Queensland Government
Department of Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 1 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES / TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | -3.35 | | | | **ESTUARINE SILTY CLAY**<br>Dark grey to black, mainly wet, very soft to soft.<br><br>High plasticity; high content of partly decomposed plant materials. | | OH | | | | | No recovery.<br>RW,-,-<br>N<1 | SPT |
| 1 | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | RW,-,-<br>N<1 | SPT |
| 4 | | | | | | | | | | | | | |
| 5 | -8.35 | | | | | | | | | | | RW,-,-<br>N<1 | SPT |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

REMARKS SPT N values in gravel can overestimate density due to influence of coarser size gravel particles. This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles were measured with respect to a horizontal plane.

LOGGED BY
A. DISSANAYAKE (DISS)

Queensland Government
Department of Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 2 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE
COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388
SURFACE R.L. -3.35
DATE STARTED 27/04/05
DATUM SETP
JOB No
DATUM AHD
DATE COMPLETED 06/05/05
DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES / TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | -8.35 | | | | **ESTUARINE SILTY CLAY**<br>(As above). | | OH | | | | | | |
| | -8.85 | | | | **ESTUARINE SILTY SAND/SAND**<br>Dark grey with green grey, wet, very loose.<br><br>Very fine to fine grained sand with partly decomposed shell fragments. | | SC-SM | | | | | RW,-,-<br>N<1 | SPT |
| 6 | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | RW,1,-<br>N<1 | SPT |
| 8 | -11.35 | | | | **ALLUVIAL SILTY CLAY**<br>Pale grey brown to brown, moist, stiff becoming firm with depth.<br><br>Medium to high plasticity; some incipient lateritic features; slightly dessicated in some areas. | | CI-CH | | | | | | |
| 9 | | | | | | | | | | | | 2,5,7<br>N=12 | SPT |
| 10 | -13.35 | | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 3 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES / TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10 | -13.35 | | | | **ALLUVIAL SILTY CLAY** (As above). | | | | | | | 4,4,5 N=9 | SPT |
| 11 | | | | | | | | | | | | | |
| 12 | | | | | | | CI-CH | | | | | RW,3,4 N=7 | SPT |
| 13 | | | | | | | | | | | | | |
| 14 | | | | | | | | | | | | 2,3,5 N=8 | SPT |
| 15 | -18.35 | | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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Department of Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 4 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
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| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES / TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15 | -18.35 | | | | **ALLUVIAL SILTY CLAY** (As above). | | | | | | | 1,2,4 N=6 | SPT |
| 16 | | | | | | | | | | | | 1,2,4 N=6 | SPT |
| 17 | | | | | | | CL-CH | | | | | | |
| 18 | | | | | | | | | | | | RW,3,4 N=7 | SPT |
| 19 | | | | | | | | | | | | | |
| 20 | -23.35 | | | | | | | | | | | 1,4,6 N=10 | SPT |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 5 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
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| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES / TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | -23.35 | | | | **ALLUVIAL SILTY CLAY**<br>(As Above). | | CI-CH | | | | | | |
| | -23.85 | | | | **ALLUVIAL SILTY SAND/SAND**<br>Pale brown to brown, moist to mainly wet, medium dense to dense.<br><br>Very fine to fine grained silty sand becoming sandy with depth; minor silt content. | | | | | | | | |
| 21 | | | | | | | | | | | | 6,8,18 N=26 | SPT |
| 22 | | | | | | | SC-SM | | | | | | |
| 23 | | | | | | | | | | | | 7,14,18 N=32 | SPT |
| | -26.85 | | | | **ALLUVIAL GRAVELLY SAND**<br>Pale grey brown to brown, wet, dense.<br><br>Medium to coarse grained sand with some gravel. | | | | | | | | |
| 24 | | | | | | | SW | | | | | 7,13,18 N=31 | SPT |
| 25 | -28.35 | | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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BOREHOLE No BH19
SHEET 6 of 13
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PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
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| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | -28.35 | | | | **ALLUVIAL GRAVELLY SAND** As Above | | SW | | | | | Large gravel at 25.1m | | |
| | -28.45 | | | | **ALLUVIAL SAND AND GRAVEL**<br>Pale brown to pale grey brown, wet, very dense.<br><br>Poorly sorted sand and gravel; trace amount of silty clay; particle size increaes with depth; subangular to subrounded lithic and quartzitic fragments sizing up to 40mm. | | | | | | | 12,23,30/110<br>N>50 | | SPT |
| 26 | | | | | | | GP-GM | | | | | | | |
| 27 | | | | | | | | | | | | 10,23,30/125<br>N>50 | | SPT |
| 28 | | | | | | | | | | | | Possible bedrock level. | | |
| | -31.85 | | (50) | | **LOW GRADE COAL FINE GRAINED MAINLY DULL TO SLIGHTLY VITREOUS THINLY LAMINATED FRAGILE CARBONACEOUS SEDIMENTARY ROCK**<br><br>MW: Dark grey to black, fine gravel thinly laminated, fine grained, low to medium strength with occasional high strength sandstone interbeds.<br><br>Highly fractured, weathered and altered seams throughout; frequent siltstone interbeds.<br>Defects :<br>- Numerous lamination/bedding partings<**deg<br>- Fractured, weathered & altered seams<** | | MW | | | | | Is(50)=0.53 MPa<br>Is(50)=0.19 MPa<br>Is(50)=0.48 MPa<br>Is(50)=0.27 MPa<br>Is(50)=0.08 MPa<br>Is(50)=0.05 MPa<br>Is(50)=0.09 MPa<br>Is(50)=0.12 MPa<br>Is(50)=0.69 MPa<br>Is(50)=0.52 MPa | o<br>x<br>o<br>x<br>o<br>x<br>o<br>x<br>x<br>o | |
| 29 | | | | | | | | | | | | | | |
| 30 | -33.35 | | | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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BOREHOLE No BH19
SHEET 7 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | ROD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | -33.35 | | | | **LOW GRADE COAL**<br>MW : (As above). | | | | | | | Is(50)=0.13 MPa<br>Is(50)=0.10 MPa | | x<br>o |
| | | | 100<br>(67) | | | | | | | | | Is(50)=0.36 MPa<br>Is(50)=0.11 MPa | | x<br>o |
| 31 | | | | | | | | | | | | Coreloss | | |
| | | | | | | | | | | | | Is(50)=0.08 MPa | | x |
| 32 | | | | | | | | | | | | | | |
| | | | | | | | | MW | | | | Is(50)=0.30 MPa | | x |
| | | | | | | | | | | | | Is(50)=0.24 MPa<br>Is(50)=0.24 MPa<br>Is(50)=0.13 MPa<br>Is(50)=0.35 MPa | | x<br>o<br>x<br>o |
| 33 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | Is(50)=0.17 MPa<br>Is(50)=0.14 MPa | | x<br>o |
| | | | | | | | | | | | | Is(50)=0.08 MPa | | o |
| | | | 83<br>(46) | | | | | | | | | | | |
| 34 | | | | | | | | | | | | Is(50)=0.79 MPa<br>Is(50)=0.16 MPa | | x<br>o |
| | -38.26 | | | | | | | | | | | Is(50)=0.28 MPa | | x |
| 35 | -38.35 | | | | **SANDY SILTSTONE** See below | | | MW- | | | | Is(50)=0.23 MPa | | o |

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BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 8 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/4/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 6/5/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | ROD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 35 | -38.35 | | | | **SANDY SILTSTONE**<br>MW-SW: Pale grey to grey, fine grained, thinly laminated, mainly medium to high strength.<br>Defects : Nil. | | | SW | | | | Is(50)=0.59 MPa | | x |
| | | | | | | | | MW-SW | | | | Is(50)=2.24 MPa<br>Is(50)=4.06 MPa | | x<br>o |
| | -38.86 | | | | | | | | | | | Is(50)=0.33 MPa<br>Is(50)=0.25 MPa | | o<br>x |
| 36 | | | 93<br>(23) | | **LOW GRADE COAL FINE GRAINED MAINLY DULL TO SLIGHTLY VITREOUS THINLY LAMINATED FRAGILE CARBONACEOUS SEDIMENTARY ROCK**<br>MW : Black mainly dull to occasionally vitreous, fine grained, thinly laminated, mainly low to medium strength.<br><br>Highly fractured, weathered and altered seams throughout.<br>Defects :<br>- Numerous lamination/bedding partings <20°<br>- Fractured, weathered & altered seams <300mm | | | MW | | | | Coreloss | | |
| 37 | -40.51 | | | | **SANDSTONE**<br>Pale grey to white, fine to medium grained, laminated, medium to high strength. | | | SW | | | | Is(50)=0.10 MPa | | x |
| | -40.90 | | 73<br>(70) | | **LOW GRADE COAL**<br>HW-MW: Highly fractured and altered with very low to low strength. | | | MW | | | | Is(50)=3.90 MPa<br>Coreloss | | x |
| | -41.25 | | | | | | | | | | | XW band | | |
| 38 | | | | | **SILTSTONE**<br>MW-SW : Pale grey to grey, fine to medium grained, laminated to massive, low to mainly medium strength.<br>Defects : Generally rare.<br>-Occasional drilling induced lamination partings <30° (1/m) | | | XW | | | | | | |
| | | | | | | | | SW | | | | Is(50)=1.10 MPa | | o |
| | | | | | | | | MW | | | | | | |
| 39 | | | | | | | | | | | | Is(50)=0.42 MPa | | o |
| | | | | | | | | SW | | | | Is(50)=0.42 MPa<br>Is(50)=0.96 MPa | | x<br>o |
| | -43.20 | | | | | | | | | | | **Pressuremeter Test 5 @39.6m**<br><br>UCS=25MPa<br>MC=2.51%<br>WD=2520N/m$^2$ | | |
| 40 | -43.35 | | | | See below | | | MW | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/8/05

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BOREHOLE No BH19
SHEET 9 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/4/05 DATUM SETP
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| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | ROD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 40 | -43.35 | | 95 (78) | | **INTERBEDDED SANDSTONE AND /MUDSTONE (SHEARED)**<br>MW - SW : Pale grey to dark grey, fine grained, thinly laminated and interbedded, low to mainly medium with some high strength bands.<br><br>Faulted, contorted and sheared throughout with some clayey and rehealed zones.<br><br>Rockmass appears to be erodable in most places. | | MW<br>SW<br>MW | | | | Is(50)=0.14 MPa | x |
| 41 | -44.50 | | | | **SANDSTONE**<br>**FINE TO MEDIUM GRAINED, LAMINATED TO MASSIVE SEDIMENTARY ROCK**<br>SW : Grey to white grey, laminated to massive, medium to mainly high strength.<br><br>Occasional thin mudstone interbeds.<br><br>Defects : Generally rare.<br>- Occasional drilling induced lamination partings <10°-15° (1/-2/m).<br>- Joints @ 55° (1/2m) | | | | | | **Pressuremeter Test 4 @ 41.5m**<br>UCS=39MPa<br>MC=3.27%<br>WD=2560N/m² | Is(50)=2.79 MPa x<br>Is(50)=2.71 MPa o<br>Is(50)=0.90 MPa x<br>Is(50)=2.56 MPa o |
| 42 | | | 100 (63) | | | | SW | | | | **Pressuremeter Test 3 @ 42.1m**<br>UCS=42MPa<br>MC=2.91%<br>WD=2540N/m² | Is(50)=0.72 MPa x<br>Is(50)=1.75 MPa o<br>Is(50)=0.37 MPa x<br>Is(50)=1.49 MPa o |
| 43 | | | | | | | | | | | | Is(50)=1.30 MPa x<br>Is(50)=2.58 MPa o<br>Is(50)=0.99 MPa x<br>Is(50)=0.79 MPa o |
| 44 | -47.35 | | | | **INTERBEDED MUDSTONE AND SANDSTONE**<br>SW : Pale grey to black, fine grained, thinly laminated, mainly medium to high strength.<br><br>Minor faulting and shearing features throughout.<br>Defects :<br>- Lamination partings <15° (1-3/m)<br>- Broken zones <150mm. | | SW | | | | | Is(50)=0.21 MPa o<br>Is(50)=1.08 MPa x |
| 45 | -48.35 | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/8/05

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BOREHOLE No BH19
SHEET 10 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 45 | -48.35 | | 100 (73) | | **INTERBEDED MUDSTONE AND SANDSTONE**<br>SW : (As above). | | SW | | | | | | | |
| | -48.97 | | | | **SANDSTONE**<br>**FINE TO MEDIUM GRAINED, LAMINATED SEDIMENTARY ROCK**<br>MW-SW : Pale grey to grey, fine grained, laminated, mainly medium to high strength with some very low to low strength HW clayey bands.<br><br>Frequent mudstone interbeds up to 100mm; some faulting and shearing features in the upper area.<br><br>Defects : Generally rare.<br>- Drilling induced lamination partings<** (*/m)<br>- Weathered clayey seams <300mm. | | SW | | | | | Is(50)=0.60 MPa | x | |
| 46 | | | | | | | MW | | | | | Is(50)=0.08 MPa | o | |
| | | | | | | | SW | | | | | Clay band. | | |
| 47 | | | | | | | HW-MW | | | | | Clay band. | | |
| | | | | | | | | | | | | Is(50)=0.22 MPa | o | |
| | | | | | | | | | | | | Is(50)=0.71 MPa<br>Is(50)=0.81 MPa | x<br>o | |
| | | | 100 (85) | | | | | | | | | Is(50)=1.04 MPa<br>Is(50)=1.05 MPa | x<br>o | |
| 48 | | | | | | | | | | | | Pressuremeter Test 2 @48.0m | | |
| | | | | | | | SW | | | | | Is(50)=0.97 MPa<br>Is(50)=0.24 MPa | o<br>x | |
| | | | | | | | | | | | | Is(50)=0.25 MPa | x | |
| 49 | | | | | | | | | | | | Is(50)=0.03 MPa | x | |
| | -52.60 | | | | **INTERBEDED MUDSTONE AND SANDSTONE. MUDSTONE. SANDSTONE DOMINANT**<br>SW: Pale grey to black, fine grained, laminated, medium to high strength. | | SW | | | | | | |
| 50 | -53.35 | | | | | | | | | | | | | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

REMARKS SPT N values in gravel can overestimate density due to influence of coarser size gravel particles. This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles were measured with respect to a

LOGGED BY
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Queensland Government
Department of Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 11 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION

LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N

PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/4/05 DATUM SETP

JOB No DATUM AHD DATE COMPLETED 6/5/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 50 | -53.35 | | | | **INTERBEDED MUDSTONE AND SANDSTONE. MUDSTONE. SANDSTONE**<br>**SW: (As above).** | | SW | | | | | Is(50)=0.37 MPa<br>Is(50)=0.27 MPa | | o<br>x |
| | -53.80 | | | | **MUDSTONE**<br>HW-SW: Dark grey to black, fine grained, thinly laminated, medium to high strength fractured core with very low to low strength sheared and brecciated zones. | | | | | | | Is(50)=0.26 MPa | | x |
| 51 | | | 100<br>(65) | | Defects:<br>- Drilling induced laminattion partings<br>- Highly fractured sheared and brecciated zones <1500mm. | | SW | | | | | UCS=37MPa<br>MC=3.26%<br>WD=2490N/m$^2$<br>Is(50)=0.48 MPa<br>Is(50)=1.81 MPa<br>**Pressuremeter Test 1 @51.1m**<br>Is(50)=0.91 MPa | | x<br>o<br>o |
| | | | | | | | HW | | | | | Brecciated zone. | | |
| 52 | | | | | | | SW | | | | | Is(50)=0.15 MPa | | x |
| 53 | | | | | | | | | | | | Is(50)=0.28 MPa | | x |
| | | | | | | | HW | | | | | Brecciated zone. | | |
| 54 | | | 100<br>(100) | | | | | | | | | | | |
| 55 | -58.35 | | | | | | SW | | | | | Is(50)=0.37 MPa | | o |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/8/05

REMARKS SPT N values in gravel can overestimate density due to influence of coarser size gravel particles. This borelog should be read in conjunction with the appropriate Defect Description Sheets. Defect angles were measured with respect to a horizontal plane.

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Department of Main Roads

# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 12 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 55 | -58.35 | | | | **MUDSTONE**<br>HW-SW: (As above) | | | | | | | |
| | | | 100<br>(46) | | | | | | | | Is(50)=0.05 MPa | o |
| 56 | | | | | | | SW | | | | Highly fractured and slightly brecciated zone. | |
| 57 | | | 100<br>(47) | | | | HW | | | | Is(50)=0.19 MPa | x |
| 58 | | | | | | | SW | | | | Highly fractured zone. | |
| | | | 100<br>(37) | | | | HW | | | | Highly fractured and slightly brecciated zone. | |
| 59 | | | | | | | SW | | | | Is(50)=0.32 MPa | x |
| | | | | | | | | | | | Is(50)=0.29 MPa | x |
| 60 | -63.35 | | | | | | | | | | Highly fractured and slightly brecciated zone. | |

BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

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# ENGINEERING BOREHOLE

FOR GEOTECHNICAL TERMS AND SYMBOLS REFER FORM F:GEOT 017/2-2004

BOREHOLE No BH19
SHEET 13 of 13
REFERENCE No H9568

PROJECT GATEWAY UPGRADE PROJECT - GATEWAY BRIDGE DUPLICATION FOUNDATION INVESTIGATION
LOCATION PIER 7 - NORTHERN FACE OF PILE CAP- UPSTREAM/LEFT HAND SIDE COORDINATES 10188.6 E; 167948.3 N
PROJECT No FG5388 SURFACE R.L. -3.35 DATE STARTED 27/04/05 DATUM SETP
JOB No DATUM AHD DATE COMPLETED 06/05/05 DRILLER CAIRNS DRILLING

| DEPTH (m) | R.L. (m) | CASING / WASH BORING / CORE DRILLING | RQD ( )% CORE REC % | SAMPLE | MATERIAL DESCRIPTION | LITHOLOGY | USC | WEATHERING | INTACT STRENGTH (EH VH H M L VL EL) | DEFECT SPACING (mm) (20 60 200 600 2000) | GRAPHIC LOG | ADDITIONAL DATA AND TEST RESULTS | SAMPLES | TESTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60 | -63.35 | | | | **MUDSTONE**<br>HW-SW: (As above) | | SW | | | | | Highly fractured and slightly brecciated zone. | | |
| | | | 100<br>(48) | | | | | HW | | | | Brecciated zone. | | |
| 61 | | | | | | | | | | | | Is(50)=0.30 MPa<br>Is(50)=0.25 MPa<br>Is(50)=0.73 MPa | x<br>o<br>x | |
| | | | | | | | | SW | | | | | | |
| 62 | | | | | | | | | | | | Highly fractured zone. | | |
| | | | | | | | | HW | | | | Brecciated zone. | | |
| 63 | -66.53 | | 100 | | Borehole terminated at 63.18m | | | | | | | | | |
| 64 | | | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | | | |

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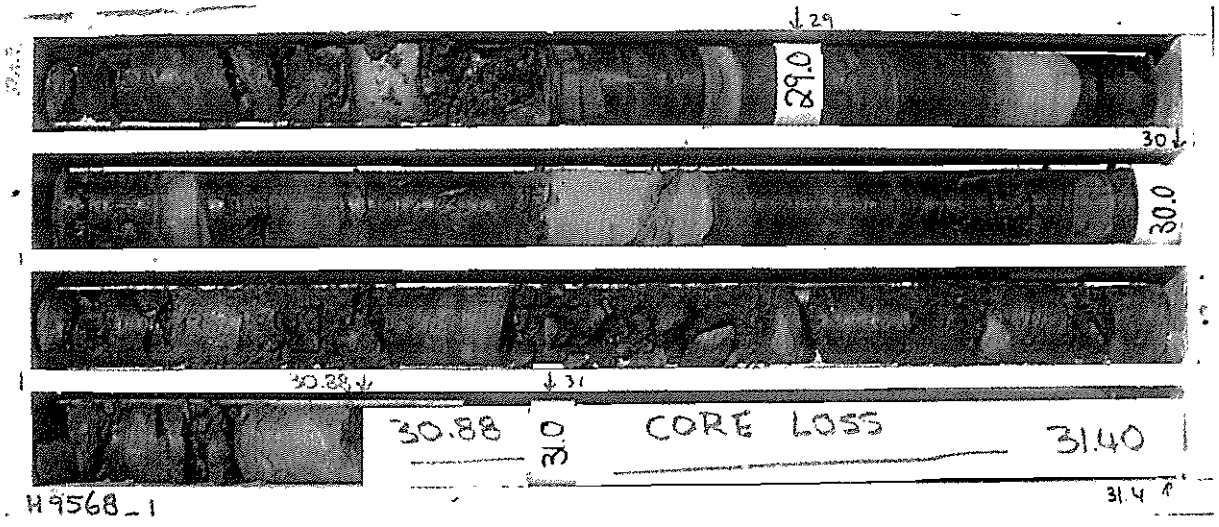
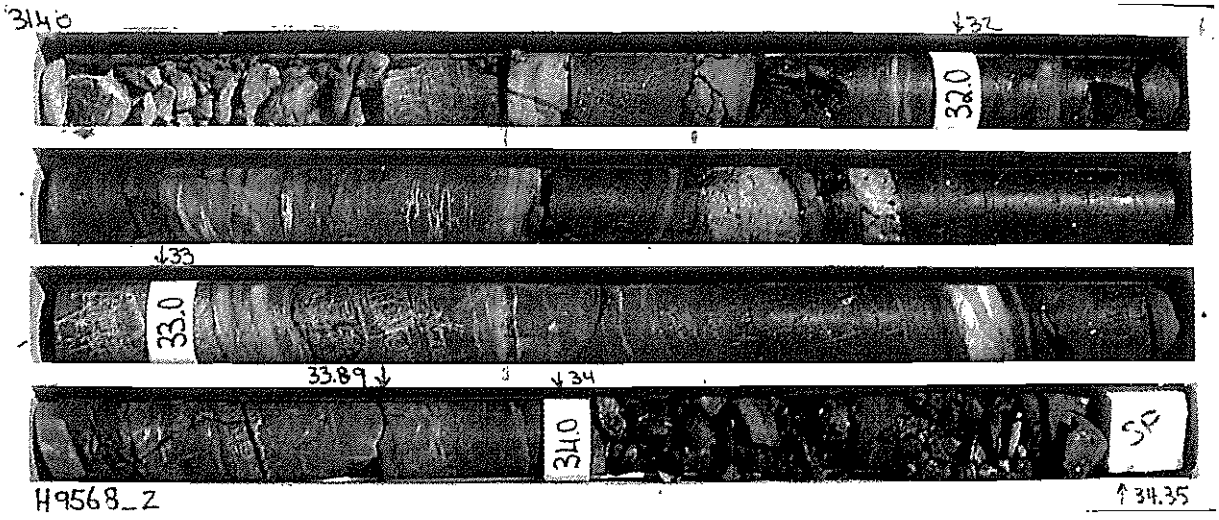
BOREHOLE WITH LITHOLOGY MEERA PIER 7 BOREHOLES-GATEWAY BRIDGE - GATEWAY UPGRADE PROJECT.GPJ ENGINEERING BOREHOLE 09_04.GDT 31/08/05

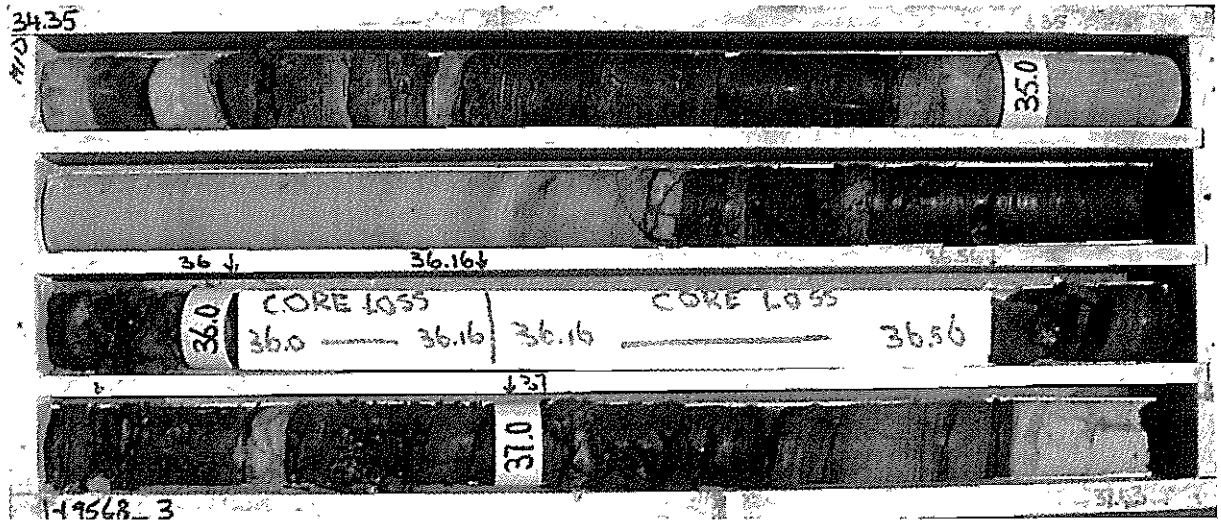
Project: **Gateway Upgrade Project - Gateway Bridge**

Borehole No: **BH 19**

Start Depth: 28.50m
Finish Depth: 63.13m
Project No: FG 5388
H No: 9568



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Borehole No: **BH 19**

Start Depth: 28.50m
Finish Depth: 63.13m
Project No: FG 5388
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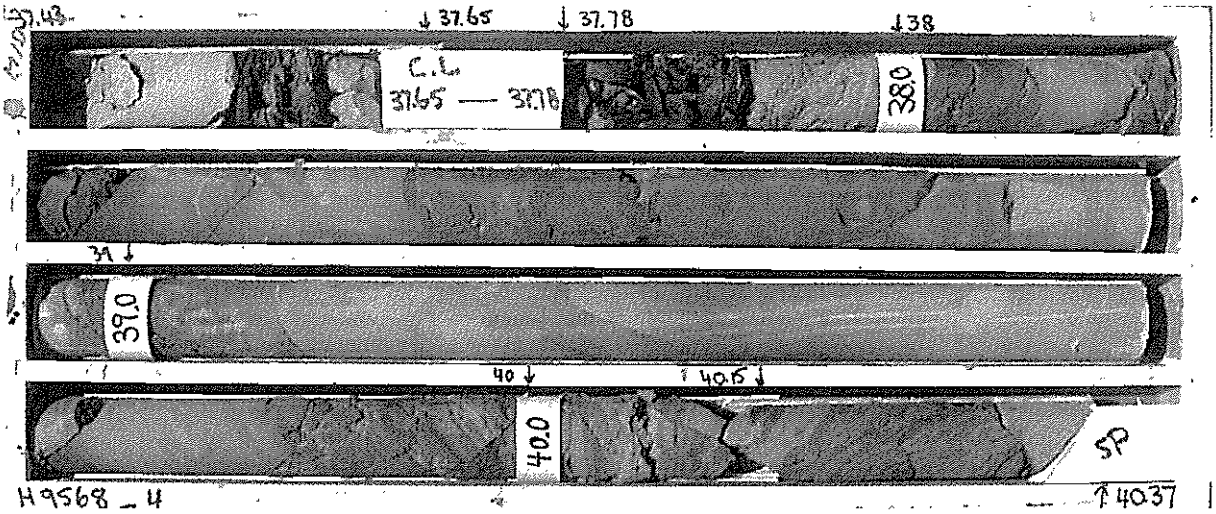


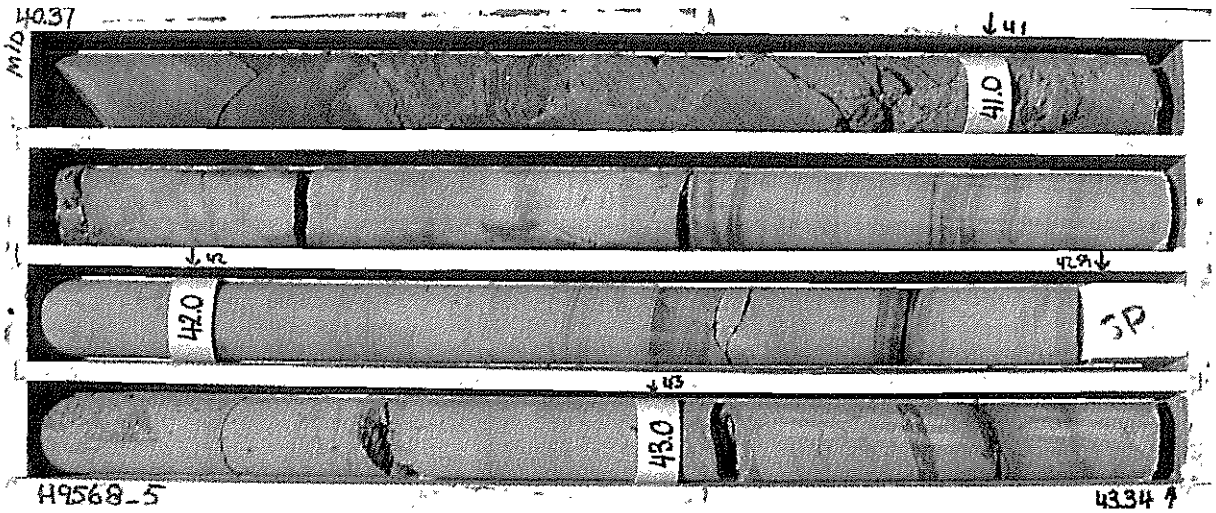


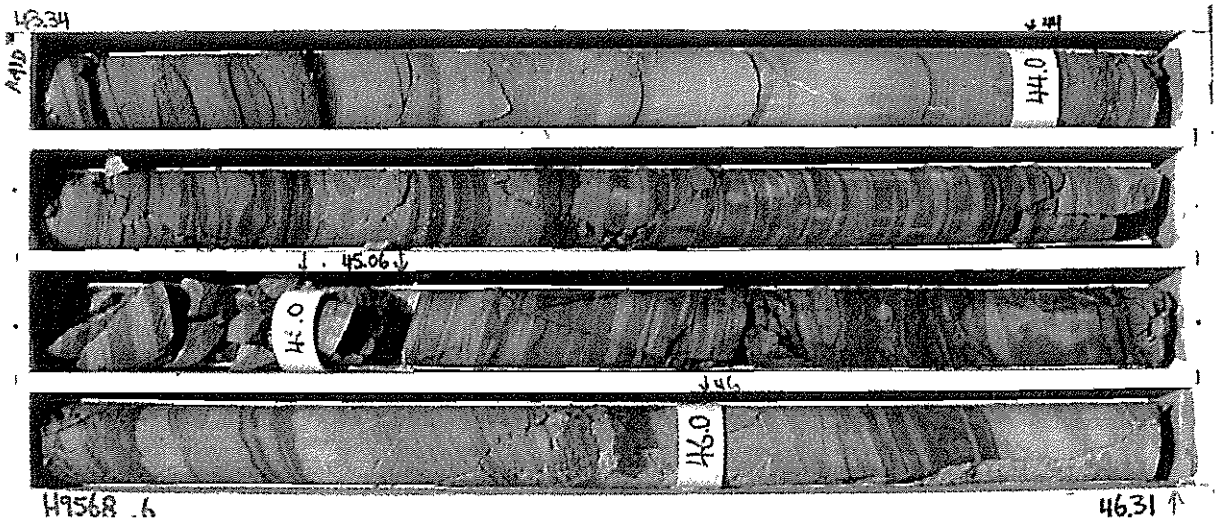

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Borehole No: **BH 19**

Start Depth: 28.50m
Finish Depth: 63.13m
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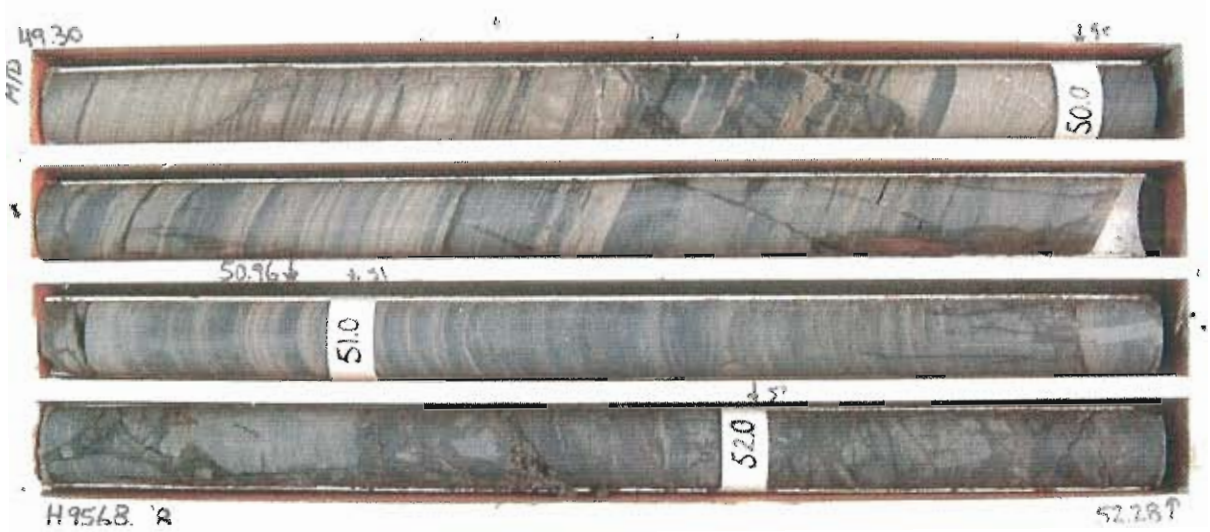


Project: **Gateway Upgrade Project - Gateway Bridge**

Borehole No: **BH 19**

Start Depth: 28.50m
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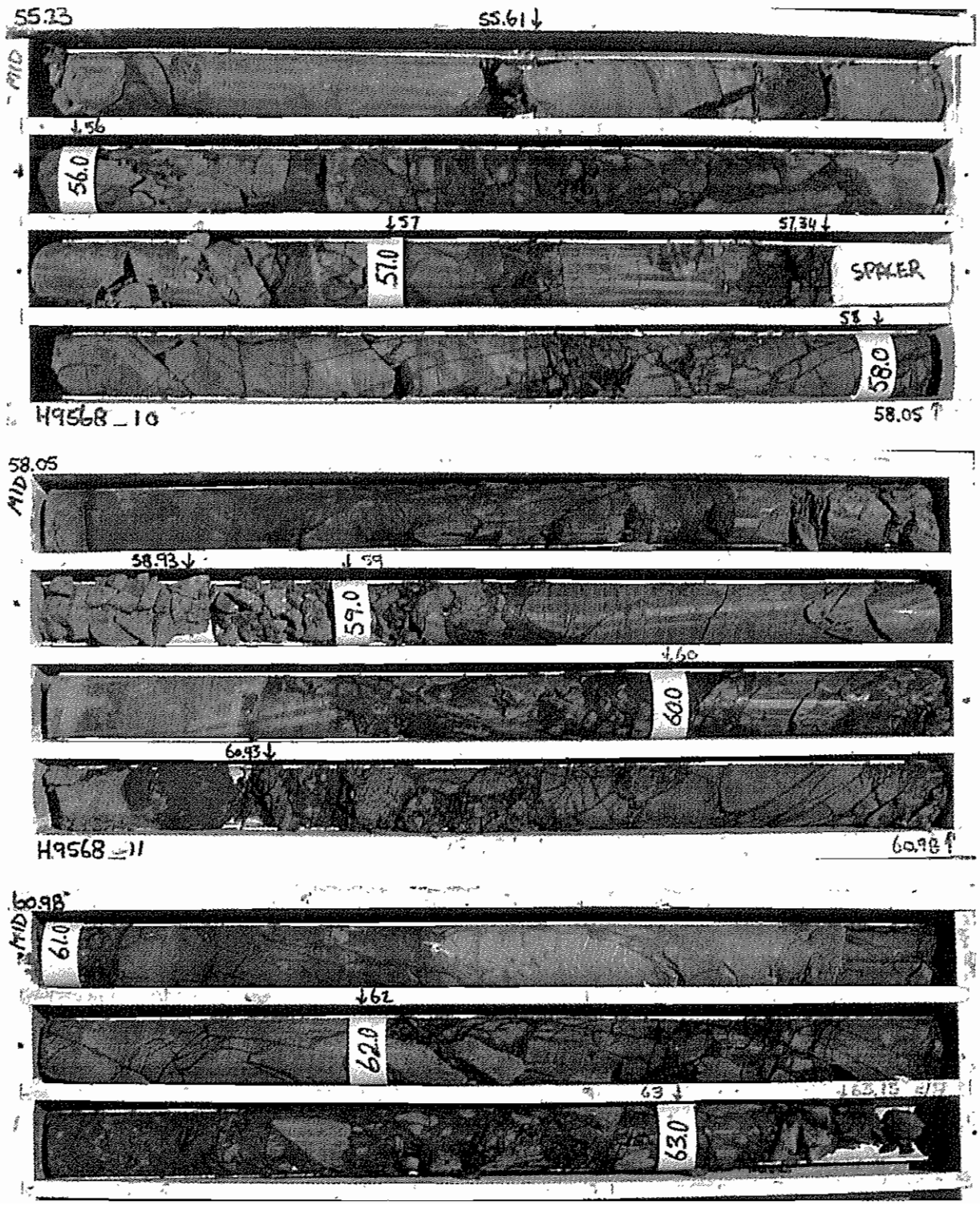

**ROAD SYSTEM AND ENGINEERING**
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Queensland Government
Department of Main Roads

# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 1 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 - 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 28.50-28.55 | BZ | <10° | - | - | O | Cn | Parallel to LP |
| 28.62 | LP | <15° | P | S | O | Cn | - |
| 28.65-28.71 | WS | - | - | | O | W | - |
| 28.75-28.53 | BZ | - | - | | O | Cn | - |
| 28.92 | LP | <10° | P | S | C | Cn | DI |
| 28.93 | LP | <10° | P | S | C | Cn | DI |
| 29.05 | LP/BP | <10° | P | S | C | Cn | DI |
| 29.20 | LP | <10° | P | S | C | Cn | DI |
| 29.27 | LP | <10° | Ir | R | C | Cn | DI |
| 29.44-29.49 | WS | - | - | - | C | Cn | Parallel to LP |
| 29.57 | BP | <15° | P | S | C | Cn | DI |
| 29.69 | BP | <15° | Ir | R | C | Cn | DI |
| 29.82 | LP | 25° | P | S | C | Cn | DI |
| 29.88 | LP | <10° | P | S | C | Cn | DI |
| 30.08-30.23 | WS | - | - | - | O | W | CI |
| 30.30-30.48 | BZ | - | - | - | O | - | PCI |
| 30.50 | LP | <15° | P | S | C | Cn | |
| 30.57-30.79 | BZ | - | P | S | O | Cn | Parallel to LP |
| 30.38-31.40 | Coreloss | - | - | - | - | Cn | - |
| 31.40-31.62 | BZ | - | - | - | O | W | Siltstone Interbed |
| 31.69 | LP | <10° | P | S | C | Cn | DI |
| 31.74 | LP | <10° | Ir | S | C | Cn | DI |
| 31.82-31.90 | WS | - | Ir | S | O | W | Parallel to LP |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | B | Bedding | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | FP | Foliation Parting | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 2 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 32.20 | LP | <10° | P | S | C | Cn | DI |
| 32.23 | LP | <10° | P | S | C | Cn | DI |
| 32.25 | J | 65° | P | S | C | Cn | - |
| 32.30 | LP | <5° | P | S | C | Cn | DI |
| 32.47 | LP | 25° | P | S | O | Cn | - |
| 32.58-32.64 | WS | - | - | - | - | W | |
| 32.66 | LP | 15° | P | S | C | Cn | DI |
| 33.03 | BP | 20° | St | - | C | Cn | DI |
| 33.08 | BP | 20° | Un | S | C | Cn | DI |
| 33.26 | J | 40° | P | S | C | Cn | - |
| 31.57 | BP | 20° | P | S | C | Cn | DI |
| 33.70-33.75 | BZ | - | - | - | O | Cn | DI |
| 34.00-34.22 | BZ | - | - | - | O | Cn | Parallel to LP |
| 34.22-34.31 | WS | - | - | - | O | W | - |
| 34.40-30.62 | BZ | 20° | P | S | C? | Cn | Parallel to LP |
| 34.71 | LP | 20° | P | S | C | Cn | DI |
| 34.80 | LP | 20° | P | S | C | Cn | DI |
| 34.91 | BP | 20° | P | S | C | Cn | DI |
| 35.47-36.00 | WS | <10° | - | - | | W | Some DI ? |
| 36.00-36.56 | | - | - | - | - | Cn | Core loss |
| 36.56-36.76 | BZ | <15° | - | - | O | Cn | LP |
| 36.86-37.16 | BZ | - | - | - | O | Cn | - |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | B | Bedding | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | FP | Foliation Parting | In | Incipient |
| **PLANARITY** | | **APERTURE** | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | Cl | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

F:GEOT533/4

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

{CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)}

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 3 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 37.20 | LP | 20° | P | S | C | Cn | DI |
| 37.27 | LP | 20° | P | S | C | Cn | DI |
| 37.32 | LP | 20° | P | S | C | Cn | DI |
| 37.55-37.65 | WS | <5° | - | - | O | W | Parallel to LP |
| 37.78-37.90 | BZ | - | - | - | O | Cn | Parallel to LP |
| 37.90-37.98 | CS | - | - | - | - | Cn | XW Siltstone |
| 37.65-37.78 | Core1.50 | - | - | - | - | Cn | |
| 38.15-38.25 | BZ | - | - | - | C | Cn | DI |
| 38.25 | J | 45° | P | S | T | Cn | - |
| 38.30 | J | 45° | P | - | T | Cn | - |
| 38.42 | LP | 35° | P | - | T | Cn | DI |
| 38.45-38.60 | BZ | - | - | - | C | Cn | DI |
| 38.70 | LP | 35° | P | - | T | Cn | DI |
| 38.70 | J | 90° | P | R | T | Cn | DI |
| 38.75 | J | 45° | P | S | T | Cn | DI |
| 39.00 | J | 45° | P | - | T | | CI |
| 39.10 | LP | 35° | P | S | T | Cn | DI |
| 39.35 | J | 75° | Ir | S | T | Cn | - |
| 39.85-40.15 | WS/SZ | - | - | - | T | W | healed |
| 40.10 | J | 45° | P | S | T | Cn | - |
| 40.20 | J | 75° | Cu | S | T | Cn | - |
| 40.30 | LP | 35° | P | S | T | Cn | DI |
| 40.37 | J | 45° | P | S | T | Cn | - |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | B | Bedding | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | FP | Foliation Parting | In | Incipient |
| **PLANARITY** | | **APERTURE** | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

F:GEOT533/4

**ROAD SYSTEM AND ENGINEERING**
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Queensland Government
Department of Main Roads

# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 4 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 40.50 | J | 45° | P | S | T | Cn | - |
| 40.60 | J | 45° | P | S | T | Cn | - |
| 40.60 | LP | 35° | P | S | T | Cn | DI |
| 40.72 | J | 45° | P | S | T | Cn | - |
| 40.85 | J | 45° | P | S | T | Cn | - |
| 40.87 | LP | 60° | P | S | C | Cn | DI |
| 40.92 | LP | 60° | P | S | C | Cn | DI |
| 41.15 | J | 45° | P | S | C | Cn | - |
| 41.25 | J | 75° | Cln | R | C | Cn | - |
| 41.29 | LP | <5° | P | R | T | Cn | DI |
| 41.55 | LP/BP | 15° | P | S | C | Cn | DI |
| 42.36 | LP | 10° | P | S | C | Cn | DI |
| 42.46 | LP/BP | 10° | P | S | C | Cn | DI |
| 42.72 | LP | 15° | P | - | T | Cn | DI |
| 42.82 | LP | 30° | Un | R | C | Cn | DI |
| 43.05 | LP | <15° | | R | C | Cn | DI |
| 43.22 | LP/BP | <15° | P | S | C | Cn | DI |
| 43.37 | LP/BP | <15° | P | S | C | Cn | DI |
| 43.43 | LP/BP | <15° | P | S | C | Cn | DI |
| 43.47 | LP/BP | <15° | P | S | C | Cn | DI |
| 43.48 | LP/BP | <15° | P | S | C | Cn | DI |
| 43.52 | LP/BP | <15° | P | S | C | Cn | DI |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | B | Bedding | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | FP | Foliation Parting | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 5 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 43.56 | LP | 20° | P | - | C | Cn | DI |
| 43.50 | LP/BP | 20° | P | S | C | Cn | DI |
| 43.91 | LP | 20° | P | S | C | Cn | DI |
| 44.15 | LP | 20° | St | S | C | Cn | DI |
| 44.27 | LP | 20° | P | - | T | Cn | |
| 44.45 | J | 60° | P | - | T | Cn | |
| 44.75-45.06 | BZ | - | - | - | C | Cn | DI |
| 45.15 | J | 70° | P | S | T | Cn | - |
| 45.25-45.48 | BZ | - | - | - | C | Cn | DI? parallel to LP |
| 45.52-45.63 | SZ | - | | - | | W | |
| 45.70 | Fr | - | Ir | - | T | Cn | D1 |
| 45.85-46.07 | SZ | - | - | - | T | W | Healed |
| 46.56-47.15 | SZ | - | - | - | | W | CS, healed |
| 47.20 | LP | 35° | P | - | T | Cn | D1 |
| 47.35 | J | 75-90° | - | - | T | Cn | - |
| 47.62 | LP/BP | 30° | P | S | T | Cn | D1 |
| 47.70 | LP | 30° | P | S | T | Cn | D1 |
| 47.75 | LP | 30° | P | S | T | Cn | D1 |
| 47.97 | LP | 20° | Un | S | C | Cn | DI |
| 48.15 | LP/BP | 20° | P | S | C | Cn | DI |
| 48.25 | J | 75° | P | S | C | Cn | - |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | B | Bedding | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | FP | Foliation Parting | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 6 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 48.43 | LP/BP | 20° | P | S | C | Cn | DI |
| 48.62 | LP/BP | 20° | P | S | C | Cn | DI |
| 48.81 | LP | 20° | P | S | C | Cn | DI |
| 49.03 | LP/BP | 20° | P | S | C | Cn | DI |
| 49.10 | LP/BP | 20° | P | S | C | Cn | DI |
| 48.35-49.00 | Fr | 75-90° | P | - | C | Cn | - |
| 49.40-49.60 | J | 75-90° | Un | - | T | Cn | - |
| 49.60 | LP | 20° | Un | S | T | Cn | DI |
| 49.70 | LP | 20° | P | S | T | W | |
| 49.85 | J | 75° | P | S | C | W | |
| 49.95 | J | 45° | P | - | T | Cn | CV |
| 50.15 | LP | 20° | P | S | T | Cn | DI |
| 50.35 | LP | 20° | P | S | T | Cn | DI |
| 50.35 | J | 60° | P | S | T | Cn | |
| 50.50 | J | 60° | P | S | T | Cn | |
| 50.60 | J | 90° | St | - | C | Cn | DI |
| 51.47 | LP | <20° | P | S | C | Cn | DI |
| 51.60 | Fr | 75-90° | Un | S | C | Cn | DI |
| 51.85 | LP | 30° | P | - | - | W | CI |
| 51.75-51.58 | SZ/BrZ | - | - | - | - | W | CI |
| 52.40 | LP | 15° | P | S | C | Cn | DI |
| 52.50-52.85 | HFZ | - | - | - | - | | MDJ |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | MDJ | Multidirectional Joints | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | BrZ | Brecciated Zone | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | Cv | Calcite Vein |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

F:GEOT533/4

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

[CHARACTERISATION OF DEFECTS ARE IN ACCORDANCE WITH ISRM SUGGESTED METHODS (1981)]

| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 7 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

PROJECT NO : FG5388 SURFACE R.L : -3.35 DRILLER : CAIRNS DRILLING PTY LTD

JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 53.03-54.40 | BrZ | - | - | - | - | | CI healed in places |
| 54.70-54.72 | BrZ | 70° | P | - | - | | CI, healed |
| 55.0 | J | 75-80° | Un | - | C | Cn | - |
| 55.05 | J | 45° | P | - | C | Cn | |
| 55.15 | J | 70° | P | - | C | Cn | |
| 55.77 | LP | 20° | P | S | C | Cn | DI |
| 55.82 | LP | 20° | P | S | C | Cn | DI |
| 55.85 | J | 60° | Un | S | C | Cn | |
| 55.88 | LP | 20° | P | S | C | Cn | - |
| 56.00-57.00 | BZ | - | - | - | - | | CI |
| 57.10 | J | 70° | P | S | C | | CI |
| 57.12-57.15 | BZ | - | - | - | C | W | CI |
| 57.25-57.34 | WS | - | - | - | - | Cn | |
| 57.4 | J | 55° | P | S | C | Cn | - |
| 57.6 | J | 50° | P | S | C | Cn | - |
| 57.72-57.89 | BZ | MDJ | | | | | CI |
| 57.95 | J | 60° | P | S | C | Cn | - |
| 57.97 | J | 60° | P | S | C | Cn | - |
| 58.35 | J | 80° | P | S | C | Cn | - |
| 58.45 | J | 80° | P | S | C | Cn | - |
| 58.52 | J | 80° | P | S | C | Cn | - |
| 58.67 | J | 80° | P | S | C | Cn | - |
| 58.67-58.80 | BZ | - | - | - | T | Cn | DI |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | MDJ | Multidirectional Joints | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | BrZ | Brecciated Zone | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | Brz | Brecciated zone |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

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# DEFECT DESCRIPTIONS OF ENGINEERING BORELOGS

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| | |
|---|---|
| BOREHOLE NO | : BH19 |
| SHEET | : 8 of 8 |
| REFERENCE NO | : H9568 |

PROJECT : GATEWAY BRIDGE FOUNDATION INVESTIGATION – GATEWAY UPGRADE PROJECT

LOCATION : PIER 7 NORTHERN FACE OF PILE CAP – UPSTREAM / LEFT HAND SIDE

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JOB NO : DATUM : AHD / SETP DATE DRILLED : 27/4/05 – 06/05/05

| DEPTH | DEFECT TYPE | DIP | PLANARITY | ROUGHNESS | APERTURE | WALL ALTERATION | OTHER |
|---|---|---|---|---|---|---|---|
| 58.80-59.05 | BZ | - | - | - | O | Cn | - |
| 59.07 | J | 60° | P | S | C | Cn | - |
| 59.09 | J | 60° | P | S | C | Cn | - |
| 59.20 | J | 60° | P | S | C | Cn | - |
| 59.45 | J | 60° | P | S | C | Cn | - |
| 59.72-60.10 | HFZ | - | - | - | C | Cn | - |
| 60.12 | J | 45° | P | S | C | Cn | - |
| 60.30-60.40 | WS | CS | - | - | O(?) | W | CI |
| 60.63 | WS | - | - | - | - | W | CI |
| 60.70-60.73 | BrZ | - | - | - | C | Cn | - |
| 60.82 | J | 60° | P | S | C | Cn | - |
| 60.85 | J | 60° | P | S | C | Cn | - |
| 60.87 | J | 60° | P | S | C | Cn | - |
| 60.89 | J | 60° | P | S | C | Cn | - |
| 60.93 | J | 60° | - | S | C | Cn | - |
| 61.25-61.50 | Fr | MDJ | - | - | - | Cn | Cv |
| 61.60-61.64 | CS | - | - | - | - | Cn | - |
| 61.75 | J | 60° | P | S | C | Cn | - |
| 61.80 | J | 60° | P | S | C | Cn | - |
| 62.0-62.05 | HFZ | - | - | | | Cn | - |
| 62.25 | LP | 10° | P | S | | | CI |
| 62.18-62.28 | HFZ | - | - | - | C | | - |
| 62.75-63.18 | HFZ | MDJ | - | - | - | | CI |

## *Abbreviations*

| ROUGHNESS | | WALL ALTERATIONS | | TYPE | | OTHER | |
|---|---|---|---|---|---|---|---|
| R | Rough | FeSt | Iron Stained | J | Joint | P | Partly |
| Sm | Smooth | W | Weathered | MDJ | Multidirectional Joints | CL | Carbonaceous lamination |
| SL | Slickensided | SM | Secondary Mineralisation | BP | Bedding Parting | Co | Coal seam |
| | | | | BrZ | Brecciated Zone | In | Incipient |
| PLANARITY | | APERTURE | | LP | Lamination Parting | SI | Sand Infill |
| Pl | Planar | C | Closed | SZ | Sheared Zone | H | Horizontal |
| St | Stepped | O | Open | CZ | Crushed Zone | V | Vertical |
| Un | Undulating | F | Filled | WS | Weathered Seam | CI | Clay Infill |
| Cu | Curved | T | Tight | BZ | Broken Zone | Cn | Clean |
| Ir | Irregular | | | HFZ | Highly Fractured Zone | CS | Clay Seam |
| | | | | Fr | Fracture | DI | Drilling Induced |

*NOTE: This sheet should be read in conjunction with appropriate Engineering Borelog. Defect angles were measured with respect to horizontal plane.*

F:GEOT533/4