STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES
BENEFICIAL USE FIELD REPORT

A. GENERAL INFORMATION

Permit No: 95-9212
Exam Date: 07/07/2020

1. Current Owner:
   HAYDEN LAKE IRRIGATION DISTRICT 2160 W DAKOTA AVE HAYDEN ID 83835-5122

2. Accompanied by: Branden Rose
   Phone No: 208-772-2616
   Address: Same as above
   Relationship to permit Holder: Permit holder's representative - District Administrator.

3. **SOURCE:**
GROUND WATER

Method of Determination: Arcmap and DRG.

B. OVERLAP REVIEW

1. Other water rights with the same place of use: YES Overlap

Water Right No.	Source	Purpose of Use	Basis
95-7234	Groundwater	Municipal	Decreed
95-7800	Groundwater	Municipal	Decreed
95-8269	Groundwater	Municipal	Decreed
95-8273	Groundwater	Municipal	Decreed
95-8279	Groundwater	Municipal	Decreed
95-8581	Groundwater	Municipal	Decreed
95-9242	Groundwater	Municipal	Adjudication Claim, Active Recommended Status
95-12512	Groundwater	Irrigation	Decreed

Comments: 95-7234, 95-7800, 95-8269, 95-8273, 95-8279, 95-8581, and 95-9242 are all municipal beneficial use rights that overlap this right's POU. Condition X35 is not recommended for use in the licensing of Permit 95-9212, as each of the listed water rights and this permit's maximum diversion rates are additive in nature. Right 95-12512 is an irrigation beneficial use right with POU that overlaps this right's POU. The groundwater source is separate from this right, and it is not being considered as concern for overlap with the municipal use water system in place under Permit 95-9212.

2. Other water rights with the same point-of-diversion: YES Overlap

Water Right No.	Source	Purpose of Use	Basis
95-7800	Groundwater	Municipal	Decreed
95-8581	Groundwater	Municipal	Decreed
95-8269	Groundwater	Municipal	Decreed
95-8273	Groundwater	Municipal	Decreed
95-8279	Groundwater	Municipal	Decreed
95-9242	Groundwater	Municipal	Adjudication Claim, Active Recommended Status

Comments: the 6 water rights listed above all share one or more PODs with Permit 95-9212. Condition F06 was added to this permit during licensing review to describe the diversion of water through shared PODs.

C. DIVERSION AND DELIVERY SYSTEM

1. **LOCATION OF POINT(S) OF DIVERSION:**

GROUND WATER NE¼ NE¼, Sec. 14, Twp 51N, Rge 04W, B.M. KOOTENAI County
Lacey well located at -116°47.475, 47°46.226; 95-78-N-21.
GROUND WATER SW¼ SE¼, Sec. 15, Twp 51N, Rge 04W, B.M. KOOTENAI County
Dakota #1 well located at -116°48.941, 47°45.698; D0067888.
GROUND WATER NW¼ SE¼, Sec. 16, Twp 51N, Rge 04W, B.M. KOOTENAI County
Carrington well located at -116°50.382, 47°45.784; 95-77-N-167.
GROUND WATER SW¼ SE¼, Sec. 15, Twp 51N, Rge 04W, B.M. KOOTENAI County
Dakota #2 well located at -116°48.913, 47°45.667; 95-88-N-112.
GROUND WATER SW¼ SE¼, Sec. 15, Twp 51N, Rge 04W, B.M. KOOTENAI County
Dakota #3 well located at -116°48.905, 47°45.709; 95-88-N-111.
GROUND WATER NE¼ NW¼, Sec. 27, Twp 51N, Rge 04W, B.M. KOOTENAI County
Larix well located at -116°49.289, 47°44.481; 95-78-N-24.

Method of Determination: Well locations identified using GPS. Well locations verified using Arcmap aerial imagery and prior water right license POD layer. See above for detailed well NAME and GPS coordinates.

3.

X Delivery System Diagram Attached (required). Indicate all major components and distances between components. Indicate weir size/pipe as applicable.

X Map Attached Showing Location(s) of point(s) of diversion and place(s) of use (required). Scale must be 1:24,000 or greater.

X Aerial Photo Attached (required for irrigation of 10+ acres).

X Photo of Diversion and System Attached

4.

Well or Diversion ID No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
95-78-N-21 (Lacey well)	Western Land Roller	300		UNKOWN	
D0067888 (Dakota #1 well)	General Electric	300		American Marsh	
95-77-N-167 (Carrington well)	UNKOWN	600		UNKOWN	
95-88-N-112 (Dakota #2 well)	UNKOWN	600		Worthington	
95-88-N-111 (Dakota #3 well)	UNKOWN	300		Worthington	
95-78-N-24 (Larix well)	General Electric	300		American Marsh	

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calib. Date
FLOWMETER(s)						

2. Measurements: Hayden Lake Irrigation District (HLID) has uses a sophisticated SCADA water management system that enables read out of instantaneous flow from each of the wells linked to the system reading from installed flow meters at each well's pump station. HLID provided pump performance curves for each well that show pump technical specification pump curves, as well as 'observed' pump performance curves for each well's pump. The six well's combined diversion rate equals 1,850 gpm (Lacey) + 1,754 gpm (Larix) + 1,800 gpm (Dakota #1) + 4,100 gpm (Dakota #2) + 2,100 gpm (Dakota #3) + 1,800 gpm (Carrington) = 13,404 gpm or 29.9 cfs, considering Department rounding standards.

E. FLOW CALCULATIONS

X Additional Computation Sheets Attached

Measured Method:
HLID provided pump performance test results for six well pumps = 1,850 gpm (Lacey) + 1,754 gpm (Larix) + 1,800 gpm (Dakota #1) + 4,100 gpm (Dakota #2) + 2,100 gpm (Dakota #3) + 1,800 gpm (Carrington) = 13,404 gpm or 29.9 cfs, considering Department rounding standards.

F. VOLUME CALCULATIONS

1. Volume Calculations for irrigation: N/A

$V_{I.R}$ = (Acres Irrigated) x (Irrigation Requirement) =

$V_{D.R}$ = [Diversion Rate (cfs)] x (Days in Irrigation season) x 1.9835 =

V = Smaller of $V_{I.R}$ and $V_{D.R}$ =

2. Volume Calculations for Other Uses:

Municipal beneficial use is for a municipality; there is no annual or maximum diversion volume applied to this water right license.

G. NARRATIVE/REMARKS/COMMENTS

Field exam performed on 7/7/2020 with the applicant's representative, Branden Rose – District Superintendent, showed six groundwater wells servicing municipal use for Hayden Lake Irrigation District (HLID). HLID services the city of Hayden, linking this water right as serving a municipality. The water system infrastructure includes the 6 wells that are covered under this permit, however the diversion rate applied for equals 1.34 cfs, which is intended to add instantaneous diversion rate capacity to the water system. At each POD, the main trunk line from each respective well day-lights inside a pump station, where installed flow meters provide system management using SCADA software. Mr. Rose demonstrated he is able to track and manage all the wells for the system using any of the pump station SCADA controls. Flow measurements were provided by the applicant, in the form of pump performance curves (tested – observed), which provide the following flow rates:

- Lacy well (300 HP pump motor) = 1,850 gpm
- Larix well (300 HP pump motor) = 1,754 gpm
- Dakota #1 well (300 HP pump motor) = 1,800 gpm
- Dakota #2 well (600 HP pump motor) = 4,100 gpm
- Dakota #3 well (300 HP pump motor) = 1,800 gpm
- Carrington well (600 HP pump motor) = 1,800 gpm
- TOTAL flow rate = 13,404 gpm or 29.9 cfs, considering department rounding standards.

Performance data demonstrates any of the six wells is capable of greater diversion rates than the permit authorized value. The total diversion rate of 29.9 is an additive value, which represents multiple water rights associated with the six wells covered under permit 95-9212 (see backfile to field exam report for calculation data sheet). This permit's maximum diversion rate of **1.34 cfs** is recommended for licensing purposes. The overage in diversion rate versus HLID's licensed OR in process licensing combined diversion rate of 25.88 cfs is expected to be covered under a separate permit (95-16962) if re-instated from its currently lapsed condition, or a new application for permit will be required by HLID to account for the difference of 29.9 cfs – 25.88 cfs = 4.02 cfs.

The Hayden Lake Irrigation District's municipal water system POU is a large are POU, and includes sections 11-16, 21-24, and 26-27 located within Township 51 North, Range 04 West. Arcmap aerial imagery was used to trace out the municipal POU, and the permit approved POU shape was used during licensing review and is recommended to be carried forward to the license. As a municipal license, HLID can request a service area POU update as their water system continues to grow in the future.

At time of licensing, the permitted POD(s) for one of the groundwater wells was found to be inaccurate with field exam determined legal description location; see below:

POD: authorized on permit = one of two GROUNDWATER 51N04W**14NENE**.
POD: verified at time of licensing = one of two changed to GROUNDWATER 51N04W**15SWSE**.

An Application for Amendment was initiated, and mailed with cover letter to the applicant on 11 January 2021.

Conditions 26A, 134, 046, and WB4 were removed from the permit during licensing review. Condition F06 was added to describe shared PODs between water rights 95-7234, 95-7800, 95-8269, 95-8273, 95-8279, 95-8581, 95-9242, and this right 95-9212. Condition 175 was added describing requirements for the diversion of water from the Rathdrum Prairie Ground Water Management Area (RPGWMA). All other conditions form the permit will remain on the license.

Overlap concerns: 95-7234, 95-7800, 95-8269, 95-8273, 95-8279, 95-8581, and 95-9242 are all municipal beneficial use rights that overlap this right's POU. Condition X35 is not recommended for use in the licensing of Permit 95-9212, as each of the listed water rights and this permit's maximum diversion rates are additive in nature. Right 95-12512 is an irrigation beneficial use right with POU that overlaps this right's POU. The groundwater source is separate from this right, and it is not being considered as concern for overlap with the municipal use water system in place under Permit 95-9212. There are multiple other overlapping water right POUs located within the municipal POU served by HLID, but as they are not connected to HLID for their respective uses, they are not a concern for overlap with this permit. There are no other overlap concerns with this water right.

Have conditions of permit approval been met? __X__ Yes ____ No

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use	Rate of Diversion
MUNICIPAL	01/01 to 12/31	1.34 CFS
	Totals:	1.34 CFS

2. Recommended Amendments

__X__ Change P.D. as reflected above ____ Add P.D. as reflected above ____ None

____ Change P.U. as reflected above ____ Add P.U. as reflected above __X__ None

I. AUTHENTICATION

Luke Bates - Water Resource Agent

Field Examiner's Name _____ Date 1/13/2021

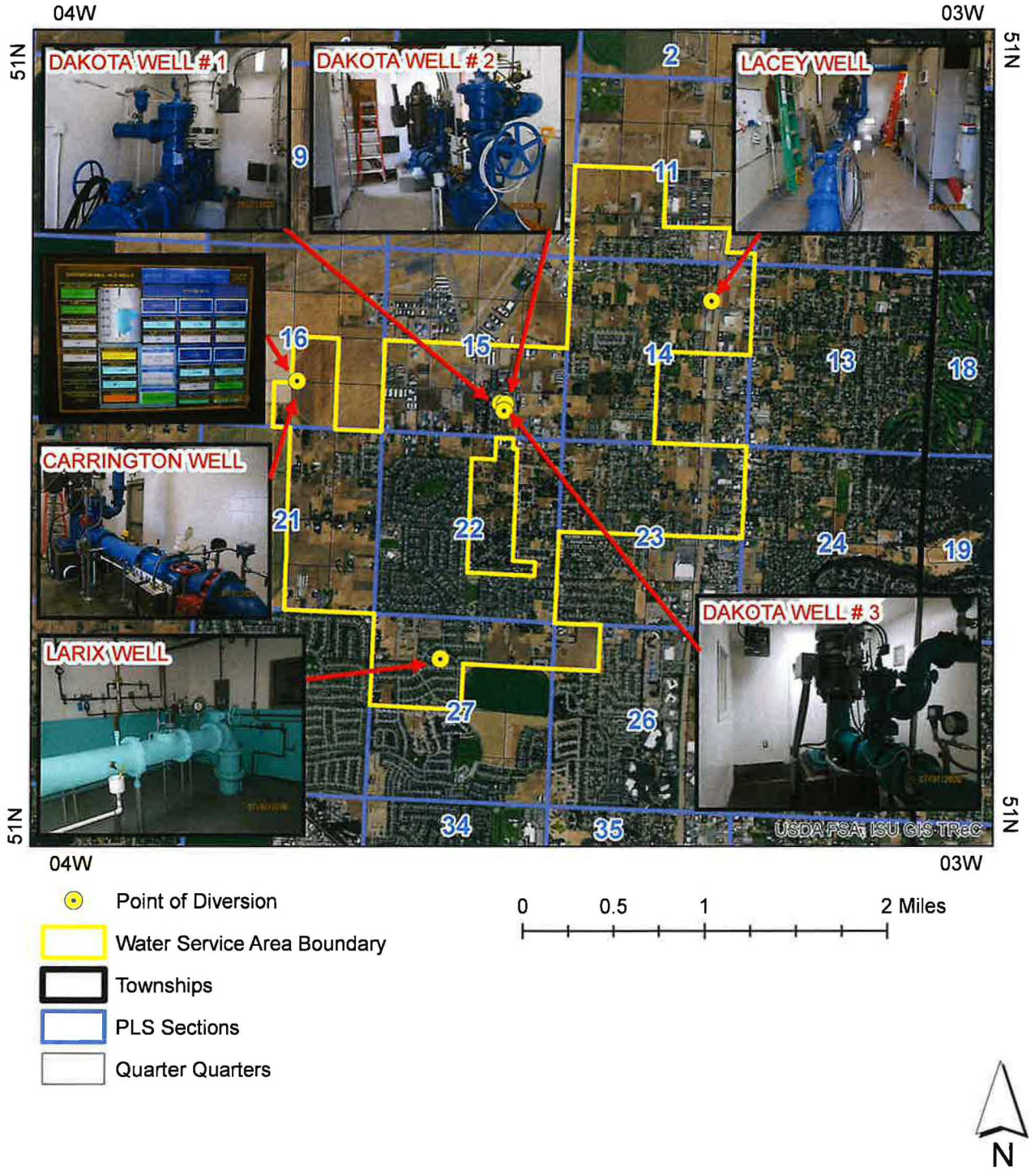
Reviewer _____ Date _____

Hayden Lake Irrigation District

Attachment to Field Exam

95-9212

MUNICIPAL system diagram.



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Hayden Lake Irrigation District
Water Use Resolution

Resolution 15-01

Whereas: The Hayden Lake Irrigation District (District) encourages efficient use of water and adopts policies, guidelines and recommendations for that purpose; **And**

The District is the water purveyor to its members; **And**

The District supplies water drawn from the Spokane Valley-Rathdrum Prairie Aquifer (Aquifer); **And**

The Aquifer is designated as a "sole source" aquifer; **And**

The District recognizes the need to encourage efficient water use.

Now, Therefore Be It Hereby Resolved, the Hayden Lake Irrigation District Board of Directors establishes this policy to support and encourage efficient water use by its members.

This policy is intended, but not limited to:

Encourage efficient water use by its members through use of current and future technology to improve efficiency of interior and exterior water use within the boundaries of the Hayden Lake Irrigation District.

The District shall establish a water use plan in accordance with Idaho Department of Water Resources Rathdrum Prairie Groundwater Management Plan requirement for a 'Conservation Plan'.

The District shall incorporate efficient water use at and on its facilities.

The District shall provide regular messages promoting efficient water uses through its written and verbal communications with members.

The District shall evaluate the effectiveness of its actions over time, and may make revisions and refinements to its actions as it deems necessary or beneficial to its operations as a water purveyor.

Adopted by the Hayden Lake Irrigation District board of Directors on this 3 day of March, 2015

BiJay Adams, Chairman

ATTEST: Brian Eifler, Secretary/Treasurer

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Hayden Lake Irrigation District

Water Use Conservation Plan

January 2015

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Introduction

The purpose of this document is to establish a formal water conservation plan for the Hayden Lake Irrigation District in accordance with the Rathdrum Prairie Groundwater Management Plan adopted by the Idaho Water Resource Board on September 15, 2005.

System Profile

Hayden Lake Irrigation District was originally formed in 1914; during its history the District evolved into a drinking water supplier. Historic water source was Hayden Lake, however that source has been replaced entirely by groundwater from the Rathdrum Prairie Aquifer (RPA).

The District pumps groundwater under various water rights. These rights are summarized in Appendix A.

Currently the District utilizes four deep wells for its supply. A recently drilled, cased and screened well will add one additional source once completed and equipped. Due to proximity of the local airport the District predominantly uses the aquifer as its storage. The four wells have a pumping capacity of approximately 9000 gallons per minute (gpm) and are controlled using variable frequency drives on three of the four wells.

This supply provides water through a distribution network consisting of one pressure zone with pipe sizes from 24" to 4" and types including concrete lined steel, asbestos cement and PVC. Age of the distribution network ranges from approximately 60 years old to current construction. The distribution system provides water to approximately 2500 connections with approximately 80% of those connections representing residential use. The remainder consists of commercial and seasonal irrigation use. The prior 15 years have resulted in District growth exceeding 100% which added significant connections and distribution network. During the same period the District has been able to reduce production per connection by approximately 40%. This reduction is discussed in more detail in the Resource Conservation section. Growth took place primarily during the recent early 21st century residential boom observed throughout the US. One additional source was added during that time.

All sources are metered as are all connections. Meters are read monthly or more frequently and the District utilizes automated meter reading equipment and software. Reliable consumption meter reading and analysis is limited to a six year period from 2009 to current.

Water Use

Analysis of production trends over the past 15 years yields the following: Average day demand (ADD) ranges from a low of 640 gallons per day per connection (g/d/c) to a high of 1150 g/d/c with an overall average of 650 g/d/c for the past 6 years. Peak day demand (PDD) ranges from a low of 1445 to a high of 3950 g/d/c/ with an overall average for the past 6 years of 1840 g/d/c. Peak hourly demand ranges from approximately 9000 gpm to 7000 gpm with 2014 exceeding 9000 gpm. Tables depicting these and the following trends are included in Appendix B

Analysis of consumption trends over the past 6 years yields the following: Average minimum daily per meter use ranges from a low of 130 g/d/c to a high of 180 g/d/c. Average maximum daily per meter use ranges from a low of 1330 to a high of 2150 g/d/c with six year averages of 155 and 1640 g/d/c

respectively. Low use typically occurs during the winter months and high use occurring during the summer months. Seasonal use variation is recognized as a multiplier of approximately ten from low to high use. The District has conducted studies of residential use in recently constructed subdivisions which confirm these seasonal variations.

Water loss is demonstrated to be generally within the industry guidelines of 10% or less; annualized unaccounted for water ranges from 7% to 20% over the past 6 years with an average of 10.6%. Unaccounted for water includes; seasonal distribution system flushing (un-metered); construction flushing, and potential distribution system leaks. A leak survey was conducted in 2014 which identified one minor leak (repaired). The District analyzes daily production with increased emphasis during wintertime low flows for consistency, trending and flow rate quantity as one of its methods for analyzing water loss potential.

Resource Conservation

The District has employed several measures to reduce water production and encourage conservation through wise use of water by its customers. These current practices consume approximately ¼ to ½ of a staff FTE. Proposed future conservation measures follow a discussion of current practices.

The District has reduced its annual production per connection by approximately 40% over the past 15 years. These reductions appear to be the result of two technological advancements; the first included installing variable frequency drives on two of its pumps (a third drive was added later when the fourth well was constructed) and installation of a control system (SCADA system). These changes resulted in significant reductions of tank overflow and once the control systems were understood and able to be fully utilized they resulted in increased overall system operational efficiency reducing production by approximately 20% total. The second advancement included replacing all consumption meters with automated meters and associated reading equipment and software.

The second improvement has enabled the District to read meters accurately, reliably and on an increased frequency and more importantly to analyze and subsequently use the information gained to notify customers of leaks and high use. The District notifies customers of these parameters on a monthly basis. Results of this effort illustrate a sharp 20% decrease in production with continued, less significant, reduction trends since.

The District constructed a demonstration garden in 2010 to illustrate a landscape alternative to lawn grasses. The District can use this garden to demonstrate the per square foot reduction in water use.

The District routinely provides information encouraging conservation to its customers in the form of meter readings and reminders on the billing statement, newsletters included with the quarterly water bill, annual consumer confidence report, District website information and personal communication with customers by office and field staff. A leak credit program is utilized to encourage quick repair of leaks.

Water rates are annually reviewed and generally increased each year by a small amount. The District finds its water pricing to be midpoint on a comparison of local providers.

Each of these measures provides a consistent message of the importance of water, its management as a resource and everyone's responsibility in preserving the resource.

Future measures may include

- Continuation of the existing educational and field programs with improvements and enhancements as they become available, and are implementable.
- Conversion to a consumption based water rate rather than an allocation based rate as currently employed. Consumption based rates have a demonstrated effect of reducing consumption.
- Odd/Even watering schedules for seasonal irrigation.
- Encouragement of soil amendments to increase water holding capacity which is shown to reduce rapid dewatering of the top soil as well as reduce surface evaporation retaining more water near the root zone.
- Encouraged use of technological advancements both indoors and for outside irrigation.
- Support of technology to use rain and soil moisture sensors, AgriMet stations and other methods to increase efficiency of irrigation of larger plots with potential for use on residential lots.

The Districts future goals for water use will be based on a per connection basis; with desired results to reduce the seasonal peaks and develop stable, consistent water use patterns. The District has significant involvement in a regional organization which is discussing conservation on a region wide basis. It is anticipated that organization will establish goals for water use and conservation which the District will than tailor its conservation programs to meet.

Conclusion

It must be noted, and understood, the Districts primary responsibility is to provide safe drinking water of high quality. Efforts spent on conservation, while embraced by the District as an important component of resource management, must be manageable, implementable and affordable to both the District staff and its members. As evidenced by its significant current efforts the District is committed to realistic conservation, however it also recognizes future conservation measures are unlikely to yield returns as high as previously observed.

The District participates significantly in the larger regional (bi-state) resource management discussions towards regional solutions to current and future resource challenges. Conservation is recognized as a significant, and logical part of that discussion. It is also recognized that the region will not 'conserve' its way out of these challenges; and conservation in many ways simply paves the road towards additional growth.

To provide greater context of the Districts current water use patterns; recent studies completed by the Idaho Water Resources Research Institute (IWRRI) and the USGS demonstrate the District's per capita use as it compares to local and national trends. The IWRRI study concluded the District as having the 2nd lowest per capita water use (87 g/d) of the regional (Idaho) purveyors supplying information. A recent USGS national study (completed every 5 years) showed a national average of 88 g/d/person and illustrated Idaho as the highest per capita water user in the nation at 168 g/d (District use shown at 87 g/d/p). These comparisons demonstrate the effectiveness of the Districts current work.

The District believes the results discussed in this report, and a comparison to regional and national trends illustrate District water use trends significantly influenced by its conservation efforts, its customer's willingness to use water wisely and the Districts commitment to manage the resource appropriately.

Hayden Lake Irrigation District
Conservation Plan
Appendix A

Rights Held by District

Right #	Priority Date	Cfs Annual	Cfs 3-15 11-15	AF Annual	AF Irr Season
95-7800 [1]	11/16/77	3.8	3.8	2751.1	
95-8581 [1]	4/25/88	10.92	12.92	4237	300
95-9212	8/7/02	1.34	1.34	968.3	
95-16962[2]	12/23/14	5.00	5.00	-	-
Total		21.06[3]	23.06[3]	7288.1[3]	8256.4[3]

Irrigation season is March 15 to November 15

Notes

1. Rights 95-7800 & 95-8581 have an instantaneous withdraw limitation of 16.72 CFS and a combined annual limit of 7288.1 Ac. Ft. CFS Annual allocation is for Municipal use.
1. Prohibition of application to lands that have surface water rights, whether for irrigation or domestic lawn watering.
2. Right 95-16962 has a conditional instantaneous withdraw limitation of 30.88[1] CFS. This total includes combined rights 95-7800, 95-8581, 95-9212, 95-16962, 95-8269, 95-8279[2], 95-9242.
    1. The total capacity listed as part of the conditions of right 95-16962 is assumed to be in error- Actual total capacity should be 29.00 CFS rather than 30.88 taking the combined limit of 3.12 for rights 95-8273 and 95-8279
    2. Right 95-8279 is linked to 95-8273 this condition is assumed to include both.

Rights Held in Deed by District

Right #	Priority Date	CFS Annual	Cfs 3-15 11-15	AF Annual	AF Irr Season
95-8279 [1]	4/1/83		3		553
95-8273 [1]	3/16/83		2		374.5
95-9242 [2]	3/9/66		1.26		371
95-8269 [3]	3/11/83		1.56		273
			5.94 [4]		1571.5

Notes:

1. Sunshine Meadows and Strawberry Fields development water rights deeded to District September 2004 instruments 1929155 & 1929156
1. Rights 95-8279 & 8273 have a combined limit of 3.12 CFS
2. Broadmoore Estates development water right
3. Carrington Meadows water right. Section 16 T51 R4
4. Represents total CFS where rights 8279 & 8273 have a combined total of 3.12.

Hayden Lake Irrigation District
Conservation Plan
Appendix B

Water Production 2009 to 2014

Source: Rathdrum Prairie Aquifer
Source wells 1 through 4 Quantity in gallons

	Year					
	2009	2010	2011	2012	2013	2014
January	20,939,000	18,283,900	18,692,000	16,836,600	17,233,000	16,265,100
February	17,493,000	16,523,000	16,315,000	15,769,100	15,088,000	14,907,800
March	19,342,000	18,745,000	17,426,000	16,491,000	16,962,300	16,746,000
April	22,340,900	21,868,000	17,801,600	19,657,100	20,202,200	20,130,100
May	66,111,100	47,361,400	25,633,400	53,419,400	64,335,600	52,075,100
June	118,205,700	51,482,300	46,146,300	53,462,300	101,967,200	86,757,900
July	159,272,500	126,110,800	106,825,500	106,365,200	155,398,400	140,461,200
August	131,389,200	142,174,100	135,640,300	140,108,500	128,065,100	129,746,900
September	98,456,600	73,579,700	125,910,400	111,912,500	68,260,400	97,459,300
October	28,802,500	32,058,900	44,800,900	34,580,700	24,059,100	40,068,100
November	17,065,400	18,592,000	17,223,400	16,620,000	16,525,300	19,241,100
December	17,776,000	18,480,000	17,143,300	17,122,400	17,948,500	17,866,900
Total	717,193,900	585,259,100	589,558,100	602,344,800	646,045,100	651,725,500

Water Use 2009 to 2014

Consumption from monthly meter readings (in gallons)

	2009	2010	2011	2012	2013	2014
January		13,196,000	15,641,000	13,712,000	14,120,000	13,976,000
February	33,978,000	12,360,000	18,828,000	12,288,000	12,722,000	11,853,000
March	13,587,000	13,734,000	11,499,000	9,961,000	12,278,000	12,301,000
April	18,960,000	18,096,000	13,490,000	14,913,000	14,414,000	18,468,000
May	39,432,000	37,565,000	29,379,000	40,299,000	56,566,000	40,821,000
June	71,709,000	40,459,000	40,706,000	37,660,000	61,048,000	66,032,000
July	114,596,000	85,785,000	107,925,000	72,859,000	117,718,000	109,998,000
Irrigation		45,461,000	26,519,000	18,721,000	44,694,000	36,247,000
August	74,682,000	99,234,000	118,167,000	109,406,000	96,615,000	92,681,000
September	157,511,000	81,871,000	100,533,000	140,584,000	94,662,000	122,807,000
October	22,538,000	61,024,000	35,349,000	48,779,000	18,702,000	32,343,000
November	13,940,000	13,793,000	15,551,000	13,925,000	18,326,000	12,300,000
December	12,137,000	21,750,000	11,729,000	23,607,000	12,267,000	15,260,000
	573,070,000	544,328,000	545,316,000	556,714,000	574,132,000	585,087,000

Unaccounted for Water

Unaccounted for water (in gallons)

	2009	2010	2011	2012	2013	2014
Production	717,193,900	585,259,100	589,558,100	602,344,800	646,045,100	651,725,500
Use	573,070,000	544,328,000	545,316,000	556,714,000	574,132,000	585,087,000
Unaccounted	144,123,900	40,931,100	44,242,100	45,630,800	71,913,100	66,638,500
Percentage	20.10%	6.99%	7.50%	7.58%	11.13%	10.22%

Note: Significant unmetered construction project flushing in 2013 and 2014 (independent projects) may have contributed to the higher unaccounted for water.

Growth in Connections

	2009	2010	2011	2012	2013	2014
beginning	2363	2445	2483	2511	2551	2597
ending	2443	2490	2521	2549	2597	2659
change	80	45	38	38	46	62
total	309					
% change	3.39%	1.84%	1.53%	1.51%	1.80%	2.39%
Total %	12.46%					

HAYDEN LAKE IRRIGATION DISTRICT – CURRENT WATER RIGHTS as of 01/07/2021

Basin	Sequence	Version Number	Process	Basis	Status	Draft	RightID	Priority Date	Diversion Rate	Source List	Water Use List	Current Owner	Approval Date	Total Acres	Volume
95	7234		Water Right	Decreed	Active	N	636193	1/29/1973	0.500	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			16.8
95	7800		Water Right	Decreed	Active	N	631042	11/16/1977	3.800	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			2,751.1
95	8269		Water Right	Decreed	Active	N	630995	3/11/1983	1.560	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			146.6
95	8273		Water Right	Decreed	Active	N	631070	3/16/1983	2.000	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			374.5
95	8279		Water Right	Decreed	Active	N	631066	4/1/1983	3.000	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			553.0
95	8581		Water Right	Decreed	Active	N	631059	4/25/1988	12.920	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			4,537.0
95	12512		Water Right	Decreed	Active	N	634590	10/23/1964	1.090	GROUND WATER	IRRIGATION	HAYDEN LAKE IRRIGATION DISTRICT		77.0	269.5
95	9212		Water Permit	Licensing Review	Active	N	630954	8/7/2002	1.340	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT	5/14/2010		
95	16962		Water Permit		Active	N	673026	1/29/2015	5.000	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT	2/13/2015		
95	9242	1	Recommendation	License	Active		631088	3/9/1966	1.260	GROUND WATER	MUNICIPAL	HAYDEN LAKE IRRIGATION DISTRICT			371.0
								GREEN HIGHLIGHTED RIGHT(S) TOTAL DIVERSION RATE =	25.88	(0.50 cfs + 1.090 cfs + 5.0 cfs = 6.59 cfs subtracted from MUNICIPAL use total)					
NOTE:	1. Water Permit No. 95-16962 has been excluded from the TOTAL diversion rate, as it is currently categorized as 'lapsed', and being evaluated for potential re-instatement.														
	2. HLID owns an IRRIGATION water right No. 95-12512, which has not been transferred to MUNICIPAL use at time of licensing PERMIT No. 95-9212; excluded from TOTAL diversion rate.														
	3. Right 95-7234's POD is not associated with the shared wells for 95-7800, 95-8269, 95-8273, 95-8279, 95-8581, 95-9242 (transfer), and 95-9212 (permit); excluded from Total diversion rate.														
	4. 25.88 cfs = combined diversion rate on paper for right(s) 95-7800, 95-8269, 95-8273, 95-8279, 95-8581, 95-9242 (transfer), and 95-9212 (permit), which all share one or more of the six (6) wells associated with 95-9212.														
	5														

Permit 95-9212 uses 6 groundwater production wells associated with their Municipal demands. Pump performance curves for each of the wells provided by HLID during licensing that demonstrate the following flow rate capacities:

Hayden Lake Irrigation District MUNICIPAL Production Wells			
Well	Pump (HP)	Capacity (gpm)	Diversion Rate (cfs)
LACEY	300	1850	4.12
LARIX	300	1754	3.91
DAKOTA #1	300	1800	4.01
DAKOTA #2	600	4100	9.13
DAKOTA #3	300	2100	4.68
CARRINGTON	600	1800	4.01
	TOTAL(S)	13404	29.9

29.9 cfs is the total pump(s) performance capacity, considering Department rounding standards. The overage in diversion rate versus HLID water right licensed/in process licensing combined diversion rate (25.88 cfs) is expected to be covered under Permit 95-16962 if reinstated, or a new permit will be required by HLID to account for the difference of 29.9 cfs – 25.88 cfs = **4.02 cfs**.

2.4.2 Source

All of the District's wells draw water from the Spokane Valley-Rathdrum Prairie Aquifer (SVRPA). The aquifer was designated as a "Sole-Source Aquifer" by the Environmental Protection Agency in 1978. The aquifer is supplied by several large surface water sources including Lake Coeur d'Alene, the Spokane River, Lake Pend Oreille, and Hayden Lake. Other small lake watersheds such as Hauser, Spirit, and Twin supply the balance of the surface water input to the aquifer. The Panhandle Health District estimates that precipitation supplies the aquifer with one third of its water (2000).

The SVRPA is comprised of a thin layer of soil overlaying 200 to 400 feet of coarse sands and gravels. The alluvial material was deposited by Ice Age floods from Glacial Lake Missoula about 12,000 years ago. The depth to groundwater in the District is approximately 300 feet and consistent to within about 20 feet at any given time.

The SVRPA provides excellent water quality for the District and surrounding water purveyors. The District regularly monitors water quality within the system. No treatment is required for the District at this time.

2.4.2.1 Existing Operations

The District has five active well sources on three well sites and one well currently under HLID ownership for future use (Carrington Well No. 5). All wells draw water from the Rathdrum Prairie Aquifer. Well construction information from the driller's logs, hydrogeological reports, and the 2016 Drinking Water Supply Report (DEQ) are listed in **Table 2-11**, well logs are included in **Appendix D.**

Table 2-11 – HLID Well Construction Information

Well	Total Well Depth (ft)	Static Water Level (ft)	Screen Depth From/To (ft)	(ft)	Well Seal Depth (ft)	Casing Depth (ft)	Casing Diameter (inch)	Capacity (gpm)	Backup Power Generation
Lacey	440	313	341	419	100	422	20	1,800	Yes
Larix	372	302	346	372	20	346	16	1,800	Yes
Dakota No. 1	449	287	388	448	60	387	16	1,800	Yes, effective fall 2018
Dakota No. 2	450	305	389	445	20	393	20	3,600	No
Dakota No. 3	415	307	359	410	20	362	16	1,800	Yes
Carrington No. 5 ~~(Future Well)~~	363	285	333	363	Not Available	333	16	NA	NA

The Lacey Well

The Lacey Well utilizes a Western Land Roller pump that was installed in 1982. This pump has a 300-horsepower motor with a 7-stage bowl assembly, and is rated to operate against a head of 525 feet. The line shaft bearings are lubricated by a food grade mineral oil drip tube. This pump is also equipped with a Saftronics soft start, while using the original starter as a bypass. The well house is in fair condition, but space within the facility is limited, making it difficult to access some of the electrical

1 of 4 Pg except

components located in the building. Avista Utilities provides 480-volt overhead electrical service to the Lacey Well. The well house is also equipped with a diesel generator so that the pump can still operate during a power outage.

The District anticipates an additional future well to be constructed at this site to support growth.

Dakota Well No. 1

Dakota Well 1 utilizes a General Electric premium efficiency motor, inverter-duty type that is rated at 300 hp for 460-volt, three-phase electrical power supply (Model 5KS447DAJ6029). The motor drives an American Marsh (Model 14LC-6 VT) six stage, line-shaft, vertical turbine pump with 367-feet of 10-inch steel column discharge pipe. The pump motor operates with a Square D/Schneider Electric (Model ATV630) variable frequency drive controller to provide variable flow and pressure that, in conjunction with the other District wells, matches the distribution system needs at any given time. Dakota Well No. 1 is located just south of the District's office on Dakota Avenue.

Dakota Well No. 2

Dakota Well 2 utilizes a Worthington pump with a 600-horsepower motor and a 7-stage bowl assembly. It is rated to operate against a head of 478 feet. Line shaft bearings receive system water pre-lubrication and product water lubrication during operation. The pump is equipped with an Allen-Bradley soft start with no bypass. The well house that serves Dakota Well 2 is located approximately 200 feet north of Dakota Well 3, located at the District's office on Dakota Avenue. A Worthington pump is also installed in Dakota 3.

Dakota Well No. 3

Dakota Well 3 utilizes a Worthington pump with a 300-horsepower motor with a 5-stage bowl assembly, and is capable of operating against a head of 495 feet. Line shaft bearings receive system water pre-lubrication and produce water lubrication during operation. The well house that serves Dakota 3 is located approximately 200 feet south of Dakota 3 located at the District's Office on Dakota Avenue. Dakota 3 is equipped with a Caterpillar generator similar to that at the Lacey Well. The District rebuilt the pump and motor bearings in Dakota 3 in the spring of 2000. The work completed at that time may account for the high pump system efficiency in Dakota 3.

Larix Well No. 4

The Larix Well was upgraded during the winter of 2017 through summer of 2018. The upgrade doubled the Larix Well pumping capacity. The upgraded Larix Well utilizes a General Electric premium efficiency motor, inverter-duty type that is rated at 300 hp for 460-volt, three-phase electrical power supply. The motor drives an America Marsh six stage, line-shaft, vertical turbine pump with 260- feet of 10-inch stainless steel column discharge pipe. The pump motor operates with a variable frequency drive controller to provide variable flow and pressure that, in conjunction with the four other District wells, matches the distribution system needs at any given time. The Larix Well is located in Sunshine Meadows at 2626 W. Larix Court in the City of Coeur d'Alene, Idaho.

Carrington Well No. 5

The District currently has a water right that expires in 2020 for the purposes of providing irrigation water for 78 acres in the district service area. The District is currently in the design phase to convert the existing irrigation well to a municipal well site. The existing well, also referred to as the Carrington well, is located in the west of Atlas Road and north of Hayden Avenue.

System Operations and Existing Pressures

The District's pumps operate in response to floats located in the reservoir outside of the District's boundary. Due to the flat terrain, the District has a single pressure zone controlled by the existing tank. Because of the small storage volume and high system demands during max day and peak hour, the District operates the tank level in a tight band at all times such that the systems pressures remain between 60 and 80 psi throughout the day. **Appendix A-2** shows system pressures, on a 24-hour basis, during maximum demand.

The District has three timeframes in which different pump operation patterns occur. The three timeframes are as follows:

- Morning Peak (3:00 a.m. to 9:00 a.m.)
- Evening Peak (9:00 a.m. to 6:00 p.m.)
- Night Operations (6:00 p.m. to 3:00 a.m.)

The District adjusts each timeframe pump operation pattern to account for the large fluctuation of water use throughout the day. The goal for the District's operating pattern is to run no more than four pumps at a time while keeping the tank level around 17.0 feet. Because the demand in the District is highly volatile and storage is minimal, the District has the ability to adjust pump start and stop levels easily. **Table 2-12** shows the pump operation patterns for summer of 2018.

Table 2-12– Summer 2018 Pump Operation Set Points

Pump	3:00 AM to 9:00 AM		9:00 AM to 6:00 PM		6:00 PM to 3:00 AM	
	Start (ft)	Stop (ft)	Start (ft)	Stop (ft)	Start (ft)	Stop (ft)
Lacey	9.0	19.0	9.0	18.5	10.0	19.0
Larix	6.5	17.0	6.5	17.0	9.0	17.0
Dakota No. 1	10.0	20.0	10.0	19.0	10.0	19.5
Dakota No. 2	8.0	17.0	12.0	20.0	9.0	18.0
Dakota No. 3	11.0	18.0	11.0	18.0	12.0	19.5

During the winter months, the District produces an average 4.89 million gallons per day. Because the water consumption rate is much lower, the District historically only needed to operate the Larix Well. The Larix Well operates continuously on a VFD matching the demand, while maintaining a system-wide pressure of 70.5 psi and tank level of 15.5 feet.

An existing pump station and intake is located at Hayden Lake that was used to serve the water system in its early years. This station was utilized from about 1957 until 1989. This surface water source was chlorinated, and then delivered directly to the distribution system. The water main from the lake pumps is still connected to the storage tank, however it is isolated from the system with closed valves. Recently

3 of 4 pg except

the District transferred the water right for the lake source to the Dalton Irrigation District, since the Hayden Lake Irrigation District no longer has a need for the lake water.

2.4.2.2 Observed Deficiencies

- The total supply capacity of the system with the largest well out of service (Dakota Well No. 2) is 7,200 gpm. The peak hour flow during the summer months is 11,040 gpm shown in **Table 2-4.** The existing supply (with the largest source out of service) is not currently able to support the growth the District is expecting.
- Total system supply is 10,800 gpm which is less than the 2017 peak hour demand (PHD) of 11,040 as noted in **Table 2-4**. During the summer of 2018, the District invoked mandatory odd-even watering days in order to sustain peak hour demands until additional supply is online.
- The supply for the District is centrally located, but growth for the District is expected on the West side.

2.4.3 Storage

2.4.3.1 Existing Operations

The District has one elevated steel reservoir with a capacity of 75,000 gallons that the Bureau built in 1955. The reservoir is located on the east side of the intersection of Lacey Avenue and Strahorn Road in the City of Hayden Lake. It connects to the system by a 27-inch reinforced concrete cylinder pipe. The reservoir support legs are located at an elevation of 2,302 feet above mean sea level according to the 1958 Bureau of Reclamation as-built drawings. The base of the storage portion of the tank is located at an elevation of 2,438 feet. The top of the tank is at an elevation of approximately 2,460 feet.

Components of finished water storage, as defined by the Idaho Administrative Code (IDAPA) 58.01.08, for the District are summarized below.

1. Dead Storage – Storage that is either not available for use in the system or can provide only substandard flows and pressures. All of the District's storage is available for use in the system to provide adequate flows and pressures. Therefore, the District does not need to account for any Dead Storage.
2. Effective Storage – Storage other than dead storage, including operational, equalization, fire suppression, and standby.
3. Operational Storage – Storage that supplies water when, under normal operating conditions, the sources are off. This component is the larger of 1) the volume required to prevent excess pump cycling and to ensure that the Equalization Storage, Fire Suppression Storage, and Standby Storage components are full and ready for use when needed or 2) the volume needed to compensate for the sensitivity of the water level sensors.
    a. The District does not need to account for any operational storage because the system is continuously pumping.
4. Equalization Storage – Storage required to compensate for the difference between a water system's maximum firm supply capacity and peak hour demand. Peak hour demand is estimated at 2.45 times the average day production based on diurnal information calculated from August 2017 data (reference **Table 2-4**). The District's firm supply capacity (i.e., capacity with the largest

4 of 4 pg except.

USE TYPEWRITER OR BALL POINT PEN

State of Idaho
Department of Water Administration

WELL DRILLER'S REPORT

Lacey Well

State law requires that this report be filed with the Director, Department of Water Administration within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name Hayden Lake Irrigation Dist.

Address Hayden Lake Idaho

Owner's Permit No. 95-78-N-21

2. NATURE OF WORK

■ New well ☐ Deepened ☐ Replacement

☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☒ Domestic ■ Irrigation ☐ Test ☐ Other (specify type)

☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

4. METHOD DRILLED

■ Cable ☐ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 20 inches Total depth 422 feet

Casing schedule: ■ Steel ☐ Concrete

Thickness	Diameter	From	To
.375 inches	2 inches	+ 2 feet	384 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

Was a packer or seal used? ■ Yes ☐ No

Perforated? ☐ Yes ■ No

How perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation _____ inches by _____ inches

Number	From	To
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet

Well screen installed? ■ Yes ☐ No

Manufacturer's name Wat Johnson

Type Stainless Steel Model No. 304

Diameter 10 Slot size 100 Set from 341 feet to 361 feet

Diameter 10 Slot size 150 Set from 361 feet to 376 feet

18" Blank: 140 to 150; 371 to 406; 405 to 419

Gravel packed? ☐ Yes ☐ No Size of gravel _____

Placed from _____ feet to _____ feet

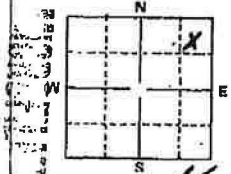
Bottom of screen shoe at 423' w/ cement plug

Surface seal depth 100' Material used in seal ☐ Cement grout ■ Puddling clay ☐ Well cuttings

Sealing procedure used ☐ Slurry pit ■ Temporary surface casing ☐ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location. 95



Subdivision Name _____

Lot No. _____ Block No. _____

County Kootenai

NE ¼ NE ¼ Sec. 14, T. 51 N/S, R. 4 E/W

USE ADDITIONAL SHEETS IF NECESSARY — FORWARD THE WHITE COPY TO THE DEPARTMENT

7. WATER LEVEL

Static water level 313 feet below land surface

Flowing? ☐ Yes. ■ No G.P.M. flow _____

Temperature _____ ° F. Quality _____

Artesian closed-in pressure _____ p.s.i.

Controlled by ☐ Valve ☐ Cap ☐ Plug

8. WELL TEST DATA

■ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped
2146	37	4½

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
24	0	19	Large Gravel & Sand		✓
✓	19	30	Boulders		✓
24	30	30	Gravel & Sand		✓
20	30	48	Gravel & Sand		✓
	48	68	Gravel		✓
	68	88	Gravel 2" mines		✓
	88	90	Gravel 10" mines		✓
	90	101	Gravel 3" mines		✓
	101	152	Gravel Coarse		✓
	152	283	Gravel & Sand		✓
	283	286	Boulders		✓
	286	309	Gravel 1½" mines		✓
	309	311	Gravel Tight		✓
	311	319	Gravel w/ water @ 313	✓	
	319	334	Gravel 1½" mines	✓	
	334	331	Sand Coarse	✓	
	331	342	Sand Fine w/ Clay		✓
	342	343	Sand Coarse	✓	
	343	351	Sand Fine w/ Some Clay	✓	
	351	360	Gravel 1" mines	✓	
	360	373	Gravel 2" mines	✓	
	373	381	Gravel 1" mines	✓	
	381	393	Sand Very Fine	✓	
	393	397	Sand Coarse w/ Rock Gravel	✓	
	397	409	Sand Coarse w/ Rock Gravel	✓	
	409	417	Sand Fine	✓	
	417	432	Sand Coarse	✓	
4"	432	427	Sand Fine w/ Clay	✓	
5	427	433	Sand Fine w/ Blue Clay	✓	
6	433	440	Clay Blue		✓
5					
5					
6					
6					
6					
6					

RECEIVED
AUG 16 1978
Department of Water Resources

10.

Work started Dec. 13 - 1977 finished Jan. 27 - 1978

11. DRILLERS CERTIFICATION

Firm Name E.B. Holman Drilling Co. Firm No. 105

Address 6 miles S. Pines Rd. Post Falls Date June 25/78

Signed by (Firm Official) E.B. Holman

and

(Operator) Dave Koch

HLID Pump System Efficiencies - Lacey, Well #1

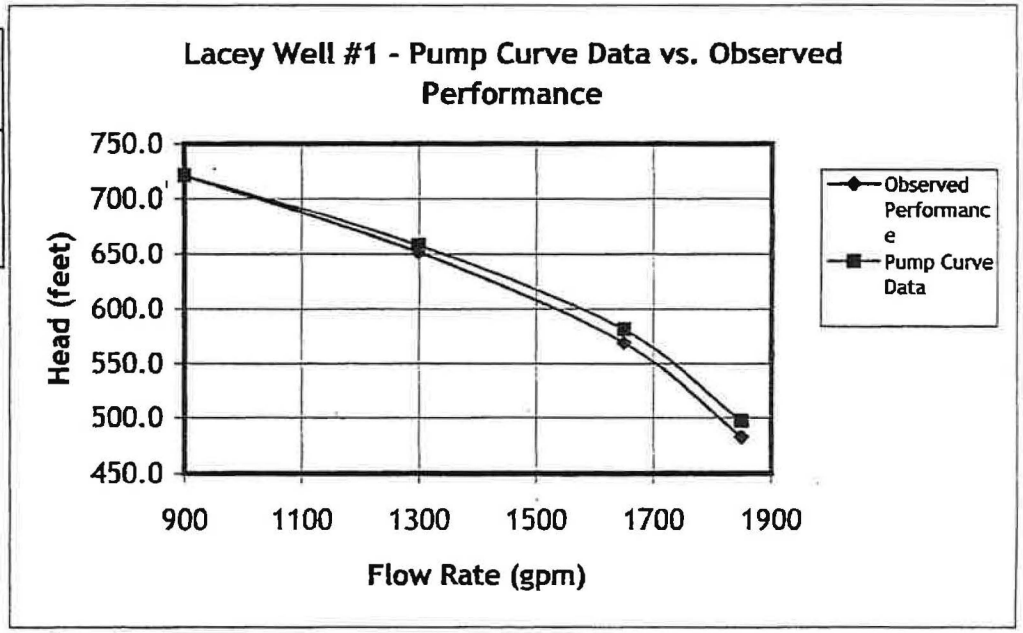
Note: gpm and pressure data taken by Paul Klatt during pump tests, kW verified by Craig Meredith of Avista

Static water level: 313 Feet below grade
Column Dia.(in): 10
Minor losses: 0.5 (90 deg bend + ent.)
f (friction factor): 0.021 (from Moody diagram)

Lacey, Well #1 300 HP pump MOTOR
95-78-N-21

GPM	Flow (cfs)	PSI	kW (delivered to motor)	Pressure Head (feet)	Velocity Head (feet)	Elevation Head (feet)	Pipe & Fitting losses (feet)	Total Head (feet)	Hydraulic Power Output (kW)	System Efficiency
1850	4.12	70	258	161.54	0.89	313	7.44	482.87	124.20	0.481
1650	3.68	108	259	249.23	0.71	313	5.92	568.85	130.50	0.504
1300	2.90	145	249	334.62	0.44	313	3.67	651.73	117.80	0.473
900	2.01	176	224	406.15	0.21	313	1.76	721.12	90.24	0.403

Observed performance		Pump Curve Data	
Total Head (feet)	GPM	Head	GPM
482.9	1850	497	1850
568.9	1650	581	1650
651.7	1300	658	1300
721.1	900	721	900



Larix Well Log and Pump Installation Report

LL POINT PEN

Department of Water Resources

WELL DRILLER'S REPORT

RECEIVED

JAN 3 1979

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

LL 1

TH Larry Armstrong

dress RT#1 Box 203 Coeur d'Alene

ring's Permit No. 95-78-N-24 33814 10

TURE OF WORK

New well ☐ Deepened ☐ Replacement

Abandoned (describe method of abandoning)

POSED USE

Domestic ☒ Irrigation ☐ Test ☐ Other (specify type)

Municipal ☐ Industrial ☐ Stock ☐ Waste disposal or injection

THOD DRILLED

Cable ☐ Rotary ☐ Dug ☐ Other

ELL CONSTRUCTION

Diameter of hole 16 inches Total depth 372 feet

asing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
.375 inches	16 inches	2 feet	346 feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet
____ inches	____ inches	____ feet	____ feet

Is casing above used? ☒ Yes ☐ No

Was a packer or seal used? ☒ Yes ☐ No

Is it perforated? ☐ Yes ☒ No

How perforated? ☐ Factory ☐ Knife ☐ Torch

Size of perforation ____ inches by ____ inches

Number	From	To
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet
____ perforations	____ feet	____ feet

Well screen installed? ☒ Yes ☐ No

Manufacturer's name JOHNSON

Type STAINLESS STEEL Model No. STANDARD

Diameter 16 Slot size 100 Set from 346 feet to 353 feet

Diameter 16 Slot size 100 Set from 355 feet to 372 feet

Gravel packed? ☐ Yes ☒ No Size of gravel ____

Gravel from ____ feet to ____ feet

Surface seal depth 30 Material used to seal ☒ Cement grout ☐ Puddling clay ☐ Well cuttings

Backfill procedure used ☐ Slurry pit ☒ Temporary surface casing ☒ Overburn to seal depth

LOCATION OF WELL

Sketch map location must agree with written location.

N

W E

S

Subdivision Name ____

Lot No. ____ Block No. ____

County KOOTENAI

NE ¼ NE ¼ Sec. 27 T. 51 N/S, R. 4 E/W

USE ADDITIONAL SHEETS IF NECESSARY

7 WATER LEVEL

Department of Water Resources

Static water level 302 feet below land surface

Flowing? ☐ Yes ☒ No G.P.M. flow ____

Temperature 48 ° F. Quality Good

Artesian closed in pressure ____ p.s.i.

Controlled by ☐ Valve ☐ Cap ☐ Plug

8. WELL TEST DATA No Test

☐ Pump ☐ Bailer ☐ Other

Drawdown G.P.M.	Draw Down	Hours Pumped

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
20	0	20	GRAVEL + SAND 2" MIX		X
16	20	59	" " "		X
16	59	110	GRAVEL + SAND 1" MIX		X
16	110	182	GRAVEL + SAND 2" MIX		X
16	182	189	BOULDERS 10" MIX		X
16	189	256	GRAVEL 3" MIX		X
16	256	297	COBBLE + SAND 1" MIX		X
16	297	310	COARSE SAND + CLAY		X
16	310	322	CLAY		X
16	322	341	COARSE SAND + CLAY		X
16	341	372	BSA GRAVEL + SAND	X	

10. Work started FEB 24-78 finished MARCH 17-78

11. DRILLER'S CERTIFICATION

Firm Name HOLMAN DRILLING CO. Inc. No. 10A

Address E3410 9TH AVE SPOKANE WASH Date APRIL 11-78

Signed by (Firm Official) Arnold E. Holman Reg.

and

(Operator) Arnold E. Holman

SECTION 15160-18 PUMPS AND MOTORS

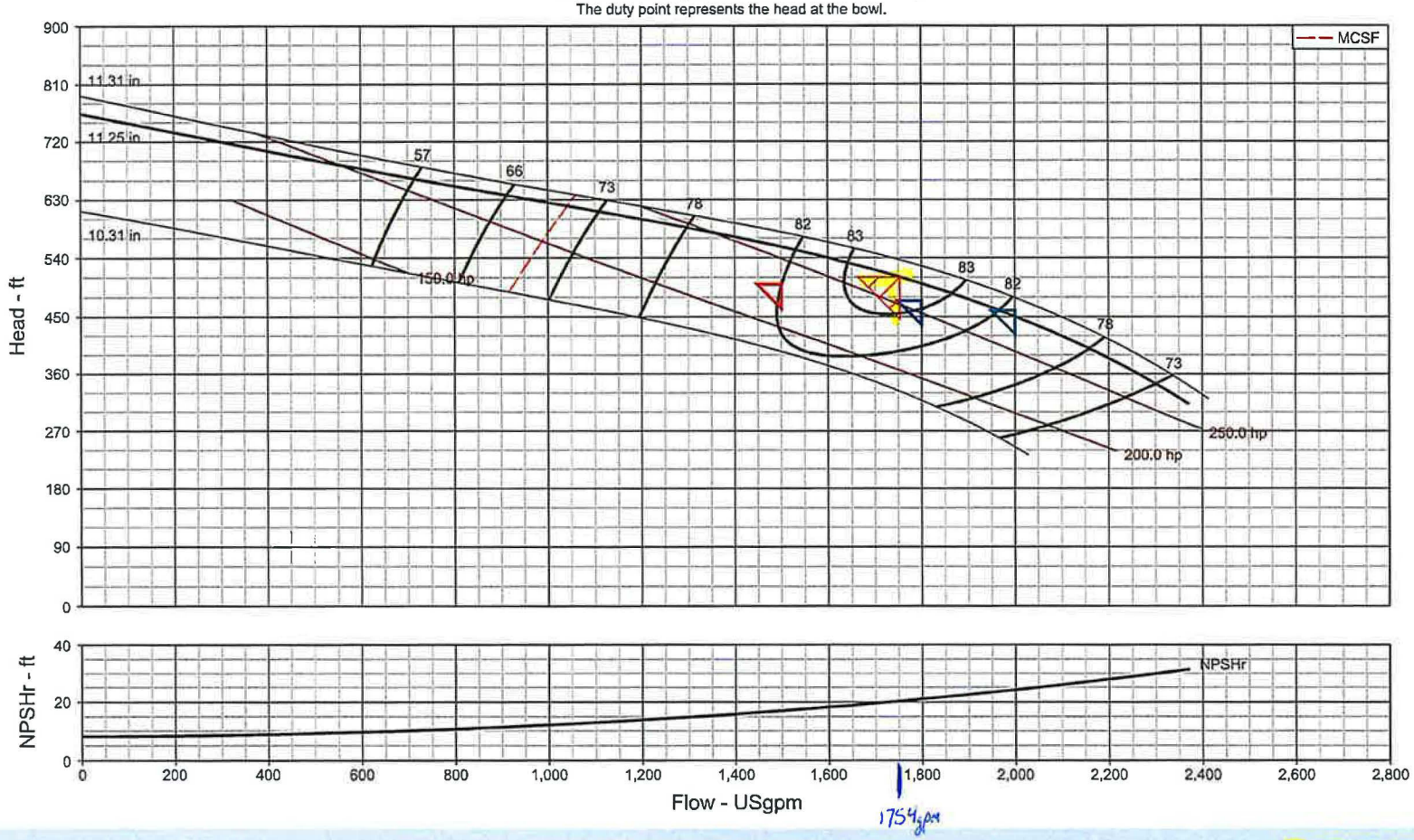
Customer Reference: LARIX WELL

Pump Performance Curve

American-Marsh Pumps Quotation System 18.2.4.0

Larix WELL - 300 HP PUMP MOTOR
95-78-N-24

Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.



Item number	: 035	Size	: 14LC	Flow, rated	: 1,754.1 USgpm
Service	:	Stages	: 6	Differential head / pressure, rated	: 510.9 ft
Quantity	: 1	Speed, rated	: 1780 rpm	NPSH required	: 20.37 ft
Quote number	: 309338	Based on curve number	: 14LC	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 13 Jul 2018 4:04 PM	Efficiency (bowl / pump)	: 83.36 / 79.25 %	Viscosity	: 1.00 cP
		Power (bowl / pump)	: 271 / 279 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00

2M Company Inc. · P.O. Box 80770 · Billings, MT 59101
phone: 406-245-1490 · fax: 406-259-7281 · mfasching@2mco.com

Dakota Well No. 1

Form 238-7
6/07

IDAHO DEPARTMENT OF WATER RESOURCES
WELL DRILLER'S REPORT

1. WELL TAG NO. D 0006788
Drilling Permit No.
Water right or injection well #
2. OWNER: Hayden Lake Irrigation District
Name
Address 2160 West Dakota Avenue
City Hayden State Id Zip 83835
3. WELL LOCATION:
Twp. 51N North ☐ or South ☐ Rge. 4W East ☐ or West ☐
Sec. 15 ___ 10 acres ___ 1/4 ___ 40 acres ___ 1/4 ___ 160 acres ___ 1/4
Gov't Lot County
Lat. 47 ° 45 42.74 N (Deg. and Decimal minutes)
Long. 116 ° 48 53.84 W (Deg. and Decimal minutes)
Address of Well Site 2160 West Dakota Avenue
(Give at least name of road • Distance to Road or Landmark) City Hayden
Lot. Blk. Sub. Name
4. USE:
☐ Domestic ☒ Municipal ☐ Monitor ☐ Irrigation ☐ Thermal ☐ Injection
☐ Other
5. TYPE OF WORK:
☒ New well ☐ Replacement well ☐ Modify existing well
☐ Abandonment ☐ Other
6. DRILL METHOD:
☒ Air Rotary ☐ Mud Rotary ☐ Cable ☐ Other
7. SEALING PROCEDURES:

Seal material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method/procedure
3/8 Bent.	0	60		poured

8. CASING/LINER:

Diameter (nominal)	From (ft)	To (ft)	Gauge/ Schedule	Material	Casing	Liner	Threaded	Welded
16"	+2	387	.375	Steel	☐	☐	☐	☒
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐

Was drive shoe used? ☒ Y ☐ N Shoe Depth(s) 387
9. PERFORATIONS/SCREENS:
Perforations ☐ Y ☒ N Method
Manufactured screen ☒ Y ☐ N Type Stainless Steel
Method of installation

From (ft)	To (ft)	Slot size	Number/ft	Diameter (nominal)	Material	Gauge or Schedule
448	438	.100	10'		S.S.	
438	418	.070	20'		S.S.	
* 418	~~388~~ 387	.100	30'		S.S.	

* Length of Headpipe 10' 0 Slot Length of Tailpipe 0'
Packer ☒ Y ☐ N Type (tight wind)
10. FILTER PACK: NONE

Filter Material	From (ft)	To (ft)	Quantity (lbs or ft³)	Placement method

11. FLOWING ARTESIAN:
Flowing Artesian? ☐ Y ☒ N Artesian Pressure (PSIG)
Describe control device

12. STATIC WATER LEVEL and WELL TESTS:
Depth first water encountered (ft) 300 Static water level (ft) 287' 5"
Water temp. (°F) Bottom hole temp. (°F)
Describe access port 2-2" CAPS.
Well test:

Drawdown (feet)	Discharge or yield (gpm)	Test duration (minutes)

Test method: Pump ☐ Bailer ☐ Air ☐ Flowing artesian ☐
Water quality test or comments:
13. LITHOLOGIC LOG and/or repairs or abandonment:

Boro Dia. (in)	From (ft)	To (ft)	Remarks, lithology or description of repairs or abandonment, water temp.	Water Y	Water N
20"	0	15	Gravels, brown dirt		✓
20"	15	95	Gravels, SAND		✓
16"	95	100'	boulders		✓
16"	100	272	Gravels, SAND		✓
16"	272	280	SAND, little gravels		✓
16"	280	300	SAND	✓	
16"	300	372	GRAVELS, SAND	✓	
16"	372	435	GRAVELS, SAND	✓	
16"	435	449	GRAVELS, FAN	✓	
			RUSTY looking SAND	✓	
			GOOD water from 375' down.		

Completed Depth (Measurable): 448
Date Started: Sep 29, 14 Date Completed:
14. DRILLER'S CERTIFICATION:
I/We certify that all minimum well construction standards were complied with at the time the rig was removed.
Company Name O'Keefe Drilling Co. No.
*Principal Driller Larry Wagner Date 12-2-14
*Driller Date
*Operator II Date
Operator I Date
* Signature of Principal Driller and rig operator are required.

* Based on video of completed well PAK May 2017

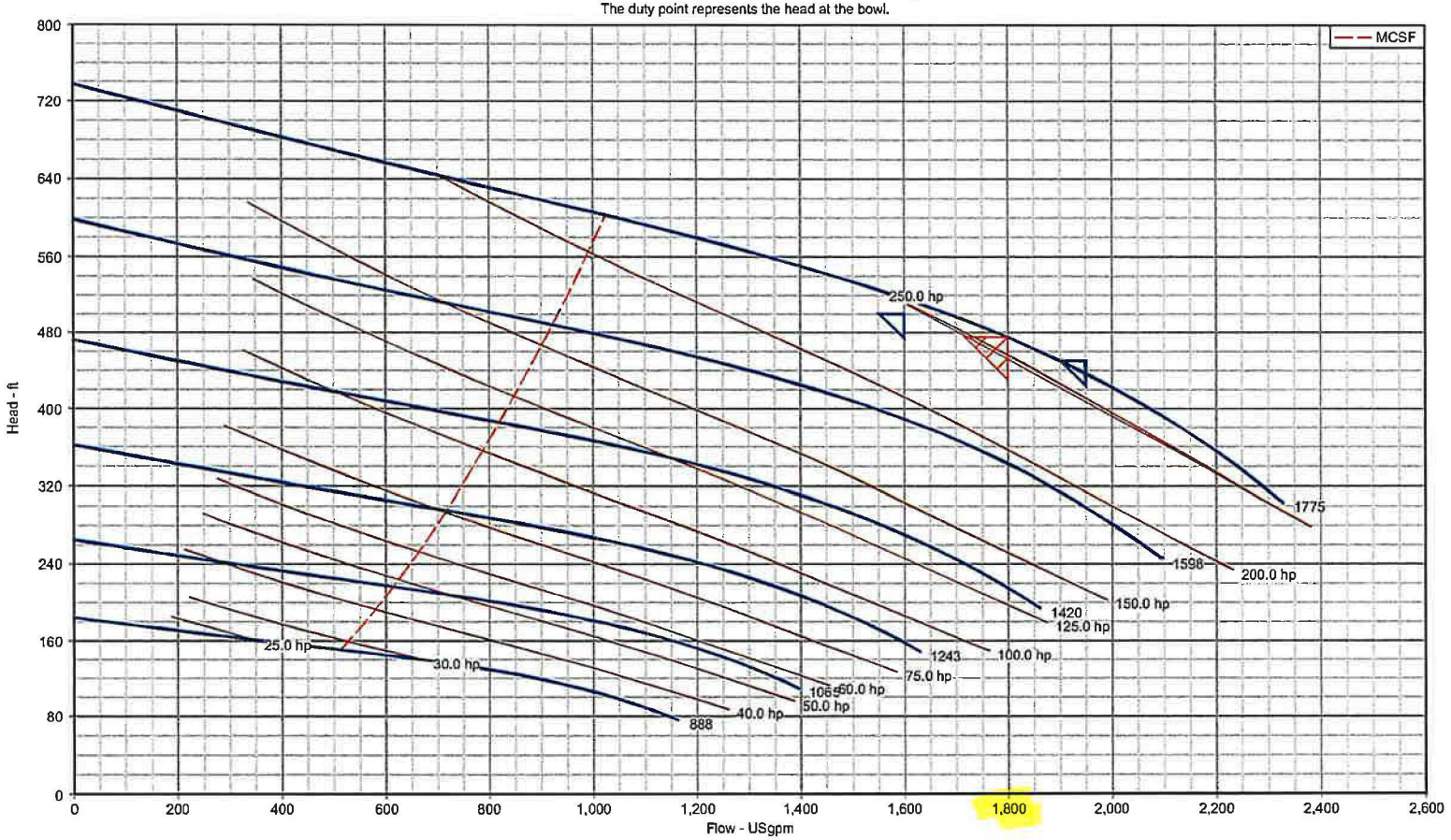
Customer : UNITED CROWN PUMP
Reference :

Multi-Speed Performance Curve

American-Marsh Pumps Quotation System 16.1.6.0

DAKOTA WELL NO 1 : 300 HP pump motor
D0067888

Bowl performance. Adjusted for construction and viscosity.
The duty point represents the head at the bowl.



Item number	: 001	Size	: 14LC	Flow, rated	: 1,800.0 USgpm
Service	:	Stages	: 6	Differential head / pressure, rated	: 475.0 ft
Quantity	: 1	Speed, rated	: 1775 rpm	NPSH required	: 21.00 ft
Quote number	: 541732	Based on curve number	: 14LC	Fluid density, rated / max	: 1.000 / 1.000 SG
Date last saved	: 03 May 2016 10:13 AM	Efficiency (bowl / pump)	: 83.13 / 78.99 %	Viscosity	: 1.00 cP
		Power (bowl / pump)	: 260 / 266 hp	Cq/Ch/Ce/Cn [ANSI/HI 9.6.7-2010]	: 1.00 / 1.00 / 1.00 / 1.00
				Impeller diameter, rated	: 11.13 in

Form 238-7
1/78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

Dakota well No. 2

USE TYPEWRITER OR BALLPOINT PEN

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name HAYDEN LAKE IRRIGATION DIST.

Address LACY + HIGHWAY 95
HAYDEN LAKE IDAHO

Owner's Permit No. 95-88-N-112

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) _____

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☒ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other _____ (specify type)

4. METHOD DRILLED

☐ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☒ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness		Diameter		From		To	
.375	inches	20	inches +	2	feet	393	feet
.375	inches	18	inches	445	feet	450	feet
	inches		inches		feet		feet
	inches		inches		feet		feet

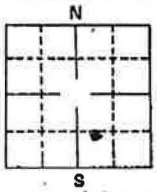
Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

Number		From		To	
	perforations		feet		feet
	perforations		feet		feet
	perforations		feet		feet

Well screen installed? ☒ Yes ☐ No
Manufacturer's name JOHNSON
Type STAINLESS STEEL Model No. TELESCOPE
Diameter 20 Slot size .MRL Set from 389 feet to 445 feet
Diameter ___ Slot size ___ Set from ___ feet to ___ feet
Gravel packed? ☐ Yes ☒ No ☐ Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 20FT Material used in seal: ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☒ Temp. surface casing ☐ Overbore to seal depth
Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☐ Cemented between strata
Describe access port 2" PIPE + CAP WELDED TO CASING

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name HAYDEN LAKE IRRIGATED TRACT
Lot No. W/2 169 Block No. _____
County KOOTENAI
SW ¼ SE ¼ Sec. 15, T. 51 N, R. 4 E W

7. WATER LEVEL

Static water level 305.6 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow _____
Artesian closed-in pressure _____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature 42 °F. Quality GOOD

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped
2000	312.5	1
3000	316.75	3
3500	319.1	4
4000	321.5	5

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
24	0	40	GRAVEL 2" MINUS		X
20	40	310	GRAVEL + SAND 2" MINUS		X
20	310	387	GRAVEL + SAND 2" MINUS	X	
20	387	409	GRAVEL 1" MINUS + COARSE SAND SOME CLAY	X	
20	409	450	GRAVEL 2" MINUS + COARSE SAND SOME CLAY LENSES	X	

RECEIVED
MAY 09 1989
NORTHERN REGION
IDWR

RECEIVED
MAY 11 1989
Department of Water Resources

013638

10.

Work started JAN 16-89 finished MARCH 24-89

DRILLERS CERTIFICATION

DL

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORPORATION Firm No. 108
Address E3410 9TH AVE SPOKANE WA. Date MAY 2-89
Signed by (Firm Official) Arnold E. Holman PRESIDENT
and
(Operator) Gene Phinney

MICROFILMED
AUG 18 1990

HLID Pump System Efficiencies - Dakota Well, #2

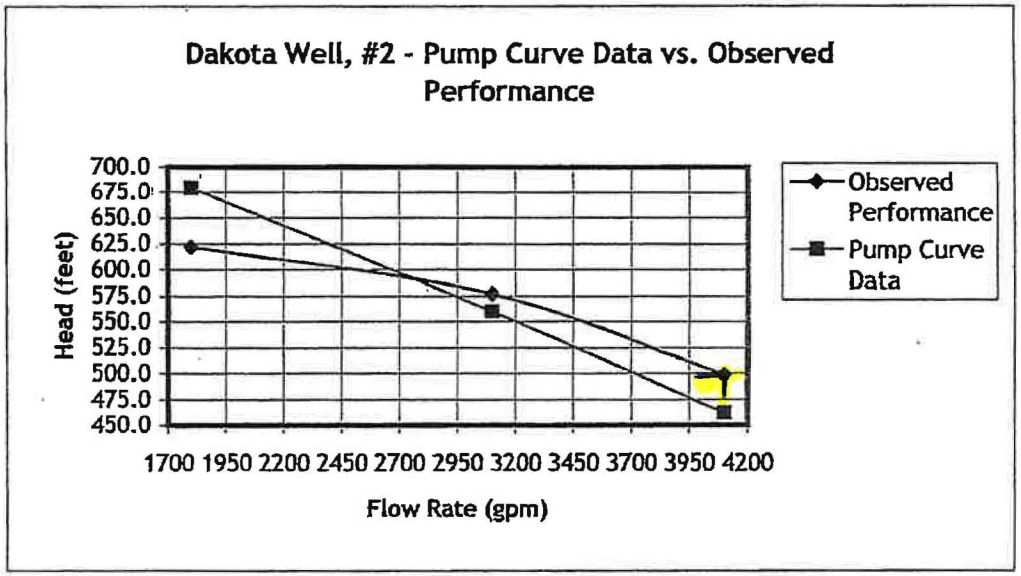
Note: gpm and pressure data taken by Paul Klatt during pump tests, kW verified by Craig Meredith of Avista

Static water level: 305 Feet below grade
Column Dia.(in): 12
Minor losses: 0.5 (90 deg bend + ent.)
f (friction factor): 0.021 (from Moody diagram)

Dakota, Well #2 600 HP Pump Motor.
95-88-N-112

GPM	Flow (cfs)	PSI	kW (delivered to motor)	Pressure Head (feet)	Velocity Head (feet)	Elevation Head (feet)	Pipe & Fitting losses (feet)	Total Head (feet)	Hydraulic Power Output (kW)	System Efficiency
4100	9.14	77	401	177.69	2.10	305	14.51	499.30	284.63	0.710
3100	6.91	113	386	260.77	1.20	305	10.07	577.04	248.72	0.644
1800	4.01	136	388	313.85	0.40	305	3.40	622.65	155.83	0.402
0	0.00	0	0	0.00	0.00	0	0.00	0.00	0.00	#DIV/0!

Observed performance		Pump Curve Data	
Total Head (feet)	GPM	Head	GPM
499.0	4100.0	462.0	4100.0
577.0	3100.0	560.0	3100.0
622.0	1800.0	679.0	1800.0
0.0	0.0	0.0	0.0



Dakota Well No. 3

Form 238-7
1/78

STATE OF IDAHO
DEPARTMENT OF WATER RESOURCES

USE TYPEWRITER OR BALLPOINT PEN

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

AC

1. WELL OWNER

Name HAYDEN LAKE IRRIGATION DIST

Address LACEY & HIGHWAY 95
HAYDEN LAKE IDAHO

Owner's Permit No. 95-88-N-111

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning) _____

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☒ Municipal
☐ Industrial ☐ Stock ☐ Waste Disposal or Injection
☐ Other _____ (specify type)

4. METHOD DRILLED

☐ Rotary ☐ Air ☐ Hydraulic ☐ Reverse rotary
☒ Cable ☐ Dug ☐ Other _____

5. WELL CONSTRUCTION

Casing schedule: ☒ Steel ☐ Concrete ☐ Other _____

Thickness		Diameter		From		To	
.375	inches	16	inches +	2	feet	362	feet
.375	inches	14	inches	410	feet	415	feet
_____	inches	_____	inches	_____	feet	_____	feet
_____	inches	_____	inches	_____	feet	_____	feet

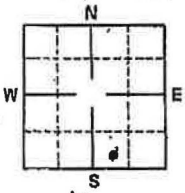
Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

Number		From		To	
_____	perforations	_____	feet	_____	feet
_____	perforations	_____	feet	_____	feet
_____	perforations	_____	feet	_____	feet

Well screen installed? ☒ Yes ☐ No
Manufacturer's name JOHNSON
Type STAINLESS STEEL Model No. TELESCOPE
Diameter 16 Slot size VARI Set from 359 feet to 410 feet
Diameter ____ Slot size ____ Set from ____ feet to ____ feet
Gravel packed? ☐ Yes ☒ No ☐ Size of gravel _____
Placed from _____ feet to _____ feet
Surface seal depth 20FT Material used in seal: ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Sealing procedure used: ☐ Slurry pit ☒ Temp. surface casing ☐ Overbore to seal depth
Method of joining casing: ☐ Threaded ☒ Welded ☐ Solvent Weld ☐ Cemented between strata
Describe access port 2" PIPE CAP WELDED TO CASING

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name HAYDEN LAKE IRRIGATED TRACT
Lot No. W/2 169 Block No. _____
County KOOTENAI
SW ¼ SE ¼ Sec. 15, T. 51 N, R. 4 E

MICROFILMED AUG 1 1990

7. WATER LEVEL

Static water level 307.7 feet below land surface.
Flowing? ☐ Yes ☒ No G.P.M. flow _____
Artesian closed-in pressure _____ p.s.i.
Controlled by: ☐ Valve ☐ Cap ☐ Plug
Temperature 45 °F. Quality GOOD

8. WELL TEST DATA

☒ Pump ☐ Bailer ☐ Air ☐ Other _____

Discharge G.P.M.	Pumping Level	Hours Pumped
1200	325	1
1600	332.7	3
1800	333.8	5
2250	338.9	6

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
20	0	48	GRAVEL & SAND 2" MIN		X
16	40	312	GRAVEL & SAND 2" MIN		X
16	312	330	GRAVEL & SAND 1" MIN. SOME CLAY LENSES	X	
16	330	359	GRAVEL & SAND 3" MIN SOME CLAY LENSES	X	
16	359	369	GRAVEL 1" MINUS & COARSE SAND	X	
16	369	383	GRAVEL 3" MINUS & COARSE SAND.	X	
16	383	393	GRAVEL 1" MINUS & COARSE SAND SOME CLAY	X	
16	393	408	COARSE SAND & CLAY LENSES	X	
16	408	415	GRAVEL 1" MINUS & COARSE SAND	X	

RECEIVED
MAY 09 1989
NORTHERN REGION
I.D.W.R.

RECEIVED
MAY 11 1989
Department of Water Resources

613637

10.

Work started NOV 10-88 finished JAN 10-89

11. DRILLERS CERTIFICATION

DL

I/We certify that all minimum well construction standards were complied with at the time the rig was removed.

Firm Name HOLMAN DRILLING CORP Firm No. 108
Address E3410 9TH AVE SPOKANE WA Date 2-10-89
Signed by (Firm Official) Arnold E Holman PRES.
and
(Operator) Gene Kinney

HLID Pump System Efficiencies - Dakota Well #3

Note: gpm and pressure data taken by Paul Klatt during pump tests, kW verified by Craig Meredith of Avista

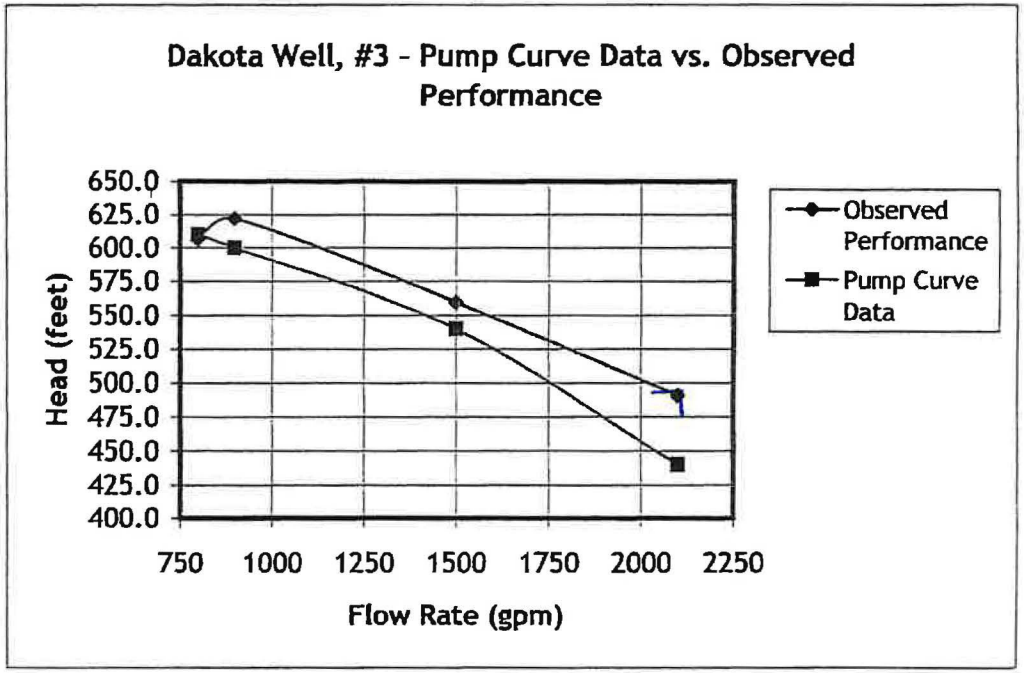
Static water level: 307 Feet below grade
Column Dia.(in): 10
Minor losses: 0.5 (90 deg bend + ent.)
f (friction factor): 0.021 (from Moody diagram)

Dakota, Well #3 300 HP Pump MOTOR

95-88-N-111

GPM	Flow (cfs)	PSI	kW (delivered to motor)	Pressure Head (feet)	Velocity Head (feet)	Elevation Head (feet)	Pipe & Fitting losses (feet)	Total Head (feet)	Hydraulic Power Output (kW)	System Efficiency
2100	4.68	76	157	175.38	1.14	305	9.41	490.94	143.34	0.913
1500	3.34	108	145	249.23	0.58	305	4.80	559.62	116.71	0.805
900	2.01	124	136	286.15	0.21	305	1.73	593.09	74.22	0.546
800	1.78	130	126	300.00	0.17	305	1.37	606.53	67.46	0.535

Observed performance		Pump Curve Data	
Total Head (feet)	GPM	Head	GPM
490.9	2100.0	440.0	2100.0
559.6	1500.0	540.0	1500.0
622.0	900.0	600.0	900.0
606.5	800.0	610.0	800.0



USE TYPEWRITER OR BALL POINT PEN

State of Idaho
Department of Water Resources

WELL DRILLER'S REPORT

Well #2
Carrington
mzadomi

State law requires that this report be filed with the Director, Department of Water Resources within 30 days after the completion or abandonment of the well.

1. WELL OWNER

Name Roy ARMSTRONG
Address Rt #1 Box 203
COEUR d'ALENE ID. 83814
Owner's Permit No. 95-77-N-167

2. NATURE OF WORK

☒ New well ☐ Deepened ☐ Replacement
☐ Abandoned (describe method of abandoning)

3. PROPOSED USE

☐ Domestic ☒ Irrigation ☐ Test ☐ Other (specify type)
☐ Municipal ☐ Industrial ☐ Stock ☐ Waste Disposal or Injection

4. METHOD DRILLED

☒ Cable ☐ Rotary ☐ Dug ☐ Other

5. WELL CONSTRUCTION

Diameter of hole 16 inches Total depth 363 feet
Casing schedule: ☒ Steel ☐ Concrete

Thickness	Diameter	From	To
.375 inches	16 inches	+ 2 feet	333 feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet
_____ inches	_____ inches	_____ feet	_____ feet

Was casing drive shoe used? ☒ Yes ☐ No
Was a packer or seal used? ☒ Yes ☐ No
Perforated? ☐ Yes ☒ No
How perforated? ☐ Factory ☐ Knife ☐ Torch
Size of perforation _____ inches by _____ inches

Number	From	To
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet
_____ perforations	_____ feet	_____ feet

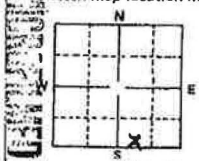
Well screen installed? ☒ Yes ☐ No
Manufacturer's name JOHNSON
Type STAINLESS Model No. STD.
Diameter 16 Slot size 50 Set from 333 feet to 363 feet
Diameter ___ Slot size ___ Set from _____ feet to _____ feet

Gravel packed? ☐ Yes ☒ No Size of gravel _____
Placed from _____ feet to _____ feet

Surface seal depth 28 Material used in seal ☒ Cement grout ☐ Puddling clay ☐ Well cuttings
Seating procedure used ☐ Slurry pit ☒ Temporary surface casing ☐ Overbore to seal depth

6. LOCATION OF WELL

Sketch map location must agree with written location.



Subdivision Name _____
Lot No. _____ Block No. _____
County KOOTENAI
SW ¼ SE ¼ Sec. 16, T. 51 (N) S, R. 4 (E) W

7. WATER LEVEL

Static water level 285 feet below land surface
Flowing? ☐ Yes ☒ No G.P.M. flow _____
Temperature 48° F. Quality GOOD
Artesian closed-in pressure _____ p.s.i.
Controlled by ☐ Valve ☐ Cap ☐ Plug

8. WELL TEST DATA

☐ Pump ☐ Bailer ☐ Other

Discharge G.P.M.	Draw Down	Hours Pumped
1000	Unknown	

9. LITHOLOGIC LOG

Hole Diam.	Depth From	Depth To	Material	Water Yes	Water No
20	0	28	GRAVEL 3" MIN		X
16	28	44	GRAVEL 3" MIN		X
16	44	99	GRAVEL 4" MIN		X
16	99	112	GRAVEL 3" MIN		X
16	112	198	GRAVEL 4" MIN		X
16	198	256	GRAVEL 2" MIN		X
16	256	270	GRAVEL + SAND 1" MIN		X
16	270	285	GRAVEL 2" MIN		X
16	285	332	GRAVEL 2" MIN	X	
16	332	363	GRAVEL + SAND 1" MIN	X	

RECEIVED
MAR 3 1978
Department of Water Resources
Northern District Office

10.

Work started April 23-77 finished MAY-27-77

11. DRILLERS CERTIFICATION

Firm Name HOLMAN DRILLING CORP Firm No. 108
Address E3410 9TH AVE Date JUNE 20-77
Signed by (Firm Official) Arnold E. Holman
and
(Operator) PRES (SAME)

USE ADDITIONAL SHEETS IF NECESSARY FORWARD THE WHITE COPY TO THE DEPARTMENT

Pump Data Sheet - Hydroflo Pumps USA, Inc.

Company: PumpTech Inc.
Name:
Date: 3/15/2019

Thrust Bearing Loss: .4 HP, Line Shaft Bearing Loss: (1.4 HP / 100') x 3.1 = 4.3, Column Friction Loss: 8.928, Bowl Effic: 82%, Overall Effic: 78.8%. No Motor/VFD Effic Included

CARRINGTON WELL - 600HP
95-77-N-167

Pump:

Size: 14LH (6 stage)

Type: Vertical
Synch Speed: 1800 rpm

Speed: 1770 rpm
Dia: 10.785 in

Curve: 121110

Impeller: 14LH SS ENCL.

Specific Speeds:

Ns: ---
Nss: ---

Dimensions:

Suction: 10 in
Discharge: 12 in

Vertical Turbine:

Bowl Size: 14 in
Max Lateral: 0.875 in
Thrust K Factor: 8.41 lbf/ft

Pump Limits:

Temperature: 140 °F
Pressure: 300 psi g
Sphere Size: 0.5 in

Power: 600 hp
Eye Area: 25.3 in²

Search Criteria:

Flow: 1800 US gpm

Head: 475 ft

Fluid:

Water
Density: 62.32 lb/ft³
Viscosity: 0.9946 cP

Temperature: 68 °F
Vapor Pressure: 0.3391 psi a
Atm Pressure: 14.7 psi a

NPSHa: ---

Motor:

Standard: NEMA
Enclosure: WP1

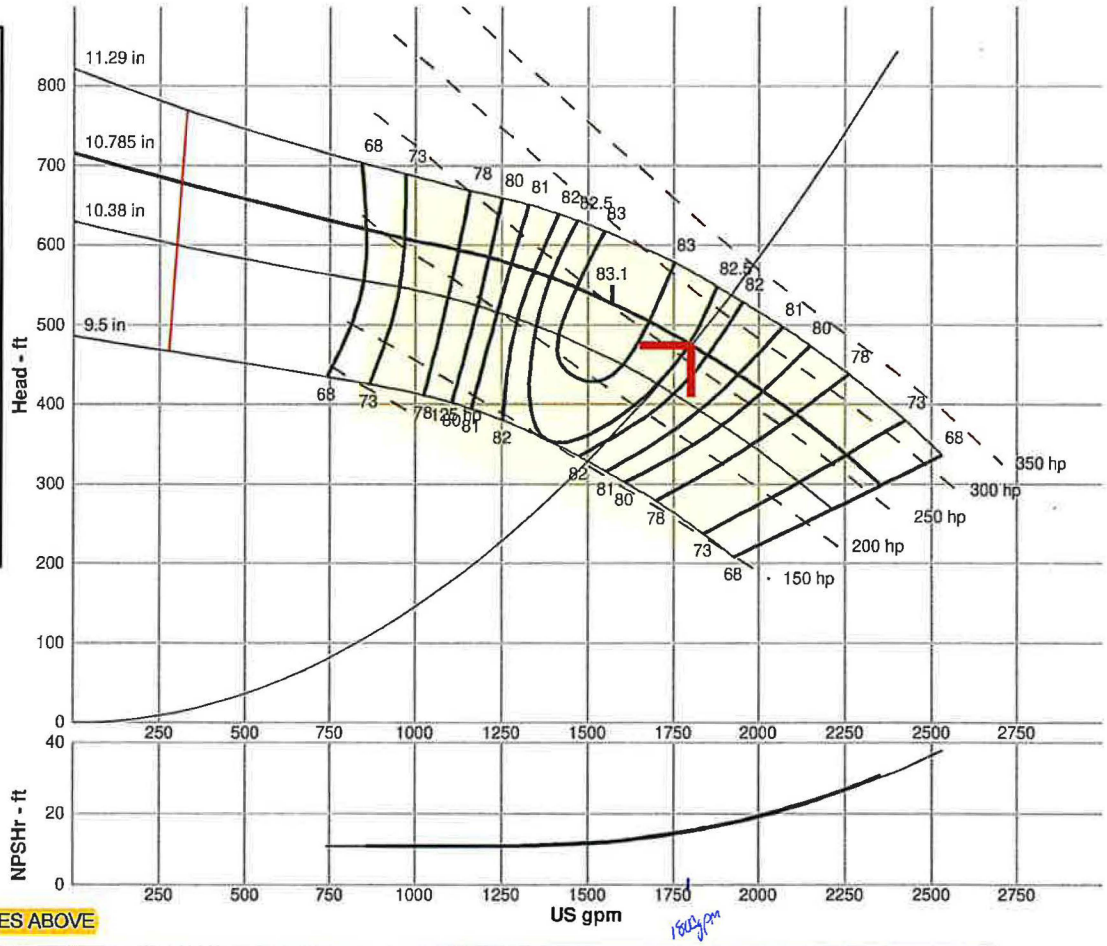
Size: 300 hp
Speed: 1800 rpm
Frame: 447T

Sizing Criteria: Max Power on Design Curve

Pump Selection Warnings:

Pump shutoff dP exceeds limit for the pump.

---- Duty Point ----	
Flow:	1800 US gpm
Head:	475 ft
Eff:	82.4%
Power:	262 hp
NPSHr:	15.4 ft
---- Design Curve ----	
Shutoff Head:	715 ft
Shutoff dP:	310 psi
Min Flow:	314 US gpm
BEP:	83.1% @ 1570 US gpm
NOL Power:	265 hp @ 2010 US gpm
-- Max Curve --	
Max Power:	321 hp @ 2147 US gpm

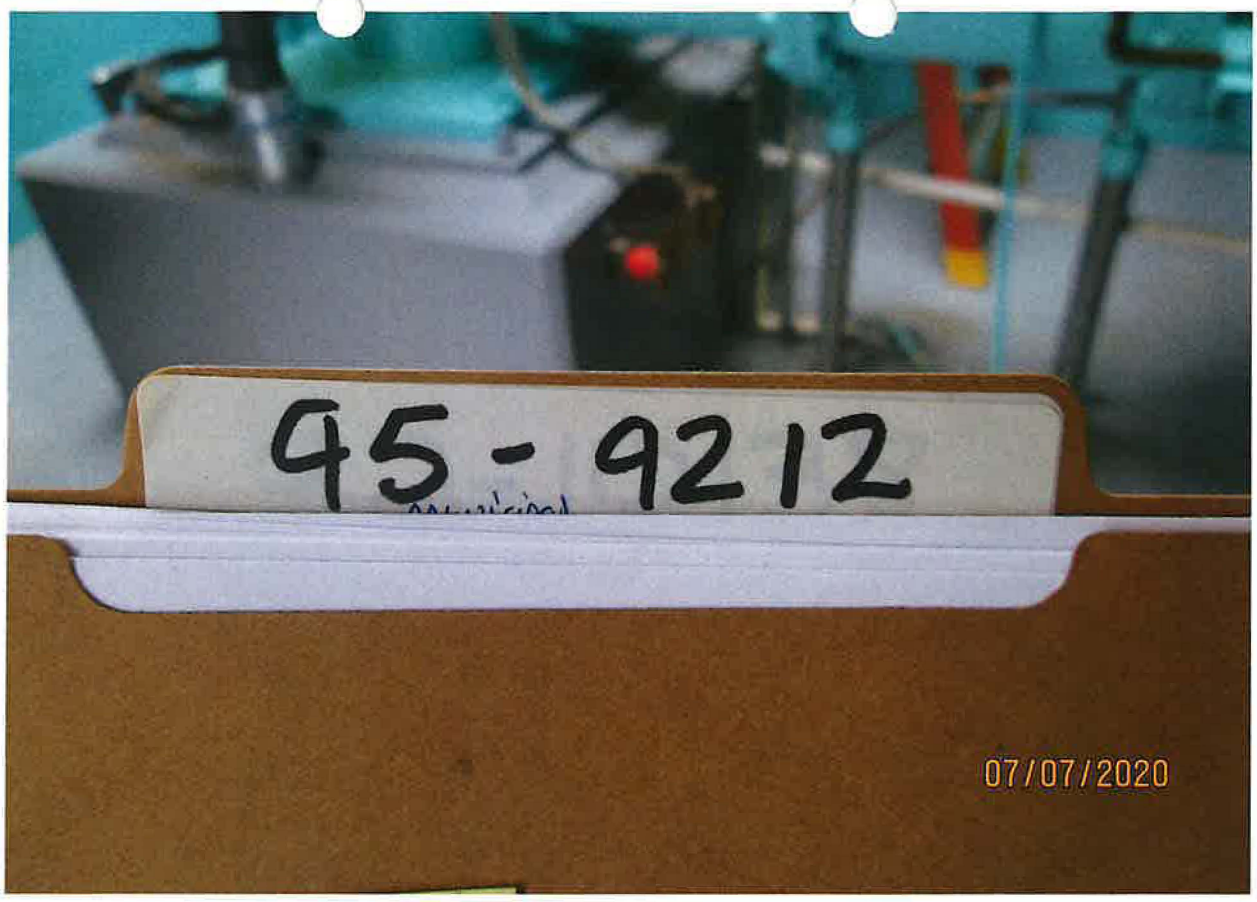


BASIS OF PUMP CURVES ABOVE

Performance Evaluation:

Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
2160	1770	369	76.1	264	24.1
1800	1770	475	82.4	262	15.4
1440	1770	552	82.8	242	11.6
1080	1770	598	76.6	213	11
720	1770	635	61.9	189	11

Selected from catalog: Hydroflo VS Pumps.60 Vers: 18.3





POD – LARIX WELL



LARIX WELL SYSTEM



LARIX WELL 75 PSI

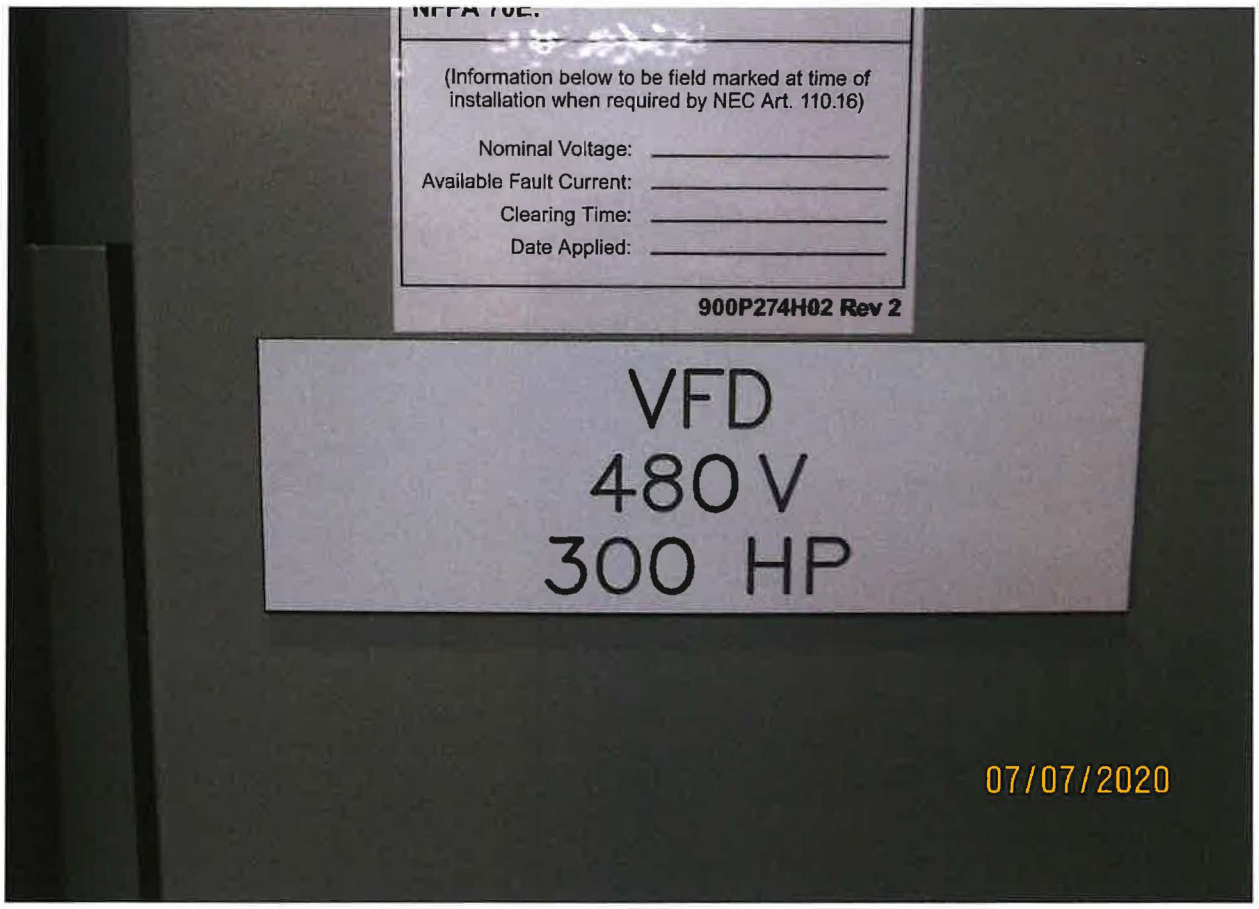


CARRINGTON WELL SITE

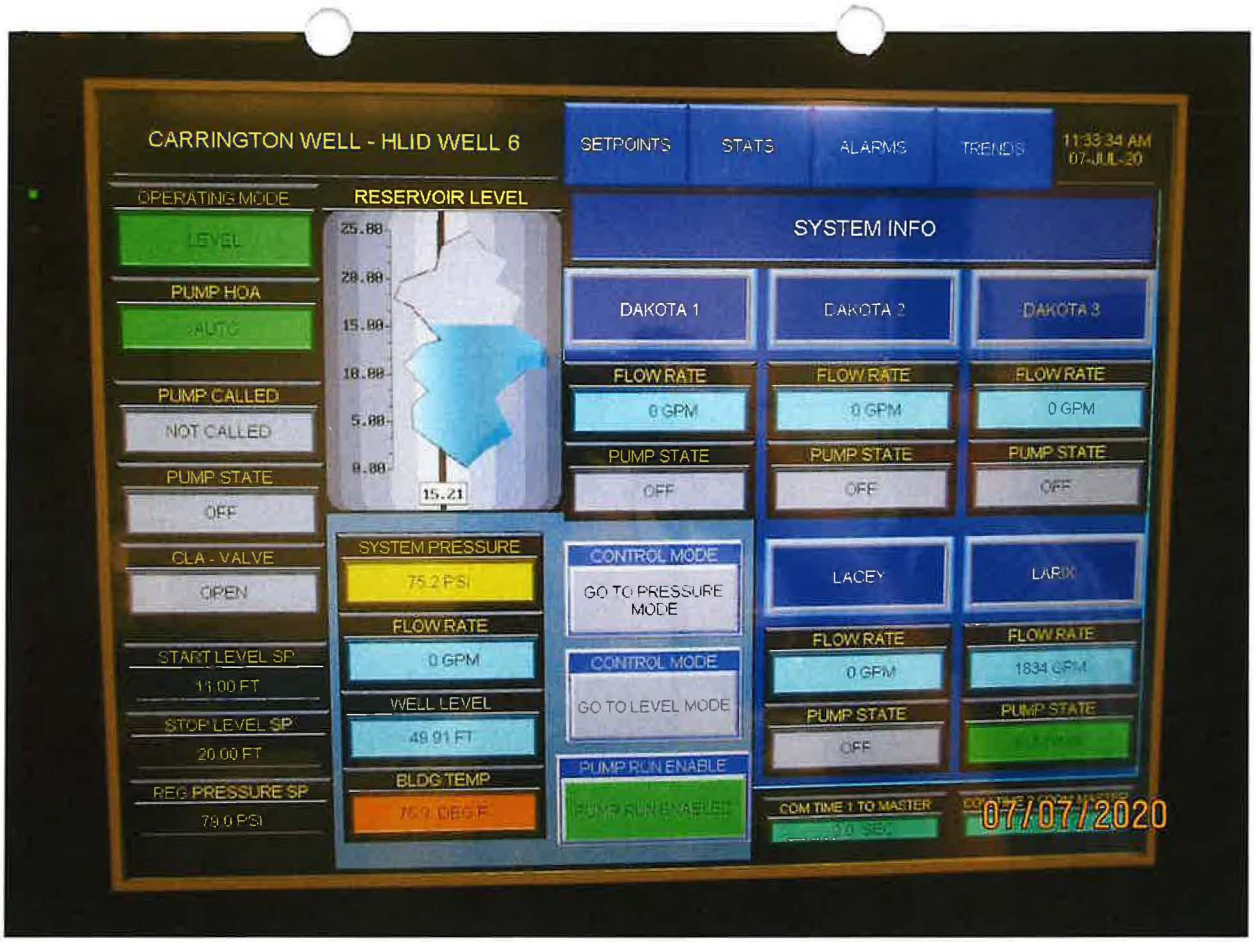




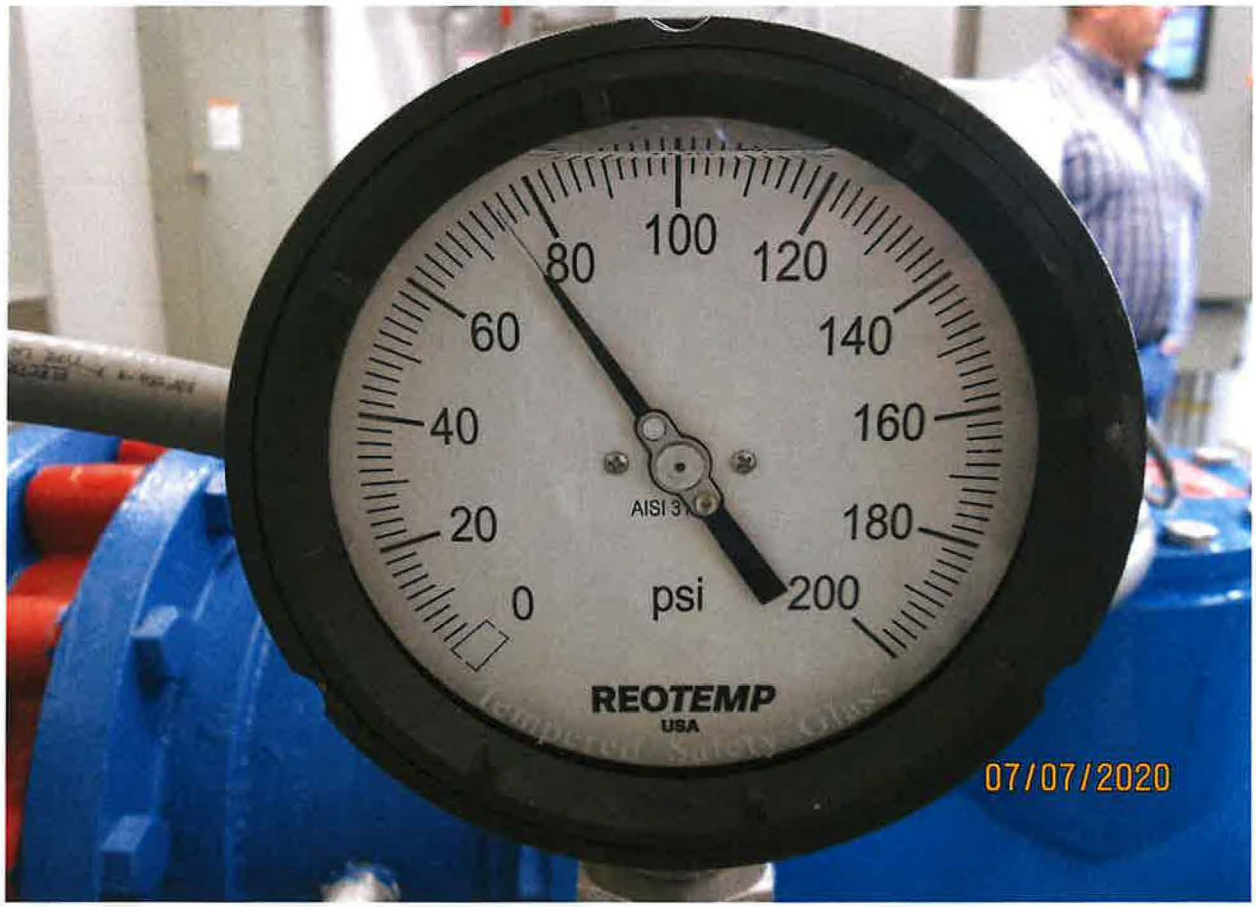
POD – CARRINGTON WELL



300 HP PUMP



CARRINGTON WELL PROGRAM MONITORING SYSTEM



CARRINGTON WELL PSI GAUGE



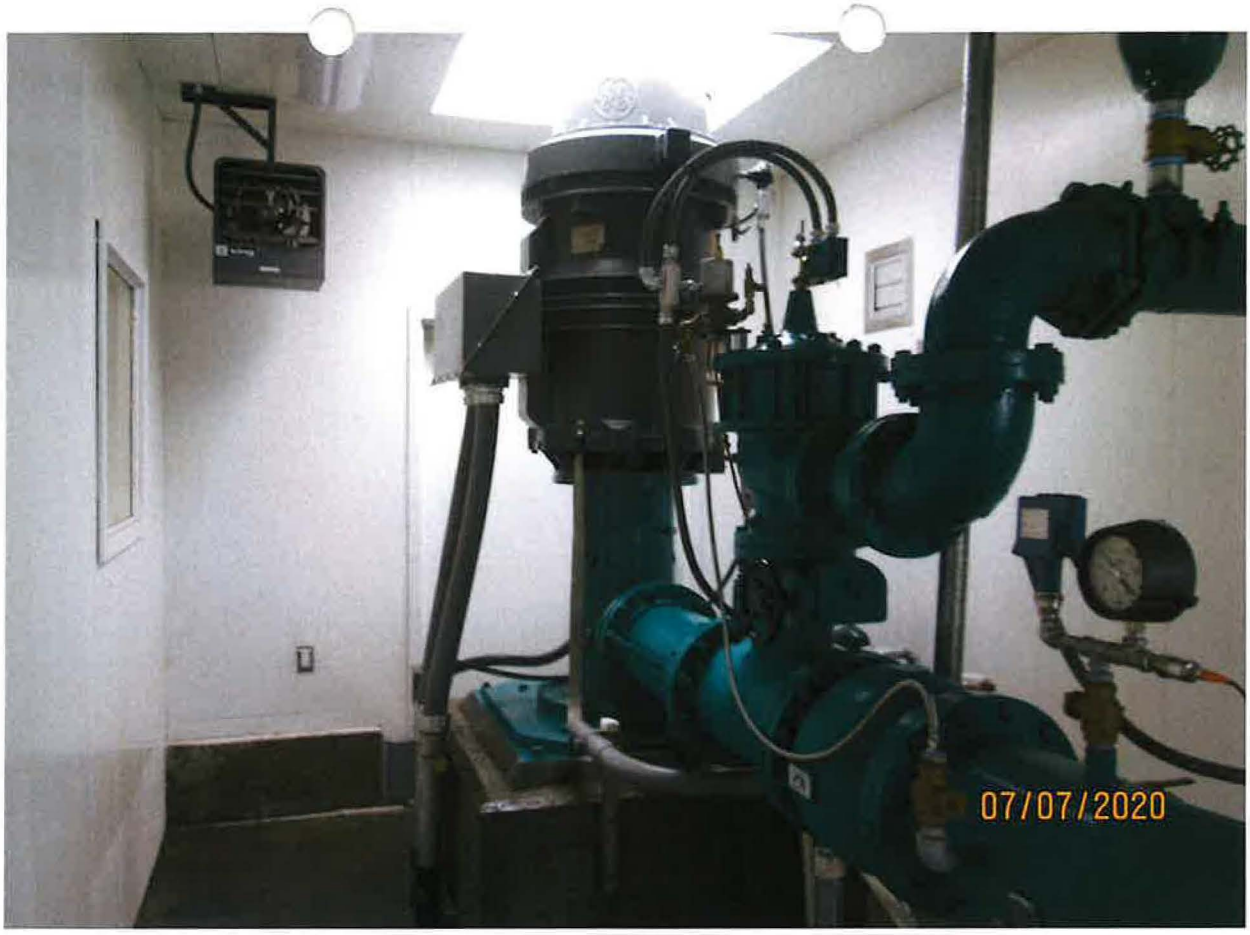
LACEY WELL SITE



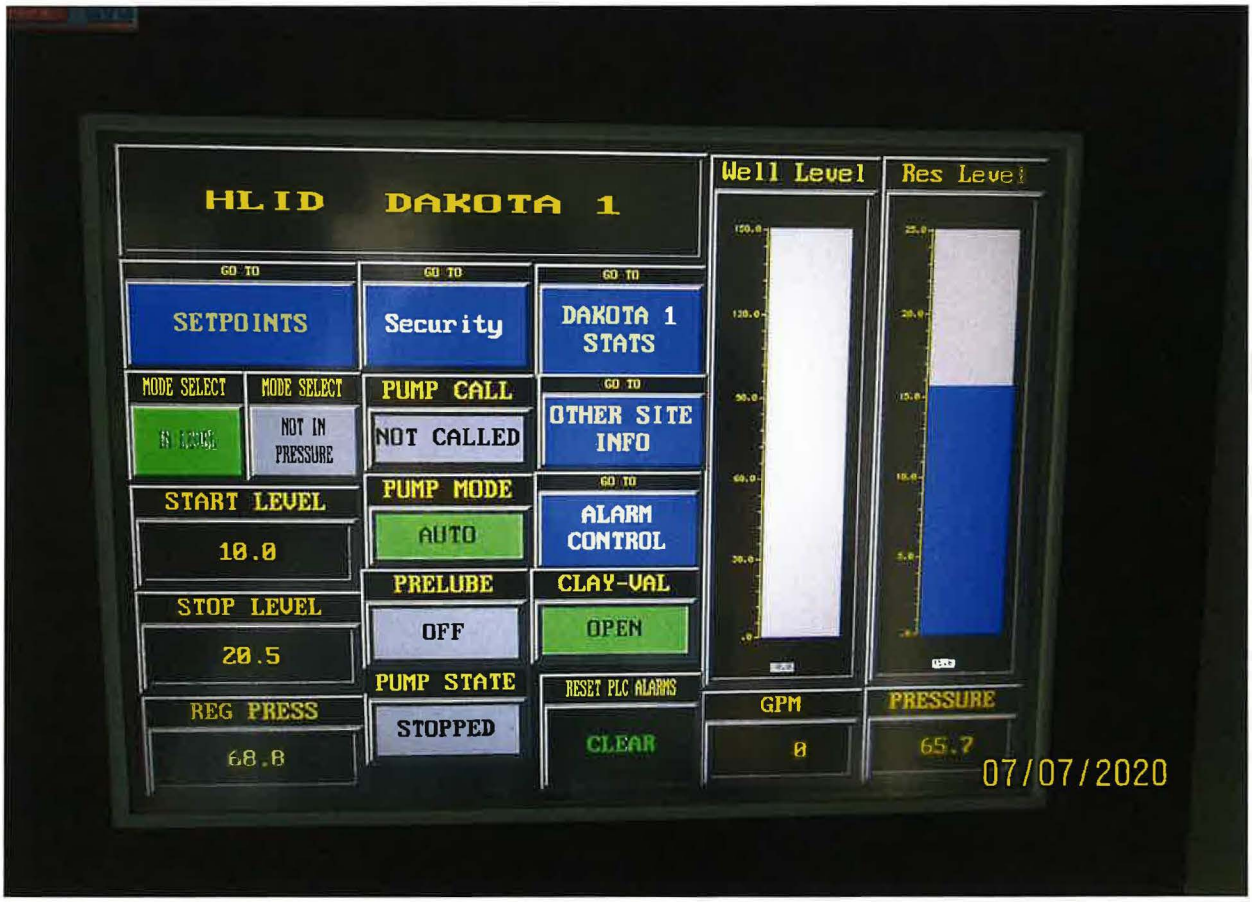


POD – LACEY WELL





POD – DAKOTA WELL #1



DAKOTA WELL #1 SYSTEM MONITORING PANEL



DAKOTA WELL #1 PSI GUAGE



POD – DAKOTA WELL #2



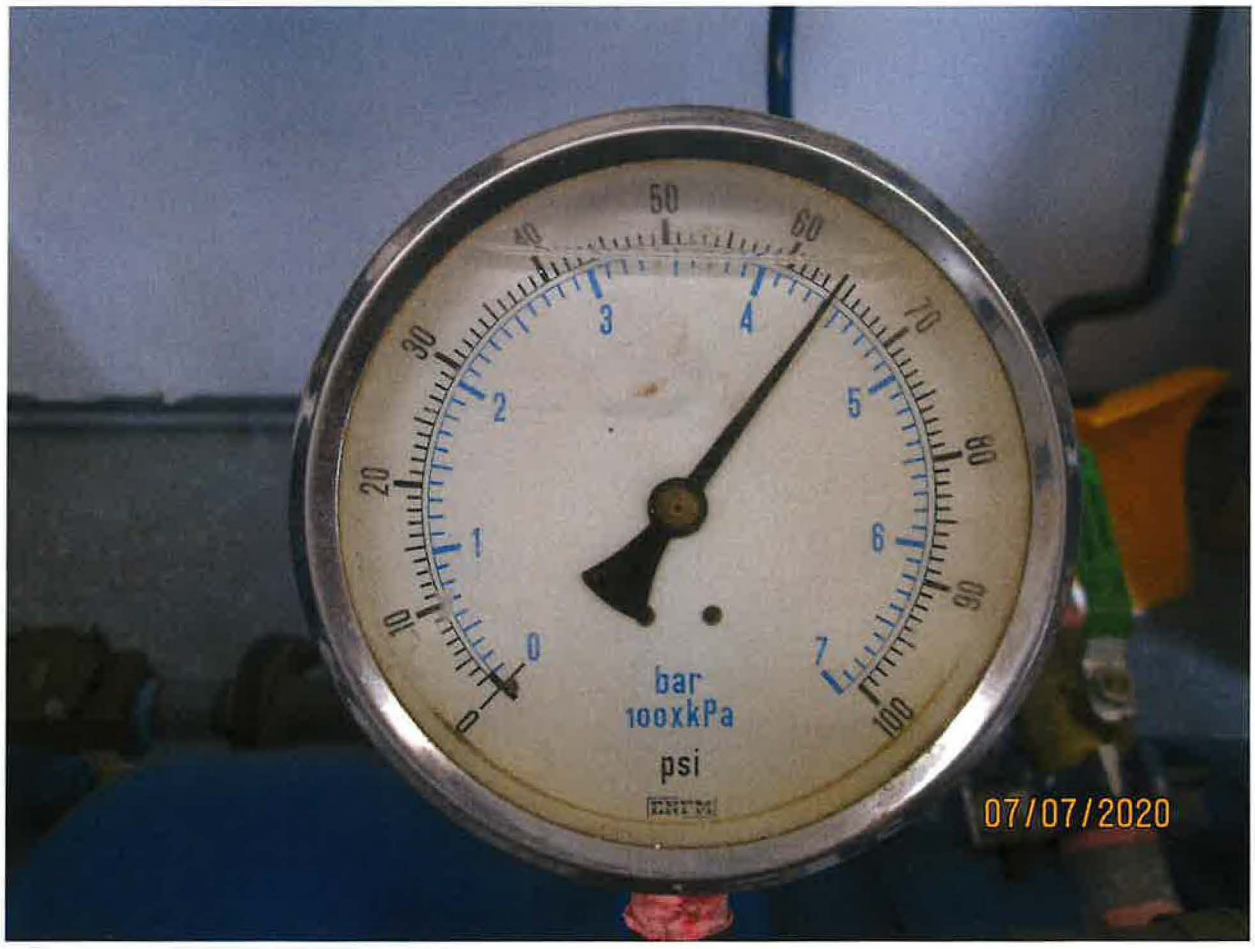
DAKOTA WELL #3 SITE



POD – DAKOTA WELL #3



DAKOTA WELL #3 SYSTEM PANEL



DAKOTA WELL #3 PSI GUAGE