Oregon

WATER
RESOURCES
DEPARTMENT

September 6, 1991

Steve Schneider
Schneider Equipment, Inc.
21881 River Road N.E.
St. Paul, OR 97137

RE: City of La Grande Twelfth Street Well - SC #26809

Dear Steve:

This letter is in response to our recent conversations regarding the above well.

I have attached a copy of your August 20, 1991 letter indicating the proposed completion plan as follows:

> Sixteen inch (16") casing extending from land surface, set and sealed to 1135'. Twelve inch (12") liner and screen assembly from 1107' to 1706'.
>
> Completion to include installation of additional liner and screen assembly from at least 1698' using materials that will meet or exceed well construction standards. The well head will also be equipped with a valve and gauge as required by the well construction standards.

As I indicated, based upon the stratigraphic information you submitted and the letter (attached) from your hydrogeologist, Dick Gullixson, the above proposal for completion is approved.

If it is determined at some future date that the well, due to its construction, does not meet current standards, it will be necessary for you to return to the site to correct any well deficiencies.

If I can be of further assistance please call 378-8455-218.

Sincerely,

Greg Beaman
Well Construction Supervisor

cc: Anderson, Perry & Associates

Dick Gullixson

W
AS
Remarks: Small Bore Hole.

3850 Portland Rd NE
Salem, OR 97310
(503) 378-3739
FAX (503) 378-8130

WELL DRILLING
IRRIGATION
CONTROL SYSTEMS

SCHNEIDER
EQUIPMENT, INC.
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PUMPS
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SALES AND SERVICE

FAX (503) 633-2668

21881 River Road N.E. St. Paul, Oregon 97137 (503) 633-2666

August 20, 1991

Water Resources Department
3850 Portland Road
Salem, Oregon 97310

ATTN: Greg Beaman

Ref: City of La Grande Twelfth Street Well - SC #26809

Dear Greg;

The referenced well was drilled with mud rotary to 1135′ and a 16" casing set and sealed (reference WRD 5/3/91 letter to Steve Schneider). Drilling continued with weighted mud rotary to 1706′. A 12" liner assembly was installed, the mud unloaded and the well developed. The well only flowed approximately 30 GPM. The yield would not significantly increase when the well was blown, creating a drawdown. Recovery was very slow. Partial shut-in exhibited a pressure over 20 psi. Because of leakage and small amount of flow, full shut-in pressure was not obtained. During developing, an attempt was made to force water into the well. The well accepted limited gallonage (e.g. approx. 20 gpm) until the backpressure gained to approximately 50 psi and then rapidly rose to over 100 psi without any significant additional acceptance.

The well is now being deepened by reverse circulation rotary (see log) and is flowing over 1500 gpm with a shut-in of over 70 psi. A small increase in flow was noticed during deepening of the first 100′ with more significant increases in flow observed as deepening continued below 1900′.

Anderson-Perry & Associates (963-8309) are the project Engineers and have retained Dick Gullixson (938-3874) as a hydro-geologic consultant. They are in concurrence that the material exposed to date below the first basalt encountered are all of the same geologic unit. In addition, there is no verifiable evidence of significant dissimilar head, temperature or mineral content of the water within that geologic unit. Accordingly, it is desired to line the borehole below 1706′ with a minimum 8′ overlap of the existing 12" liner. The additional liner will meet or exceed water supply well construction standards. The well head will be

equipped with a valve and gauge as required by the standards.

Do you concur with our analysis and approach? Please let us know immediately if you foresee a problem or need to discuss further. Thank you for your prompt attention to this matter.

Sincerely,

Stephen J. Schneider
Vice President-Drilling

Concurrence:

Anderson, Perry & Associates
P.O. Box 1107
La Grande, Or 97850

Dick Gullixson
1003 Davis
Milton Freewater, Or 97862

26 Aug 97

L09568.WRD
SJS:bm

City of LaGrande
Twelfth Street Well
by Schneider Equipment, Inc.
Start Card # 26809

| From | To | |
|---|---|---|
| 0 | 2 | Gravel, Fill |
| 2 | 8 | Clay, blk w/gravel, soft |
| 8 | 13 | Clay, gray w/gravel, 4" minus, conglomerate |
| 13 | 23 | Gravel & clay, brn 6" minus, conglomerate |
| 23 | 32 | Gravel 2" minus w/some clay binder, brn |
| 32 | 36 | Gravel 4" minus & clay, brn, conglomerate |
| 36 | 41 | Gravel 2" minus & clay, brn w/some water |
| 41 | 51 | Gravel, brn course sand, clay, brn |
| 51 | 106 | Gravel, brn course sand, cemented |
| 106 | 124 | Gravel, brn course sand, slightly cemented |
| 124 | 160 | Gravel, brn sand w/clay binder |
| 160 | 211 | Gravel, gray sand, mud, loose |
| 211 | 286 | Clay, brn, sandy, some small gravel |
| 286 | 348 | Clay, brn, sandy w/small layer cemented sand |
| 348 | 371 | Clay, brn, claystone |
| 371 | 393 | Clay, brn, w/some small gravel |
| 393 | 414 | Clay, brn |
| 414 | 433 | Clay, sand, small gravel |
| 433 | 495 | Clay, brn, sandy, some grvl, lyrs of gray clay |
| 495 | 581 | Clay, gray, sandy, some gravel |
| 581 | 610 | Clay & claystone, blue, gritty |
| 610 | 618 | Clay, drk brn & gray, sticky |
| 618 | 656 | Clay, blue & gray, med w/some claystone |
| 656 | 699 | Clay, gray & lt gray, sticky w/claystone strks |
| 699 | 711 | Clay, gray & lt gray, some wood, claystone lyr |
| 711 | 741 | Clay, gray & brn with wood |
| 741 | 762 | Clay, blue, hard |
| 762 | 811 | Clay, gray, silty, soft |
| 811 | 870 | Clay, blue, sticky, firm |
| 870 | 890 | Clay, green & gray, w/some wood, some brown |
| 890 | 910 | Clay, blue, sticky, firm |
| 910 | 911 | Clay, gray, blue & brown |
| 911 | 965 | Clay, blue, sticky |
| 965 | 992 | Clay, blue & gray, med-soft |
| 992 | 996 | Clay, blue & gray, med-firm |
| 996 | 1006 | Clay, blue & gray, med |
| 1006 | 1025 | Clay, gray, med-soft |
| 1025 | 1064 | Clay, blue, sticky |
| 1064 | 1081 | Clay, blue, sticky, firm |
| 1081 | 1100 | Clay, gray & brn, med-soft |
| 1100 | 1107 | Clay & claystone, gray, hard |
| 1107 | 1121 | Claystone, gray, hard |
| 1121 | 1127 | Basalt (Andesite?), gray, hard, vesicular |
| 1127 | 1138 | Basalt, blk, hard |
| 1138 | 1144 | Basalt, black |
| 1144 | 1153 | Basalt, black, some fractures |
| 1153 | 1171 | Basalt, black, some claystone, blk layers |

City of LaGrande
Twelfth Street Well
by Schneider Equipment, Inc.
Start Card # 26809

| | | |
|---|---|---|
| 1171 | 1214 | Basalt, blk & red, hard, some fractures |
| 1214 | 1241 | Basalt, blk, some green & red, hard, fractured |
| 1241 | 1253 | Clay, red layers, Basalt layers, blk, soft |
| 1253 | 1263 | Basalt, brwn & blk, ves, soft fractures |
| 1263 | 1271 | Basalt, blk, some red & gray, hard, little brkn |
| 1271 | 1286 | Clystn, brn & blk, sme cly brn w/Bslt blk, brn & rd ves |
| 1286 | 1346 | Basalt, blk ves, brn & grn & red, hard |
| 1346 | 1355 | Basalt & claystone layers, blk & gray |
| 1355 | 1362 | Clay, gray & green, soft |
| 1362 | 1386 | Bslt, blk, clystn, brn, rd, grn, ves, hrd, stf cly gry |
| 1386 | 1436 | Basalt, blk, red, brn, grn, some clay, hard |
| 1436 | 1451 | Bslt, blk, rd, brn, clystn, grn, sme cly gry, hd & sft |
| 1451 | 1456 | Bslt, blk, rd, brn, ves, fcted, clystn grn layers |
| 1456 | 1476 | Bslt, blk, rd, brn, ves, brkn,some hd cly, grn |
| 1476 | 1485 | Bslt, blk, rd, ves, bkn, hd, some cly lyrs, gry, sft |
| 1485 | 1506 | Bslt, blk, rd, ves, bkn, hd, some cly lyrs, red, sft |
| 1506 | 1511 | Clay, brown & red, soft |
| 1511 | 1522 | Bslt, rd, blk, ves, brkn, sme clystn lyrs, grn |
| 1522 | 1528 | Basalt, gray, red, & brown, hard |
| 1528 | 1543 | Basalt, gray, hard, some red & brown |
| 1543 | 1554 | Clay, red, soft |
| 1554 | 1564 | Basalt, black, hard |
| 1564 | 1576 | Basalt, red & black, w/clay, brown, med, ves |
| 1576 | 1599 | Basalt, black w/clay, multi-layered, med |
| 1599 | 1605 | Basalt, black w/some clay, brown |
| 1605 | 1617 | Basalt, black w/clay, red, med-soft |
| 1617 | 1618 | Basalt, black w/clay, red, med |
| 1618 | 1630 | Basalt, blk, fctd w/clay, blue-gray, med |
| 1630 | 1637 | Basalt, blk, brkn, ves w/some clystn, blue |
| 1637 | 1680 | Claystone & clay, green w/some pumice |
| 1680 | 1706 | Clay, green, soft, sticky |
| 1706 | 1740 | Clay & claystone, green |
| 1740 | 1750 | Cinder, red |
| 1750 | 1778 | Claystone & cinder, red |
| 1778 | 1782 | Basalt, blk, hard |
| 1782 | 1798 | Basalt, blk, frac |
| 1798 | 1814 | Claystone & cinder, red |
| 1814 | 1818 | Basalt, blk, frac |
| 1818 | 1829 | Basalt & claystone, med-soft, blk & green |
| 1829 | 1840 | Claystone, multi-colored, hard |
| 1840 | 1848 | Claystone, blue & basalt, brn & blk, weathered |
| 1848 | 1887 | Basalt, blk & red, frac, ves w/claystone, blue |
| 1887 | 1890 | Basalt, blk, frac, hard w/some claystone, blue |
| 1890 | 1900 | Basalt, blk & red, med-hd, w/some clystn, blue |
| 1900 | 1910 | Basalt, blk, frac, hard w/some claystone |
| 1910 | 1937 | Basalt, blk, frac, med-hd |
| 1937 | 1980 | Basalt, grey & brn, frac, hard |
| 1980 | 1997 | Basalt, red & grey, bkn, ves w/some clystn, blue |

| | | |
|---|---|---|
| 1997 | 2009 | Basalt, grey, frac, med-hd |
| 2009 | 2028 | Basalt, grey, frac, hard |
| 2028 | 2033 | Claystone, brn, blue, green, med-hd |
| 2033 | 2039 | Basalt, grey, frac, ves, med |
| 2039 | 2054 | Basalt, blk, frac, ves, med-hd w/claystone |
| 2054 | 2064 | Basalt, blk, frac, ves, med |
| 2064 | 2087 | Basalt, grey & brn, bkn, frac, ves, some clystn |
| 2087 | 2146 | Basalt, grey, frac, hard |
| 2146 | 2155 | Basalt, blk, red, brn, bkn, ves, some clystn,blu |
| 2155 | 2160 | Basalt, grey & red, frac, med hard |
| 2160 | 2165 | Basalt, red bkn, ves, med w/claystone, blue |
| 2165 | 2177 | Basalt, grey, frac, med-hd |
| 2177 | 2179 | Basalt, grey, some red, frac, ves, w/cs, blue |
| 2179 | 2187 | Basalt, grey, frac, hard |
| 2187 | 2193 | Basalt, grey & brn, ves, med, some cs, blue |
| 2193 | 2229 | Basalt, grey, frac, some ves, hard |
| 2229 | 2244 | Basalt, blk, med, bkn, ves & cs, blue |
| 2244 | 2260 | Basalt, grey, frac, hard |
| 2260 | 2290 | Basalt, brn, grey, red, bkn, ves & cs, blue |
| 2290 | 2299 | Basalt, grey, frac. |
| 2299 | 2300 | Basalt, grey, brn, red bkn, ves w/some cly, sft |
| 2300 | 2305 | Basalt, red & grey, ves, bkn |
| 2305 | 2315 | Basalt, grey, frac, hard |
| 2315 | 2350 | Basalt, grey & brn, frac, ves, med w/some cs |
| 2350 | 2360 | Basalt, grey, frac, hard, some cs |
| 2360 | 2380 | Basalt, red & grey, bkn, ves w/cs |
| 2380 | 2394 | Basalt, blk, frac |
| 2394 | 2414 | Basalt, grey & red, bkn, ves, med w/cs, blue |
| 2414 | 2420 | Basalt, red & grey, bkn, med |
| 2420 | 2434 | Basalt, grey, frac, hard |
| 2434 | 2436 | Basalt, grey, frac, med w/cs, blue |

City of La Grande
Twelfth Street Well
SC #26809

16" casing from surface to 1135' - Cemented in.
12" liner from 1107' to 1706':

| | | | |
|---|---|---|---|
| 'J' receptor, k packer & bell rod | 1107.2 | - | 1112.8 |
| blank | 1112.8 | - | 1132.8 |
| perf | 1132.8 | - | 1142.8 |
| screen | 1142.8 | - | 1148.1 |
| perf | 1148.1 | - | 1233.3 |
| screen | 1233.3 | - | 1243.6 |
| perf | 1243.6 | - | 1268.9 |
| blank | 1268.9 | - | 1284.0 |
| perf | 1284.0 | - | 1299.0 |
| screen | 1299.0 | - | 1304.3 |
| perf | 1304.3 | - | 1324.4 |
| screen | 1324.4 | - | 1339.7 |
| blank | 1339.7 | - | 1389.5 |
| perf | 1389.5 | - | 1500.0 |
| blank | 1500.0 | - | 1575.5 |
| perf | 1575.5 | - | 1531.5 |
| screen | 1531.5 | - | 1541.8 |
| perf | 1541.8 | - | 1577.9 |
| screen | 1579.9 | - | 1610.5 |
| perf | 1610.5 | - | 1630.6 |
| blank | 1630.6 | - | 1706 |

1003 Davis Street
Milton-Freewater, OR 97862
August 28, 1991

Water Resources Department
3850 Portland Road
Salem, OR 97310

ATTENTION: Greg Beaman

RE: City of LaGrande - 12th Street Well
SC #26809
Telecon Wednesday, 28 August 1991

Dear Greg:

The Schneider Drilling Company has prepared a position letter dated 20 August, describing the general construction features of the well. As you will see, the letter was routed first through Anderson & Perry and Associates, Inc. and signed off by Howard Perry. I received the letter on 27 August and signed off today. The construction sequence and the data reported is correct.

In the letter to you, I want to further clarify the stratigraphic sequence of formations.

| | |
|---|---|
| 0.0 to 211 | Recent Alluvium |
| 211 to 1121 | Claystone (Pliestocene) |
| 1121 to 1706 | Andesite (either Mahogany or Craig Mountain (Miocene) |

The 1706 foot depth is an end of contract depth feature, and is actually at a midpoint in a thick interbed from 1637 to 1740. Because of its thickness I am inclined to assign this claystone to the Glass Hill Basalt Formation.

Therefore:

| | |
|---|---|
| 1637 to 2436 | Glass Hill Basalt Formations (Water bearing under high head)(Miocene) |

On the telephone, I had said that the bottom section of the well was in the Grande Ronde formation. A review has changed my mind, because of the blue claystone in the bottom of the hole. At least this is not a known feature of the Grande Ronde Basalt.

The 16-inch surface casing is seated at depth 1135 or 14 feet into the Andesite rock and grouted in place. Thus, the surface casing is seated in the confining Andesite

Formation. The thickness of rock assigned to the Andesite, was not anticipated and is the principal reason for the drilling over runs. The casing and screens installed through the Andesite neither add nor detract from use of the well. These materials were not removed because of the risk of losing the well during removal.

In summary, the water bearing formation is the Glass Hill Basalts which are capped by Andesites (either Craig Mountain or Mahogany Mountain). All temperatures taken were at the collar of the hole.

The complete title of the Reference Publication is "Geology of the LaGrande Area, Oregon" dated 1980 by Geosciences Research Consultants, and Oregon Department of Geology and Mineral Resources. Special Paper No. 6. If I can provide any additional information please inquire.

Sincerely yours,

RICHARD L. GULLIXSON
Engineering Geologist

Copies to: Anderson Perry and Assoc.