 8
   **Hazards** -
   Chemical: Potential VOC’s (gas, oil) on the roadway as well as transportation of chemicals through the management area.
Weed abatement/sterilization along the shoulders of the roads with herbicides. (See Appendix B, Table B-1)

3.3 Prioritize the Inventory

The list in Table 3 shows the prioritized inventory of potential contamination sources. The septic tank in the town park was given the highest priority because it is an uncontrolled pollution source and is located in zone 2. Because it is an uncontrolled pollution source, the city will periodically pump the septic tank instead of discharging it into a septic field. The septic tank is in use for only 6 months of the year and is not used often. The city may not need to pump the septic tank if it can be shown that the vertical travel time plus the horizontal travel time of the contamination is greater than 250 days. The horizontal travel time is less than 250 days because the tank is inside zone 2. During the drilling of the well, soil samples will be taken to determine the soil properties necessary (vertical unsaturated hydraulic conductivity) to calculate the vertical travel time of the contamination. If the total travel time is not greater than 250 days, the septic tank will be disconnected from the septic field and sealed off and the sewage will be stored in the septic tank. The tank will be pumped periodically as needed. The dairy farm was given the next highest priority because it is upstream of the well and located in zone 2. Manure piles and a milk processing unit are located on the dairy farm. However, these contamination sources are located outside of zone 2 and thus pose no threat to the Park Well. Existing wells in the area were listed next on the priority because one well is located within zone 2. The agricultural lands were given the fourth priority due to the pesticides and herbicides used to help grow the crops followed by the residential homes in the area that all use septic tanks and chemicals on their yards and gardens. Mayfield Town does not have a sewer system and therefore no sewer lines are found in the town. Farm equipment was the sixth priority because not many of the farmers have a lot of farm equipment. Most of the farms are classified as having 10 animals or less and excessive equipment is not necessary. The gas station is regulated and therefore poses no significant threats. The roads are listed last on the priority list as contamination of the Park Well by these hazards is unlikely.

Although potential contamination sources exist in the management area, the potential for contamination of the groundwater source is relatively low. Most of the higher priority items are located outside of zone 2 and the proposed depth of the well is 400 feet. Both of these factors provide protection to this source of water.

3.4 Potential Contamination Source Location

Figure 4 shows the locations of the potential contamination sources in zones 1, 2, 3 and 4.
3.5 Potential Contamination Sources Plotted on Map

The potential contamination sources are plotted in Figure 4. All potential contamination sources are represented by the symbols shown in the legend. Because most of the farms are small, large amounts of farm equipment do not exist on most of the agricultural lands. A land ownership map for zones 1, 2, 3 and 4 is shown in Figure 5. Because the aquifer has been classified as being unprotected, no uncontrolled pollution sources can be located on properties within zones 1 and 2. There are no uncontrolled pollution sources located in zones 1 and 2 with the exception of a septic tank located in the town park. This potential contamination source will be handled as described in section 3.3. See Appendix C for a list of landowners who own property within zones 1 and 2.
4.0 ASSESSMENT OF POTENTIAL CONTAMINATION SOURCE HAZARDS

An assessment of the potential contamination source hazards is outlined in this section. The purpose of this section is to determine if the hazards are adequately controlled. If the hazards are not adequately controlled, a management strategy will be outlined for the hazard in section 5.0. Reassessment dates are also required in the source protection plan to evaluate each of the hazards in the future. These dates are discussed in the implementation schedule which can be found in section 7.0.

1. Town Park Septic Tank - Potential Contamination Source(s) - 1
   Hazards - Biological: Septic System.
   Assessment - Due to the unconfined aquifer condition of the well, no potential contamination source may be located in zones 1 or 2. The septic tank is located in zone 2 and poses a significant threat to the Park Well. The contents of the septic tank are discharged underground over a drain field. There is no barrier protecting the aquifer from the leachate of the septic tank. Because of this, the septic tank hazard is classified as not adequately controlled.

2. Dairy Farm - Potential Contamination Source(s) - 2
   Hazards - Biological: Manure piles provide a source of contamination that could leach into the groundwater.
   Chemical: Chlorine, acid and salts are used to clean the milk processing machinery.
   Assessment - The dairy farm is relatively small compared to other dairy farms and both the manure piles and the chemicals are located outside of zone 2. This makes contamination by these hazards unlikely. However, there is no regulation on how these hazards must be managed and it is not certain that best management practices are being used. This hazard is therefore classified as not adequately controlled.

3. Existing Wells (one irrigation and one culinary) - Potential Contamination Source(s) - 3
   Hazards - Biological: Could be a direct contaminant path into the groundwater.
Chemical: Submersible pumps are located in the wells and could contaminate the water if approved lubricants are not used.

Assessment:
The culinary well is the existing town well and was constructed according to State requirements. This hazard is therefore classified as adequately controlled. The irrigation well is owned by Erval Hansen and was constructed in 1935 when the State requirements were different than existing State requirements. Therefore, the irrigation well will be classified as not adequately controlled.

4. Agricultural Lands (Alfalfa) - Potential Contamination Source(s) - 4 Hazards -
Chemical: Farm equipment is used on the land. The land is also sprayed with pesticides, herbicides, and fertilizers. Manure piles in #1 above are used as a fertilizer. (see Table B-1 in Appendix B).

Assessment:
The use of pesticides, herbicides and fertilizers is applied in quantities necessary for its purpose. The pesticides are aerially applied which reduces the possibility of large amounts of pesticides in one area. The herbicides that are used degrade after 20 days. The amount of farm equipment is fairly small and the potential for contamination from the farm equipment is also small. Therefore, these hazards are classified as adequately controlled based on negligible quantity.

5. Residential Homes - Potential Contamination Source(s) - 5 Hazards -
Biological: Septic Systems used in this area on all residential properties.

Chemical: Use and storage of pesticides, herbicides, and fertilizers for lawn and garden use (see Table B-1 in Appendix B).

Assessment:
New septic systems are controlled under R317-501 of the Utah Administrative Code. Existing septic systems were built before this regulation and therefore were not regulated. It is not likely that all residents use best management practices to control this contamination source. However, the Town periodically sends out flyers that outline the best management practices for septic
systems. Therefore, this hazard will be classified as adequately controlled. (It is recognized that absolutely no septic systems will be allowed in zones 1 or 2 due to the unprotected status of the aquifer.) It is also worth mentioning that the Town of Mayfield will be seeking to put in a sewer system in the near future.

6. Farm equipment - Potential Contamination Source(s) - 6

Hazards -
Chemical: Fuel and lubricant leakage from farm equipment onto the ground surface. Storage of fuel for equipment.

Assessment -
Fuel is stored in containers that are above ground and the containers are in good condition. Because the containers are above the ground, leaking fuel is easily detected. Also, very few of these large fuel containers exist in the Town. Because of these facts, this hazard will be classified as adequately controlled due to negligible quantity and physical control.

7. Gas Station - Potential Contamination Source(s) - 7

Hazards -
Chemical: Potential gas spills or leakage at the gas station.

Assessment -
The gas station located in the Town of Mayfield is regulated. All gas tanks are stored above ground and are enclosed by concrete walls. Therefore, this hazard is classified as adequately controlled due to physical control.

8. Roads - Potential Contamination Source(s) - 8

Hazards -
Chemical: Potential VOC’s (gas, oil) on the roadway as well as transportation of chemicals through the management area. Weed abatement/sterilization along the shoulders of the roads with herbicides. (See Appendix B, Table B-1)

Assessment -
The use of herbicides for the purpose of weed abatement along the roads in Mayfield rarely occurs. The herbicide that is used degrades in 20 days and contamination is unlikely. Transportation of chemicals through Mayfield doesn’t occur. Therefore, these hazards are classified as adequately controlled based on negligible quantity.
5.0 THE MANAGEMENT PROGRAM TO CONTROL EACH PRE-EXISTING POTENTIAL CONTAMINATION SOURCE

A management program must be included for each potential contamination source that was classified as not adequately controlled. The hazards that were classified as not adequately controlled were the Town Park septic tank, the dairy farm and Erval Hansen’s irrigation well. The purpose of this section is to outline land management strategies that will be implemented by the PWS to control these hazards. The Town Park septic tank and Erval Hansen’s well are located in zone 2 while the dairy farm is located in zone 3.

The land management strategy for the Town Park septic tank was discussed previously in the delineation report. Because the aquifer that the Park Well will be drawing from is unconfined, no uncontrolled potential contamination source can be located in zones 1 or 2. Because of this, the septic tank will be sealed off and the contents of the tank will be periodically pumped. The septic tank is generally used very little. Use of the septic tank generally occurs during the summer during family reunions and softball games. Therefore, the tank will be pumped as needed. It is anticipated that this will be about once a year.

The dairy farm is located east of the well about 600 feet away. Because this hazard is located in zone 3 and because the dairy farm is relatively small, it is unlikely that contamination will occur. The milk processing chemicals (chlorine, acid and salts) are discharged to a drain field about two times a day. A septic tank fact sheet will be given to Stanford Peterson (owner of the dairy farm) to inform him about appropriate discharges to the drain field. There are also 2 or 3 manure piles on the dairy farm at a time and these manure piles are used as fertilizer. Stanford Peterson will be contacted and informed that his dairy farm is located in a protection area and he will be informed of best management practices that he could implement to protect the water source from contamination by the milk processing chemicals and the manure piles.

Erval Hansen’s irrigation well was built in 1935 by the Mayfield Irrigation Company. Because the well was built so long ago, it was not constructed according to current State regulations. The well is not grouted over the top 100 feet and the lubricants for the pump could contaminate the groundwater. Hansen will be contacted and informed that he is located in the protection area for the Park Well. Best management practices will also be presented to him that he could implement to protect the Park Well from contamination by his irrigation well.

The implementation time frames and schedules for the land management strategies described below will be discussed in Section 7.0, Implementation Schedule.
6.0 THE MANAGEMENT PROGRAM FOR FUTURE POTENTIAL CONTAMINATION SOURCES

6.1 Management Program

The Town of Mayfield has a zoning ordinance (See Appendix C, Ordinance No. 1997-98A) that prohibits the location of any future uncontrolled pollution sources within zones 1 and 2. The ordinance’s purpose is to insure a ‘safe and sanitary drinking water supply for the Town’. The ordinance gives the Town the authority to designate and regulate the property uses and conditions that can exist in the protection zones. The ordinance prohibits the location of any potential contamination sources in any of the protection zones that cannot be adequately controlled. Referring back to Figure 4, it can be seen that most of the protection zones are located outside of the Mayfield Town boundary.

Land use agreements will be required for the properties that are located in Zones 1 and 2. The list of property owners for which land use agreements will be required can be found in Appendix C. The following four steps will be followed to fulfill the requirement for controlling future PCS’s in other management areas:

1) Each Potential Contamination Source (PCS) will be contacted as it locates within the protection zones.
2) Each new PCS will be notified that they live in a management area for a PWS.
3) Each new PCS will be added to the inventory of PCS’s.
4) After identification of a PCS an assessment for control of the PCS will be conducted.
5) Land management strategies will be planned and implemented, if the PCS is not adequately controlled.

6.2 Land Ownership Map

Refer back to Figure 5 which is a map of the properties and corresponding landowners that have properties in the protection area.
7.0 THE IMPLEMENTATION SCHEDULE

- All proposed land management strategies previously discussed will be implemented immediately following DDW approval of this Source Protection Plan.
- Erval Hansen and Stanford Peterson will be contacted and informed of best management practices for the irrigation well and the dairy farm respectively immediately following plan approval.
- Fact sheets regarding septic systems will be re-distributed six months after plan approval.
- An assessment of new PCS’s will be conducted annually starting six months after plan approval.
- A re-assessment of existing PCS’s will be performed every 3 years to determine that best management practices are still being used.
8.0 THE RESOURCE EVALUATION

The Town of Mayfield will provide the necessary funds to implement this DWSP plan and will be responsible for updating the inventory of potential contamination sources.
9.0 RECORDKEEPING

The Mayfield Town Clerk will be responsible for all the record keeping that is associated with this Source Protection Plan. The Town Clerk will also record key personnel and update the Emergency Response Plan annually.
10.0 THE CONTINGENCY PLAN

See Mayfield Town DWSP #1 (Existing Well), Appendix G: "Emergency Response Plan, Mayfield Town Culinary Water System".
References


APPENDIX A

Water Right Documentation

Report of Well Driller, Erval Hansen Well
(former Mayfield Irrigation Well)

Pump Test Data, Erval Hansen Well
Dear Applicant:  

RE: APPROVED CHANGE APPLICATION NUMBER 63-2517 (a22382)

This is your authority to proceed with the actual construction work under the above referenced application which under Sections 73-3-10 and 73-3-12, Utah Code Annotated, 1953, as amended, must be diligently prosecuted to completion. The water must be put to beneficial use and proof of beneficial use filed with the State Engineer, as provided in the original application, a20462, with the proof-due date of January 31, 2001, as amended by this approved change application.

Failure on your part to comply with the requirements of the statutes may result in forfeiture of this application. It is the applicant's obligation to maintain a current address with this office. Please notify this office immediately of any change.

Also enclosed are two post cards. You must give the Driller (Start) Card to the licensed driller with whom you contract to construct the well(s). The other card is the Applicant Card which is your responsibility to sign and return to this office immediately after final completion of the well. CAUTION: There may be local health department requirements for the actual siting of your well. Please check with the proper local authority before construction begins.

Your contact with this office, should you need it, is with the Richfield Regional Office. The telephone number is (435)896-4429.

Sincerely,

[Signature]
Robert L. Morgan, P.E.
State Engineer

RLM:et
Encl.: Memorandum Decision
BEFORE THE STATE ENGINEER OF THE STATE OF UTAH

IN THE MATTER OF CHANGE APPLICATION )
NUMBER 63-2517 (a22382) ) MEMORANDUM DECISION

Change Application Number 63-2517, 63-3233, 63-4234, and 63-4239 (a22382), in the name of Mayfield Town, was filed on July 14, 1998, to change the point of diversion, place of use, and nature of use of 3.246 cfs or 968.98 acre-feet of water. Heretofore, the water has been diverted from Twelve Mile Creek, Order Canyon Creek and a well, located at points (1) North 2420 feet and West 795 feet from the SE Corner of Section 32. (2) South 1100 feet and East 110 feet from the SE Corner of Section 29. (3) North 2310 feet and West 1720 feet. (4) North 2380 feet and West 1760 feet. (5) North 2710 feet and West 860 feet. all from the SE Corner of Section 33. (6) North 250 feet and East 660 feet. (7) North 1370 feet and West 1500 feet. both from the SE Corner of Section 34. (8) North 1780 feet and East 1710 feet from the SW Corner of Section 34. all of T19S, R2E. (9) South 7698 feet and East 14492 feet. (10) South 9184 feet and East 10038 feet. both from the NW Corner of Section 4. T20S. R2E. SLB&M. The water was used for the irrigation of 4.67 acres from April 1 to October 31. the domestic purposes of 537 persons from October 15 to April 1. and municipal purposes in Mayfield Town in Section 8: Section 16: Section 17: Section 20: Section 21: Section 28: Section 29: Section 30: Section 32: Section 33. T19S: SE¼ of Section 3: Section 4: Section 5: Section 6: Section 7: Section 8: NE¼NE¼ of Section 10: Section 17: Section 18. T20S. R2E. SLB&M.

Hereafter, it is proposed to divert 3.246 cfs or 968.98 acre-feet of water from two wells and four springs located (1) North 2420 feet and West 795 feet from the SE Corner of Section 32. an 8-inch well. 300 feet deep (2) South 1330 feet and West 1320 feet from the NE Corner of Section 32. a 14-inch well. 200 feet to 500 feet deep (3) South 405 feet and West 1019 feet from the E¼ Corner of Section 33. a spring, all of T19S. R2E. (4) South 827 feet and East 522 feet from the NW Corner of Section 2. a spring (5) South 7698 feet and East 14492 feet. Olsen Canyon Spring (6) South 9184 feet and East 10038 feet. both from the NW Corner of Section 4. T20S. R2E. SLB&M. Order Canyon Spring, to be used for municipal purposes in Mayfield Town.

The application was advertised in The Gunnison Valley News on August 12, 1998. and August 19, 1998. and was protested by CMADC. A hearing was held on September 24, 1998. in Manti, Utah.

The protestants were concerned that if this change is granted and depletion increases, the vested and decreed rights of the protestant will be diminished. impaired and adversely affected.

The applicant is diverting from springs and wells for the municipal supply and ceasing the diversions from Twelve Mile Creek. It is the opinion of the State Engineer that this application can be approved without adversely affecting prior rights if certain conditions are met. Therefore, the applicants are put on notice that diligence must be shown in pursing the development of this application which can be demonstrated by the completion of the project as proposed in the application.

It is, therefore. ORDERED and Application Number 63-2517 (a22382) is hereby APPROVED subject to prior rights and with the following conditions:
MEMORANDUM DECISION
CHANGE APPLICATION NUMBER
63-2517 (a22382)

1) Diversion is limited to 3,246 cfs or 968.98 acre-feet annually. Depletion cannot exceed the historic rate.

2) Diversion from the creek under this change must cease to accommodate downstream rights in place of the water taken from the spring and well sources.

This Decision is subject to the provisions of Rule R655-6-17 of the Division of Water Rights and to Sections 63-46b-13 and 73-3-14 of the Utah Code Annotated, 1953, which provide for filing either a Request for Reconsideration with the State Engineer or an appeal with the appropriate District Court. A Request for Reconsideration must be filed with the State Engineer within 20 days of the date of this Decision. However, a Request for Reconsideration is not a prerequisite to filing a court appeal. A court appeal must be filed within 30 days after the date of this Decision, or if a Request for Reconsideration has been filed, within 30 days after the date the Request for Reconsideration is denied. A Request for Reconsideration is considered denied when no action is taken 20 days after the Request is filed.

Dated this 18th day of March, 1999.

Robert L. Morgan, P.E., State Engineer

RLM:KF:cr:et

Mailed a copy of the foregoing Memorandum Decision this 18th day of March, 1999, to:

Mayfield Town
P.O. Box 541
Mayfield, UT 84643

DMADC
c/o Richard Waddingham
362 West Main Street
Delta, UT 84624

Ray Owens
Sevier River Commissioner
280 North 100 East
Joseph, UT 84739

BY: Eileen Jocke
Eileen Jocke, Secretary
Report of Well and Tunnel Driller
STATE OF UTAH

GENERAL INFORMATION:

Report of well or tunnel driller is hereby made and filed with the State Engineer, together
with a filing fee of $1.00, submitted in accordance with Sections 100-3-22 and 100-3-14, Revisor
Statutes of Utah 1953, as amended by Session Laws of 1935. This report shall be filed with the
State Engineer within 30 days after the completion or abandonment of well or tunnel. Failure to
file such report constitutes a misdemeanor.

1. Name and address of person, company or corporation boring or drilling well or tunnel
   (Strike words not needed)
   
   Mayfield Irrigation Company, P.O. Box, Mantle, Utah

2. Name and address of owner of well or tunnel
   (Strike words not needed)
   
   Mayfield Irrigation Co.

3. Source of supply is in
   (Strike words not needed)
   
   Sanpete County

4. The number of approved application to appropriate water is
   (Strike words not needed)
   
   A-14220

5. Location of well or mouth of tunnel is situated at a point
   
   1132' SSO and 222' WNE from the NE Cor. of Sec. 38, T. 19 S., R. 11 E., UT

6. Date on which work on well or tunnel was begun
   
   April 23, 1935

7. Date on which work on well or tunnel was completed or abandoned
   (Strike words not needed)
   
   Apr. 25, 1935

8. Maximum quantity of water flowing, pumped or dipped on completion of well or tunnel in
   sec. ft. or in gals. per minute; Date
   
   1500; Date: Apr. 25, 1935

DETAIL OF COLLECTING WORKS:

9. WELL: It is a drilled, dug-flowing or pump well. Temperature of water
   (Strike words not needed)
   
   temperature at present

   (a) Total depth of well is
   
   125 ft. below ground surface

   (b) Pressure in lbs. per sq. inch at ground surface if flowing well

   (c) If pump well, give depth from ground surface to water surface before pumping
       water bearing formation from 49 ft. to 135
       12 ft. ; during pumping

   (d) Size and kind of casing
   
   12 in. 10 gauge Steel Pipe casing
   (If more than one stratum, give depth to each)

   (e) Depth to water bearing stratum

   (f) If casing is perforated, give depth from ground surface to perforations

   (g) Log of well lower to 4.5 ft. top soil, 4 to 50 ft. dry sand and
       gravel, 10 ft. gravel and holders, 10 ft. gravel and holders, water

   (h) Well was equipped with cap, valve, or

   (Strike words not needed)

   (Over)
10. **TUNNEL:** It is timbered, tiled, piped, open, bulkheaded, covered or ____________ (strike words not needed)

(a) **Dimensions:** ____________; total length ____________; temperature of water ____________ ° F.

(b) Position of water bearing stratum or strata with reference to mouth of tunnel ____________

(c) Log of tunnel ____________

11. **GENERAL REMARKS:** (Note any general or detail information not covered above)

---

**STATE OF UTAH.**

**COUNTY OF ____________ Sandate ____________ ss.

I ____________ E.O. Reid ____________ being first duly sworn, do hereby certify that I am the driller of the aforesaid well or tunnel who furnished the foregoing statement of facts; that I have read said statement and each and all of the items therein contained are true to the best of my knowledge and belief.

E.O. Reid  
Driller

Subscribed and sworn to before me this 25th day of May, 1938.

(SEAL) E.D. Ellul  
Notary Public

My Commission Expires: ____________  
Residence: Manti, Utah.

Sept. 19th, 1938.
STATE OF UTAH
OFFICE OF STATE ENGINEER
WELL RECORD SHEET

Claim or
Application No. 11281

Mayfield Irrigation Co

Use Claimed

Well No. (D-19-2)324ac1 B.M. Elev. _______ B.M. Description _______

Note: Elevations are mean sea level in feet; Hydrostatic water level from B.M.
unless otherwise stated; Plus (+) indicates above B.M.; Minus (-) indicates below B.M.

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<th>Yield G.P.M.</th>
<th>Hydrostatic water level</th>
<th>Piezometric water level</th>
<th>Temp. °F</th>
<th>Use</th>
<th>Remarks</th>
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<td>begins in 1923. Water levels in feet below measuring point,</td>
<td>1940: Feb. 7,</td>
<td>37.52; Mar. 19, 37.61; June 4, 14.61; Aug. 1, 28.74; Dec. 8, 31.72.</td>
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GENERAL:

The test covered by this report was started April 1st at which time the equipment to be used was moved to the well site, visual observations made, and the static water level in well measured, which was 38'-7" from top of well casing. The test was actually run April 6 and 7.

EQUIPMENT USED:

1 - Deep well turbine pump with a capacity of 900 GPM at 180' total head consisting of:
   - 1 - discharge head with 6" discharge
   - Right Angle Gear Drive.
   - 140 Ft. 6" column
   - 1 - 5-stage 10" bowl unit.
   - 1 - 10' suction & strainer
   - 1 - 65 HP gas engine power unit.
Installing derrick tool & miscel. equipment.

MEASUREMENTS:

Measurements of well discharge were made by calibrated orifice size 6" x 4' and monometers reading in inches. Measurement of well water level was by means of 1/4" air line and direct reading well depth gauge reading in feet.

DESCRIPTION OF TEST:

Prior to running the pump test, it was deemed advisable to use a series of charges of dry ice so as to loosen up the material that would be around the perforations in the well casing; because of the well standing without use, it might be that the material adjacent to the perforation be compacted so as to retard the flow of water into the well. This was done.

The pump test was started at 1:30 PM April 6 and run until 10:15 PM the same day and resumed April 7 at 9 AM. It was concluded at 10 AM April 7. Stops were made at intervals to check the static water level and well recovery. A copy of the test log accompanies this report.

RESULTS:

This well was found to be in a stable condition, and it is unlikely that prolonged pumping would develop any more water.
Mayfield Pump Co. --3-- 5/27/49

The maximum quantity pumped was 525 GPM, and at this rate the water table showed an immediate lowering. The most stable condition was found to be at 455 GPM.

The recovery of this well is good, showing that the specific capacity with 71' of drawdown at 450 GPM was 6.4 GPM. The safe pumping capacity would be 480 GPM with 100' of drawdown.

RECOMMENDATIONS:

To insure safe pumping capacity over an irrigation season, we would recommend extreme care in the selection of a pump for this well.

We would recommend a pump for 450 GPM with 140' setting, which will give you the maximum safe drawdown of this well. With any seasonal lowering of the water table, the pump would have head capacity to handle the maximum water from the well.

COMMENTS:

It has been noted that there is a definite fluctuation of the water table in this particular area, and that due to water coming in from higher elevations later in the spring and early summer, this is indicated in your well. Therefore, it may be expected that the well can actually produce more water for the irrigation season than what is actually shown by this test. That is one reason you should use extreme care in the selection of a pump to meet these variable conditions.

Very truly yours,

UTILITY ENGINEERS, INC.

/s/

By Wm. N. Grooms

WNG/m
Encl.
<table>
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<th>Date</th>
<th>Time</th>
<th>Static Level</th>
<th>Engine RPM</th>
<th>Pumping Level</th>
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<td>1350</td>
<td>70'</td>
<td>29'</td>
<td>31&quot;</td>
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<td>70'</td>
<td>29'</td>
<td>31&quot;</td>
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<td>2:00</td>
<td></td>
<td>1400</td>
<td>71'</td>
<td>30'</td>
<td>31.5&quot;</td>
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<tr>
<td></td>
<td>2:15</td>
<td></td>
<td>1400</td>
<td>71'</td>
<td>30'</td>
<td>32&quot;</td>
<td>357</td>
<td>Water Clear with fine White Sand</td>
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<tr>
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<td>2:30</td>
<td>Recovery to 50' in 30 seconds.</td>
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<td>GPM</td>
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<td>8:45</td>
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<td>455</td>
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Shut down for night

70' Recovery from 112' to 70' in 1 Min. 30 Sec.

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<th>Date</th>
<th>Time</th>
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<th>Engine RPM</th>
<th>Pumping Level</th>
<th>Draw down</th>
<th>Orifice &quot;4&quot;</th>
<th>GPM</th>
<th>Remarks</th>
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<tr>
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<td>70</td>
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<td>65'</td>
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<td></td>
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</tr>
<tr>
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<td>1600</td>
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Started Up

Shut down

39' Recovery to 39' in 7 Min.

Test Concluded

Wm. N. Grooms 4/7/49
APPENDIX B

Lists of Herbicides, Pesticides, and Fertilizers
## TABLE B-1
Residential and Agricultural Common Herbicides, Pesticides and Fertilizers

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<th>Herbicides</th>
<th>Pesticides</th>
<th>Fertilizers</th>
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<td>2,4-D</td>
<td>Malathion</td>
<td>Phosphates</td>
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<tr>
<td>Roundup</td>
<td>Furdan</td>
<td>Nitrates</td>
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<td>Host</td>
<td>Gathion-Orchard</td>
<td>Potassium</td>
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<td></td>
<td>Diazinon</td>
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<tr>
<td></td>
<td>Dursban</td>
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APPENDIX C

List of landowners with property located in Zones I and II

Mayfield Town Drinking Water Source Protection Ordinance
**Landowners with property located in Zones I and II**

<table>
<thead>
<tr>
<th>Name of Land Owner</th>
<th>Figure 5 Property #</th>
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<tr>
<td>1-Delbert D. Butcher</td>
<td>(235)</td>
</tr>
<tr>
<td>2-Stanford J. Peterson</td>
<td>(257)</td>
</tr>
<tr>
<td>3-Mayfield Town-Park</td>
<td>(258)</td>
</tr>
<tr>
<td>4-Ardell A. Peterson</td>
<td>(259)</td>
</tr>
<tr>
<td>5-Erval O. Hansen</td>
<td>(261)</td>
</tr>
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<td>6-Erval O. Hansen</td>
<td>(262)</td>
</tr>
<tr>
<td>7-Leslie Clark Bogh</td>
<td>(263)</td>
</tr>
<tr>
<td>8-Erval O. Hansen</td>
<td>(264)</td>
</tr>
<tr>
<td>9-Stanford Peterson</td>
<td>(265)</td>
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</table>
MAYFIELD TOWN
DRINKING WATER SOURCE PROTECTION ORDINANCE

ORDINANCE NO 1997-98A

BE IT ORDAINED by the Mayor and Council of Mayfield Town in Council duly assembled and it is hereby ordained by the authority of same that the following ordinance known as the Drinking Water Source Protection Ordinance is adopted and made a part of the Code of Ordinance of Mayfield Town, to wit:

Section 1. Short title and purpose:

(a) This ordinance shall be known as the "Drinking Water Source Protection Ordinance."

(b) The purpose of this ordinance is to insure the provision of a safe and sanitary drinking water supply for the City by the establishment of drinking water source protection zones surrounding the wellheads and spring collection areas for all wells and springs which are the supply sources for the City water system and by the designation and regulation of property uses and conditions which may be maintained within such zones.

Section 2. Definitions. When used in this ordinance the following words and phrases shall have the meanings given in this Section:

(a) Design standard - means a control which is implemented by a potential contamination source to prevent discharges to the ground water. Spill protection is an example of a design standard.

(b) Land management strategies - means zoning and non-zoning controls which include, but are not limited to, the following: zoning and subdivision ordinances, site plan reviews, design and operating standards, source prohibitions, purchase of property and development rights, public education programs, ground-water monitoring, household hazardous waste collection programs, water conservation programs, memoranda of understanding, written contracts and agreements, and so forth.

(c) Pollution source - means point source discharges of contaminants to ground water or potential discharges of the liquid forms of "extremely hazardous substances" which
are stored in containers in excess of "applicable threshold planning quantities" as specified in SARA Title III. Examples of possible pollution sources include, but are not limited to, the following: storage facilities that store the liquid forms of extremely hazardous substances, septic tanks, drain fields, class V underground injection wells, landfills, open dumps, landfilling of sludge and septage, manure piles, salt piles, pit privies, and animal feeding operations with more than ten animal units. The following clarify the definition of pollution source:

(1) **Animal feeding operation** - means a lot or facility where the following conditions are met: animals have been or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12 month period, and crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility. Two or more animal feeding operations under common ownership are considered to be a single feeding operation if they adjoin each other, if they use a common area, or if they use a common system for the disposal of wastes.

(2) **Animal unit** - means a unit of measurement for any animal feeding operation calculated by adding the following numbers; the number of slaughter and feeder cattle multiplied by 1.0, plus the number of mature dairy cattle multiplied by 1.4, plus the number of swine weighing over 55 pounds multiplied by 0.4, plus the number of sheep multiplied by 0.1, plus the number of horses multiplied by 2.0.

(3) **Extremely hazardous substances** - means those substances which are identified in the Sec. 302 (EHS) column of the "TITLE III LIST OF LISTS - Consolidated List of Chemicals Subject to Reporting Under SARA Title III," (EPA 560/4-91-011).

(d) **Potential contamination source** - means any facility or site which employs an activity or procedure which may potentially contaminate ground water. A pollution source is also a potential contamination source.

(e) **Regulatory agency** - means any governmental agency with jurisdiction over hazardous waste as defined herein.

(f) **Sanitary landfill** - means a disposal site where solid wastes, including putrescible wastes, or hazardous wastes, are disposed of on land by placing earth cover thereon.

(g) **Septic tank/drain-field systems** - means a system which is comprised of a septic tank and a drain-field which accepts domestic wastewater from buildings or facilities for subsurface treatment and disposal. By their design, septic tank/drain-field system discharges cannot be controlled with design standards.
(h) **Wellhead** - means the upper terminal of a well, including adapters, ports, seals, valves and other attachments.

**Section 3. Establishment of drinking water source protection zones.** There is hereby established use districts to be known as zones one, two, three, and four of the drinking water source protection area, identified and described as follows:

(a) **Zone one** is the area within a 100-foot radius from the wellhead, or spring collection area.

(b) **Zone two** is the area within a 250-day ground-water time of travel to the wellhead or spring collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

(c) **Zone three** (waiver criteria zone) is the area within a 3-year ground-water time of travel to the wellhead or margin of the spring collection area, the boundary of the aquifer(s) which supplies water to the ground-water source, or the ground-water divide, whichever is closer.

(d) **Zone four** is the area within a 15-year ground-water time of travel to the wellhead, the boundary of the aquifer(s) which supplies water to the ground-water sources, or the ground-water divide, whichever is closer.

**Section 4. Permitted uses.** The following uses shall be permitted within drinking water source protection zones:

(a) Any use permitted within existing agricultural, single family residential, multi-family residential, and commercial districts so long as uses conform to the rules and regulations of the regulatory agencies.

(b) Any other open land use where any building located on the property is incidental and accessory to the primary open land use.

**Section 5. Prohibited uses.** The following uses or conditions shall be and are hereby prohibited within drinking water sources protection zones, whether or not such use or condition may otherwise be ordinarily included as a part of a use permitted under Section 4 of the ordinance:

(a) **Zone one** - The location of any pollution source as defined herein.

(b) **Zone two** - The location of a pollution source unless its contaminated discharges can be controlled with design standards.
Zone three and four - The location of a potential contamination source unless it can be controlled through land management strategies.

Section 6. Administration. The policies and procedures for administration of any source protection zone established under this ordinance, including without limitation those applicable to nonconforming uses, exception, enforcement and penalties, shall be the same as provided in the existing zoning ordinance for Mayfield Town, as the same is presently enacted or may from time to time be amended.

This Ordinance shall be effective immediately upon adoption and posting, at three public places within the Town of Mayfield, Sanpete County, Utah. All ordinances and parts or ordinances in conflict herewith shall not be and the same are hereby repealed.

ENACTED AND ADOPTED this 15th day of August, 1997.

[Signature]
Mayor

[Signature]
Town Clerk
APPENDIX D

WHPA Capture Zone Delineations

Delineation Report Calculations

Geologic Profiles of Wells in Mayfield
1- Specific Capacity (Use Enel Hansen well pump test data):

Specific Capacity = \( \frac{Q}{S} = \frac{450 \text{ gpm}}{41 \text{ ft}^2 \text{/ day}} = 6.34 \text{ gpm / ft}^2 \)

2- Transmissivity:

Transmissivity = \( \frac{6.34 \text{ gpm}}{\text{ft}^2} \times \frac{(1 \text{ ft}^3)}{(5.88 \text{ gpm} \cdot \text{hr}) \cdot (24 \text{ hrs} \cdot \text{day})} = 1220.5 \text{ ft}^2 / \text{day} \)

3- Hydraulic Conductivity:

\( K = \frac{I}{b} = \frac{1220.5 \text{ ft}^2 / \text{day}}{127} \approx 9.61 \text{ ft/day} \)

4- Velocity of flow:

\( V = \frac{K_i}{n} = \frac{(9.61 \text{ ft/day}) \cdot (0.25)}{0.25} = 1.03 \text{ ft/day} \)

5- Calculate average saturated aquifer thickness:

\( h_{ave} = \frac{12' \cdot (\text{Enel}) + 200' \cdot (\text{proposed})}{2} = 163.5' \)

6- Use average saturated aquifer thickness to calculate average transmissivity:

\( T = kh = \frac{(9.61 \text{ ft/day}) \cdot (163.5 \text{ ft})}{1571 \text{ ft}^2 / \text{day}} = 1571 \text{ ft}^2 / \text{day} \)

7- Hand calculated protection zones:

- Zone 1 = 100'
- Zone 2 = (250 days) \cdot (1.03 \text{ ft/day}) = 257.5 ft
- Zone 3 = (3 years) \cdot (365 \text{ days/yr}) \cdot (1.03 \text{ ft/day}) = 1127.85 ft
- Zone 4 = (15 years) \cdot (365 \text{ days/yr}) \cdot (1.03 \text{ ft/day}) = 5619.25 ft
APPENDIX E

Protection Zones Sensitivity Analysis
Zone Delineation Sensitivity Analysis

Introduction

Prior to the construction of the Mayfield Park Well, a Preliminary Evaluation Report (PER) was submitted and approved by the Division of Drinking Water. One major objective of this report is to delineate protection zones for the proposed well. Protection zones can be delineated with a program called WHPA (Well Head Protection Area). WHPA requires a number of different aquifer parameters to accurately delineate the protection zones. These include transmissivity, porosity, saturated aquifer thickness, hydraulic gradient and flow rate pumped from the well. The hydraulic gradient and flow rate were the only parameters that were known. The other parameters are difficult to define until the well has been drilled and pump tests have been performed. For the purposes of the PER, the transmissivity, porosity and saturated aquifer thickness were estimated based on the best information available. Most of the estimates came from information on a well (Erval Hansen's well) that is located 500 feet east of the Park Well. The calculations for the estimated parameters are found in Appendix D. Because the parameters were estimates, a sensitivity analysis was performed to analyze how the protection zones vary with different estimated aquifer parameters.

Sensitivity Analysis Results

The three parameters that were varied are transmissivity, porosity and aquifer thickness. Figure 1 demonstrates visually the effects of varying the estimated parameters. The first zone delineation in the figure represents the original and final delineation that was used in the PER along with the values of the estimated parameters that were used in the report. The other seven zone delineations represent the effects of changing the estimated parameters slightly. The parameters that were changed along with the changed value are listed underneath each zone delineation. The first three delineations represent the effects of changing only one parameter. The next three delineations represent the effects of changing two of the parameters and the last delineation represents the effects of changing all three parameters at the same time. It can be seen that the size and shape of the protection zones are sensitive to the estimated parameters. It also appears that the zones are most sensitive to the aquifer thickness. This fact is seen in Table 1 which shows the zone 4 dimensions of each delineation. The length of the zone is changed the most by the aquifer thickness followed by the porosity and then the transmissivity. The width is also most affected by the aquifer thickness followed by the transmissivity and then the porosity.

The larger estimated aquifer thickness nearly cut the zone 4 length in half while reducing the zone width by about 700 feet. This makes sense because a larger aquifer thickness means that more water is available near the well and so the zone is smaller because the water is coming from a smaller and deeper
aquifer. The overall area of zone 4 was nearly cut in half by increasing the aquifer thickness.

A smaller estimated transmissivity has the effect of decreasing the length while increasing the width of zone 4. The overall area increases by decreasing the transmissivity. A larger area is expected because the lower transmissivity means that the soil is transporting the water slower necessitating a larger zone to draw water from.

A larger estimated porosity value had the effect of increasing the length while decreasing the width of zone 4. The overall area was reduced by a larger porosity. This makes good sense because a larger porosity means that more water can be stored in the soil matrix. With more water stored in the soil, the zone will decrease because more water is available.

Changing multiple parameters in the model results in smaller protection zones as was expected.

**Conclusions**

Doing a sensitivity analysis is very important especially when the parameters that are used in a model are estimated. This sensitivity analysis demonstrated that the protection zones were most sensitive to the aquifer thickness. Changing the aquifer thickness alone resulted in protection zones that were nearly half of the original parameters that were used in the actual analysis. If the zones were cut in half, less potential contamination sources would exist in the management area. This would obviously be advantageous. The sensitivity analysis demonstrated that the original estimated parameters resulted in a worse case scenario and will probably be conservative estimates. Once the actual aquifer parameters are calculated from pump tests on the newly constructed Park Well, the actual protection zones will be re-delineated.
Aquifer Parameters Sensitivity Analysis

Original Parameters:
- Porosity=0.25
- Aquifer Thickness=127 ft
- Transmissivity=1220 ft^2/day

Porosity=0.3
- Aquifer Thickness=260 ft
- Transmissivity=1096 ft^2/day

Figure 1-Zone Sensitivity
### Table 1-Zone 4 Sensitivity

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