

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?

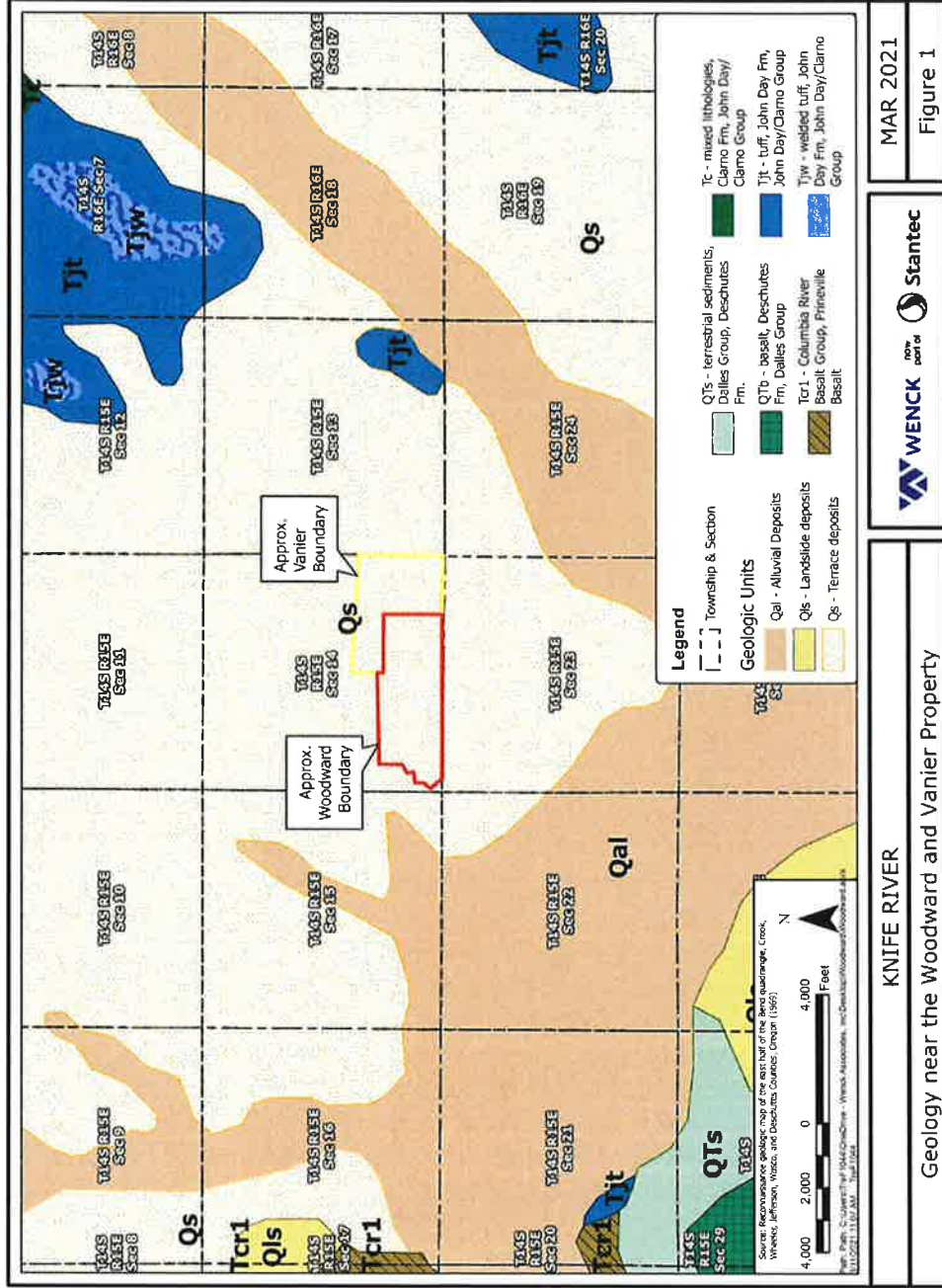


Hydrogeologic Assessment Approach

- 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

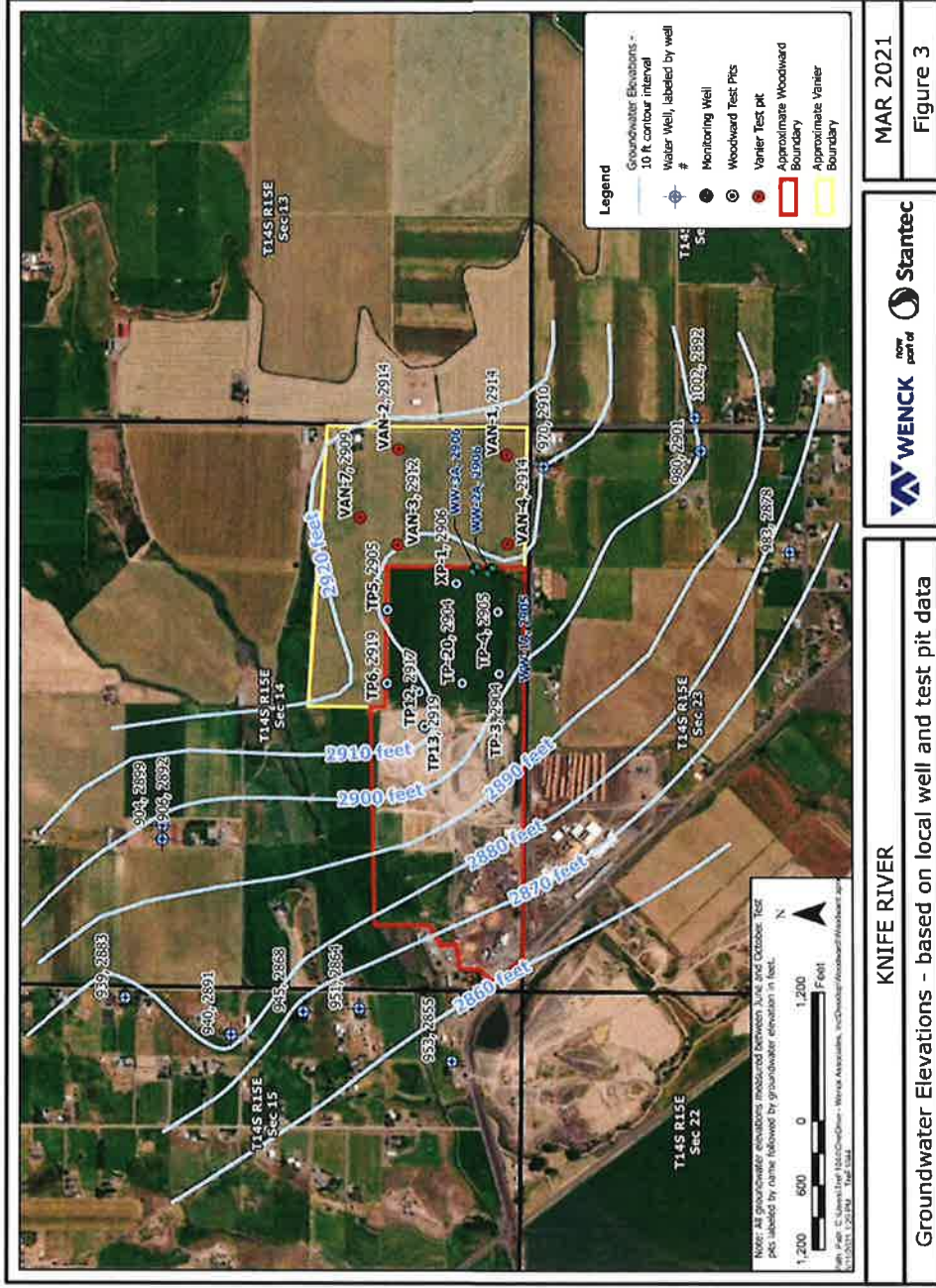


MAR 2021
Figure 1



KNIFE RIVER
Geology near the Woodward and Vanier Property

Groundwater Flow



Well Drilling and Aquifer Testing – WW1A

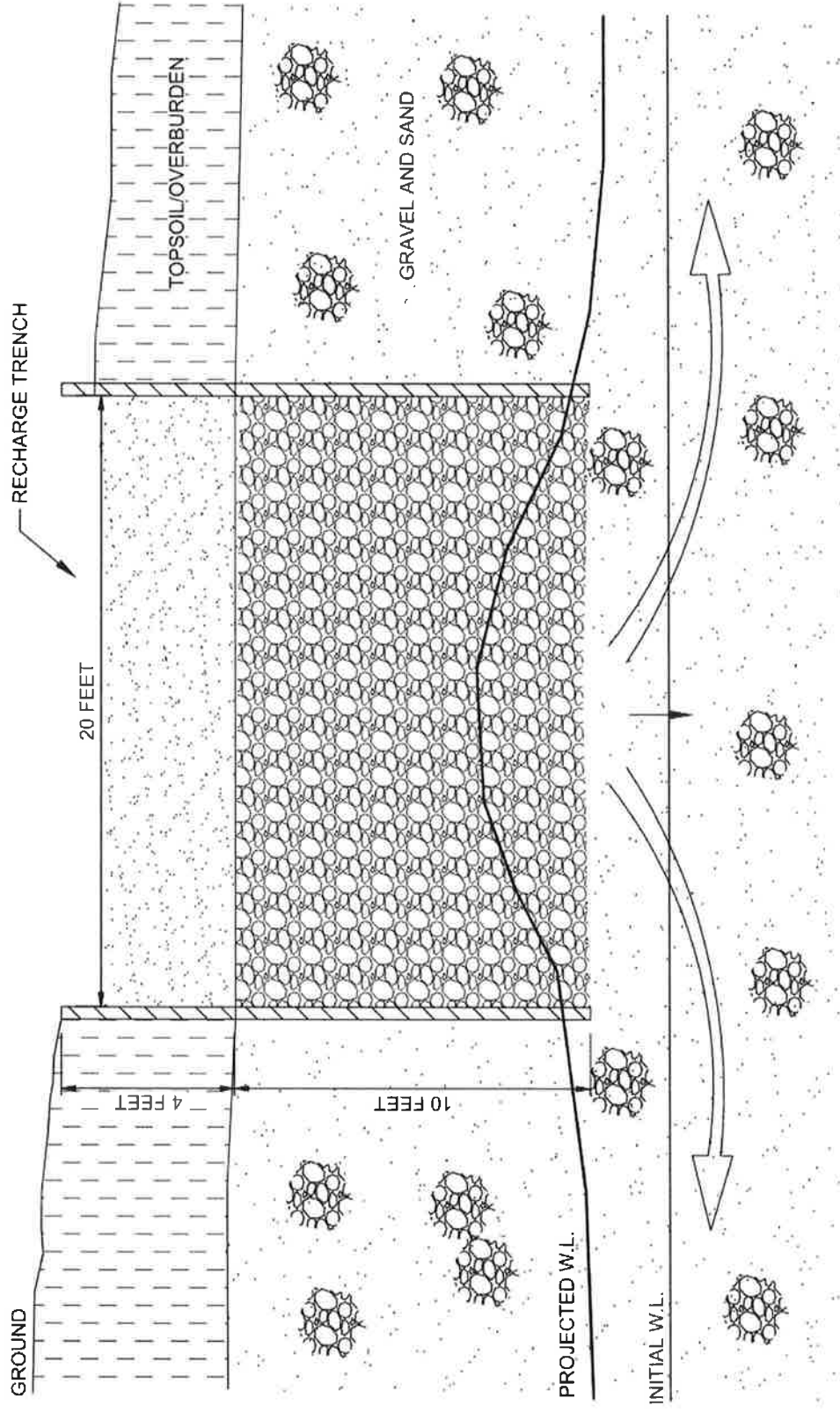
Well Construction	Lithology	Remarks
0-2.71: Not connected to surface	0-3' F. SILTY SAND (SM) dark brown, moist and moist with some organic materials, carbonaceous concretions at 2', silty, very carbonaceous, trace amounts of gravel at 4'	
2.71-4.21: 15" diameter PVC casing with 10" screen	3-7' F. SILTY 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	
4.21-5.27: 12" diameter PVC casing with 10" screen	7-10' F. 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 at 8-9', some trace gravel, carbonaceous beds to clay at 9.5'	
5.27-6.21: 12" diameter PVC casing with 10" screen	10-12' F. SILTY SAND (SM) loose, moist, fine to medium grained sand, non carbonaceous, trace amounts of gravel, granular and carbonaceous below that, trace gravel at 10' diameter	Wellbore measures at 20.73 feet (to 11/16/2021)
6.21-7.21: 12" diameter PVC casing with 10" screen	12-13' F. 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 10' diameter	
7.21-8.21: 12" diameter PVC casing with 10" screen	13-16' F. SILTY SAND (SM) non carbonaceous, similar to 10-12' interval, moist, silty, carbonaceous below 14', medium sand, medium grained, sub rounded, non carbonaceous, trace amounts of gravel - 10' diameter	
8.21-9.21: 12" diameter PVC casing with 10" screen	15-21' F. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 20-50%, carbonaceous, granular, gravel below 18', silty sand dominates below 19', non carbonaceous	
9.21-10.21: 12" diameter PVC casing with 10" screen	21-22' F. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 20-50%, carbonaceous, granular, gravel below 18', silty sand dominates below 19', non carbonaceous	
10.21-11.21: 12" diameter PVC casing with 10" screen	22-24' F. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 20-50%, carbonaceous, granular, gravel below 18', silty sand dominates below 19', non carbonaceous	
11.21-12.21: 12" diameter PVC casing with 10" screen	24-25' F. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 20-50%, carbonaceous, granular, gravel below 18', silty sand dominates below 19', non carbonaceous	
12.21-13.21: 12" diameter PVC casing with 10" screen	25-26' F. WELL GRADED SAND (SM) brown, loose to medium dense, moist, compact, 20-50%, carbonaceous, granular, gravel below 18', silty sand dominates below 19', non carbonaceous	
13.21-14.21: 12" diameter PVC casing with 10" screen	26-27' F. SILTY SAND (SM) wet, fine sand in a non carbonaceous silty, gravelly silty, clay structure, silty, carbonaceous, silty sand increases significantly below 27' block, sand gone below 28'	
14.21-15.21: 12" diameter PVC casing with 10" screen	28-30' F. LEAN CLAY (CL) wet, medium plasticity, silty to fine carbonaceous	



KNIFE RIVER
As-drilled Test Wells and Test Pits
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Figure 2



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.