Skyline Level II Study

Progress Meeting Agenda

I. Meeting Date: Monday, Jan. 25th, 2021 @ 10am

II. Attendees: Jim Lewis, Kevin Boyce, Kurt Garland, Josh Kilpatrick, Braden Olson, Emily Hanner, Latham Jenkins

III. Study Purpose is to complete a Level II study to address and prioritize improvements to Skyline's ageing water system. "It has become increasingly clear that major improvements to the system are needed to extend the life of the system." Most of the existing system was built in the 1960s and 1970s and has, or is close, to reaching its useful life.

IV. Review Task List and Project Schedule: **Figure 1**

V. Key Focus of this Meeting:

A. Review water system map and location of water facilities.
B. Review current and projected future water demands.
C. Review NE findings following a condition assessment of existing facilities, regulatory compliance, hydraulic adequacy of the system.
D. Identify potential key short term improvements (1 to 3 years out) & long term improvements (3+ years out)
E. Review of what water system improvements can be grant and/or loan funded. Discuss whether Skyline would like to be on the WDSRF Funding Short list.

A. Mapping

- NE created a map of located and surveyed water facilities, including pipelines by size. Clearwater has reviewed and is now in need of ISD review. Following finalization, we will be utilizing this map to generate the Skyline Water System GIS. Review **Figure 2** – Existing Water System Map.

B. Current & Estimated Future Demands

- Review **Figure 3** describing demands based on Well #2 and #3 production.
- Review **Figure 4** describing difference in metered well production and customer meter demands for 2020. Cover repair of recent leak on Mallard and associated water savings.
- Review **Figure 5** describing a summary of existing demands and estimated future demands.

NE is looking to seek input from Skyline Water System Stakeholders regarding the following assumptions made for developing future demands.

- Assumptions for Estimating Future Demands:
  - Build-out lots is 88, up from current of 82 w/ half (44) containing ARUs.
  - Future Irrigation increase of 10% per household due to "high-end" homes.
  - Unaccounted for water is down 15% from the current 29% assuming future leakage is fixed. *Note: It is questionable how much unaccounted for water is due to inaccurate meters.

- Findings based on assumptions above:

  Without adequate storage capability, supply wells should be capable of peak hour demand. Based on modeling, if the current wells operated simultaneously, they could provide 580 gpm and maintain the low pressure setpoint (59 psi) at the tank. Resulting lower system pressure is 51 psi at the intersection of Tanager and West Ridge, and roughly 41 psi in the second story of the residence at Lot 3-8. Minimum system pressure for public water systems is 35 psi (WDEQ).

  Based on current and future conditions, an additional supply well, or if possible replacement of existing well pumps and motors with larger units, is recommended so that the system will comply with either of the two WDEQ criteria:

  1. Meet peak hour demand with the largest well out of service
  2. Meet max. day plus fire flow (500 to 1000 gpm) with the largest well out of service.

  In lieu of utilizing max. day per WDEQ above, it is suggested that peak hour is utilized at the design point for future supply facilities. The reason behind this is unlike systems with ample flow equalization volume in the form of storage, Skyline's storage consists of a 5000 gallon storage facility (hydrophneumatic pressure tank), which effectively only has storage for 400 to 500 gallons, or less than 1 minute storage under peak hour flow. Given the amount of available storage, it is suggested the supply facilities are improved or expanded (new well) to accommodate peak hour flows plus fire demands if prioritized by the Skyline ISD.

  Are fire flows an SIDS priority? It is possible that providing fire protection would have a positive influence on homeowner insurance rates.

C. <u>Conditions Assessment & Recommendations for Improvements</u>

NE completed a condition assessment of facilities based on site inspection and notes provided by Emily Hanner with Clearwater. Recommendations have been tailored to address concerns identified by the Skyline ISD at the onset of the study. Below is a summary of our review along with preliminary recommendations for improvement.

- **Supply Facilities**
  - <u>Wells</u>

- Electrical Test on Well Motors: Measured insulation resistance and load (current) between conductor leads while in operation. Testing indicated wells motors are in good condition and pumps are likely balanced with limited wear.

- Verification of Flows: Well pump model numbers were obtained from well control panels and pump curves were obtained to verify well flows. Below are the results for both wells.

    - Well #2 - 30HP 460V 3P - Berkeley 6T275 (2005): Hydraulic calculations indicate Well #2 pump curve does not match pressures and flows recorded at the tank. The well is operating with an additional 18.5' (8 psi) of headloss, or reduced capacity of 232 gpm from 255 gpm. It is presumed that something within the supply pipeline, possibly the check valve on the column pipe within the well, or the check valve in the exterior vault at the well is causing an unforeseen restriction/headloss. Average flow rate during normal tank filling cycle (59 to 74 psi) is 228 gpm.

    - Well #3 - 25HP 460V 3Ph - Texas Turbine (Goulds) - 7WAHC3 (2005): Hydraulic calculations indicate Well #3 pump curve does match pressures and flows recorded at the tank. Well motor is VFD rated. Average flow rate during normal tank filling cycle is 270 gpm. Hydraulic calculations and recorded flow and pressure readings at the tank indicate that Well #3 is operating as expected and the flow meter at the tank is calibrated correctly.

- Verification of Simultaneous Well Operation: The controller has HOA switches, but does not have a lead/lag selection for well pump operation, indicating the system is not set up for simultaneous well operation. Under high flow (fire hydrant open) only one well runs at a time. Wells alternate operation. Suggest modifying the control system for simultaneous operation.

- Supply Pipeline: Existing supply line was installed in 2003, is 8" diameter ductile iron and is expected to be in good condition.

<u>Summary of Suggested Supply Improvements:</u>

1. Install new well controller and replace well soft starters with VFDs to allow for simultaneous operation of wells and to limit pump cycling. Current electrical supply and the backup generator can support simultaneous operation of wells. Simultaneous well startup under standby power would not be feasible as discussed in detail below in the "Generator" section.

2. Will need to confirm that Well #3 motor is VFD rated. If will need to plan on replacing pump and motor.
3. Upgrades in each vault (manhole) downstream of well.
    a. Well #2 manhole – replace check valve, clean and install new corrosion resistant steps/ladder.
    b. Well #3 manhole – replace flow meter (doesn't work) and seal manhole from leaks (currently flooded). Emily pumped out and sealed cracks in Nov. 2020
4. Increase Supply Capacity: Look at options for expanding supply capability in order to meet future peak hour demand with the largest well out of service. Securing additional easement and installing a new well would seem to be the best alternative. Existing electrical and system backup would support this. In order to better track supply and ascertain actual peak hour demand, it suggested that a new SCADA system is installed prior to considering expanding well facilities.

- <u>Backup Power</u>

    - Review of August 2019 Load Tests: Review of the load test found no issues. The values for amperage are consistent with the expected nameplate values, indicating the generator is operating as expected. Oil pressure and water temp readings throughout the test remained consistent with no major dips or peaks. In summary, results of the load test indicate the generator is working as expected and no issues are present.

    - Propane/Fuel Storage: NE completed an analysis to determine fuel storage (in days) to operate the water system. The analysis completed assumed winter conditions as the worst case scenario due to limited access to fill the tank. With an 80% full tank, it is estimated the generator could operate continuously, idle and times at 25% load to run one well, for 15 days. Historical power outages average less than a couple of hours, with multiples days (5) being an extreme outage (Teton Village, 2017). Storage capacity at this time is considered adequate.

    - DEQ requires "*Alternative power source. Where the finished water storage volume that floats on the distribution system is not capable of supplying the maximum daily demand, an alternative power shall be provided for the finished water pumps. The combined finished water storage volume and pumping capacity supplied by alternative power <u>shall be at least adequate to provide the maximum daily demand</u>. Acceptable alternative power sources include an engine generator, engine drive pumps, or a second independent electrical supply."* According to this criteria and estimate future maximum day demand,

the generator is sized to accommodate future maximum day demands and will not require replacement.

Summary of Recommended Backup Power Improvements:

1. It has been determined that the generator capacity, taking deratings into account, is capable of operating both wells simultaneously, however, both pumps would not be able to startup simultaneously, or even within a couple seconds of each other as a result of the motor load draw at startup. A controls interlock limiting simultaneous startup should be required on standby (generator) power to prevent simultaneous starting.
2. Complete modifications to generator to operate on natural gas and install new natural gas line. Current propane storage for backup power is two weeks plus.

- Disinfection

  Per DEQ, *"Groundwater supply facilities shall provide disinfection equipment and connections, as a minimum."* Currently there are not disinfection facilities. It is recommended new injection facilities are provided within the tank building. Normally it would be suggested that chlorine disinfection facilities are isolated in a separate room or other building due to the long-term corrosive nature of chlorine gas (off-gassing) on electrical and plumbing equipment. In this case, DEQ only requires you provided facilities in the event disinfection of the system is required. It is not anticipated these facilities will be utilized often, if at all, therefore temporary mobilization and demobilization of chlorine disinfectant (in and out the building) during emergency use wouldn't seem to be much of an issue.

Summary of Recommended Disinfection Improvements:

1. Install dual disinfectant metering pumps and required plumbing connections and electrical in order to comply with DEQ.
2. Store disinfectant in heated location outside the building, and/or arrange with disinfectant supplier, or other PWS (Town or District) emergency supply of disinfectant chemical. Sodium hypochlorite is unstable and has a limited shelf life; 13% sodium hypochlorite solution will degrade to 8% in 3 months.

- **Storage Facilities**
  - Existing storage facility was built in 1974/1975. In2019 the roof, siding and building electrical (outlets. lighting & HVAC) were replaced; those components are in good condition.
  - Foundation: The foundation is comprised of a concrete slab and CMU block walls. The walls and foundation show no signs of significant cracking/structural failure and are considered to be in good condition. Block walls show actual and

historical signs (efflorescence) of leakage. It is suggest the block walls are sealed to reduce leakage and potential condensation on building elements as a result of humidity. This improvement would protect building elements from corrosion and decay.

- HVAC: A new heater and exhaust fan was installed in 2019. Clearwater indicates that ventilation has significantly reduced condensation in the building. Suggest installing a humidistat to control operations of the exhaust fan, if not already provided.
- Pressure Tank: Existing pressure tank appears to be in good condition. Each fill cycle is roughly 400 to 500 gpm. Exterior of pressure tank appears to be in good condition. Could use a new coat of paint. The condition of the interior of tank is questionable. Suggest accessing the interior of the tank for inspection – this could be done if VFDs were installed on the wells and the tank bypass was functional; the VFDs would control well operations (speed) to maintain system flow and pressure w/out the tank.
- Air Compressor: The air compressor utilized to maintain air levels in the hydropneumatic tank. The air pressure looks new and in good condition.
- Control Equipment:

- Flow Meter: appears to be accurate based on flow calculations for each well. Metering system is antiquated and hard to read.
- Bypass PRV: PRV on the tank bypass is corroded and likely not functional based on discussions with Clearwater.
- Alarm System: Needs to be replaced. Clearwater has indicated that it does not function.

<u>Summary of Recommended Storage Improvements:</u>

1. Suggest sealing block foundation walls on the building interior to reduce leakage and potential condensation on building elements as a result of humidity. Plug cracks with Water Plug and paint with Drylok, or equal. This improvement will provide additional protection for electrical and wood elements within the building from corrosion and decay.
2. Remove bypass PRV and install check valve with pressure relief valve to daylight on downstream side of check. This will provided better over-pressure protection for the supply and distribution system.
3. Install humidistat with temperature interlock to control exhaust fan operations. The temperature interlock will initiate shutdown of the exhaust fan if the building temperature is below an operator setpoint (40 degrees).
4. Install float switch to automate operation of the existing air compressor in order to maintain air levels in the water tank. Example float switch is L6 Flotect Liquid Level Switch.
5. Replace alarm system with new Supervisory Control and Data Acquisition (SCADA) system, or automated control system comprised of operator setpoints, statuses and alarms. System to include Program Logic Controllers

(PLCs) with Human Machine Interfaces (HMIs/touch-style digital screen display) at the Tank and Well sites. Install fiber between tank and well site for communication (data transfer) between sites. Provide internet access at the tank site to allow for remote access via. web browser. New system will display and store (trend) system flows (hourly, daily, weekly, monthly, annual, etc.) and pressures. Data will be utilized to better track peak hour usage in anticipation of future well.

a. Replace existing flow meter with a magnetic flow meter (no internal moving parts) to provide instantaneous flow readings with output capability to SCADA system.
b. Remove existing pressure switch and replace with pressure transducer to provide instantaneous pressure readings with output capability to SCADA system.
c. Install low level float switch in water tank so the system will alarm to the SCADA should tank levels reach and undesirable low level.
d. Install building temperature gauge with output capability to SCADA.

- **Distribution**
  - Water Valves: Valve survey indicates there are four existing water main valves that should be found, cleaned and/or repaired soon. Reference **Figure 2**.
    - V-13 – Valve seizes when operated. Isolates flow from NW Ridge downstream to Killdeer. Recommendation is to replace.
    - V-14 – Not found. Isolates flow from NW Ridge reaching Teal and Goldfinch. Recommendation is to perform exploratory excavation to find.
    - V-15 – Debris (sludge) in lower 3ft of valve box. Isolates Teal Road from NW Ridge. Recommendation is to either dig or clean valve box via. vacuum pump (Macys Services).
    - V-20 – Valve box is full of water. Valve isolates flows at the subdivision entrance from traveling east/west. It is likely the valve is leaking given the adjacent valve box of V-21 is not full of water and there is no irrigation system nearby. Suggestion is to excavate the valve, verify if it is leaking and replace if necessary.
    - V-7 and V-8 have also not been found. These valves are located on the mid-section of distribution mains and are believed to not be as critical to find as those at junctions (tees). They will be more critical to find in the event Skyline ISD moves forward with distribution line replacement in the future.

  - Pressure Reducing Valves
    - PRV-1: The PRV is located downstream of the Killdeer and NW Ridge Road intersection. It was installed in 2003 and appears to be in fair condition. The facility consists of 2” and 1” parallel PRVs, allowing for a

combined maximum intermittent flow of 330 gpm. This equates to a scouring velocity of 8.43 fps and 3.74 fps in a 4" and 6" main, which is sufficient to remove sediment. Minimum scouring velocity is 2.5 fps, and recommended is 5 fps. Estimated existing peak hour and maximum day demands for the entire system are 570 gpm and 190 gpm, respectively. Based on average household demands, roughly 48% of those flows are demands below the PRV. Recommended maximum flow through both PRVs is 260 gpm. This suggests the PRV facility is adequately sized for maximum day, but undersized for the estimated existing peak hour flows. If the estimated peak hour is correct, it is likely that the PRV could be experiencing damage as a result of valve cavitation. Anti-cavitation PRVs are available, however they limit flow to 190 gpm (2" valve) to prevent valve damage, where in that case it would make sense to install a larger valve 3"+. In the event the existing valve is up-sized, it is also recommended that the smaller 1" valve is evaluated for replacement as well.

- Air Release Valves
  - ARV-1: ARV is located east of the storage tank. The valve is not located at the highest point on the main, which is evident by air reaching the neighboring service to the east. It is suggest the line is potholed at the neighboring service connection and near the road to determine the highest point. The existing ARV and enclosure could be relocated or a new ARV installed where the high point is determined.

  - ARV-2: ARV is located at the intersection of Tanager and NW Ridge Roads. Clearwater indicates the valve is not functional and needs replaced. It is recommended that the valve and replaced and enclosure replaced with a traffic rated manhole.

- Fire Hydrants
  - Existing fire hydrants are relatively new; installed in 2018/2019. Based on hydraulic modeling and flow testing, all except FH-4 can deliver flows in excess of 500 gpm at a 20 psi residual system pressure on an existing maximum day per DEQ criteria; 500 gpm for fire flows is considered the minimum in the industry for residential fire protection. The modeling analysis assumes supply is provided by simultaneous operation of both wells. Tabulated below are modeling results:

Hydraulic Model Results for Fire Hydrants					
Fire Hydrant Designation	Maximum Summer Day Flow (gpm)	Available Fire Flow - both Wells Operating (gpm)	Total Flow Provided by Wells (gpm)	Residual Pressure @ Hydrant (psi)	Notes
FH-1	197	523	720	20	-
FH-2		581	778	20	-
FH-3		555	752	20	-
FH-4		462	659	20	2" PRV at Killdeer suspected of restricting flow @ FH much less than modeled. It is suggested flows at the hydrant could be <400 gpm, consistant with hydrant test performed.
*Hydraulic modeling analysis assumes both existing wells are operating simultaneously.					

- Fire hydrants all serve as an adequate flushing apparatus for the system, capable of 2.5 fps in existing distribution mains, and may also be utilized in the event of a wild land fire. It is suggested that another hydrant is placed near the valve cluster at the intersection of Teal and Mallard to provide anther flushing point (See **Figure 6**). Skyline ISD has indicated they have another fire hydrant purchased recently in storage.

- Water Mains:
  - The distribution system is comprised of 6” and 4” diameter pipe constructed between 1964 and 1974. Pipe installed in 1965 under the first filing of the subdivision (lower area near HWY 22) is asbestos-cement pipe. The rest of the distribution system, comprised of PVC water main, was installed in 1974.

  - Recent leak detection surveys (2019) indicate minimal leakage. A recent leak on Mallard drive was fixed resulting in a 8,000+ gpd reduction in well flows. Board members have indicated that new leaks typically occur when the system is run dry (depressurized).

  - Based on comparison of well production and customer meter use, there is substantial amount of unaccounted for water (25 to 30%). In response, the ISD has procured leak detection services on a more frequent basis, including two surveys completed in the last two years.

  - PVC & A.C. Pipe: Available literature and empirical data suggest that the PVC mains are nearing there useful life. The early 1970s marked the start of widespread use of PVC for water systems. Modern day PVC has a life expectancy in excess of 100 yrs as reported by many pipeline manufactures, however, PVC installed for the current water system lacked advancements in design (better pipe material and joint gaskets)

that now insure the current life expectancy of PVC. Reported in a study by Folkman, “2012 Water Main Breaks Study”, which surveyed 188 utilities across the U.S. and Canada, the average age of failing PVC water mains, is 47 years. It also reports that when compared to other pipe materials including cast iron, ductile iron, concrete and A.C, PVC had the lowest failure rate. This would suggest that existing A.C. pipe could be in worse shape than existing PVC.

- Given age (45 yrs), pipe type and history of leakage, it is suggested that all water mains and valves are replaced in phases starting at the tank working down and to the east. New mains should be 8" and 6” diameter minimum for dead-end and looped lines in accordance with WDEQ for mains providing maximum day plus fire protection. All mains should be modeled to insure they can deliver 1000 gpm fire flow on a future maximum day, consistent with the Teton County Fire Protection Resolution for new residential subdivisions with 30+ lots and DEQ.

- Service Lines
  - Most water service lines in Skyline consist of copper or galvanized metal. Based on a leak detection survey conducted by Water Utility App, LLC, in June of 2020, the following WAS discovered, much of it consistent with NE findings:
    a. 69 services with no leak - sound
    b. 4 fire hydrants with no leak - sound
    c. 7 mainline valves with no leak - sound
    d. 1 active leak between the main and the service valve at lot 12, 3125 W. Mallard Road
    e. 1 active leak indication on the customer side, could be a customer leak, leaking toilet, faucet running or other source of consistent water usage
    f. 1 Frost-free hydrant with irrigation piping connected to the service line immediately after the service valve – illegal irrigation connection
    g. 8 stuck caps
    h. 3 risers full of dirt
    i. 5 service connection unable to be located.
    j. 5 vacant properties without service connections or lost connections

    A map was produce describing the locations of these findings. It is suggested that the un-meter irrigation connection (frost free hydrant) is removed by owner, any curb stops that are inaccessible due to a stuck cap are fixed, and curb stop boxes full of dirt are either vacuumed or excavated and cleaned. It is expected that the un-locatable curb stops will be found at a later date when distribution mains are replaced.

- It will be important to consider assessing integrity of water service lines in the event that mains are replaced. According to District water policies, the District maintains the service line from the curb stop to the water main. It is suggest this segment, including curb stop is replaced during any water main replacement project. In addition, it would be wise to pressure test from the curb stop into the house to identify any other leaks to be repaired by the homeowner at that time.

- It may also be important to assess the integrity of water service lines in the event new water meters are installed. This can be done by isolating and pressure testing the service line from the curb stop to the meter location.

- **Residential Water Meters**
  - It has been indicated by the ISD Board that existing residential meters should be replaced. Arguments for replacement include:
    a. Existing meters are old and likely are no longer calibrated correctly, which could be why there is such a large amount (29%) of unaccounted for water.
    b. It would alleviate the need to collect readings from each residence, and the need for residences to access their meters in hard to reach locations to obtain the reading.
    c. Replacement of existing water meters with a remote read system will allow for collection of monthly flows providing for a more accurate assessment of water usage for billing, leak detection downstream of the meter and comparison with well production. It would also better facilitate decision making in the future regarding system improvements.

  - The two options for water meter replacement include:

    Option 1: Replace the existing meter in the house. This is the cheapest option ($750+/-), however it would fail to identify any user leaks or illegal connections upstream of the water service entry point to the residence.

    Option 2: Install water meter pit downstream of curb stop at the road edge. If the water main is replaced at the same time, all materials and installation would be new from the meter pit to the main. The downside is each pit would cost roughly $6K to install, and for reasons of economy, it is likely meter pits would be installed in phases along with the distribution mains.

Does the District have thoughts/preference on either of the two options above?

Summary of Recommended Distribution Improvements:

1. More immediate repairs/improvements:
    a. Repair all main line valves (4 ea.) so they are operational.
    b. Replace PRV-1 with 3"+ PRV with anti-cavitation trim to accommodate estimated peak hour flows + xxx gpm fire flow.
    c. Relocate or replace ARV-1. Replace ARV-2 and place in a traffic rated manhole or install bollards to protect.
    d. Place a new fire hydrant near the valve cluster at the intersection of Teal and Mallard. Hydrant will provide a new location for water line flushing and with possibility for use in the event of a fire.
2. Secondary Improvements:
    a. Install new residential water meters at existing residences.
    b. Plan for phased replacement of water distribution mains starting at the tank. New mains should be sized appropriately for future max. day demand plus fire flow (500 or 1000gpm).

Other Considerations:

Regionalization to Increase Water Storage and Supply

- Storage quantity is limited in the existing pressure tank between 400 and 500 gallons for the 5000 gallon storage tank. Ideal situation for water storage is a gravity-type elevated tank that would provide adequate system pressures, however, topography within the Skyline ISD makes this impractical.
- Options for Additional Storage:
    - Drill a new well and utilize the existing aquifer for storage; this was already suggested to meet peak hour demands.
    - Regionalization, including connecting to Indian Springs Ranch HOA, TOJ or Gros Ventre West ISD (Bar Y) are options.
        - Indian Springs and Bar Y systems have elevated tanks that would provide adequate pressures to Skyline. It would only be suggested that Skyline initiate conversations surrounding connection to these systems if they were only seeking extra supply to satisfy fire demand; existing tank supply and likely distribution facilities for Bar Y or Indian Springs would likely not be sized to handle peak demands for Skyline. In that event, their facilities would need to expand. Any benefit to Bar Y or Indian Springs surrounding a connection would likely be seen through additional water system revenue; Skyline would not be able to supplement supply to these systems w/out a booster station connected to the dedicated water tank supply line.

- TOJ would be the least expensive (capital cost) option, but would come with user and connection fees. There is an existing 12" dia. main available near the Science School, however, delivery pressure from TOJ system would be roughly 17 psi (at best) at the current Skyline Tank site, so a booster station would be required. In addition, TOJ would assess (at a minimum) the standard user and base fees below required by TOJ residences.

  $1625/residence connection fee.
  $600+ for meter cost and installation
  $7.22/month for ¾" meter – increases as meters get larger, &
  $2.12/1000 gal. use fee

  TOJ Assessed Fees for 3-Creek Subdivision

  $1296 Base Charge/ year
  $1.06 / 1000 gal. volume charge
  $600+ for meter cost and installation

  Note, additional fee by Skyline ISD would need be assess for upkeep/replacement of existing distribution facilities.

  NE can inquire with any of the above entities to see what future connection would look like and what they would require. There is a possibility they may required existing Skyline wells to be abandoned.

  Is there interest in regionalizing with another system?

D. Prioritizing Improvements and Available Funding

Next step in this study is to prioritize the improvements that the District finds most critical for continued water system operation, produce schematic plans for improvements, cost estimates and financial planning. Consider that WWDC will typically fund (grant + loan) supply and storage improvements, but will not do the same for distribution system improvements. WWDC grants for water supply and storage related projects will typically cover up to 67%. WWDC loans are expected to be 30-yr fixed at 4% interest. DWSRF loans can be sought for WWDC ineligible project components, including the remaining 33% not covered by WWDC, distribution & metering at a rate of 2.5% for 30yrs, with a 0.5% origination fee.

DWSRF Description:

http://deq.wyoming.gov/wqd/state-revolving-loan-fund/resources/3-drinking-water-state-revolving-fund/

Intended use Plan (IUP) Priority List:

https://lands.wyo.gov/grants-loans/loans/intended-use-plan

Review Recommended Improvements Spreadsheet

Consultant (NE) Action Items:

- Call DWSRF and inquire about principal forgiveness on loans, specifically for meters.
- Investigate tank replacement considering current and any future wells will operate on VFDs.
- Complete schematic design and cost estimates for #1 ranked priorities. Estimate budgeted amount for Skyline improvements to be include on the DWSRF IUP list (deadline is Feb. 15th)

- It will be important to consider assessing integrity of water service lines in the event that mains are replaced. According to District water policies, the District maintains the service line from the curb stop to the water main. It is suggest this segment, including curb stop is replaced during any water main replacement project. In addition, it would be wise to pressure test from the curb stop into the house to identify any other leaks to be repaired by the homeowner at that time.

- It may also be important to assess the integrity of water service lines in the event new water meters are installed. This can be done by isolating and pressure testing the service line from the curb stop to the meter location.

- **Residential Water Meters**
  - It has been indicated by the ISD Board that existing residential meters should be replaced. Arguments for replacement include:
    a. Existing meters are old and likely are no longer calibrated correctly, which could be why there is such a large amount (29%) of unaccounted for water.
    b. It would alleviate the need to collect readings from each residence, and the need for residences to access their meters in hard to reach locations to obtain the reading.
    c. Replacement of existing water meters with a remote read system will allow for collection of monthly flows providing for a more accurate assessment of water usage for billing, leak detection downstream of the meter and comparison with well production. It would also better facilitate decision making in the future regarding system improvements.

  - The two options for water meter replacement include:

    Option 1: Replace the existing meter in the house. This is the cheapest option ($750+/-), however it would fail to identify any user leaks or illegal connections upstream of the water service entry point to the residence.

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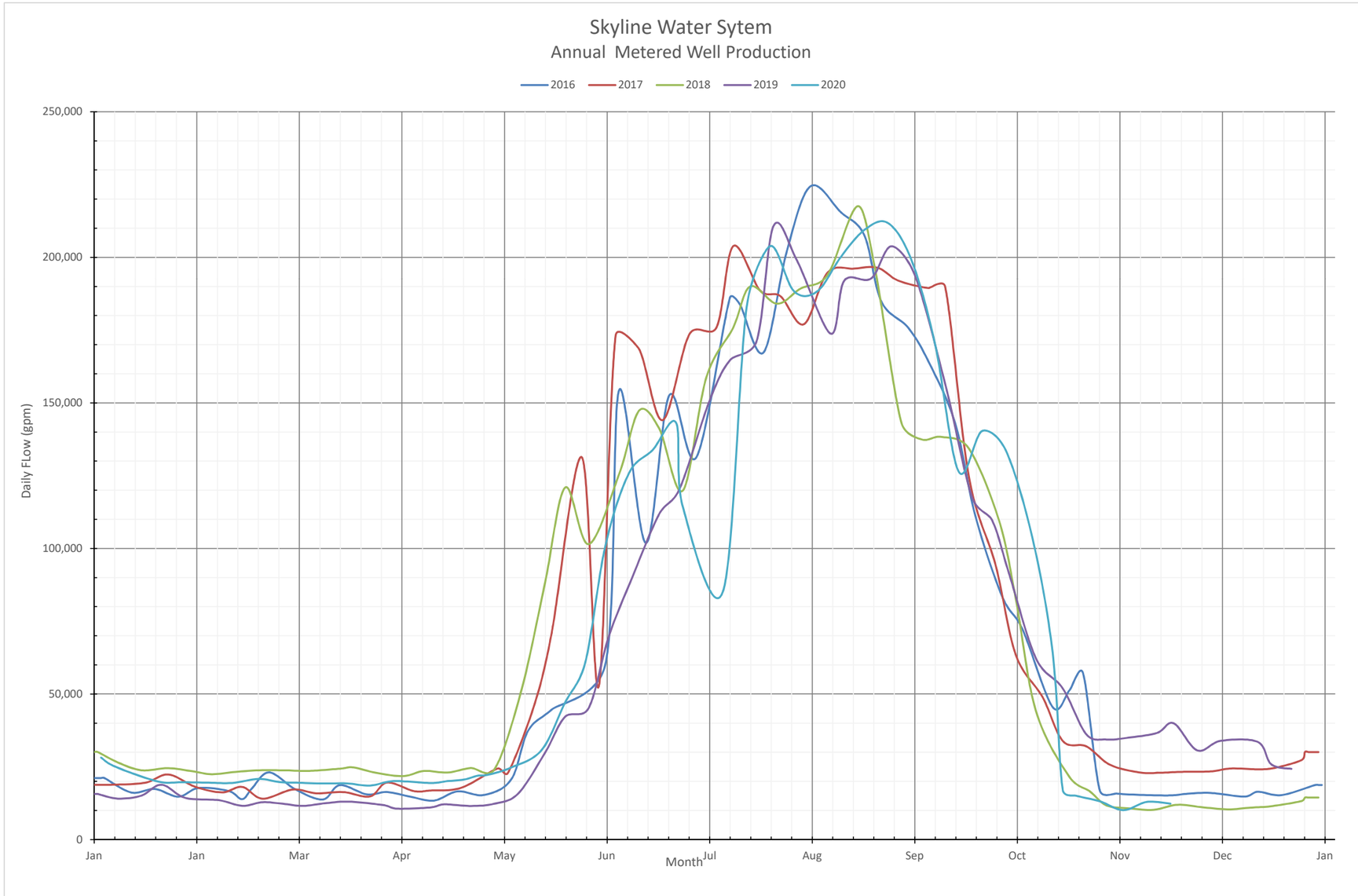
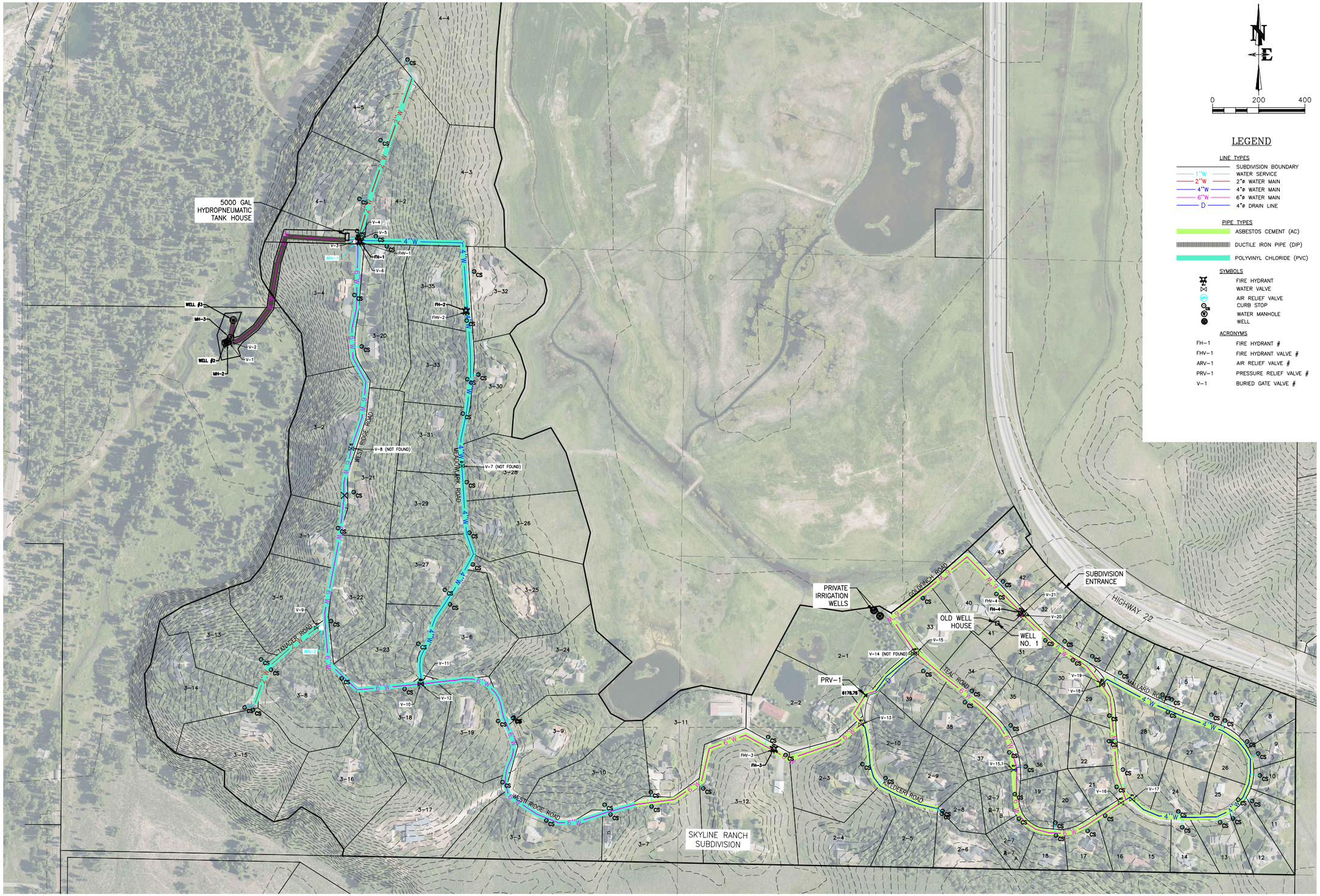


Existing Demands

Average Annual Well Supply, (2016-2020)	26,036,200	gallons
Average Winter Day, Nov. - Mar. for 2016-2019	20,500	gpd
Ave. Day Max. Month (Aug. 2020)	203,998	gpd
Ave Day Max. Week (Aug. 2016)	224,400	gpd
Non-Irr. Dom. Use	7,482,500	gal./yr
Irrigation (May 1st - Oct 15th)	18,553,700	gal./yr
% Irrigated Water	71%	
% Irrigation (August)	90.0%	

Figure 2



DATE	16 JULY 2020	REV.
SURVEYED	NE	
ENGINEERED	BO	
DRAWN	BO	
CHECKED	JK	
APPROVED	JK	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE
SKYLINE RANCH SUBDIVISION
EXISTING WATER SYSTEM

JOB TITLE
SKYLINE RANCH LEVEL II STUDY
TETON COUNTY, WY

DRAWING NO **C1.0**

JOB NO **20-094-01**

*SUMMARY OF EXISTING DEMANDS			
Description	**Demand (gpd)**	**Demand (gpm)**	**Demand/Lot (gpd)**
Average Day	63,700	45	777
Average Winter Day	12,200	9	149
Maximum Month Ave. Day	189,800	132	2315
Max. Week Ave. Day	210,000	146	2561
Max. Day (1.3 x Max. Week)	273,000	190	3330
Peak Hour (3 x Max. Day)	-	569	-

*Existing Demands for 82 lots w/ 13 lots containing ARUs. Demands include 29.4% of unaccounted for water.

*SUMMARY OF FUTURE DEMANDS			
Description	**Demand (gpd)**	**Demand (gpm)**	**Demand/Lot (gpd)**
Average Day	73,100	51	831
Average Winter Day	14,700	11	168
Maximum Month Ave. Day	217,800	152	2475
Max. Week Ave. Day	249,800	174	2839
Max. Day (1.3 x Max. Week)	324,700	226	3690
Peak Hour (3 x Max. Day)	-	676	-

*Future Demands for 88 lots w/ 44 lots containing ARUs. Demands include 15% of unaccounted for water and an irrigation increase of 10%.

Example Flows for Max. Month Ave. Day (August)

Granite Ridge (Teton Village)	1950 gpd/Lot
Spring Creek Ranch	2080 gpd/Lot
Esther Way (Teton Village)	2500 gpd/Lot - Peak Hour is 4 x MD

WORK SCHEDULE
SKYLINE ISD WATER SUPPLY, LEVEL II STUDY

	TASK	2020								2021					
		MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
1	Meetings														
2	Information Review														
3	Growth and Demand Projections														
4	Inventory, Evaluate, and GIS														
5	Water Source														
6	Hydraulic Model														
7	Recommendations and Cost Estimates														
8	Water System Financing														
9	Draft Report														
10	Report Presentations														
11	Final Report and Deliverables														

Project Milestones:

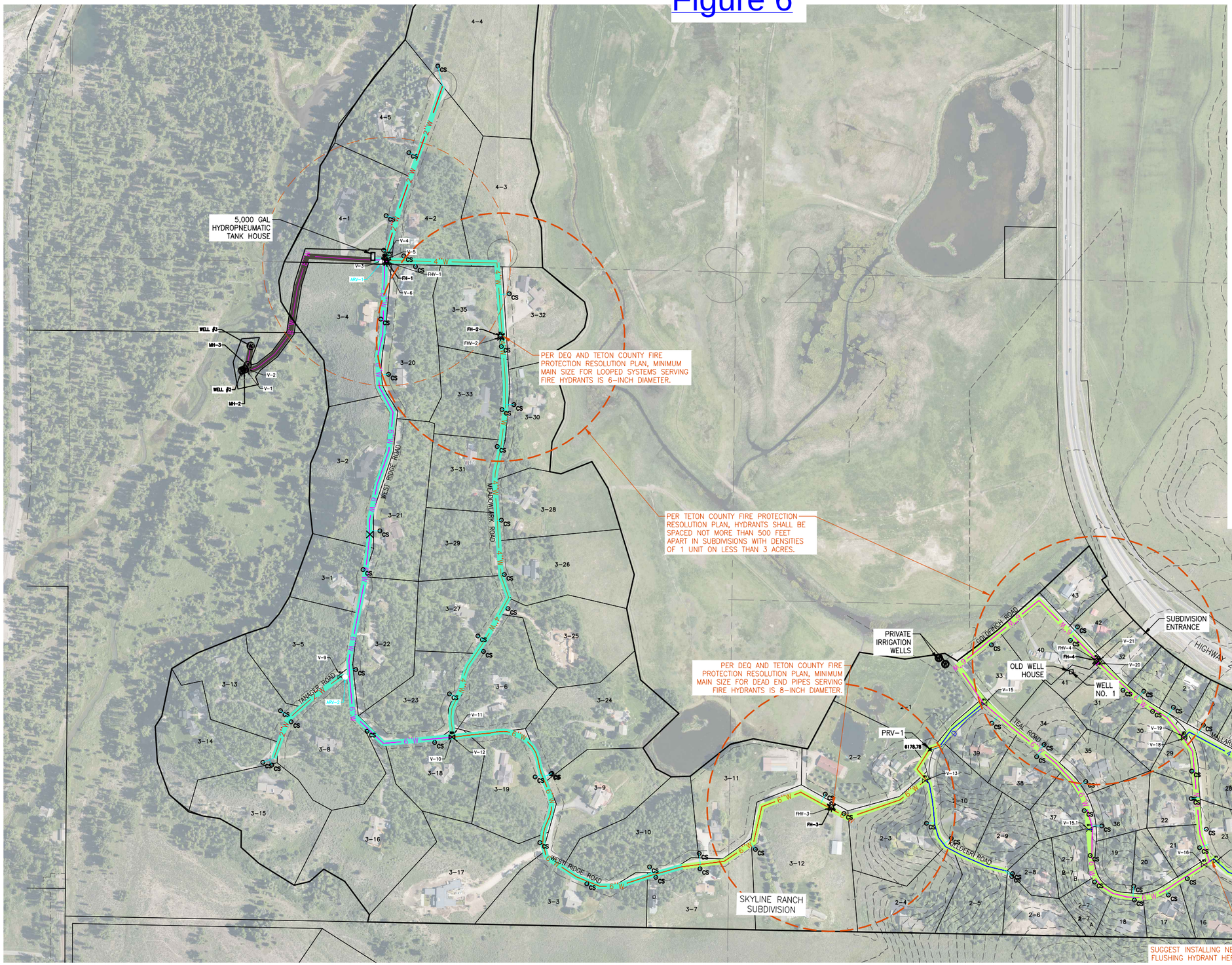
May 1, 2021	Draft Report
June 15, 2021	Final Report

WELL WATER SUPPLY VS. CUSTOMER METER DEMANDS				
Date	**Annual Demand Based on Customer Meters (gal.)**	**Annual Demand Based on Well Demand (gal.)**	**Un-Accounted for Water (gal.)**	***Un-Accounted for Water (%)**
4/15/2019 to 4/15/2020	16,101,900 gal.	25,539,800 gal.	9,437,900 gal.	37.0%
	44,115 gpd	69,972 gpd	*25,860 gpd	37.0%

* Typical unaccounted for water should be in the 10% range. In this case most of it is likely un-metered irrigation since it exceeds winter flows (20,500 gpd, or 250 gpd/lot), or it could be the result of inaccurate (uncalibrated) residential meters. Roughly 0% of total annual water consumption is irrigation based on well production data.

Leaks on Mallard were fixed around Oct. 1st, 2020 and daily flows have since dropped roughly 8,300 gpd.

Figure 6



LEGEND

LINE TYPES

- SUBDIVISION BOUNDARY
- 1"W WATER SERVICE
- 2"W 2"ø WATER MAIN
- 4"W 4"ø WATER MAIN
- 6"W 6"ø WATER MAIN
- D 4"ø DRAIN LINE

PIPE TYPES

- ASBESTOS CEMENT (AC)
- DUCTILE IRON PIPE (DIP)
- POLYVINYL CHLORIDE (PVC)

SYMBOLS

- FIRE HYDRANT
- WATER VALVE
- AIR RELIEF VALVE
- CURB STOP
- WATER MANHOLE
- WELL

ACRONYMS

FH-1	FIRE HYDRANT #
FHV-1	FIRE HYDRANT VALVE #
ARV-1	AIR RELIEF VALVE #
PRV-1	PRESSURE RELIEF VALVE #
V-1	BURIED GATE VALVE #

		REV.
DATE	16 JULY 2020	
SURVEYED	NE	
ENGINEERED	BO	
DRAWN	BO	
CHECKED	JK	
APPROVED	JK	

NELSON ENGINEERING
P.O. BOX 1599, JACKSON WYOMING (307) 733-2087

DRAWING TITLE
EXHIBIT A - FIRE HYDRANT DEFICIENCIES
EXISTING WATER SYSTEM

JOB TITLE
SKYLINE RANCH LEVEL II STUDY
TETON COUNTY, WY

DRAWING NO **EX A**

JOB NO **20-094-01**

S:\Proj\2020\094-01 (Skyline Ranch - Level II Water Study)\5_Draft & Final Reports\4 Drawings\Survey\20-094-01 Existing updated.dwg (EXHIBIT A) - Jun 04 2021 10:56:42 am PLOTTED BY: kdpatrick DWG FORMAT: 23.0