Preliminary Report
on the
Gravel Resources
of the
Red Deer Area

Explanatory Notes

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Alberta Research

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For the purpose of this report a radius of approximately 25 miles of the City of Red Deer was chosen for study. In terms of the encompassing townships the area may be described as lying between range 23 west of the fourth meridian and range 3 west of the fifth meridian and between townships 34 and 42 (Fig. 1). An area of approximately 3,000 square miles is thus included. The major parts of the counties of Red Deer and Lacombe fall within the study region.

The bedrock underlying the entire area belongs to the nonmarine Tertiary and Upper Cretaceous Paskapoo Formation which is comprised of grey to greenish grey, thick-bedded, calcareous, cherty sandstone; grey and green mudstone; minor carbonate, thin limestone, coal and tuff beds (Green, 1972). The overlying surficial deposits of nearly the entire area have been mapped by Stalker (1956, 1960) and Bayrock, Boydell and Reimchen (in preparation). A reconnaissance mapping of the southwest portion was carried out by the writer. A simplified composite map of the surficial geology is presented in figure 2.

Investigations for gravel during the summer of 1973 were confined to areas blanketed by preglacial alluvial deposits, glacial outwash, deltaic alluvial deposits, and recent alluvium as outlined in figures 3, 4, 5 and 6. Surrounding deposits include tills, lacustrine materials and sand dunes which yield little or no coarse graded sediments. Topographic base maps with a scale of 1:50,000 were employed for surface control. Air photos were scanned to provide further interpretation with respect to the areal extent of deposits and location of pits and exposures. Prospective areas were visited and bulk sampled. Western Canadian Geological Drilling Services were retained to supplement surface information and as a result approximately 200 auger holes were drilled with a truck-mounted 8 inch auger at regular intervals within promising areas. Drilling was commonly confined to depths of less than 25 feet and sites were only selected along road allowances. Satisfactory
samples were obtained from drilling although few materials greater than 3 inches in diameter were recovered. Test hole data from records in the files of the Groundwater Division were used in addition to drilling information from the 1973 program.

Location of pits, exposures and test holes are given in figures 3 to 6 inclusive. The depth of gravel in each occurrence is indicated wherever the thickness exceeds 5 feet. Sample numbers of each are given and the pertinent analyses may be referred to in tables 1 and 2 and the appendix of this report.

Coal analyses were run on the minus #8 sieve fraction of pit and exposure samples, according to the Alberta Department of Highways laboratory procedures.

Sieve analyses were run on all samples and deviate from ASTM and Alberta Department of Highways procedures only in the use of a slightly different nest of coarse sieves.

Pebble counts were run on the minus 1 1/2" and plus 5/8" fraction of pit and exposure samples. Quartzite pebbles were counted independently of metamorphics, the latter of which normally consist of gneisses. The chert typically shows very little indication of erosional deterioration and, although some workers discourage the use of chert-bearing gravels (e.g., Price, 1958), there appears to be little concern for its effects in regular usage. The sandstones vary considerably from soft Paskapoo-derived rock to well-cemented Lower Cretaceous materials. Deposits which contain high percentages of igneous and metamorphic rock are of good quality except in areas where weathering conditions have resulted in friable pebbles. Vein quartz was arbitrarily counted with igneous pebbles. Shales and ironstones are normally considered detrimental materials.
Table 1. Coal Content of Sand Fraction (minus #8) of Pit Samples

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Percent Coal</th>
<th>Sample No.</th>
<th>Percent Coal</th>
<th>Sample No.</th>
<th>Percent Coal</th>
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<tr>
<td>1</td>
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<td>0.89</td>
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<td>0.06</td>
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<td>2</td>
<td>0.35</td>
<td>22</td>
<td>1.58</td>
<td>42</td>
<td>0.43</td>
</tr>
<tr>
<td>3</td>
<td>0.23</td>
<td>23</td>
<td>0.70</td>
<td>43</td>
<td>0.05</td>
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<tr>
<td>4</td>
<td>0.34</td>
<td>24</td>
<td>2.05</td>
<td>44</td>
<td>0.20</td>
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<tr>
<td>5</td>
<td>0.08</td>
<td>25</td>
<td>1.11</td>
<td>45</td>
<td>0.29</td>
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<tr>
<td>6</td>
<td>0.09</td>
<td>26</td>
<td>0.26</td>
<td>46</td>
<td>0.33</td>
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<tr>
<td>7</td>
<td>0.05</td>
<td>27</td>
<td>0.31</td>
<td>47</td>
<td>0.43</td>
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<tr>
<td>8</td>
<td>0.30</td>
<td>28</td>
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<td>48</td>
<td>0.41</td>
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<tr>
<td>9</td>
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<td>29</td>
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<tr>
<td>11</td>
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<td>31</td>
<td>0.77</td>
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<td>0.22</td>
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<tr>
<td>12</td>
<td>0.61</td>
<td>32</td>
<td>0.42</td>
<td>52</td>
<td>0.41</td>
</tr>
<tr>
<td>13</td>
<td>0.37</td>
<td>33</td>
<td>0.14</td>
<td>53</td>
<td>0.23</td>
</tr>
<tr>
<td>14</td>
<td>0.91</td>
<td>34</td>
<td>0.22</td>
<td>54</td>
<td>0.42</td>
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<tr>
<td>15</td>
<td>0.38</td>
<td>35</td>
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<td>55</td>
<td>0.06</td>
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<tr>
<td>16</td>
<td>1.22</td>
<td>36</td>
<td>0.58</td>
<td>56</td>
<td>0.19</td>
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<td>17</td>
<td>0.61</td>
<td>37</td>
<td>0.47</td>
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<td>18</td>
<td>0.93</td>
<td>38</td>
<td>0.37</td>
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<td>19</td>
<td>0.31</td>
<td>39</td>
<td>0.40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>1.38</td>
<td>40</td>
<td>0.18</td>
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Table 2. Coal Content of Sand Fraction (minus #8) of Exposure Samples

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Percent Coal</th>
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<tbody>
<tr>
<td>A</td>
<td>0.54</td>
</tr>
<tr>
<td>B</td>
<td>0.51</td>
</tr>
<tr>
<td>C</td>
<td>0.13</td>
</tr>
<tr>
<td>D</td>
<td>2.69</td>
</tr>
<tr>
<td>E</td>
<td>0.10</td>
</tr>
<tr>
<td>F</td>
<td>0.29</td>
</tr>
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</table>
Some indication is given of the degree of roundness of the pit and exposure pebbles retained on the 5/8" mesh sieve. The ultimate use of the gravel will dictate the roundness desired.

Descriptions of the amount of surface incrustation are provided for pit and exposure samples (minus 1 1/2", plus 5/8" mesh fraction). "Extreme" incrustation is applied to gravels including a larger number of pebbles with one half or greater of their surface covered with a carbonate layer. "Moderate" incrustation is used to describe gravels with a large number of pebbles with one quarter to one half the surface covered. Gravels made up of pebbles with small patches of carbonate scale on the surface are classified as having "slight" incrustation.

Properly graded quartzite-rich gravels are much preferred as a quality product except where crushing costs rise as a result of working harder rock. Preglacial gravels have particularly high contents of quartzite and therefore those deposits located west of Lacombe in township 41, range 27, west of the fourth meridian are regarded as excellent.

Recent alluvial and Pleistocene outwash deposits normally include good quality gravels although the former are frequently somewhat inaccessible in deeper river valleys and the latter are more unpredictable in occurrence. For example, major outwash deposits such as those in the Lacombe-Red Deer and Pine Lake areas predominantly contain sand. However, commercial quantities of good quality gravel have been outlined and developed. Outwash sheets in the Markerville and Huxley areas appear to be almost entirely devoid of gravel. Localized occurrences of outwash constitute some of the most important gravel sources in many parts of the area (for example, in the Ponoka, Tees and Eckville areas). Glacial alluvial materials are of poor quality. They typically contain high contents of clay and silt and high percentages of weak and friable pebbles such as shale and sandstones, both probably derived from local bedrock.
Eskers have been important sources of gravel in a few localities but large reserves of coarse sediments are relatively rare within them. Associated kame or outwash complexes, such as the one located in township 41, range 2, west of the fifth meridian are, on the other hand, of considerable importance.

REFERENCES


Green, R., 1972: Geological Map of Alberta, Map 35; Alberta Research.


DEFINITIONS

Aeolian — applied to deposits which are due to the transporting action of the wind.

Alluvial alluvium — pertaining to river deposits of relatively recent time.

Esker — sinuous ridge of gravel and sand taken to mark channels in the decaying ice sheet, through which streams passed.

Kame — a mound commonly composed of gravel or sand whose form is the result of original deposition against or upon melting ice.
Lacustrine - produced by lakes.

Outwash - drift deposited by meltwater streams beyond active glacier ice.

Pleistocene - Glacial epoch or ice age.

Preglacial - pertaining to or occurring in geologic time before the Glacial epoch.

Surficial - unconsolidated materials lying on the bedrock.

Till - nonsorted, nonstratified sediment deposited by a glacier.
APPENDIX

HISTOGRAMS OF ANALYSES
Sieve Analyses,

Pit Samples
* Cumulative Wt. %

SAMPLE NO.: Pit 1
DEPTH: 0-20
LOCATION: W1/2 22-7-27W4
SAMPLE NO.: Pit 2
DEPTH: 0-10
LOCATION: NW 21-34-2W5
SAMPLE NO.: Pit 3
DEPTH: 0-2
LOCATION: NE 9-35-2W5
SAMPLE NO.: Pit 4
DEPTH: 0-8
LOCATION: NE 6-35-2W5
Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 5
DEPTH: 0-10
LOCATION: SE 5-41-27W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

SAMPLE NO.: Pit 6
DEPTH: 3 - 15
LOCATION: W1/2 4-41-27W4
SAMPLE NO.: Pit 7
DEPTH: 3-20
LOCATION: SE 16-41-27W4
* Cumulative Wt. %

SAMPLE NO.: Pit 8
DEPTH: 2-5
LOCATION: SW 27-41-27W4
SAMPLE NO.: Pit 9
DEPTH: 1-2
LOCATION: E1/2 22-41-27W4
SAMPLE NO.: Pit 10
DEPTH: 0-6
LOCATION: N1/2 22-42-26W4
SAMPLE NO.: Pit 11
DEPTH: 5
LOCATION: SW 25-42-26W4
SAMPLE NO.: Pit 12
DEPTH: 10-15
LOCATION: SW 35-42-26W4
SAMPLE NO.: Pit 13
DEPTH: 4-6
LOCATION: SW 27-42-26W4
*Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 14
DEPTH: 0-5
LOCATION: N1/2 1-42-25W4
SAMPLE NO.: Pit 15
DEPTH: 12-15
LOCATION: SE 16-40-1W5
SAMPLE NO.: Pit 16
DEPTH: 6-10
LOCATION: E1/2 21-39-27W4
SAMPLE NO.: Pit 17
DEPTH: 2-6
LOCATION: N1/2 31-40-23W4
SAMPLE NO.: Pit 18
DEPTH: 2-5
LOCATION: S1/2 29-40-23W4
SAMPLE NO.: Pit 19
DEPTH: 0-5
LOCATION: NW 12-41-28W1
SAMPLE NO.: Pit 20
DEPTH: 3
LOCATION: S 1/2 5-41-24W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

SAMPLE NO.: Pit 21
DEPTH: 3-6
LOCATION: W 1/2 36-40-24 W4
SAMPLE NO.: Pit 22
DEPTH: 2-5
LOCATION: NW 33-33-23W4
SAMPLE NO.: Pit 23
DEPTH: 0-4
LOCATION: W 1/2 17-38-23W4
SAMPLE NO.: Pit 24
DEPTH: 0-15
LOCATION: SW 18-33-23W4
SAMPLE NO.: Pit 25
DEPTH: 20-25
LOCATION: NW 33-37-26 W1/4
SAMPLE NO.: DIT 26
DEPTH: 2-7
LOCATION: NW 3-33-24W4
SAMPLE NO.: Pit 27
DEPTH: 0-6
LOCATION: SW, 1-38-24W4
Cumulative Wt. %

MESH SIZE (U.S.)

WEIGHT (%)

SAMPLE NO.: Pit 28
DEPTH: 0-6
LOCATION: E1/2 14-37-24W4
Less than 1%

Pebble
Angularity: Subangular to Subrounded

Surface Incrustation: Extreme

SAMPLE NO.: Pit 29
DEPTH: 0 - 5
LOCATION: SE 13-37-24W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 30
DEPTH: 0-4
LOCATION: S1/2 27-37-24W4
SAMPLE NO.: Pit 31
DEPTH: 0-8
LOCATION: SW 4-38-24W4
*Cumulative Wt. %

SAMPLE NO.: Pit 32
DEPTH: 5-10
LOCATION: W1/2 34-37-25W4
Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 33
DEPTH: 0-8
LOCATION: NE 4-37-25W4
SAMPLE NO.: Pii 34
DEPTH: 0 - 35
LOCATION: N1/2 28-36-25W4
*Cumulative Wt. %

SAMPLE NO.: Pit 35
DEPTH: 0-3
LOCATION: S1/2 5-37-26W4
* Cumulative Wt. %

**MESH SIZE (U.S.)**

2 1/2'' 1 1/4'' 5/8'' 5/16'' 4 8 16 30 50 100 200 <200

**WEIGHT (%)**

0 10 20 30 40 50 60 70 80 90 100

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

**SAMPLE NO.:** Pit 36

**DEPTH:** 3-23

**LOCATION:** SE 29-36-23W4
SAMPLE NO.: Pit 37
DEPTH: 7-10
LOCATION: SE 13-40-28W4
SAMPLE NO.: Pit 38
DEPTH: 1-4
LOCATION: E 1/2 S 5-41-3W5
* Cumulative Wt. %

SAMPLE NO.: Pit 39
DEPT: 1-5
LOCATION: S 1/2 16-39-3W5
SAMPLE NO.: Pit 40
DEPTH: 3-10
LOCATION: NE 12-36-2W5
* Cumulative Wt. %

Sample No.: Pit 41
Depth: 0-9
Location: NW 19-35-3W5
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 42
DEPTH: 0-7
LOCATION: NE 12-35-3W5
*Cumulative Wt. %

**SAMPLE NO.:** Pit 43  
**DEPTH:** 2  
**LOCATION:** W 1/2 8-35-24W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 44

DEPTH: 0-4

LOCATION: N1/2 11-35-25W4
SAMPLE NO.: Pit 45
DEPTH: 1-7
LOCATION: SE 14-35-25W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Pit 46
DEPTH: 4-11
LOCATION: N1/2 12-38-28W4
SAMPLE NO.: Pit 47
DEPTH: 0-7
LOCATION: NW 27-38-27W/4
SAMPLE NO.: Pit 48
DEPTH: 0-7
LOCATION: Ctr. 20-39-27W4
SAMPLE NO.: Pit 49
DEPTH: 4-16
LOCATION: W1/2 11-41-2W5
SAMPLE NO.: Pit 50
DEPTb: 4-8
LOCATION: NE 14-35-3W5
SAMPLE NO.: Pit 51
DEPTH: 3
LOCATION: NE 11-35-3W5
SAMPLE NO.: Pit 52
DEPTH: 6-10
LOCATION: S1/2 4-43-24W4
SAMPLE NO.: Pit 53
DEPTH: 3-6
LOCATION: NE 34-34-25W4
SAMPLE NO.: Pit 54
DEPTH: 10-19
LOCATION: NE 8-36-28W4
* Cumulative Wt. %

<table>
<thead>
<tr>
<th>WEIGHT (X)</th>
<th>MESH SIZE (U.S.)</th>
</tr>
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<tbody>
<tr>
<td>100</td>
<td>2 1/2&quot;</td>
</tr>
<tr>
<td>90</td>
<td>1 1/2&quot;</td>
</tr>
<tr>
<td>80</td>
<td>5/8&quot;</td>
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<td>70</td>
<td>5/16&quot;</td>
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<td>1024</td>
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SAMPLE NO.: Pit 55
DEPTH: 9.12
LOCATION: SE 5-37-27W4
Sample No.: Pit 56
Depth: 4 - 6
Location: W 1/2 29-35-28W4
SAMPLE NO.: Pit 57
DEPTH: 2 - 3
LOCATION: NE:10-38-27W4
Pebble Counts and Quality,
Pit Samples
SAMPLE NO.: Pit 1
DEPTH: 0 - 20
LOCATION: W 1/2 28-39-27W4
SAMPLE NO.: Pit 2
DEPTH: 0 - 10'
LOCATION: NW 21-34-2W5
SAMPLE NO.: Pit 3
DEPTH: 0 - 2
LOCATION: NE 9-35-2W5
SAMPLE NO.: Pit 4
DEPTH: 0 - 8
LOCATION: NE 6-35-2W5
Less than 1%

Pebble
Angularity: Subrounded and Broken
Surface Incrustation: Nil

Sample No.: Pit 5
Depth: 0 - 10
Location: SE 5-41-27W4
SAMPLE NO.: Pit 6
DEPTH: 3 - 15
LOCATION: W1/2 4-41-27W4
SAMPLE NO.: Pit 7
DEPTH: 3 - 20
LOCATION: SE 16-41-27W4
SAMPLE NO.: Pit B
DEPTH: 2 - 5
LOCATION: SW 27-41-27W4
SAMPLE NO.: Pit 9
DEPTH: 1 - 2
LOCATION: E 1/2 22-41-27 W 4
SAMPLE NO.: Pit 10
DEPTH: 0 - 6
LOCATION: N 1/2 22-42-26W4
COMPOSITIONAL % (\(-1\frac{1}{4}'' + \frac{5}{8}''\) Mesh)

- Quartzite
- Chert
- Sandstone
- Igneous and Metamorphic
- Carbonate
- Ironstone
- Shale

Sample No.: Mii.11
Location: SW 25-42-26W4
Depth: 5

Surface Incrustation: Slight
Angularity: Subrounded to Subangular

Less than 1%
SAMPLE NO.: Pit 12
DEPTH: 10 - 15
LOCATION: SW 35-42-26W4
SAMPLE NO.: Pit 13
DEPTH: 4 - 6'
LOCATION: SW 27-42-26W4
SAMPLE NO.: Pit 14
DEPTH: 0 - 5
LOCATION: N1/2 1-42-25W4
SAMPLE NO.: Pit 16
DEPTH: 6 - 10
LOCATION: E 1/2 21·39-27W4
SAMPLE NO.: Ph17
LOCATION: N1/2 31-40-23W4
DEPTH: 2-6

COMPOSITIONAL % (−1\frac{1}{4}'' + \frac{5}{8}'' Mesh)

Quartzite
Chert
Sandstone
Igneous and Metamorphic
Carbonate
Ironstone
Shale

Pebble Angle: Subrounded to Subangular
Surface Incrustation: Moderate
SAMPLE NO.: Pit 18
DEPTH: 2 - 5
LOCATION: S 1/2 29-40-23W4
SAMPLE NO.: Pit 19
DEPTH: 0 - 5
LOCATION: NW 12-41-23W4
COMPOSITIONAL % \((-1\frac{1}{4} + 5\text{ Mesh})\)

Quartzite 30%
Chart 10%
Sandstone 10%
Igneous and Metamorphic 20%
Carbonate 5%
Ironstone 5%
Shale 0%

Sample No.: Pit 20
Depth: 3
Location: S 1/2 5-41-24W4

Pebble
Angularity: Subround to Subangular

Surface
Incrustation: Nil
SAMPLE NO.: Pit 22
DEPTH: 2 - 5
LOCATION: NW 33-38-23W4
SAMPLE NO.: Pit 23
DEPTH:  0 - 4
LOCATION: W1/2 17-38-23W4
SAMPLE NO.: Pill 24
DEPTH: 0 - 15
LOCATION: SW 18-38-23W4
Pebble
Angularity: Subangular to Subrounded

Surface
Incrustation: Slight

SAMPLE NO.: Pit 25
DEPTH: 20 - 25
LOCATION: NW 33-37-26W4
SAMPLE NO.: Pit 26
DEPTH: 2 - 7
LOCATION: NW 3-38-24W/4
SAMPLE NO.: Pit 27
DEPTH: 0 - 6
LOCATION: SW 1-38-24W4
SAMPLE NO.: Pit 28
DEPTH: 0 - 6
LOCATION: E 1/2 14-37-24 W4
Less than 1%

Pebble Angularity: Subangular to Subrounded

Surface Incrustation: Extreme

SAMPLE NO.: Pit 29
DEPTH: 0 - 5
LOCATION: SE 13-37-24W4
SAMPLE NO.: PH 30
DEPTH: 0 - 4
LOCATION: S1/2 27-37-24W4
SAMPLE NO.: Pit 31
DEPTH: 0 - 8
LOCATION: SW 4-38-24W4

Pebble
Angularity: Subangular
to Subrounded

Surface
Incrustation: Moderate
SAMPLE NO.: Pit 32
DEPTH: 5 - 10
LOCATION: W 1/2 34-37-25W4
SAMPLE NO.: Pit 33
DEPTH: 0 - 8
LOCATION: NE 4-37-25W4

Pebble
Angularity: Subangular to Subrounded
Surface Incrustation: Nil

Less than 1%
SAMPLE NO.: Pit 34
DEPTH: 0 - 35
LOCATION: N1/2 28-35-25W/4
Less than 1%

Pebble
Angularity: Subround to Subangular

Surface
Incrustation: Slight

COMPOSITIONAL % (−1\(\frac{1}{4}\) + 5\(\frac{1}{8}\) Mesh )

Quartzite  Chert  Sandstone  Igneous and Metamorphic  Carbonate  Ironstone  Shale

SAMPLE NO.: Pit 35
DEPTH: 0 - 3
LOCATION: S1/2 5-37-28W4
SAMPLE NO.: Pit 37
DEPTH: 7 - 10'
LOCATION: SE 13-40-28W4
SAMPLE NO.: Pit 38
DEPTH: 1 - 4
LOCATION: E1/2 5-41-3W5
SAMPLE NO.: Pit 39
DEPTH: 1 - 5
LOCATION: S1/2 16-39-3W5
SAMPLE NO.: Pit 40
DEPTH: 3 - 10
LOCATION: NE 12-36-2W5
SAMPLE NO.: PH 41
DEPTH: 0 - 9
LOCATION: NW 19-35-3W5
SAMPLE NO.: Pit 42
DEPTH: 0 - 7
LOCATION: NE 12-35-3W5
SAMPLE NO.: Pit 43
DEPTH: 2
LOCATION: W1/2 8-35-24W4

Pebble
Angularity: Subangular to Subrounded

Surface
Incrustation: Slight
SAMPLE NO.: Pit 44
DEPTH: 0 - 4
LOCATION: N 1/2 11-35-25W4

Pebble
Angularity: Subangular to Subround

Surface Incrustation: Very Slight
SAMPLE NO.: Pit 45
DEPTH: 1 - 7
LOCATION: SE 14-35-25W14
Less than 1%

Pebble
Angularity: Subrounded to
Subangular

Surface
Incrustation: Slight

Compositional % (≤1 1/4 + 5/8 Mesh)

Quartzite
Chert
Sandstone
Igneous and
Metamorphic
Carbonate
Ironstone
Shale

Sample No.: Pit 46
Depth: 4 - 11'
Location: N 1/2 12-38-28W4
COMPOSITIONAL % (-1\textsuperscript{\frac{1}{4}} + \frac{5}{8} \text{ Mesh})

- Quartzite
- Chert
- Sandstone
- Igneous and Metamorphic
- Carbonate
- Ironstone
- Shale

Less than 1%

Pebble
Angularity: Subrounded

Surface
Incrustation: Very Slight

SAMPLE NO.: Pit 47
DEPTH: 0 - 7
LOCATION: NW 27-38-27W4
SAMPLE NO.: Pit 48
DEPTH: 0 - 7
LOCATION: 20-39-27W4
SAMPLE NO.: Pit 49
DEPTH: 4 - 16'
LOCATION: W1/2 11-41-2W5
SAMPLE NO.: Pit 50

DEPTH: 4 - 8

LOCATION: NE 14-35-3W5
SAMPLE NO.: Pit 52
DEPTH: 6 - 10
LOCATION: S1/2 4-43-24W4

Less than 1%

Pebble
Angularity: Subrounded

Surface
Incrustation: Nil
SAMPLE NO.: Pit 53
DEPTH: 3 - 6
LOCATION: NE 34-34-25W4
SAMPLE NO.:  Pit 54
DEPTH:  10 - 19
LOCATION:  NE 8-36-28W4

Pebble
Angularity: Subrounded to Subangular

Surface
Incrustation: Nil
Sieve Analyses
Test Hole Samples
SAMPLE NO.: Hole 1
DEPTH: 12, 27
LOCATION: W 1/2 18-36-1W5

*Cumulative Wt. %

<table>
<thead>
<tr>
<th>MESH SIZE (U.S.)</th>
<th>WEIGHT (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>32</td>
</tr>
<tr>
<td>2 1/2</td>
<td>1 1/2</td>
</tr>
</tbody>
</table>
Cumulative Wt. %

SAMPLE NO.: Hole 2
DEPTH: 13, 27
LOCATION: SE 13-36-2W5
SAMPLE NO.: Hole 3
DEPTH: 18
LOCATION: S 1/2 18-36-1W5
* Cumulative Wt. %

SAMPLE NO.: Hole 4
DEPTH: 9, 23, 27, 33
LOCATION: SW-30-35-2W5
SAMPLE NO.: Hole 5
DEPTH: 12, 23
LOCATION: NW 21-35-3W5
*Cumulative Wt. %

<table>
<thead>
<tr>
<th>WEIGHT (%)</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>80</th>
<th>90</th>
<th>100</th>
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</thead>
<tbody>
<tr>
<td>MESH SIZE (U.S.)</td>
<td>2 1/2&quot;</td>
<td>1 1/4&quot;</td>
<td>5/8&quot;</td>
<td>5/16&quot;</td>
<td>4</td>
<td>8</td>
<td>16</td>
<td>30</td>
<td>50</td>
<td>100</td>
<td>200</td>
</tr>
</tbody>
</table>

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Hole 6
DEPTH: 9
LOCATION: SW4-35-3W5
SAMPLE NO.: Hole 7
DEPTH: 12
LOCATION: S 1/2 29-36-28 W4
* Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64  32  16  8  4.8  2.4  1.2  0.6  0.3  0.15  0.07 <0.07 mm.

SAMPLE NO.: Hole 8
DEPTH: 18
LOCATION: SW 20-36-28 W 4
SAMPLE NO.: Hole 9
DEPTH: 12
LOCATION: SE 31-36-28 W4
SAMPLE NO.: Hole 10
DEPTH: 8
LOCATION: NW 2-40-27W4
* Cumulative Wt. %

SAMPLE NO.: Hole 11
DEPTH: 8
LOCATION: SW 17-39-27W4
*Cumulative Wt. %

WEIGHT (%)

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Hole 12
DEPTH: 18
LOCATION: NE 3-40-26W4
* Cumulative Wt. %

Sample No.: Hole 13
Depth: 7, 18
Location: N 1/2 10-42-24W4
* Cumulative Wt. %

<table>
<thead>
<tr>
<th>WEIGHT (%)</th>
<th>MESH SIZE (U.S.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2 1/2</td>
</tr>
<tr>
<td>10</td>
<td>1 1/4</td>
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<tr>
<td>20</td>
<td>5/8</td>
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<tr>
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<td>5/16</td>
</tr>
<tr>
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<td>4</td>
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<td>70</td>
<td>32</td>
</tr>
<tr>
<td>80</td>
<td>64</td>
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<tr>
<td>90</td>
<td>120</td>
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<td>160</td>
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<td></td>
<td>200</td>
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<tr>
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<td>&lt;200</td>
</tr>
</tbody>
</table>

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Hole 14
DEPTH: 6
LOCATION: SE 18-41-24W4
* Cumulative Wt. %

SAMPLE NO.: Hole 15
DEPTH: 12
LOCATION: NW 5-41-24W4
SAMPLE NO.: Hole 16
DEPTH: 6
LOCATION: SE 32-40-24W4
**Cumulative Wt. %**

**MESH SIZE (U.S.)**

64  32  16  8  4.8  2.4  1.2  0.6  0.3  0.15  0.07 <0.07 mm.

**SAMPLE NO.**: Hole 17  
**DEPTH**: 8  
**LOCATION**: NW 33-40-24W4
Cumulative Wt. %

SAMPLE NO.: Hole 18
DEPTH: 6
LOCATION: S1/2 14-40-23W4
* Cumulative Wt. %

![Graph showing cumulative weight percentages against mesh size with sample details]

**SAMPLE NO.:** Hole 19  
**DEPTH:** 13, 17, 28  
**LOCATION:** SW 1-40-23W4
SAMPLE NO.: Hole 20
DEPTH: 5
LOCATION: E 1/2 20-39-23W4
* Cumulative Wt. %

MESH SIZE (U.S.)

64  32  16  8  4.8  2.4  1.2  0.6  0.3  0.15  0.07  <0.07 mm.

SAMPLE NO.: Hole 21
DEPTH: 3
LOCATION: SE 28-39-23W4
* Cumulative Wt. %

**SAMPLE NO.:** Hole 22  
**DEPTH:** 10  
**LOCATION:** NW 34-37-25W4
SAMPLE NO.: Hole 23
DEPTH: 12
LOCATION: SW 4-38-25W4
SAMPLE NO.: Hole 24
DEPTH: 5
LOCATION: NW 1-38-26W4
* Cumulative Wt. %

MESH SIZE (U.S.)

64 32 16 8 4.8 2.4 1.2 0.6 0.3 0.15 0.07 <0.07 mm.

SAMPLE NO.: Hole 25
DEPTH: 6
LOCATION: SE.3-37-25W4
SAMPLE NO.: Hole 26
DEPTH: 12
LOCATION: S1/2 26-36-25 W4
SAMPLE NO.: Hole 27
DEPTH: 20
LOCATION: NW 1-35-25W4
SAMPLE NO.: Hole 28
DEPTH: 8
LOCATION: NW 31-40-27W4
Sieve Analyses
Exposure Samples
Sample No.: Exposure A
Depth: 2-5
Location: SE'5-42-26W4
SAMPLE NO.: Exposure B
DEPTH: 0-4
LOCATION: NE 7-41-24W4
SAMPLE NO.: Exposure C
DEPTH: 30-40
LOCATION: SE, 24-39-27W4
*Cumulative Wt. %

SAMPLE NO.: Exposure D
DEPTH: 0-25
LOCATION: NW 12-40-23W4
*Cumulative Wt. %

SAMPLE NO.: Exposure E
DEPTb: 5-10
LOCATION: 51/2 19-38-27W4
SAMPLE NO.: Exposure F
DEPTH: 0-8
LOCATION: NW 9-36-28W/4
Pebble Counts and Quality
Exposure Samples
SAMPLE NO.: Exposure A
DEPTH: 2 - 5
LOCATION: SE 5-42-26W4
SAMPLE NO.: Exposure B
DEPTH: 0 - 4
LOCATION: NE 7-41-24W4
SAMPLE NO.: Exposure C
DEPTH: 30 - 40
LOCATION: SE 24-39-27 W4
SAMPLE NO.: Exposure D
DEPTH: 0 - 25
LOCATION: NW12-40-23W4
SAMPLE NO.: Exposure E
DEPTH: 5 - 10
LOCATION: S1/2.19-38-27W4
Less than 1%

Pebble
Angularity: Subround

Surface
Incrustation: Nil

SAMPLE NO.: Exposure F
DEPTH: 0 - 8
LOCATION: NW 9-36-28W4