# Sladden Engineering

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November 11, 2019

Project No. 644-19049
19-11-186

Panorama Development
2005 Winston Court
Upland, California 91784

Project: Proposed Commercial Development
The Shops at Jurupa Valley
NEC Pyrite Street and Mission Boulevard
Jurupa Valley, California

Subject: Percolation/Infiltration Testing for On-Site Storm Water Management

Ref: Geotechnical Investigation report prepared by Sladden Engineering dated October 28, 2019; Project No. 644-19049, Report No. 19-10-081

In accordance with your request, we have performed percolation/infiltration testing on the subject site to evaluate the infiltration potential of the near surface soil to assist in storm water management system design. It is our understanding that on-site storm water retention/infiltration is proposed for the project.

Percolation testing was performed on November 15, 2019 within four (4) test bores excavated on the site. Testing was performed at a depth of approximately 10 (P-2 & P-4) and 20 (P-1 & P-3) feet below existing grade. The approximate locations of the tests are presented on the attached Test Location Plan (Figure 1). Testing was performed by placing water within the test bores and recording the drop in the water surface with time. Testing was performed in general accordance with the *United States Bureau of Reclamation (BOR) Procedure 7300-89 (1999)*. Test results are summarized in the following table.

**PERCOLATION/INFILTRATION TEST RESULTS**

| Test No. | Depth (Ft) | Percolation Rate (in/hr) | *Infiltration Rate (in/hr) |
|---|---|---|---|
| P-1 | 20.0 | 14.4 | 0.24 |
| P-2 | 10.0 | 16.2 | 1.55 |
| P-3 | 20.0 | 10.8 | 1.01 |
| P-4 | 10.0 | 21.6 | 2.14 |

*Porchet Method

The percolation rates determined represent ultimate field rates that do not include a safety factor. The corresponding infiltration rates were calculated using the Porchet Method in accordance with Riverside County guidelines. An appropriate safety factor should be applied to account for long-term saturation, subsoil inconsistencies and the potential for silting of the percolating soil. The safety factor should be determined with consideration to other factors in the storm water retention system design (specifically storm water volume estimates) and the safety factors associated with these design components.

Groundwater was not encountered within our exploratory boreholes that extended to a maximum depth of approximately 51.5 feet on August 1, 2019. The presence of groundwater should not impact the design or performance of the storm water retention system.

If you have any questions regarding this memo, please contact the undersigned.

Respectfully submitted,
**SLADDEN ENGINEERING**

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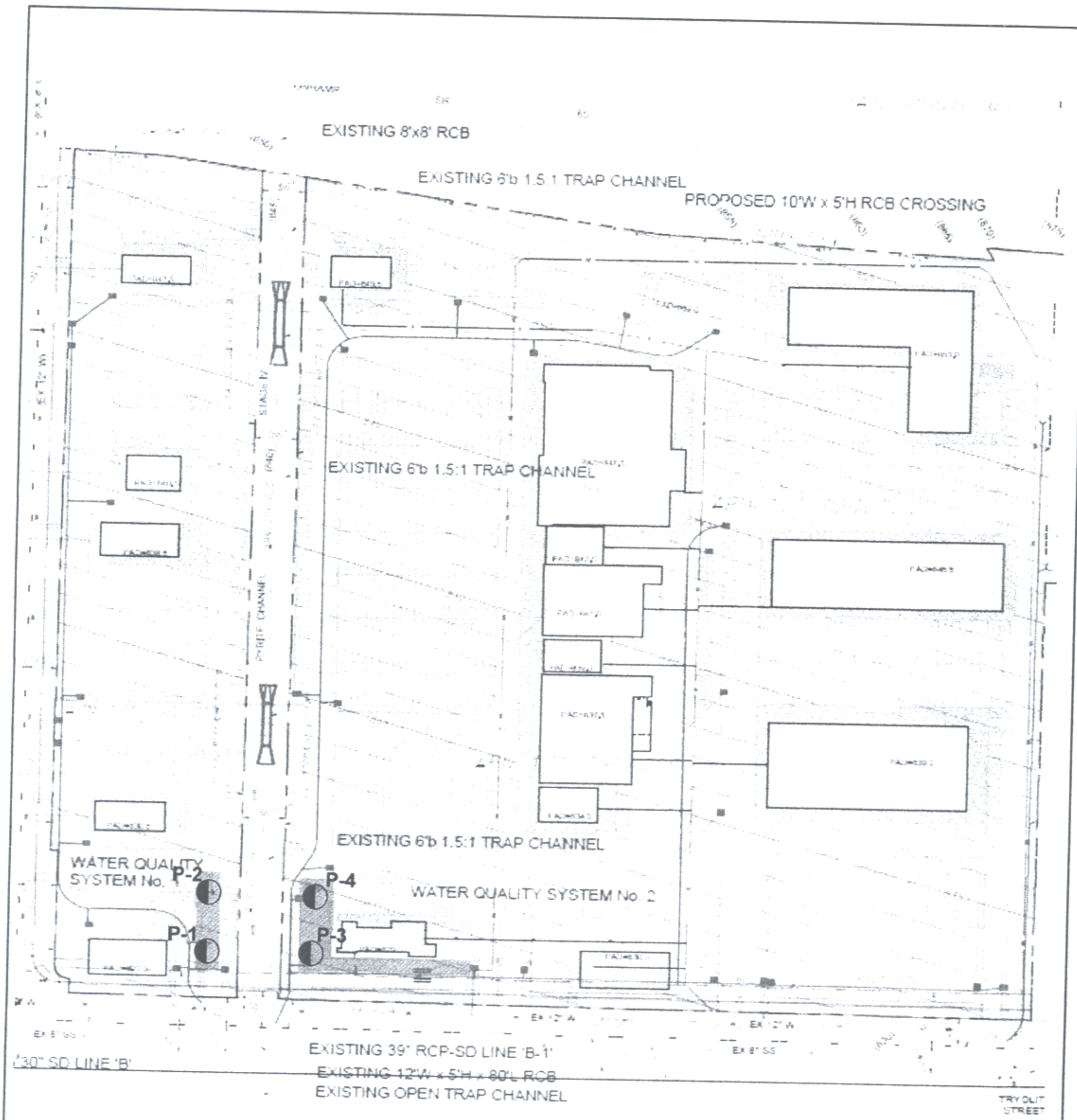


Madole & Associates, Inc. (2019)

| | | | |
|---|---|---|---|
| Sladden Engineering | TEST LOCATION PLAN | | FIGURE 1 |
| | Project Number: | 644-19049 | |
| | Report Number: | 19-11-186 | |
| | Date: | November 21, 2019 | |

# ***STORMWATER PERCOLATION SHEET***

Project: Proposed Commercial Development
Test Hole: P-1
Depth of Test Hole: 20.0 Feet
Check for Sandy Soil Criteria Tested by: J. Minor
Actual Percolation Tested by: R.Farabough

Job No: 644-19049
Date Excavated: 11/6/19
Soil Classification: SC
Date: 11/6/19
Date: 11/15/19

| Reading Number | Time of Reading | Time Interval Minutes | Total Depth of Hole (ft) | Initial Water Level (in) | Final Water Level (in) | Difference Water Level (in) |
|---|---|---|---|---|---|---|
| *A | 9:00 | 25 | 20.0 | 20.0 | 8.9 | 11.1 |
| *B | 9:27 | 25 | 20.0 | 20.3 | 12.8 | 7.5 |
| 1. | 9:39 | 10 | 20.0 | 20.1 | 14.7 | 5.4 |
| 2. | 9:41 | 10 | 20.0 | 20.2 | 15.4 | 4.8 |
| 3. | 9:53 | 10 | 20.0 | 20.6 | 16.1 | 4.5 |
| 4. | 10:05 | 10 | 20.0 | 20.1 | 16.6 | 3.5 |
| 5. | 10:17 | 10 | 20.0 | 20.0 | 17.1 | 2.9 |
| 6. | 10:29 | 10 | 20.0 | 20.3 | 17.3 | 3.0 |
| 7. | 10:41 | 10 | 20.0 | 21.2 | 16.9 | 4.3 |
| 8. | 10:53 | 10 | 20.0 | 21.1 | 17.2 | 3.9 |
| 9. | 11:05 | 10 | 20.0 | 20.8 | 17.4 | 3.4 |
| 10. | 11:27 | 10 | 20.0 | 20.3 | 17.5 | 2.8 |
| 11. | 11:39 | 10 | 20.0 | 20.1 | 17.7 | 2.4 |
| 12. | 11:51 | 10 | 20.0 | 20.0 | 17.6 | 2.4 |

Test Hole to be filled to 5 times the hole radius.
*2 (25 min) readings-
If 6 inches seeps away = sandy soil; 10 min readings for one hour.
If <6 inches seeps away, presoak; 30 min readings for 6 hours.

# ***STORMWATER PERCOLATION SHEET***

Project: Proposed Commercial Development
Test Hole: P-2
Depth of Test Hole: 10.0 Feet
Check for Sandy Soil Criteria Tested by: J. Minor
Actual Percolation Tested by: R.Farabough

Job No: 644-19049
Date Excavated: 11/6/19
Soil Classification: SC
Date: 11/6/19
Date: 11/15/19

| Reading Number | Time of Reading | Time Interval Minutes | Total Depth of Hole (ft) | Initial Water Level (in) | Final Water Level (in) | Difference Water Level (in) |
|---|---|---|---|---|---|---|
| *A | 9:05 | 25 | 10.0 | 20.0 | 9.0 | 11.0 |
| *B | 9:35 | 25 | 10.0 | 20.5 | 9.5 | 11.0 |
| 1. | 9:47 | 10 | 10.0 | 20.3 | 12.3 | 8.0 |
| 2. | 9:59 | 10 | 10.0 | 20.1 | 15.0 | 5.1 |
| 3. | 10:11 | 10 | 10.0 | 20.6 | 15.2 | 5.4 |
| 4. | 10:23 | 10 | 10.0 | 20.1 | 15.0 | 5.1 |
| 5. | 10:35 | 10 | 10.0 | 20.3 | 16.4 | 3.9 |
| 6. | 10:47 | 10 | 10.0 | 20.9 | 16.7 | 4.2 |
| 7. | 10:59 | 10 | 10.0 | 21.6 | 16.7 | 4.9 |
| 8. | 11:11 | 10 | 10.0 | 20.0 | 17.2 | 2.8 |
| 9. | 11:23 | 10 | 10.0 | 20.1 | 17.0 | 3.1 |
| 10. | 11:35 | 10 | 10.0 | 21.1 | 17.8 | 3.3 |
| 11. | 11:47 | 10 | 10.0 | 20.1 | 17.3 | 2.8 |
| 12. | 11:59 | 10 | 10.0 | 20.2 | 17.5 | 2.7 |

Test Hole to be filled to 5 times the hole radius.
*2 (25 min) readings-
If 6 inches seeps away = sandy soil; 10 min readings for one hour.
If <6 inches seeps away, presoak; 30 min readings for 6 hours.

# ***STORMWATER PERCOLATION SHEET***

Project: Proposed Commercial Development
Test Hole: P-3
Depth of Test Hole: 20.0 Feet
Check for Sandy Soil Criteria Tested by: J. Minor
Actual Percolation Tested by: R.Farabough

Job No: 644-19049
Date Excavated: 11/6/19
Soil Classification: SC
Date: 11/6/19
Date: 11/15/19

| Reading Number | Time of Reading | Time Interval Minutes | Total Depth of Hole (ft) | Initial Water Level (in) | Final Water Level (in) | Difference Water Level (in) |
|---|---|---|---|---|---|---|
| *A | 11:40 | 25 | 20.0 | 20.4 | 10.4 | 10.0 |
| *B | 12:10 | 25 | 20.0 | 20.0 | 10.7 | 9.3 |
| 1. | 12:22 | 10 | 20.0 | 20.0 | 15.6 | 4.4 |
| 2. | 12:34 | 10 | 20.0 | 20.5 | 17.3 | 3.2 |
| 3. | 12:46 | 10 | 20.0 | 20.1 | 17.0 | 3.1 |
| 4. | 12:58 | 10 | 20.0 | 20.6 | 17.3 | 3.3 |
| 5. | 1:10 | 10 | 20.0 | 21.4 | 17.6 | 3.8 |
| 6. | 1:22 | 10 | 20.0 | 20.3 | 17.9 | 2.4 |
| 7. | 1:34 | 10 | 20.0 | 20.3 | 18.3 | 2.0 |
| 8. | 1:46 | 10 | 20.0 | 20.0 | 18.0 | 2.0 |
| 9. | 1:58 | 10 | 20.0 | 20.1 | 18.1 | 2.0 |
| 10. | 2:10 | 10 | 20.0 | 20.4 | 18.8 | 1.6 |
| 11. | 2:22 | 10 | 20.0 | 20.1 | 18.3 | 1.8 |
| 12. | 2:34 | 10 | 20.0 | 20.3 | 18.5 | 1.8 |

Test Hole to be filled to 5 times the hole radius.
*2 (25 min) readings-
If 6 inches seeps away = sandy soil; 10 min readings for one hour.
If <6 inches seeps away, presoak; 30 min readings for 6 hours.

# ***STORMWATER PERCOLATION SHEET***

Project: Proposed Commercial Development
Test Hole: P-4
Depth of Test Hole: 10.0 Feet
Check for Sandy Soil Criteria Tested by: J. Minor
Actual Percolation Tested by: R.Farabough

Job No: 644-19049
Date Excavated: 11/6/19
Soil Classification: SC
Date: 11/6/19
Date: 11/15/19

| Reading Number | Time of Reading | Time Interval Minutes | Total Depth of Hole (ft) | Initial Water Level (in) | Final Water Level (in) | Difference Water Level (in) |
|---|---|---|---|---|---|---|
| *A | 11:45 | 25 | 10 | 20.4 | 9.0 | 11.4 |
| *B | 12:15 | 25 | 10 | 20.1 | 9.0 | 11.1 |
| 1. | 12:27 | 10 | 10 | 20.3 | 12.8 | 7.5 |
| 2. | 12:39 | 10 | 10 | 20.6 | 13.0 | 7.6 |
| 3. | 12:51 | 10 | 10 | 21.5 | 14.1 | 7.4 |
| 4. | 1:03 | 10 | 10 | 21.0 | 14.5 | 6.5 |
| 5. | 1:15 | 10 | 10 | 20.3 | 14.9 | 5.4 |
| 6. | 1:27 | 10 | 10 | 20.6 | 16.0 | 4.6 |
| 7. | 1:39 | 10 | 10 | 20.4 | 16.1 | 4.3 |
| 8. | 1:51 | 10 | 10 | 20.5 | 16.2 | 4.3 |
| 9. | 2:03 | 10 | 10 | 20.0 | 16.3 | 3.7 |
| 10. | 2:15 | 10 | 10 | 20.1 | 16.5 | 3.6 |
| 11. | 2:27 | 10 | 10 | 20.3 | 16.4 | 3.9 |
| 12. | 2:39 | 10 | 10 | 20.0 | 16.4 | 3.6 |

Test Hole to be filled to 5 times the hole radius.
*2 (25 min) readings-
If 6 inches seeps away = sandy soil; 10 min readings for one hour.
If <6 inches seeps away, presoak; 30 min readings for 6 hours.

## PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

$\Delta t$ (minutes)

$D_f$ (Final Depth to water)

r (hole radius in inches)

$D_0$ (Initial Depth to water)

$D_t$ (Total Depth of test hole)

$H_0$ (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

$H_f$ (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

$\Delta H$ (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

$H_{avg}$ (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

**Test Hole:** **P-1**

| | |
|---|---|
| $\Delta t$ = | 10 |
| $D_f$ = | 222.4 |
| r = | 4.00 |
| $D_0$ = | 220 |
| $D_t$ = | 340.00 |
| $H_0$ = | 120 |
| $H_f$ = | 117.6 |
| $\Delta H$ = | 2.40 |
| $H_{avg}$ = | 118.80 |

$I_t$= 0.24 in/hr

## PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

$\Delta t$ (minutes)

$D_f$ (Final Depth to water)

r (hole radius in inches)

$D_0$ (Initial Depth to water)

$D_t$ (Total Depth of test hole)

$H_0$ (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

$H_f$ (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

$\Delta H$ (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

$H_{avg}$ (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

**Test Hole:** **P-2**

| | |
|---|---|
| $\Delta t$ = | 10 |
| $D_f$ = | 102.5 |
| r = | 4.00 |
| $D_0$ = | 99.8 |
| $D_t$ = | 120.00 |
| $H_0$ = | 20.2 |
| $H_f$ = | 17.5 |
| $\Delta H$ = | 2.70 |
| $H_{avg}$ = | 18.85 |

$I_t$= 1.55 in/hr

## PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

$\Delta t$ (minutes)

$D_f$ (Final Depth to water)

r (hole radius in inches)

$D_0$ (Initial Depth to water)

$D_t$ (Total Depth of test hole)

$H_0$ (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

$H_f$ (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

$\Delta H$ (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

$H_{avg}$ (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

**Test Hole:** **P-3**

| | |
|---|---|
| $\Delta t$ = | 10 |
| $D_f$ = | 221.5 |
| r = | 4.00 |
| $D_0$ = | 219.7 |
| $D_t$ = | 240.00 |
| $H_0$ = | 20.3 |
| $H_f$ = | 18.5 |
| $\Delta H$ = | 1.80 |
| $H_{avg}$ = | 19.40 |

$I_t$= 1.01 in/hr

## PERCOLATION RATE CONVERSION (PORCHET METHOD)

$$I_{t=} \quad \frac{\Delta H\ 60\ R}{\Delta t(r+2H_{avg})}$$

$\Delta t$ (minutes)

$D_f$ (Final Depth to water)

r (hole radius in inches)

$D_0$ (Initial Depth to water)

$D_t$ (Total Depth of test hole)

$H_0$ (initial height of water at selected time interval)

$$H_0 = D_t - D_0$$

$H_f$ (final height of water at the selected time interval)

$$H_f = D_t - D_f$$

$\Delta H$ (change in head over the time interval)

$$\Delta H = H_0 - H_f$$

$H_{avg}$ (average head height over the time interval)

$$H_{avg} = (H_0 + H_f)/2$$

**Test Hole:** **P-4**

| | |
|---|---|
| $\Delta t$ = | 10 |
| $D_f$ = | 103.6 |
| r = | 4.00 |
| $D_0$ = | 100 |
| $D_t$ = | 120.00 |
| $H_0$ = | 20 |
| $H_f$ = | 16.4 |
| $\Delta H$ = | 3.60 |
| $H_{avg}$ = | 18.20 |

$I_t$= 2.14 in/hr