



LNFH Groundwater Supply IWG Presentation

May 16, 2014

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Supplementing LNFH Groundwater Source

- *GW Supply - Scope of the Problem*
- *Existing Information – Conceptual Model*
- *Efforts to Date to Improve GW Supply*
- *Suite of Options Considered*
- *Planning Level Unit Costs*
- *Next Steps - Action Plan*

LNFH Water Rights

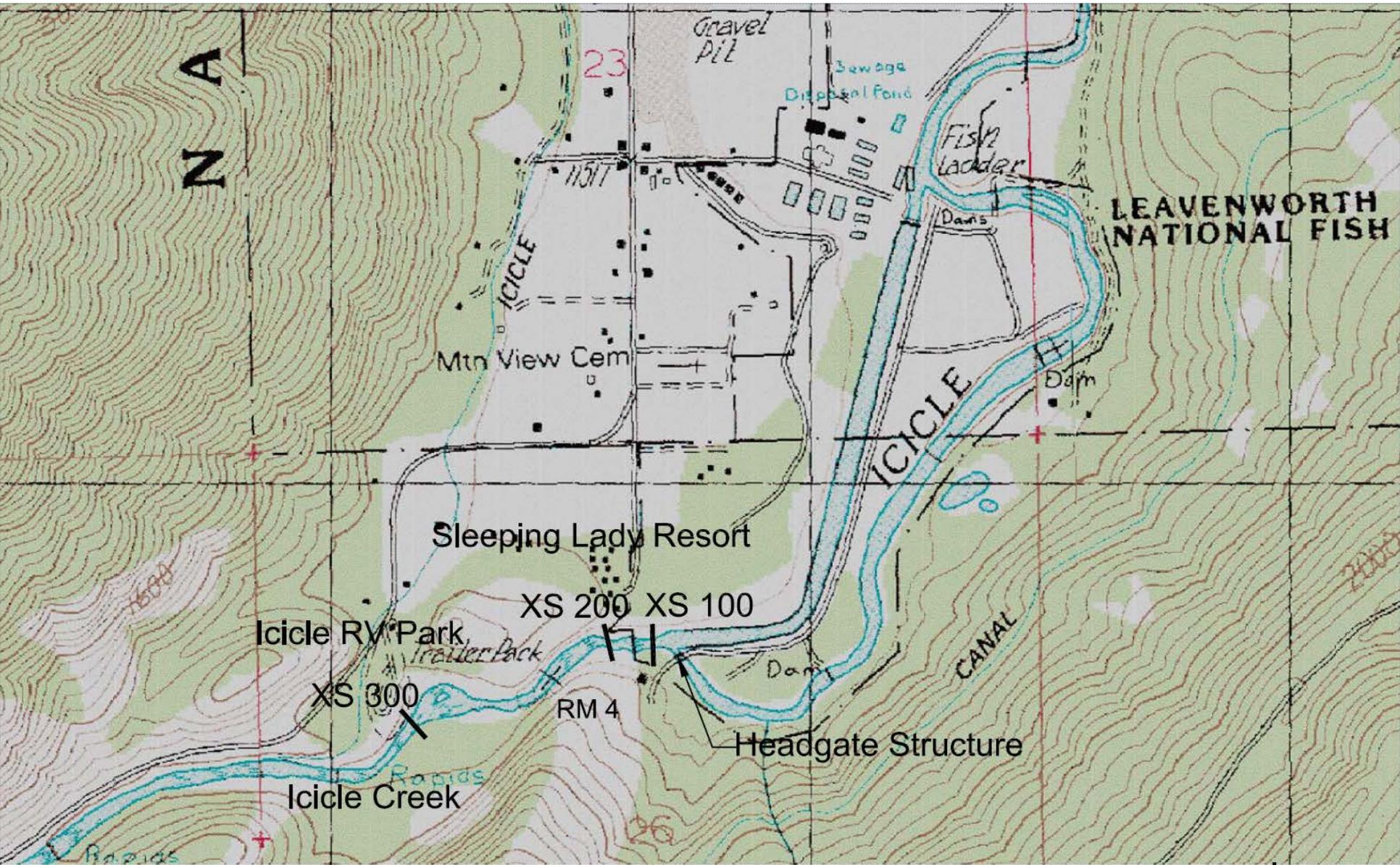
Groundwater

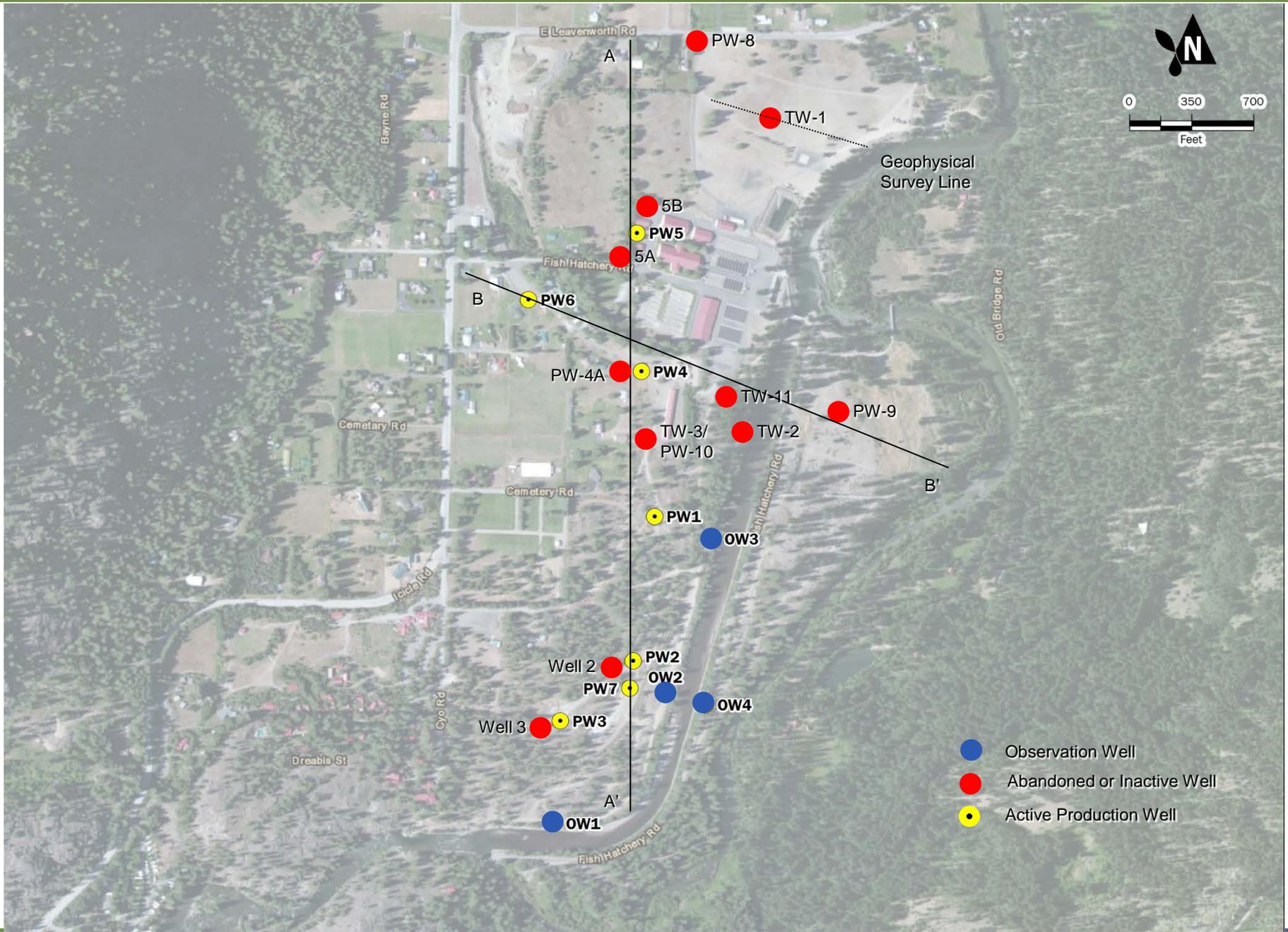
- 4 Existing Groundwater Rights
 - Total $Q_i = 6,700$ gpm
 - Total $Q_a = 7,677$ afy
- GW Supply Capacity
 - 7 active production wells; 11 total
 - Pumping Capacity Constraints

LNFH Water Rights Groundwater

Certificate Number	Source	Purpose of Use	Priority Date	Amount
1824	Icicle Creek	Fish Propagation	3/26/42	42 cfs
1825	Snow and Nada Lakes	Fish Propagation	3/26/42	16,000 AF
3103-A (well 1)	Groundwater	Fish Culture	10/16/57	1200 gpm/ 1120 AF
Claim # 016379 (well 2)	Groundwater	Fish Culture	6/1940	900 gpm/ 730 AF
Claim # 016378 (well 3)	Groundwater	Fish Culture	8/1939	700 gpm/ 570 AF
G4-27115C (well 4: 800 gpm, well 5: 1500 gpm, well 6: 1200 gpm, well 7: 400 gpm)	Groundwater	Fish Propagation	10/20/80	3900 gpm/ 5257 AF

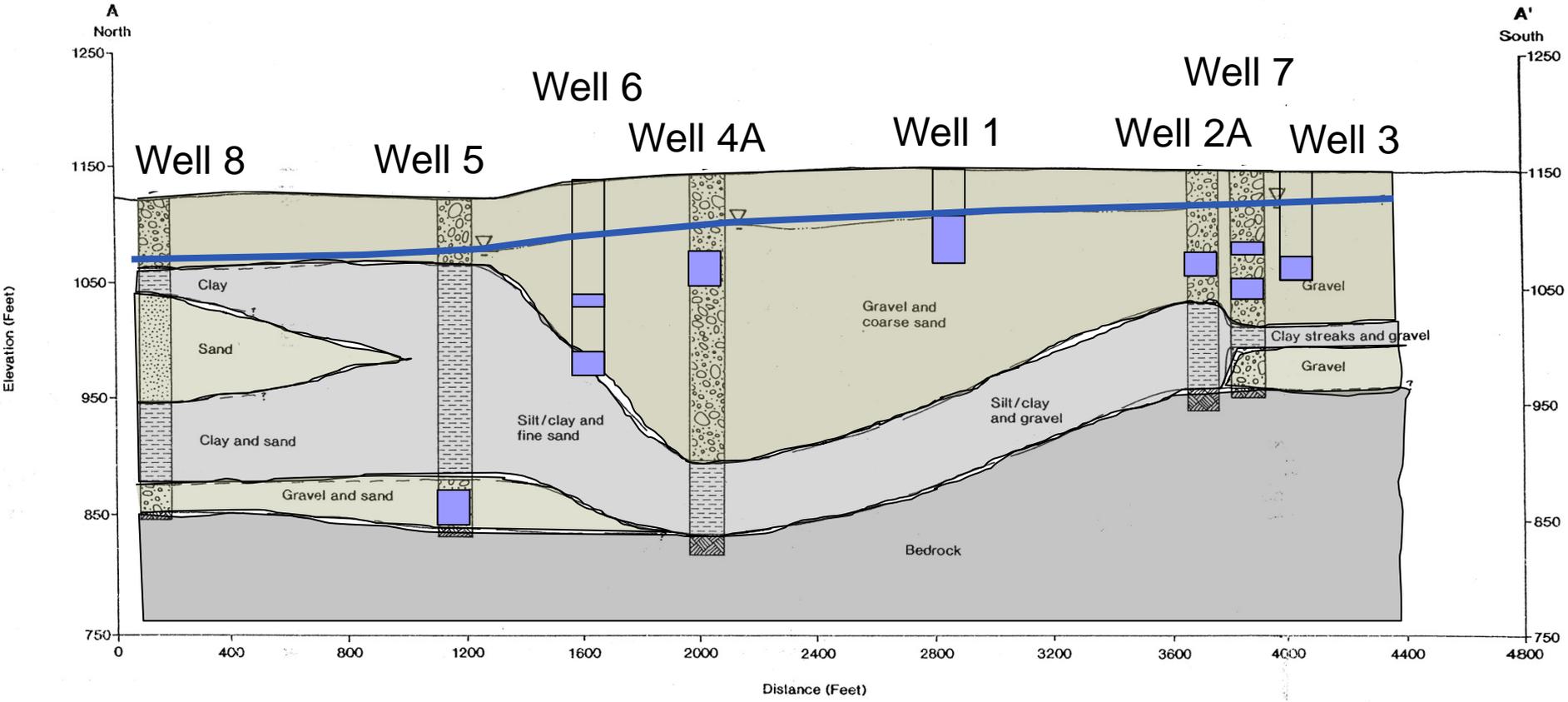
From Table 1, BoR, 2014





LNFH Groundwater Existing Information

- **Prior Groundwater Investigations**
 - Shallow and deep alluvial aquifers
 - High variability over short distances
- Existing Wells, Pumps, Controls
 - Pump performance; well efficiency
- USFWS Monitoring Effort (initiated 2010)
- BoR Groundwater Model Results

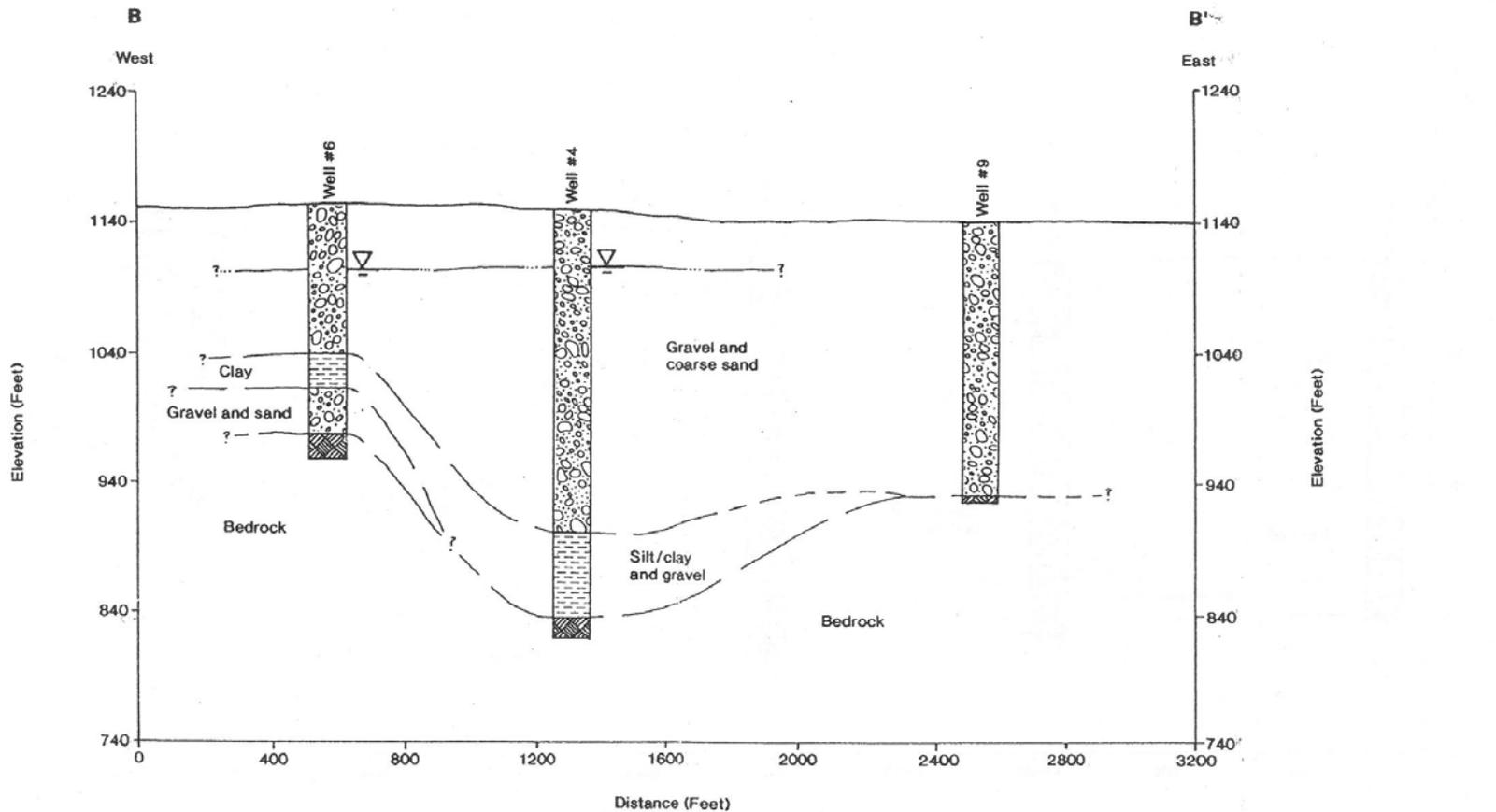


HORIZONTAL SCALE: 1" = 400'
 VERTICAL SCALE: 1" = 100'
 VERTICAL EXAGGERATION: 4X
 Cross section based on driller's logs.

EXPLANATION:
 STATIC WATER TABLE ELEVATION MEASUREMENT ON 08/01/89, 08/02/89 OR 06/01/89
 INFERRED GEOLOGIC CONTACT

Note: Geologic conditions shown are interpreted and approximate. Actual conditions likely vary from those which are shown.

Modified from Figure 4,
 GeoEngineers, 1995



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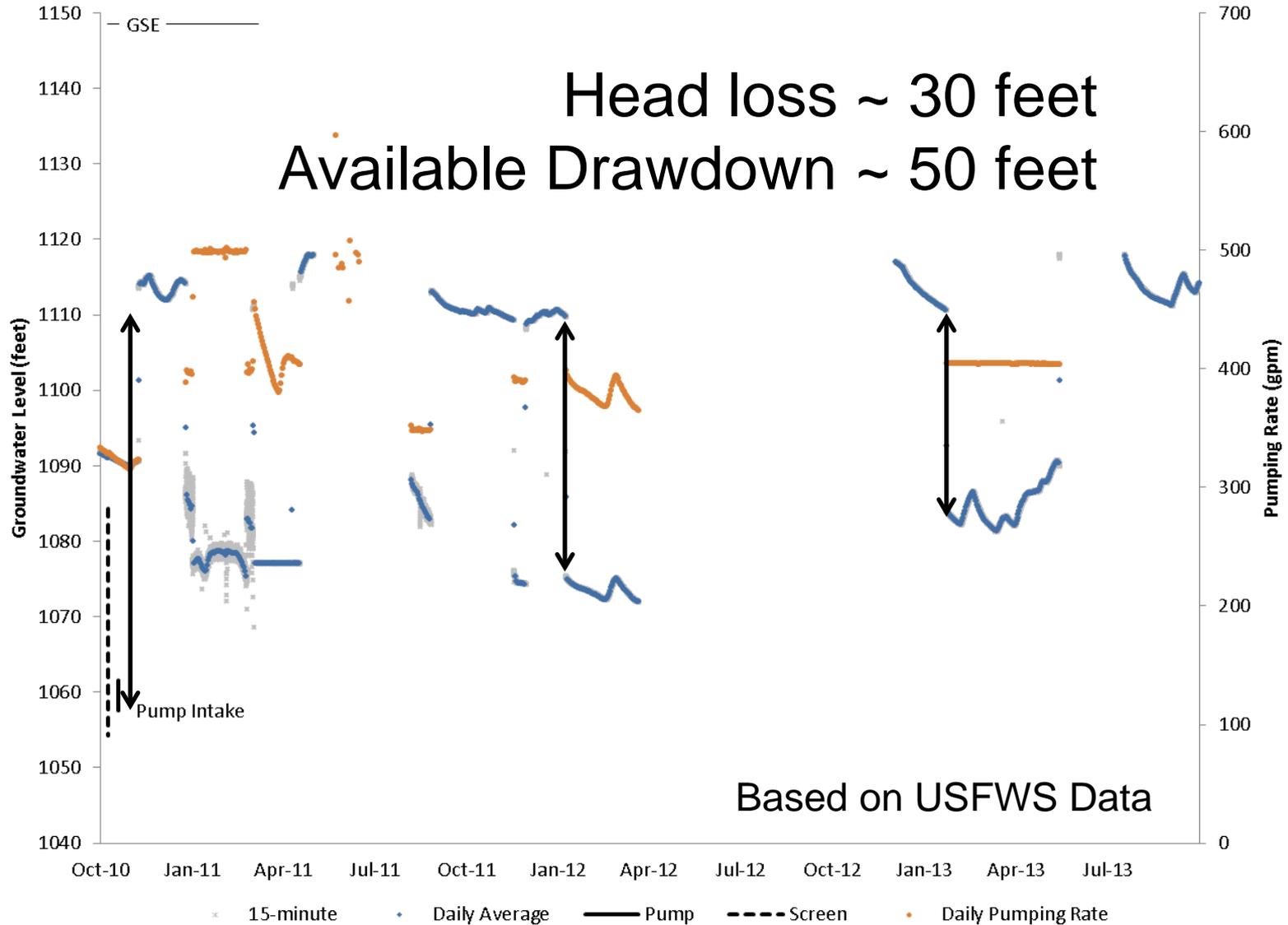
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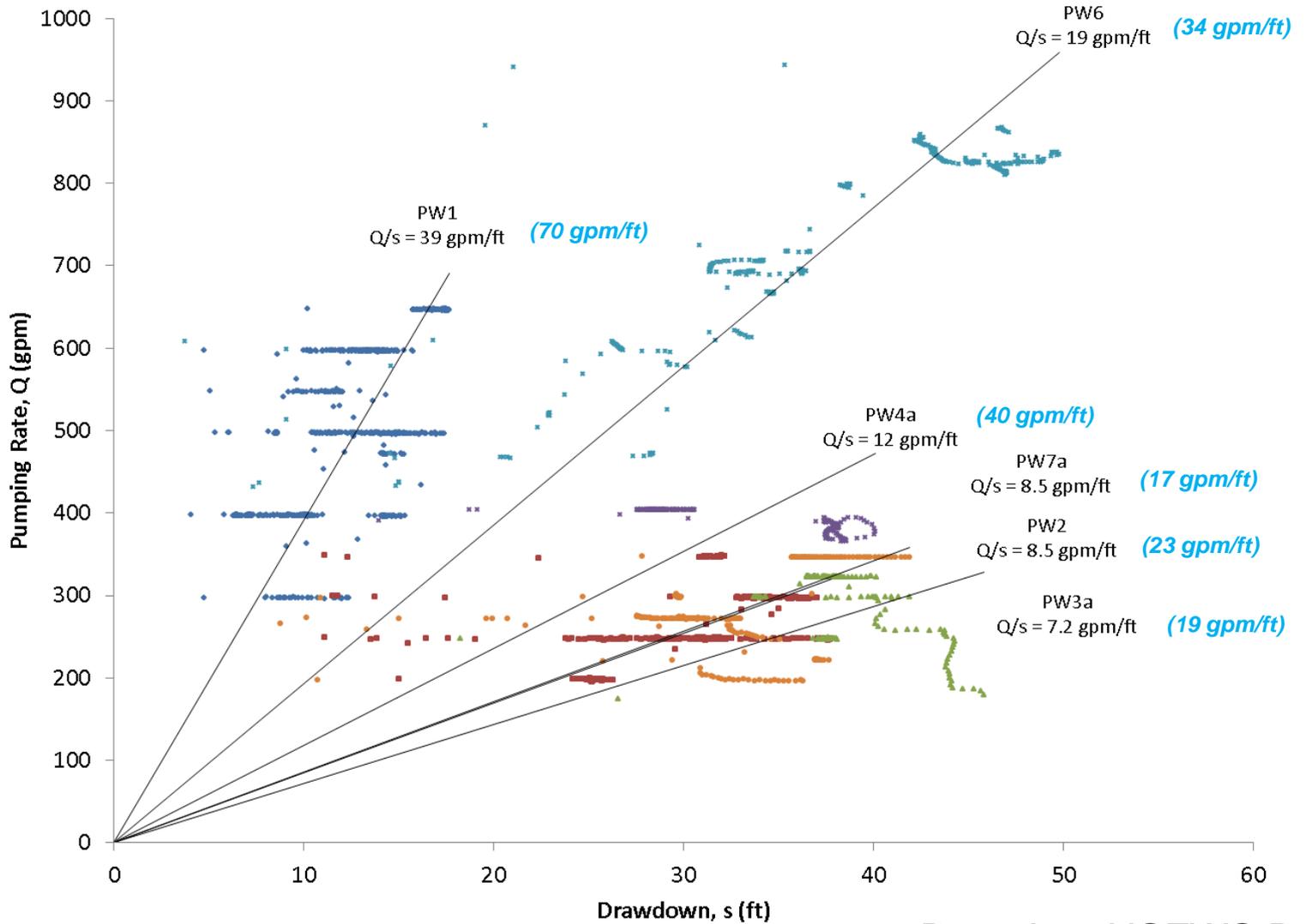
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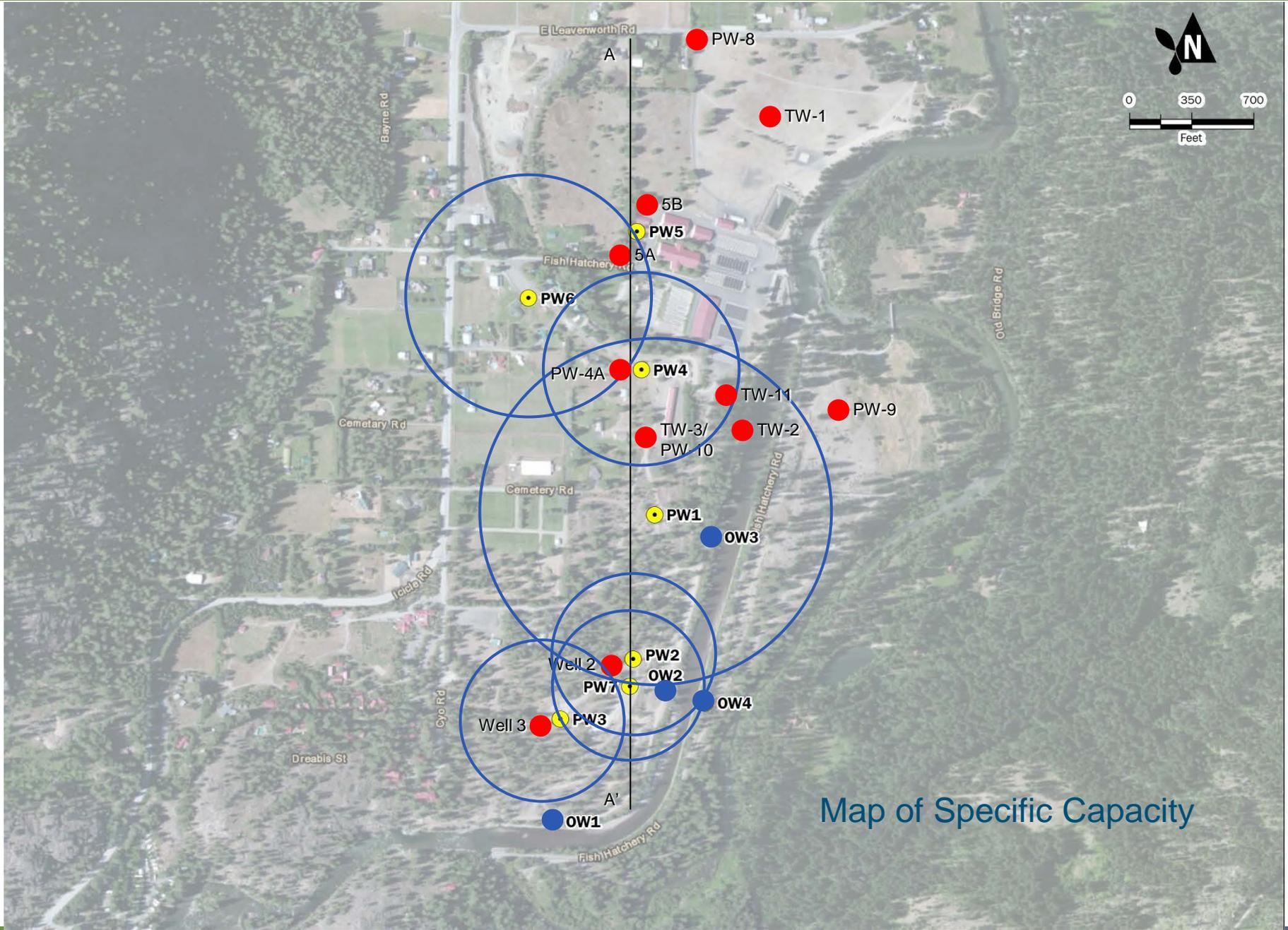
PW-4A: Well Construction, Pump Setting, and Groundwater Levels over Time



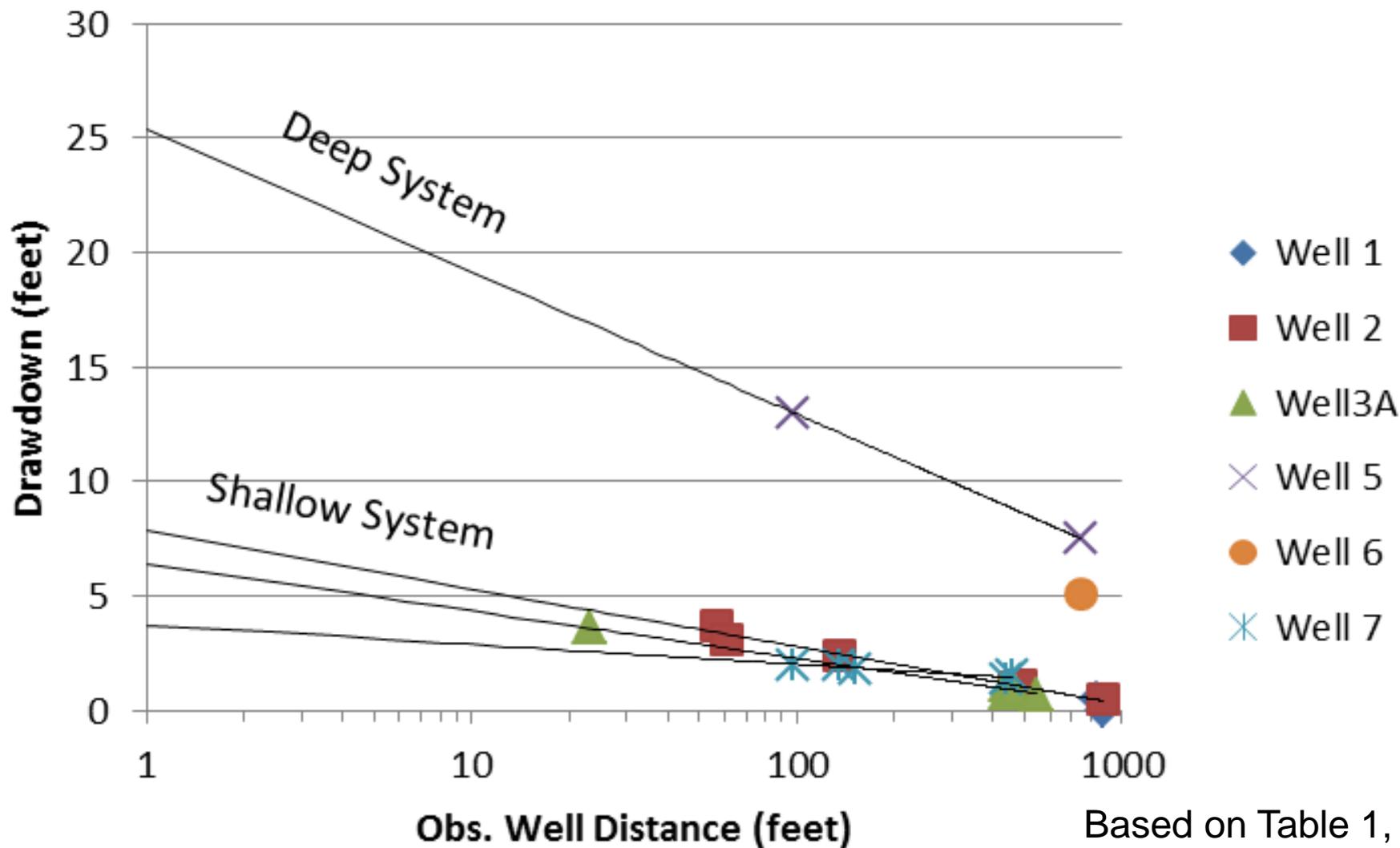
Specific Capacity



[normalized to water level at OW-09-1] Based on USFWS Data



Map of Specific Capacity



Based on Table 1,
GeoEngineers, 1995

LNFH Groundwater Historical Efforts

Appendix B: Well logs and construction schematics for wells at Leavenworth National Fish Hatchery

Table B-1: Summary of Well Information for Hatchery Wells

Well Number	Date Drilled	Well Construction Details					Source Aquifer	Status of well	Static Water Level	
		Drilled Depth (ft)	Completion Depth (ft)	Diameter (inches)	Perforated Casing or Screened Depth (ft)	Pump Inlet Depth (ft)			Date	Depth (ft)
1	(04/58)?	80	80	12	40-80	70	Shallow	Active	28.5	5/5/09
2	1940	94	94	12.5	20-90	77	Shallow	Replaced by 2A	--	--
2A	07/91	206	203	20	70-90	--	Shallow	Active	24.0	5/5/09
3	--	103	103	12	20-92 ⁵	75	Shallow	Replaced by 3A	25.8	5/5/09
3A	06/91	120	98	16	63-98	55 ⁶	Shallow	Active	30.8	9/30/09
4	10/76	324	237	16	60-69 95-225 ⁷	92	Shallow	Active	38.75	8/25/09
4A	10/08	333	105	16	64-94	60	Shallow	Active	29.04	7/8/09
5	07/79	290	279	14	249-279	120	Deep	Active	17.0	5/5/09
5A	02/78	300	300	14	250-300		Deep	Collapsed during pumping test	--	--
5B	10/76	286	280	16			Deep	Pumped excessive sand during pumping test	--	--

⁵ Screen is filled with sand to a depth of 92 ft.

⁶ Pump inlet depth is estimated

⁷ Screen is filled with sand to a depth of 101 ft.

From BoR, 2010

LNFH Groundwater Historical Efforts

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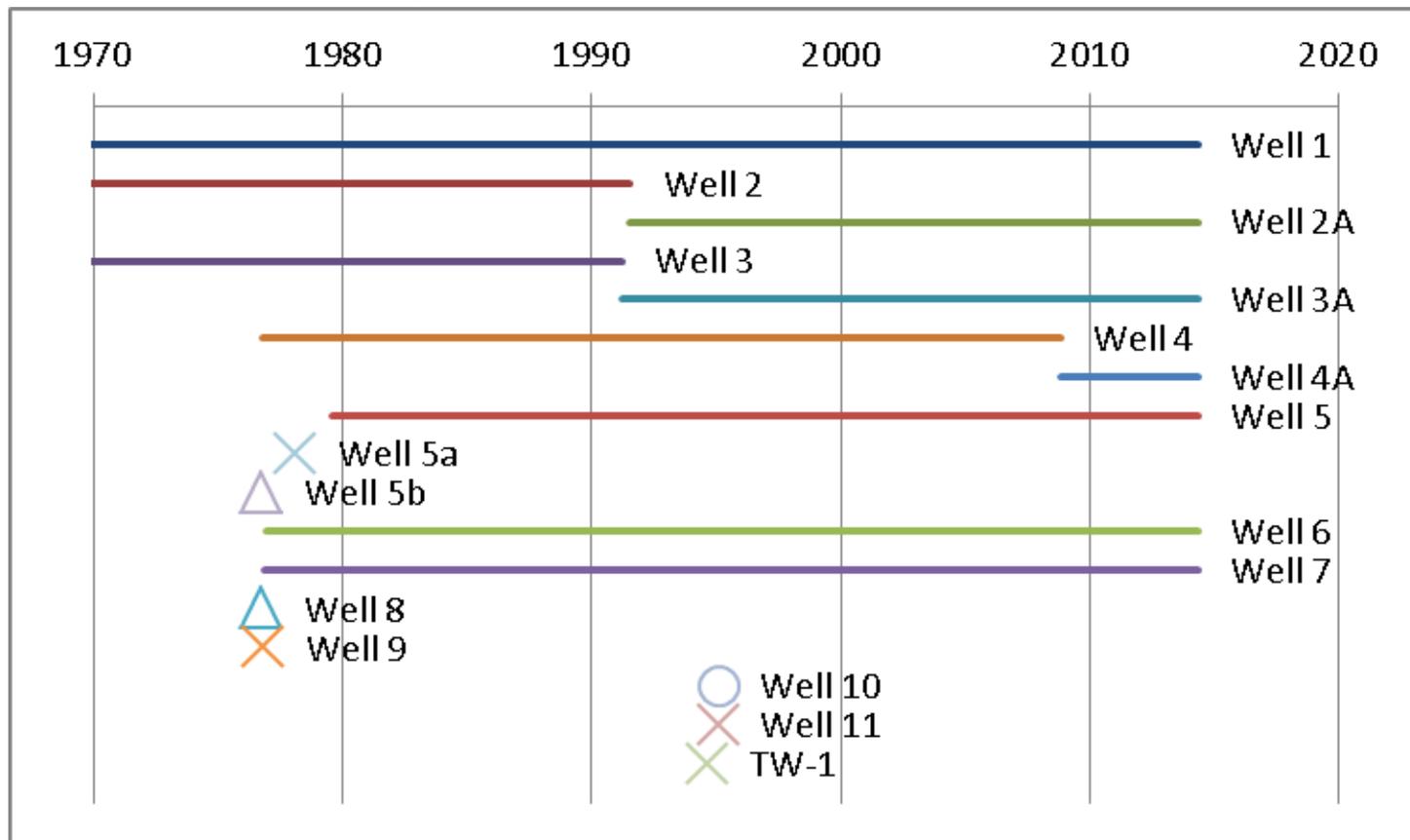
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6	12/76	195	170	14	102-112 150-170	103	Shallow and Deep	Active	35.44	7/8/09
7	11/76	192	110	14	72-82 92-110	75	Shallow	Active	24.5	5/5/09
8	10/76	278	278 ⁸	1.5	--	--		Obser. Well	--	--
9	11/76	213	205	16	80-105 115-136 180-200	--	Shallow	Collapsed during pumping test, used as obser. well	17.7	9/30/09
10	2/95	110	104	12	75-100	--	Shallow	Not Pumped	38.15	9/30/09
11	2/95	278	278	16	--	--	Shallow	Decommissioned	--	--
TW-1	9/94	276	--	--	--	--	--	Abandoned	--	--
TW-2	11/94	150	--	--	--	--	Shallow	Used as obser. well	34.75	9/30/09
TW-3	1/95	145	--	--	--	--	Shallow	Cased well near well 10	--	--

From BoR, 2010

LNFH Groundwater Historical Efforts

■ Well Drilling and Replacement



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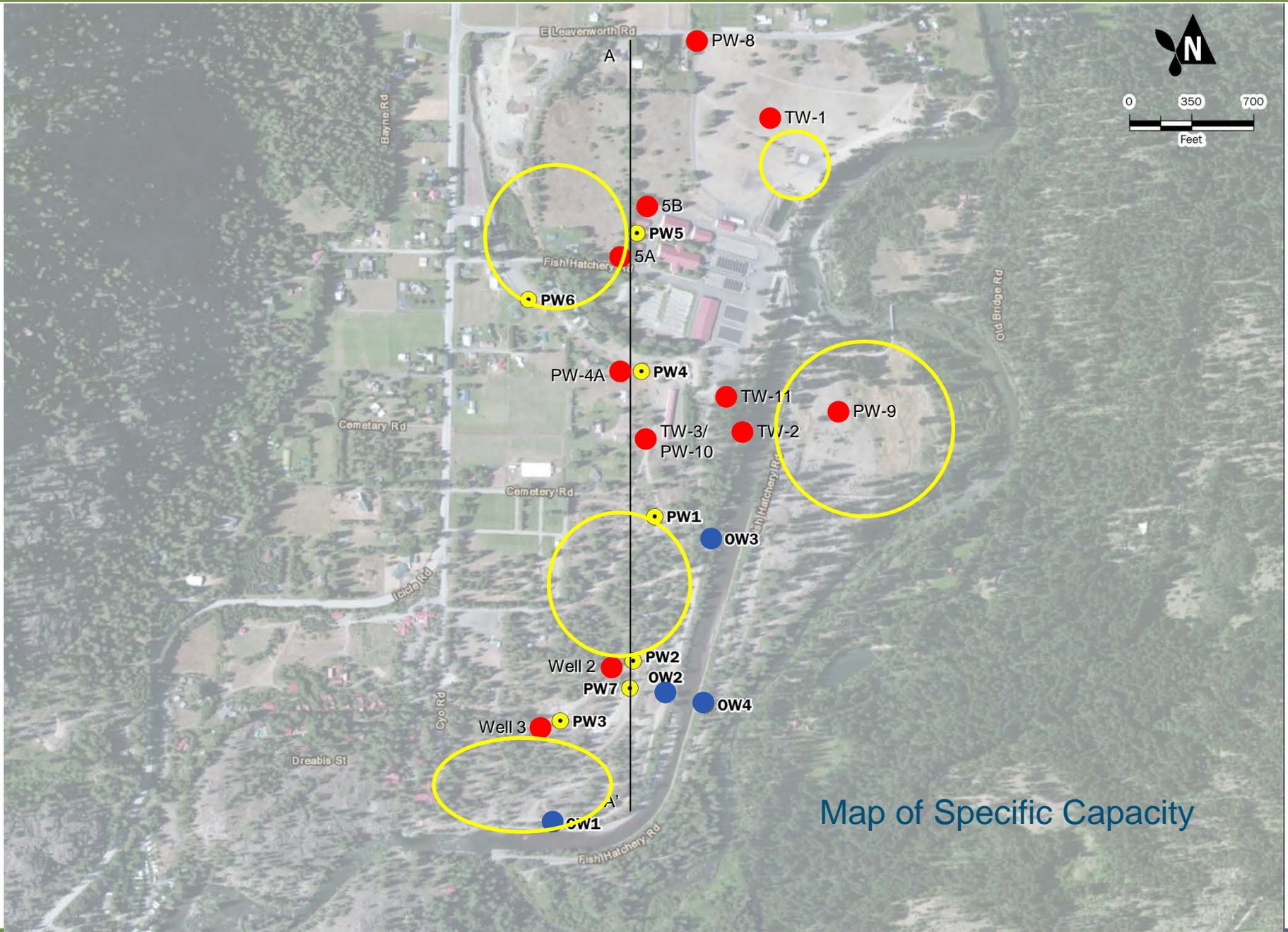
LNFH Groundwater

Influence of Recharge Sources

- Icicle Creek and Hatchery Channel
 - USFWS Monitoring Program & BoR GW Modeling Effort – under current operations
 - Channel recharge has short residence time
 - Icicle Creek is important recharge sources
 - GW levels not as sensitive to Hatchery Channel operations
 - Hydrating the hatchery channel may provide other functions (high flows, temperature moderation, tribal fishery enhancement)

LNFH Groundwater Suite of Options Considered

- **New Well Locations**
 - Augment existing well field (PW-1 area)
 - Expand existing well field (north or south)
 - Hatchery Island (wells/gallery)
 - West (on or off-property wells)
- **Rehab/Modification to Existing Wells**



Map of Specific Capacity

LNFH – Groundwater Supply Unit Cost

12-Inch Well Cost	Shallow 200'	Deep 300'
Well Drilling & Testing	\$85k	\$100k
Pump	\$50k	\$50
Total*	\$135	\$150

* without conveyance

16-Inch Well Cost	Shallow 200'	Deep 300'
Drilling & Testing	\$100k	\$130k
Pump	\$50k	\$50
Total*	\$155k	\$200k

* without conveyance

LNFH - Next Steps

- Further Evaluation/Investigation
 - Update conceptual model/aquifer conditions
 - Geophysical survey and/or exploratory drilling
 - Quantify seepage rates from the Hatchery Channel
 - Prioritize area(s) for well field development
- Analysis of Source Alternatives
 - New well field development
 - Effluent Pump-Back
 - Modification/Rehabilitation of Existing Wells
 - Compare Pros/Cons, Infrastructure (power/conveyance), permitting, cost
- Develop Action Plan
 - Process for Reviewing Options & Preparing Action Plan (Tech Advisory Group)
 - Present Recommendations to IWG

Questions?



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