

Hydrogeologic Conditions

- Can we reduce or eliminate groundwater during backfill and reclamation?
- Can we meet desired final land use of pasture and hay meadow?
- Can we handle the groundwater without impacting existing water rights and landowners?
- Can we continue our reclamation success, or do we need any modifications to ensure our landowners requested final land use- return to agriculture?

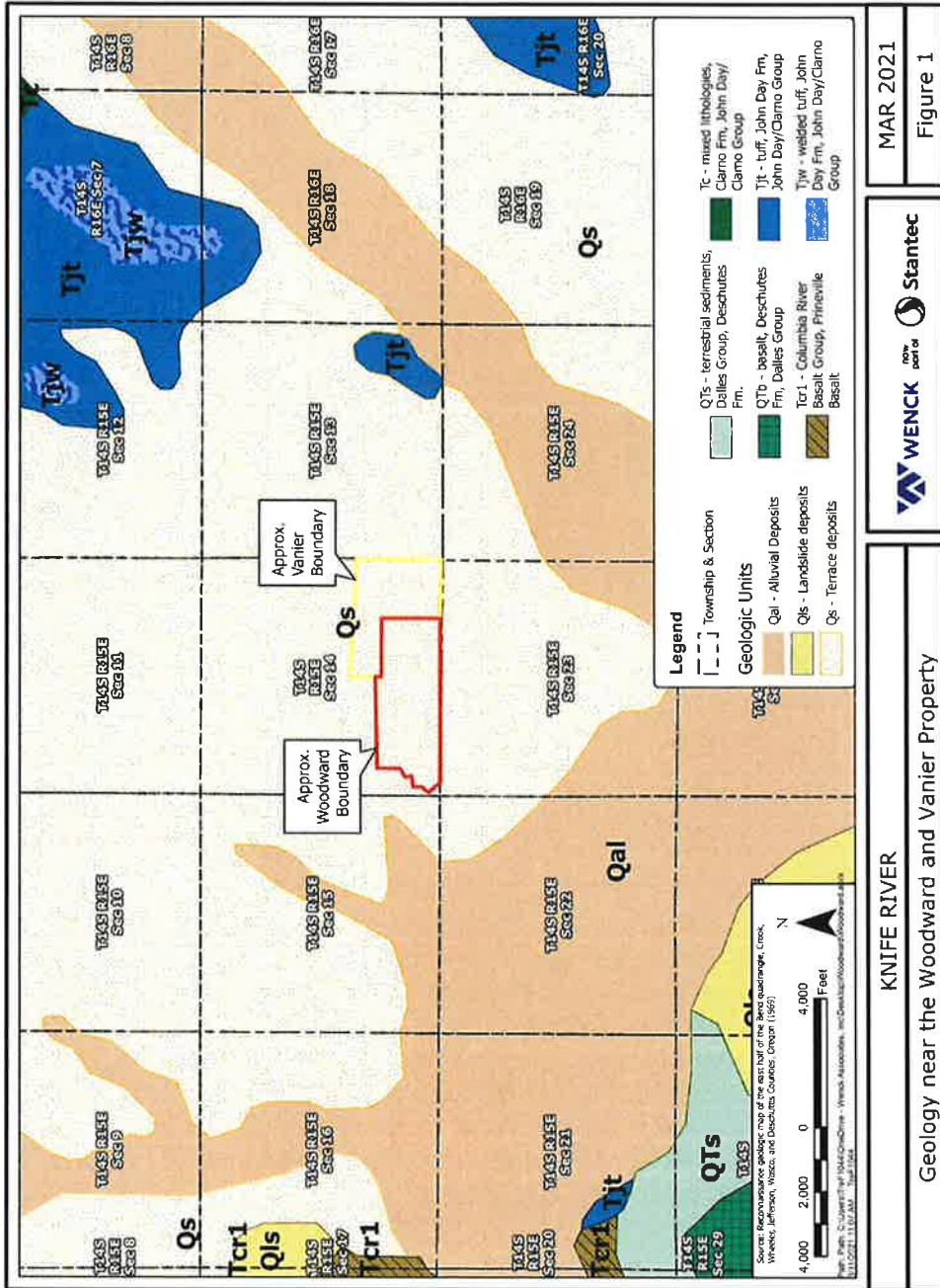


Hydrogeologic Assessment Approach

- Identified water rights on file with the Oregon Water Resources Department
- Reviewed geologic and hydrogeologic data
- Drilled and geologically logged three test wells to define site hydrogeologic conditions
- Completed aquifer tests on these wells to assess aquifer characteristics
- Cored and tested soils, overburden and gravels to address reclamation concerns
- Estimated potential groundwater inflows and identified potential recharge trench and monitoring well locations
- Evaluated reclamation plans and options



Geologic Setting

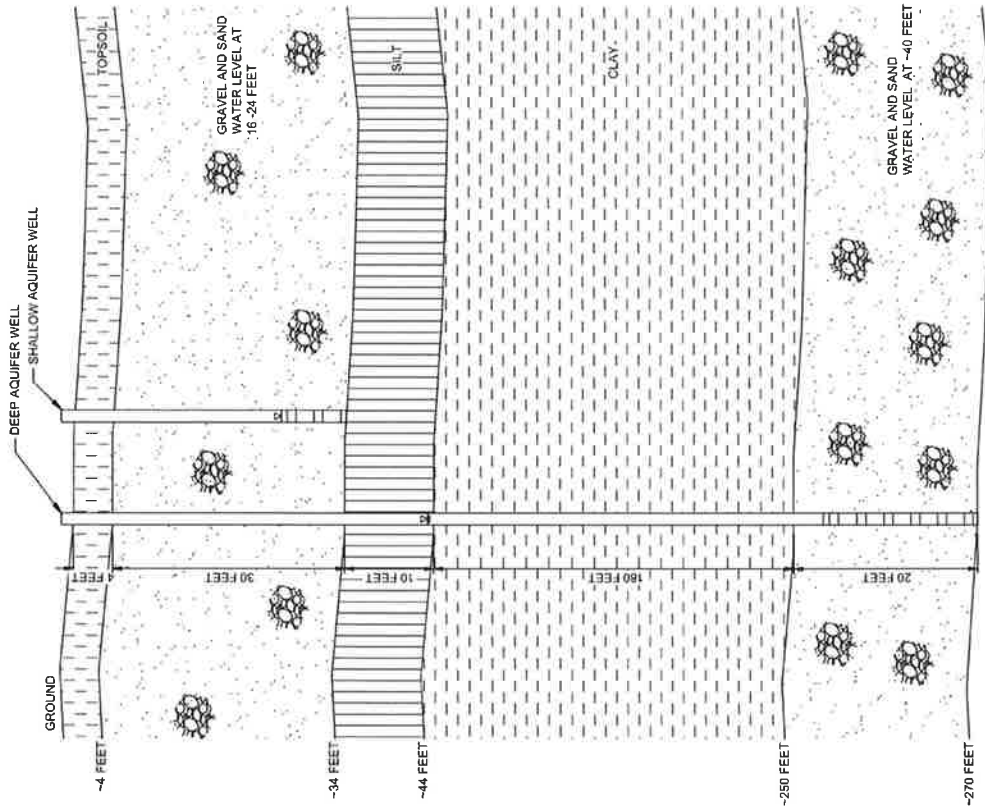


MAR 2021
Figure 1



KNIFE RIVER
Geology near the Woodward and Vanier Property

Terrace Deposits - Aquifer Configuration



Approved Name
CROO 54339

Approved Project Address

STATE OF OREGON
WATER SUPPLY WELL REPORT
As required by ORS 37.765 & OAR 600-005-0210

WELL ID: LABR1 # 121397
STARJ CARD # 229272
ORIGINAL LOG #

DATE: 3/12/2016

(1) LAND OWNER: Koon, Inc. 1000 NW 2nd St, Astoria, OR 97103
Address: 1000 NW 2nd St, Astoria, OR 97103
City: Astoria, OR 97103
County: Clatsop
Zip: 97103

(2) TYPE OF WORK: New Well Altering Existing Well Abandonment

(3) PRE-QUALIFICATION: Yes No

(4) PROPOSED USE: Domestic Irrigation Commercial Industrial

(5) BORE HOLE CONSTRUCTION: Rotary Auger Hand Dug

(6) CASING LINER: Yes No

(7) PERFORATION SCREENS: Yes No

(8) WELL TESTS: Minimum testing time is 1 hour

(9) LOCATION OF WELL (Legal description):
Lot 21, Block 3, Sub 2, Astoria, OR 97103

(10) STATIC WATER LEVEL:
Date: 3/12/2016
Time: 10:00 AM
Depth: 20.0 feet

(11) WELL LOG:
Interval: 0 to 20 feet
Material: SANDY SILT
Ground Elevation: 20.0 feet

RECEIVED BY: OMEI
DATE: MAY 17 2016
SALEM, OR

Date Started: 3/12/2016
Completed: 3/12/2016

This report was originally e-filed to the Department; the original e-filed document is attached.

License Number: 738
Date: 3/12/2016

Signed: [Signature]
Title: [Title]

(Borehole) Water Well Construction Certification
I accept responsibility for the construction, deepening, alteration or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

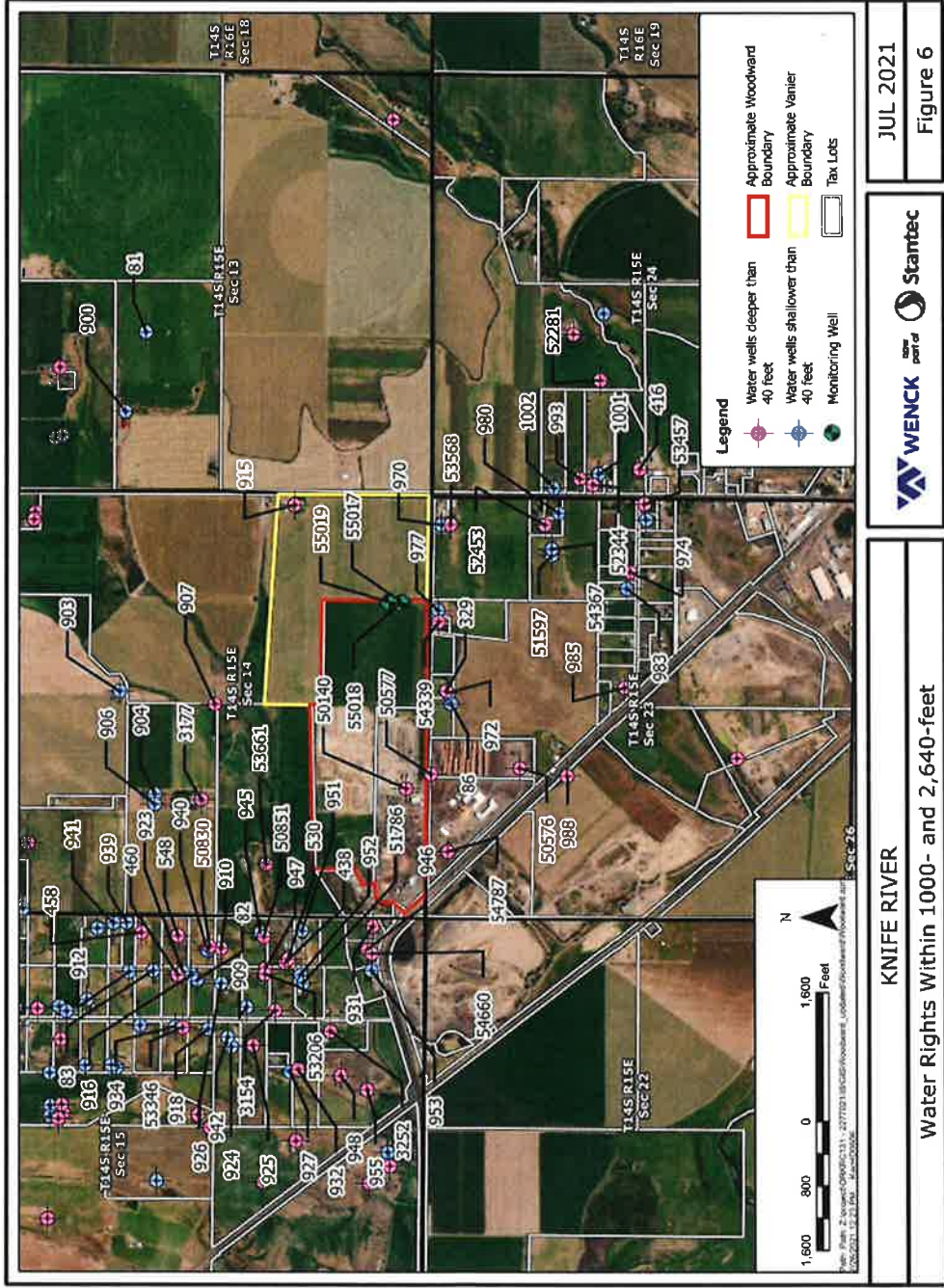
License Number: 129
Date: 3/12/2016

Signed: [Signature]
Title: [Title]

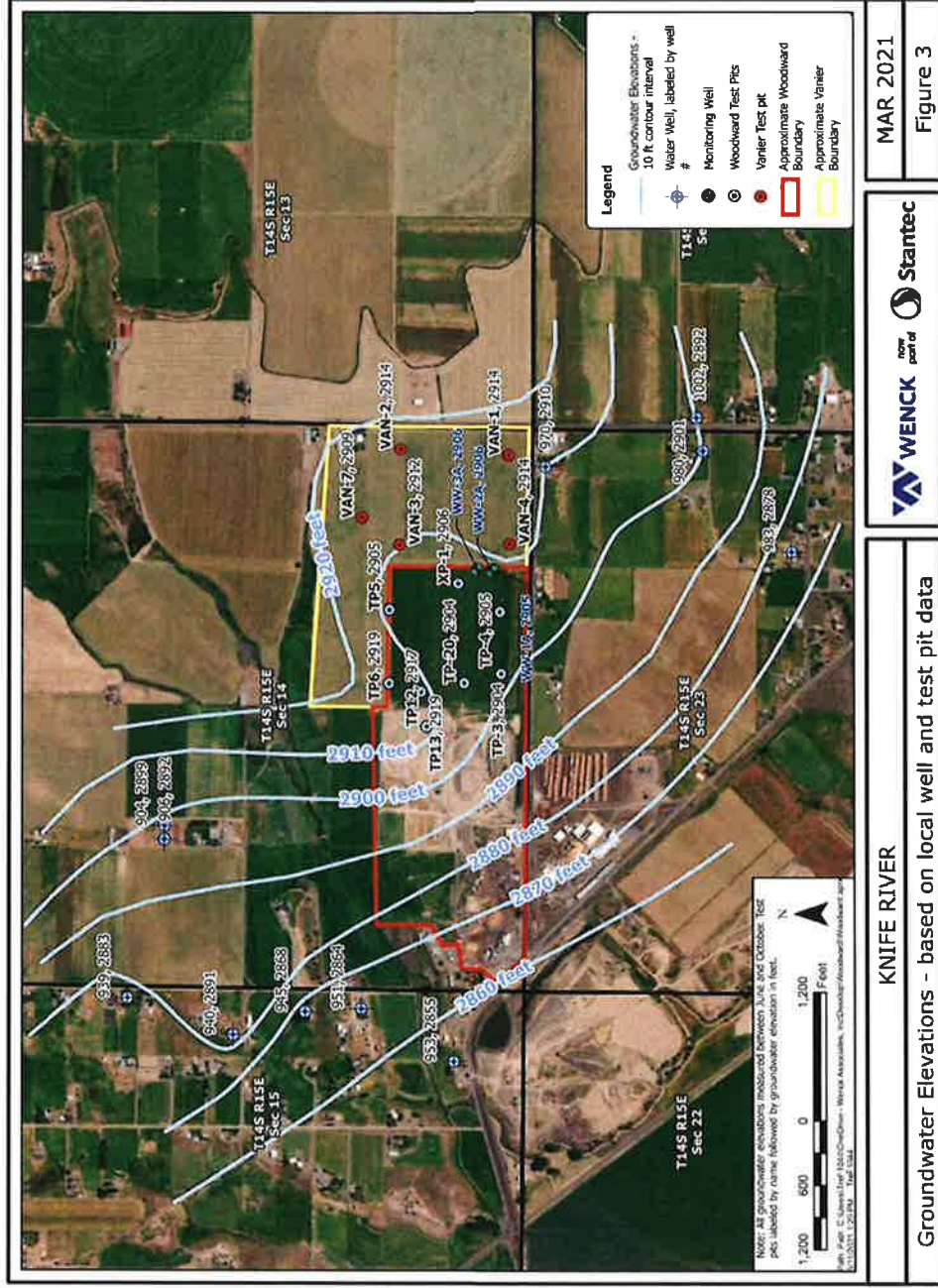
ORIGINAL - WATER RESOURCES DIVISION

THIS REPORT MUST BE SUBMITTED TO THE WATER RESOURCES DIVISION WITHIN 30 DAYS OF COMPLETION OF WORK. Form Version:

Local Water Wells

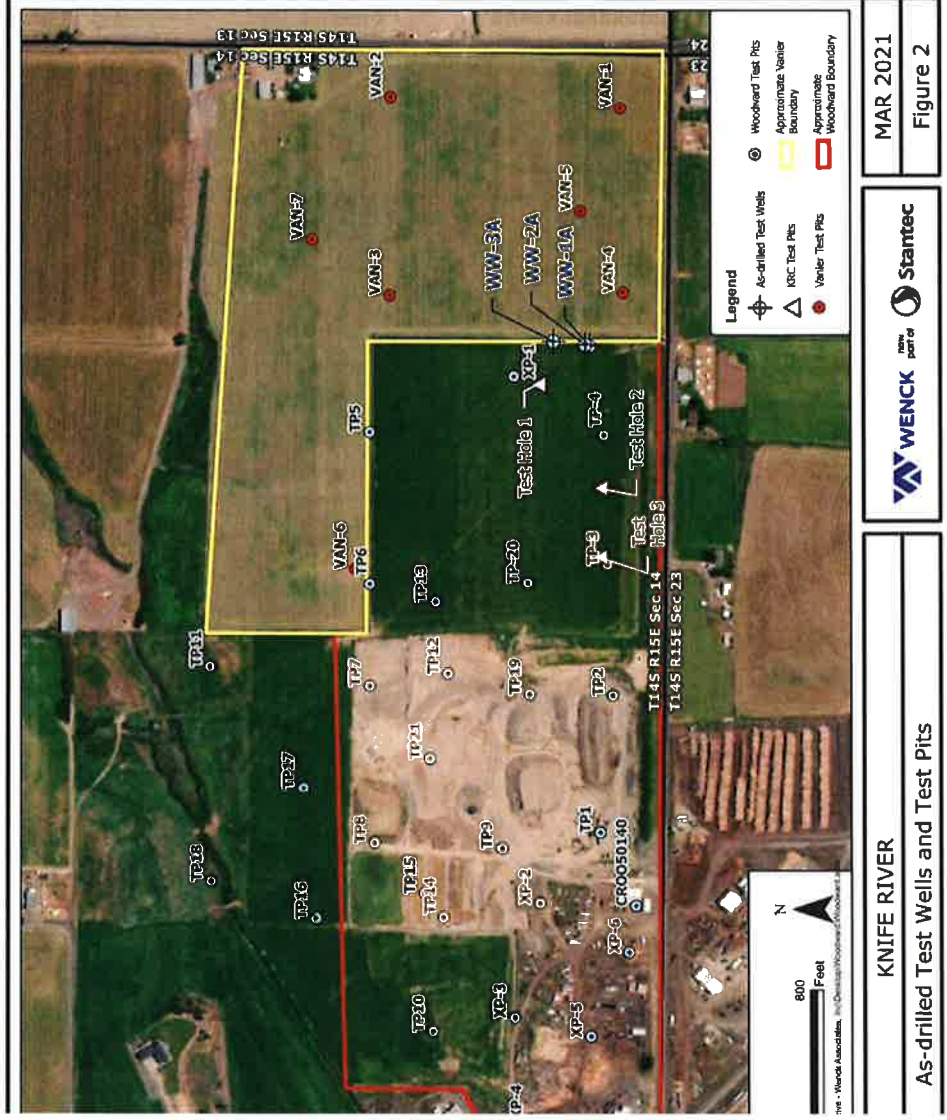


Groundwater Flow



Well Drilling and Aquifer Testing – WW1A

Well Construction	Lithology	Remarks
0-2.71: Not connected to surface	0-3.75 FT. SILTY SAND (SM) dark brown, moist and moist with some organic materials, carbonaceous concretions at 2.71, silty, very carbonaceous, trace amounts of gravel at 4'	
2.71-3.75 FT. SILTY SAND (SM) brown, medium to low plasticity, clay, fine sand in a graded, clay structure and conglomerate at 5', slightly to very carbonaceous, 0.25-0.5' bedding	3.75-10.10 FT. SILTY SAND (SM) brown, high plasticity, clay to no coarse elements, pink, medium to dense, cohesive, highly bedded, non to slightly carbonaceous, 12' carbonaceous concretions, silty sand at 8.5', some trace gravel, carbonaceous beds to clay at 9.5'	
10.10-12.75 FT. SILTY SAND (SM) loose, moist, fine to medium grained sand, non carbonaceous, silty sand, trace gravel, granular and carbonaceous below that, trace gravel at 11' diameter	12.75-14.75 FT. SILTY SAND (SM) brown, fine sand in a carbonaceous silty, loose to medium plasticity, carbonate, granular, little carbonaceous concretions, very carbonaceous below that, trace gravel at 11' diameter	
14.75-15.25 FT. SILTY SAND (SM) non carbonaceous, similar to 10-12.75 interval, moist, silty, carbonaceous below 14', medium sand, medium grained, sub rounded, non carbonaceous, trace amounts of gravel - 1/8" diameter	15.25-16.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
16.75-21.25 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	21.25-22.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
22.75-24.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	24.75-26.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
26.75-30.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	30.75-32.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
32.75-34.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	34.75-36.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
36.75-38.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	38.75-40.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
40.75-42.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	42.75-44.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
44.75-46.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	46.75-48.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
48.75-50.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	50.75-52.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
52.75-54.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	54.75-56.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
56.75-58.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	58.75-60.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
60.75-62.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	62.75-64.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
64.75-66.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	66.75-68.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
68.75-70.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	70.75-72.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
72.75-74.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	74.75-76.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
76.75-78.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	78.75-80.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
80.75-82.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	82.75-84.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
84.75-86.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	86.75-88.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
88.75-90.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	90.75-92.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
92.75-94.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	94.75-96.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	
96.75-98.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	98.75-100.75 FT. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 25-50% carbonaceous, granular, gravel below 15', silty sand dominates below 16', non carbonaceous	

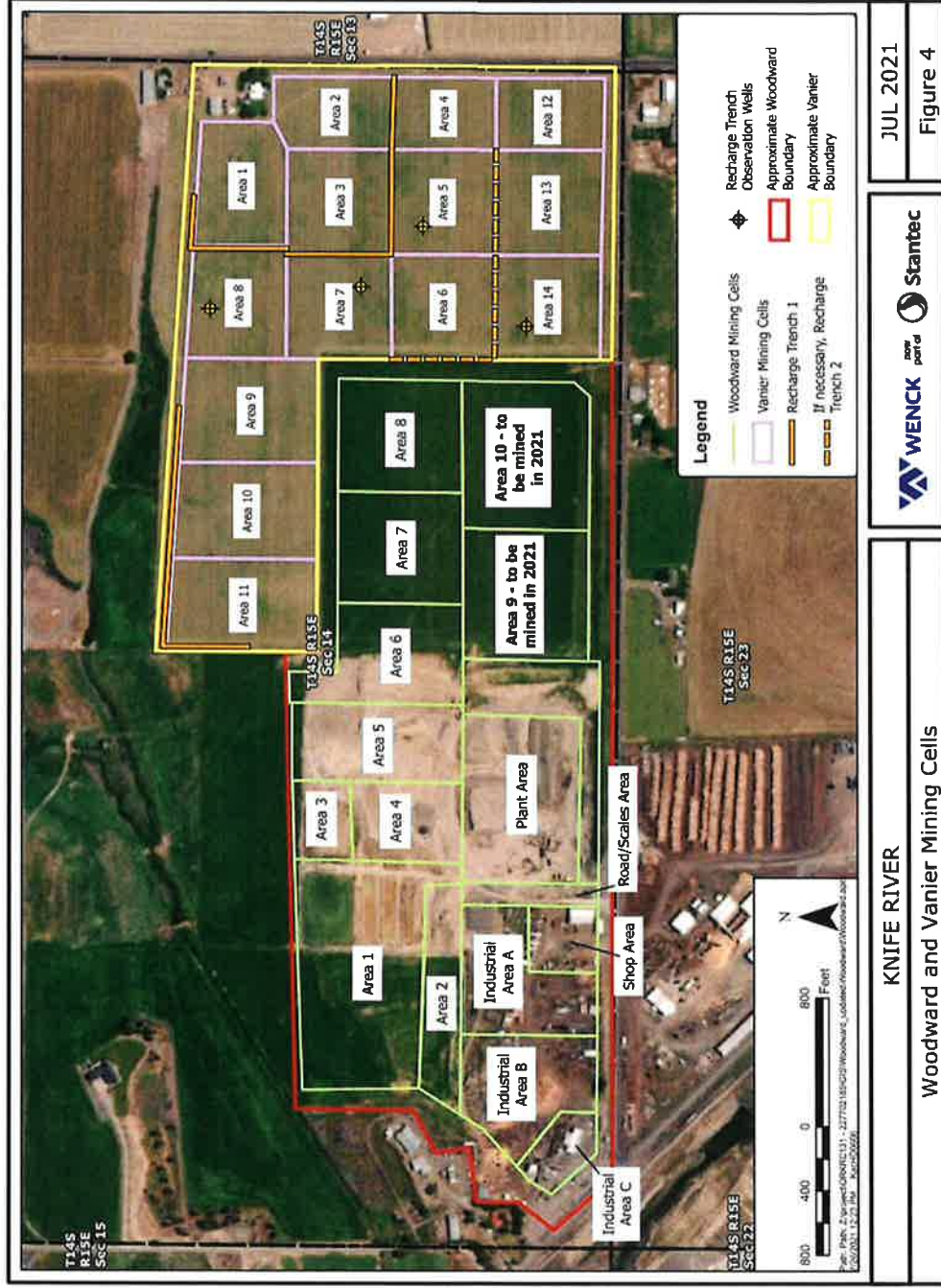


KNIFE RIVER
As-drilled Test Wells and Test Pits

WENCK now part of Stantec

MAR 2021
Figure 2

Recharge Trenches and Monitoring Wells

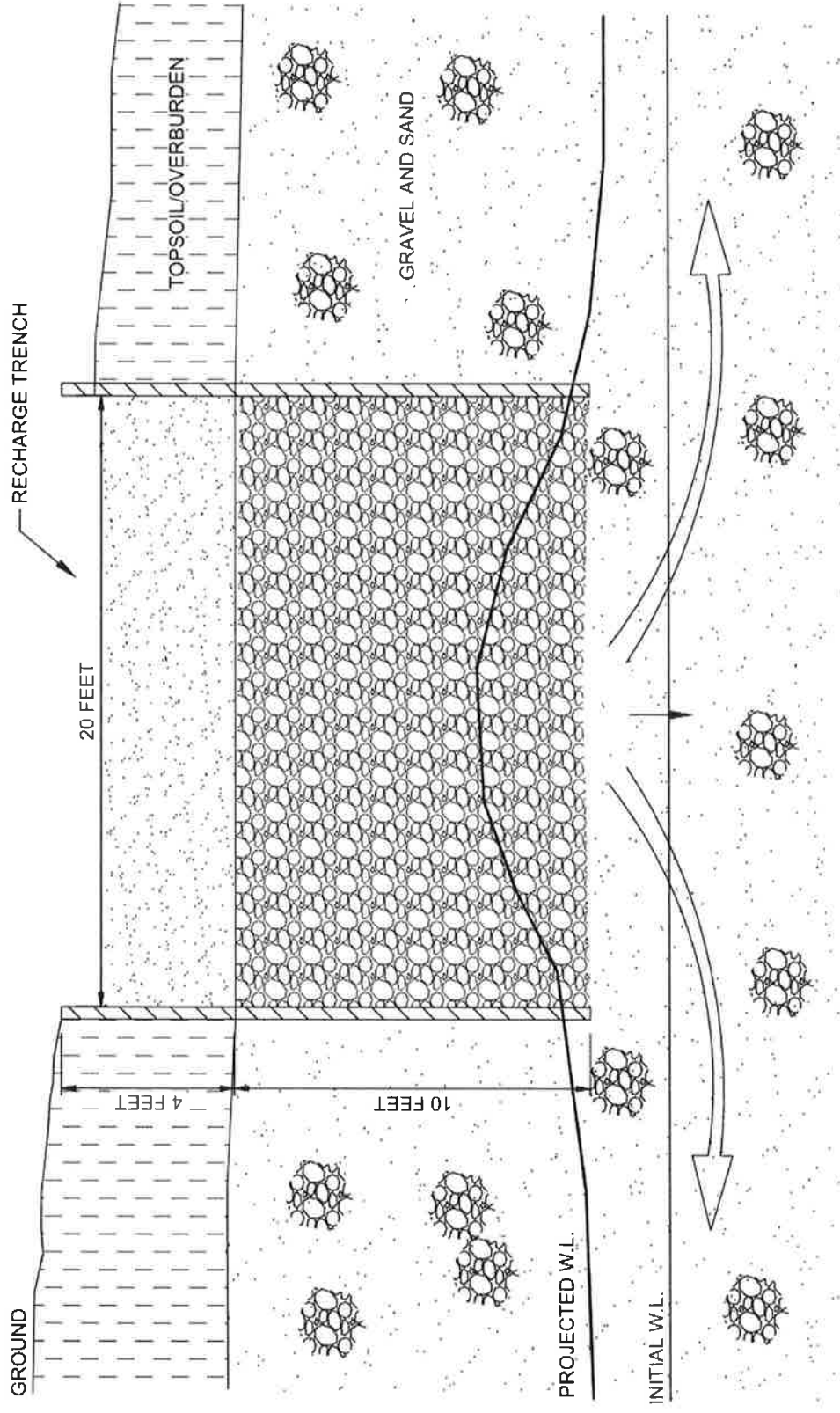


JUL 2021
Figure 4



KNIFE RIVER
Woodward and Vanier Mining Cells

Recharge Trench Approach



Findings and Recommendations

- Mining will remove water only from the uppermost aquifer and given our proposed mine plan, Knife River will be able to mitigate any operational impacts to groundwater and will not impact neighboring water rights.
- Aquifer testing of these wells indicated the shallow aquifer has a relatively high permeability. Transmissivity values range from 2,215 and 9,195 gpd/ft, hydraulic conductivity values varied between 218 and 903 gpd/ft², and the storage coefficient was estimated to be 0.285.
- Potential groundwater inflows to Vanier may range up to approximately 290 gpm on the eastern edge of the property and diminish to the west. Lesser flows may be encountered, and may range from 13 to 60 gpm.
- To minimize the potential impacts to local water resources and water rights, Knife River will establish recharge trenches and observation wells between the mine area and adjacent water rights. All water removed from the mine cell will be replaced into the recharge trench.
- Knife River will backfill mine cells immediately following mining. Overburden will be backfilled followed by separately stockpiled topsoil. Overburden can be placed directly on the mine floor with negligible impacts to the soil as suggested by its favorable agronomic characteristics.