GILLETTE MADISON PIPELINE PROJECT (GMPP)
TECHNICAL MEMORANDUM #4
FINAL

TO:	Mike Cole, P.E., City of Gillette
FROM:	Casey Hanson, P.E., MMI
DATE:	April 29, 2010, Finalized July 16, 2010
JOB NO.:	BMcD # 54432, MMI #4776.001
RE:	GMPP New Well Field Pumping Alternatives
CC:	Darin Brickman, P.E., BMcD Dan Korinek, P.E., BMcD Carl Anderson, P.E., MMI Bryan Clerkin, P.E., WWDC
ATTACHMENTS:	11x17 Blowup of USGS Carlile Quadrangle Map

☐ **Urgent** ☒ **For Review** ☒ **Please Comment** ☐ **Please Reply** ☐ **For Your Use**

Background

The City of Gillette Long Term Water Supply, Level II Study did not definitively identify the preferred strategy for delivering water from the new proposed Madison well field to the Pine Ridge Reservoir. Preliminary alternatives included using higher-head well pumps or using lower head well pumps coupled with an intermediate pump station similar to the existing system. It was anticipated the new Madison well field would abut the existing Madison well field to the east. This arrangement would have produced a very similar pumping condition to the existing layout.

New Madison Well Field Location

The new Madison well field location is highly dependent on the outcome of the two Madison test wells. Tech Memo #2 identified test well drilling locations on Section 36 directly north of the existing Pine Ridge reservoir. While the final Madison well field will be based on what is learned

from these test wells, it is anticipated that Section 36 is the most likely site for the second Madison well field. The general location of this well field is identified in relation to the Pine Ridge tank on the attached blowup of the Carlile USGS Quadrangle.

The Section 36 proposed drilling pattern presents a much different pumping scenario than that envisioned with the Level II preliminary well field layout. The Section 36 site lies north of the Pine Ridge Tank, rather than east like the existing Madison pump station and tank. Additionally, the elevation of the Section 36 site varies, but the land surface is generally the same elevation as the water surface elevation (WSE) in the Pine Ridge tank or higher. This is a contrast to the Level II site, which had land surface elevations approximately 325-350 feet lower than the Pine Ridge tank WSE.

Second Madison Pump Station Discussion

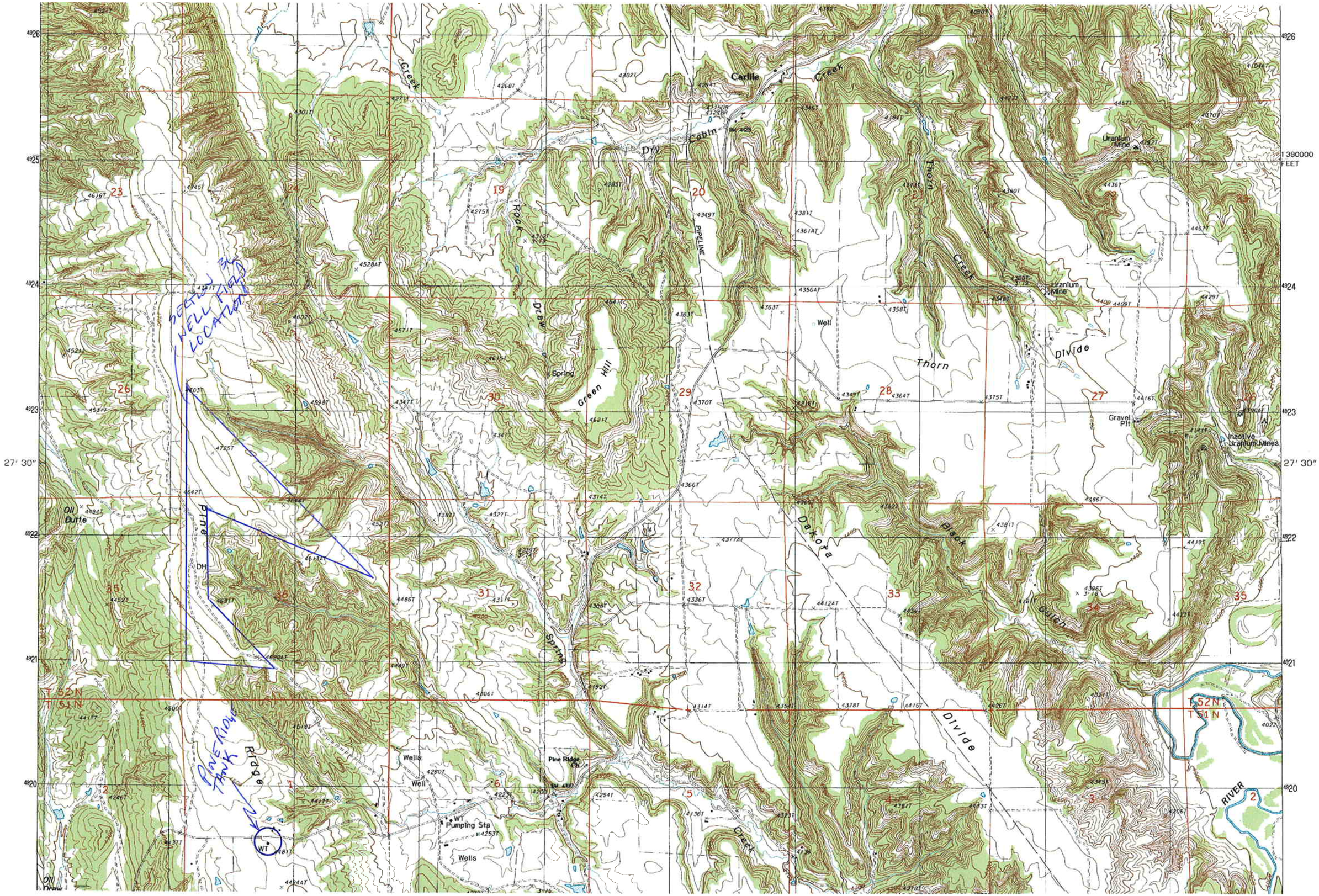
The concept of a second Madison pump station has been discussed through the last part of the Level II and the preliminary phases of the Gillette Madison Pipeline Project (GMPP). The concept behind using a second pump station is to utilize the increased efficiency of either vertical turbine (Similar to existing Madison station) or horizontal centrifugal pumps. The savings in power costs from this increased efficiency over submersible well pumps produces a power savings that can be compared on a net present worth (NPW) basis to the construction and additional maintence costs of a second pump station.

In the case of the Section 36 site, there is no additional head required by a second pump station as the highest head location is at the land surface of the wells. From this location the lines run generally downhill into the Pine Ridge tank. Accordingly, there is no efficiency and consequent power cost savings that would justify a second intermediate pump station.

Recommendations

If the Section 36 well site is used, it is recommended that a second intermediate pump station be excluded from consideration with the well pumps being sized appropriately to pump the water to the Pine Ridge tank. If this location is not ultimately utilized due to unexpected test well production, this consideration of a second pump station could be revisited. Preliminary evaluations undertaken before the Section 36 site concept was developed indicate that the present worth of the power savings from a second pump station are roughly an order of magnitude smaller than the capital costs of the station. Even though it should be verified for any well sites considered in the future, it is unlikely that a second pump station will be economically feasible.

It should be noted that the original scope included an add alternate for design of an additional pump station if warranted. If well production at the Section 36 well site is as expected this add-alternate would not be exercised. However, the City of Gillette has since requested use of on-site hypochlorite generation for disinfection. Technical memorandum #13 details this disinfection discussion. Although a second pump station may not be needed, a facility of similar size and construction will need to be designed to house the hypochlorite generation equipment.


SOLID FIELD WELL LOCATION
PINE RIDGE TANK
Carlile
Dry Cabin Creek
Rock Draw
Green Hill
Spring
Thorn Creek
Thorn Divide
Uranium Mine
Well
Gravel Pit
Inactive Uranium Mines
Oil Butte
Pine Ridge
Dakota Divide
Black Gulch
Pine Ridge Ch
Wells
Pumping Sta
WT
DH
T 52N
T 51N
RIVER
1 390000 FEET
27' 30"