





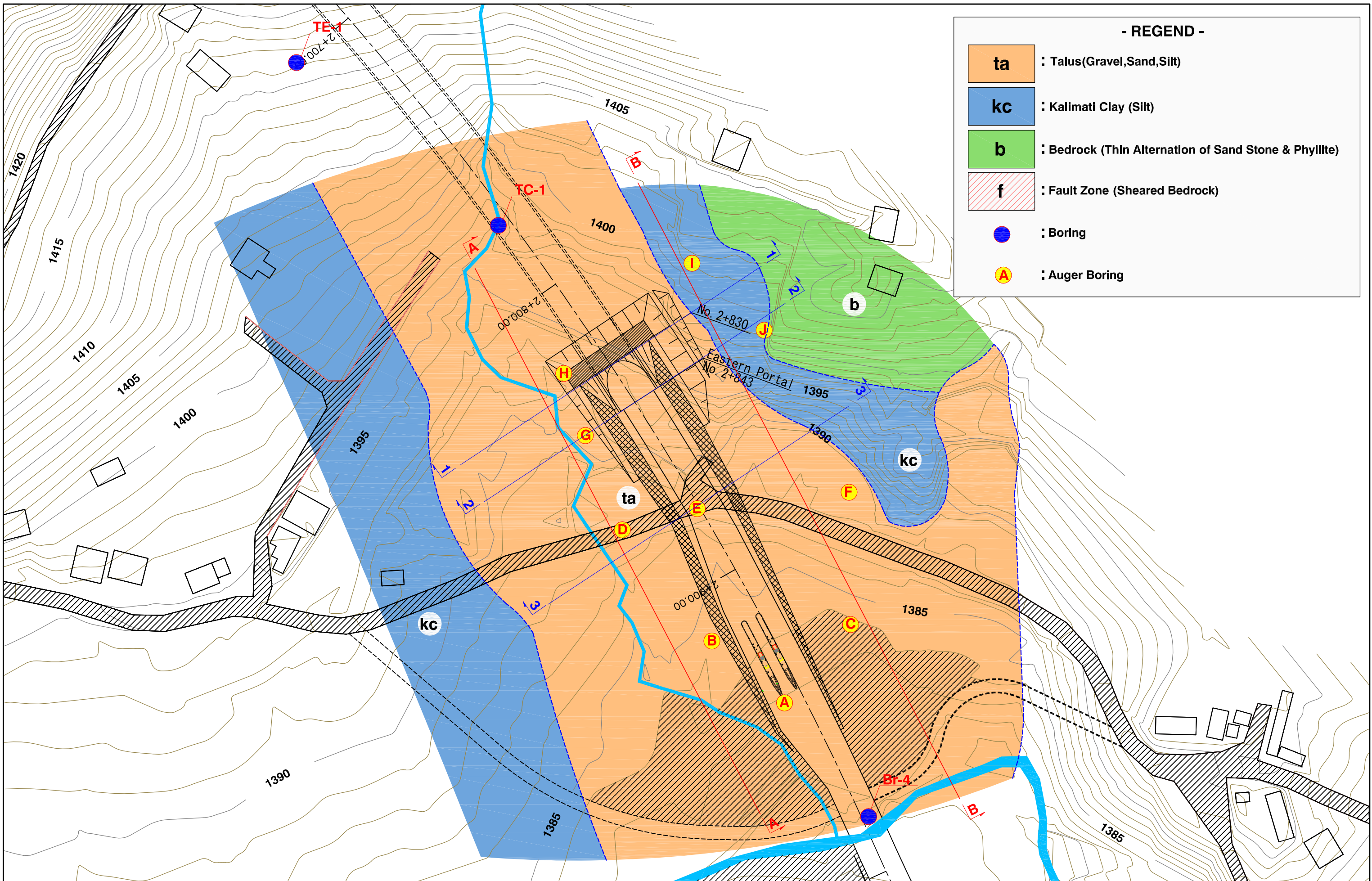


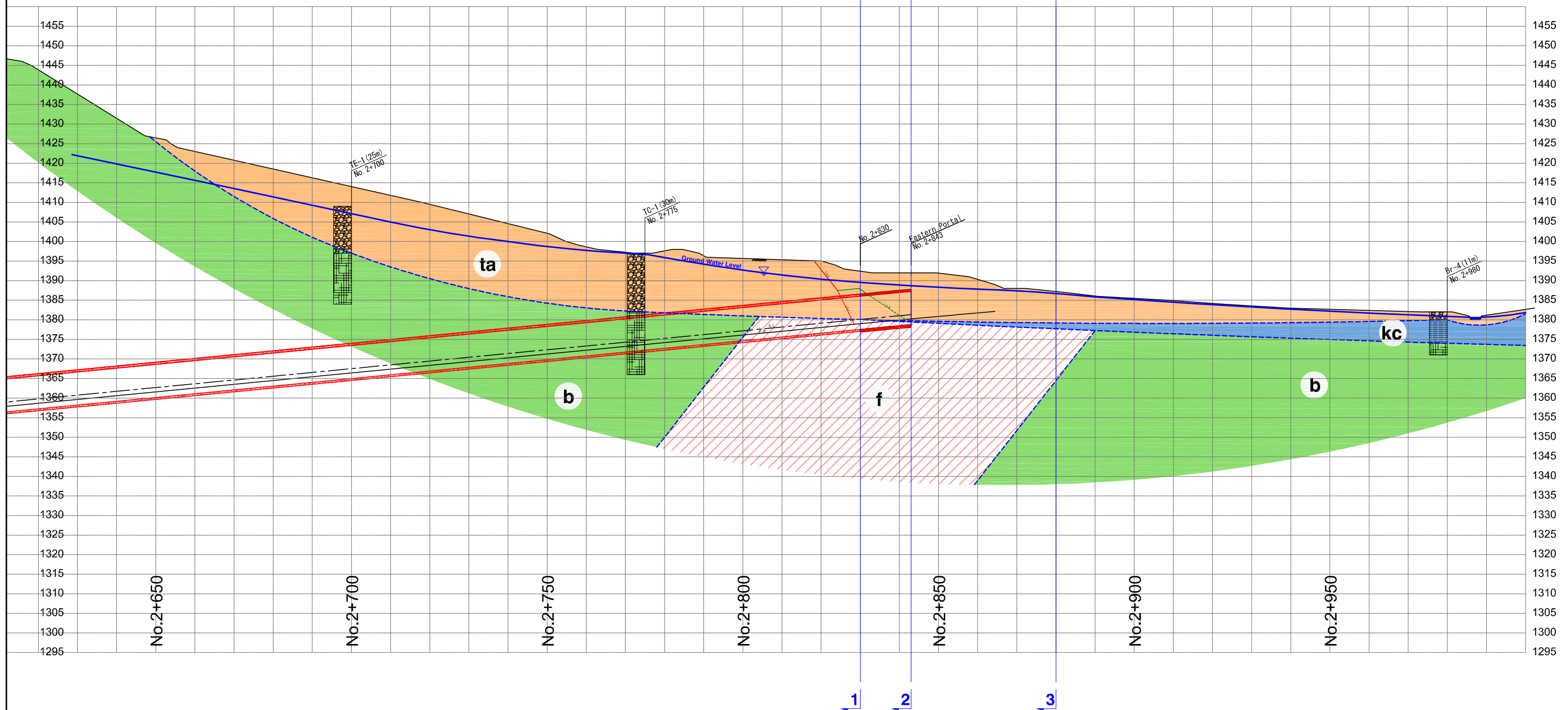
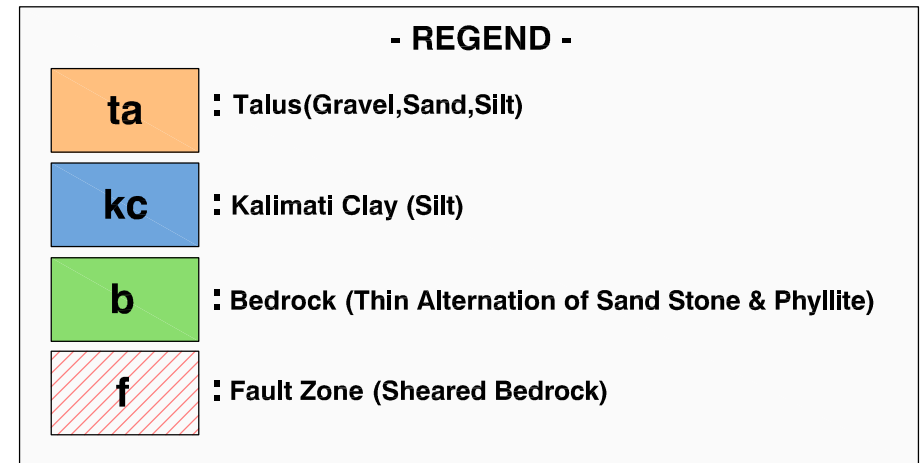
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|---|--|---|--|---|-------------------------|---------------------------|
| Clients:  Japan International Cooperation Agency |  Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants:  CTI Engineering International Co., Ltd.  Tonichi Engineering Consultants, Inc.  Metropolitan Expressway Co., Ltd.  Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Sheet Contents: Geological Plan and Cross Section of West Tunnel Portal (2) | Scale: 1:1200 | SHT. NO. App. 2 |
|---|--|---|--|---|-------------------------|---------------------------|



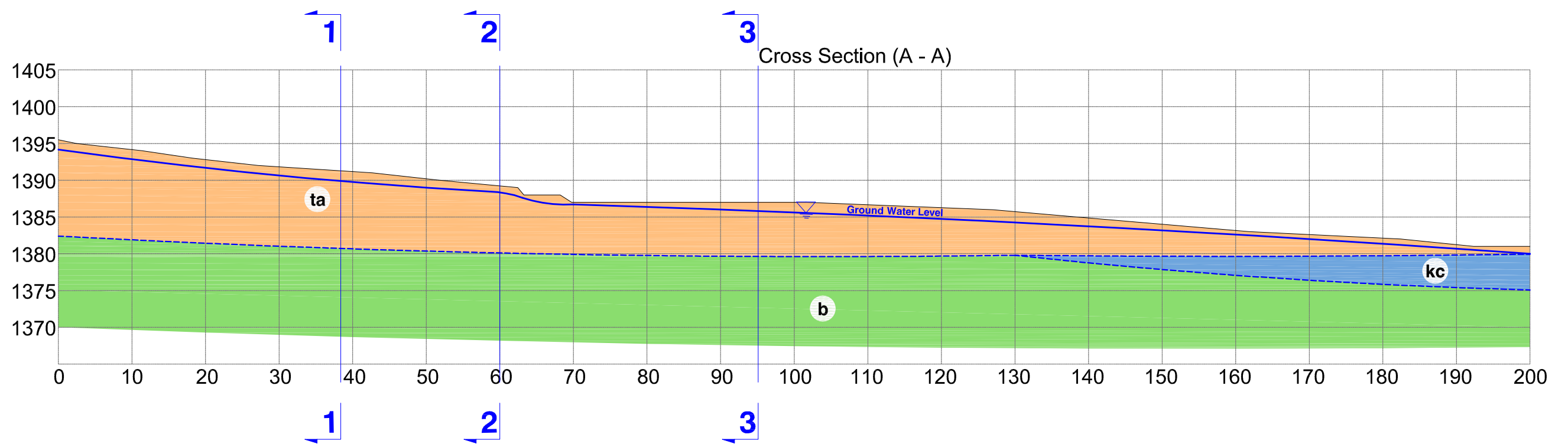
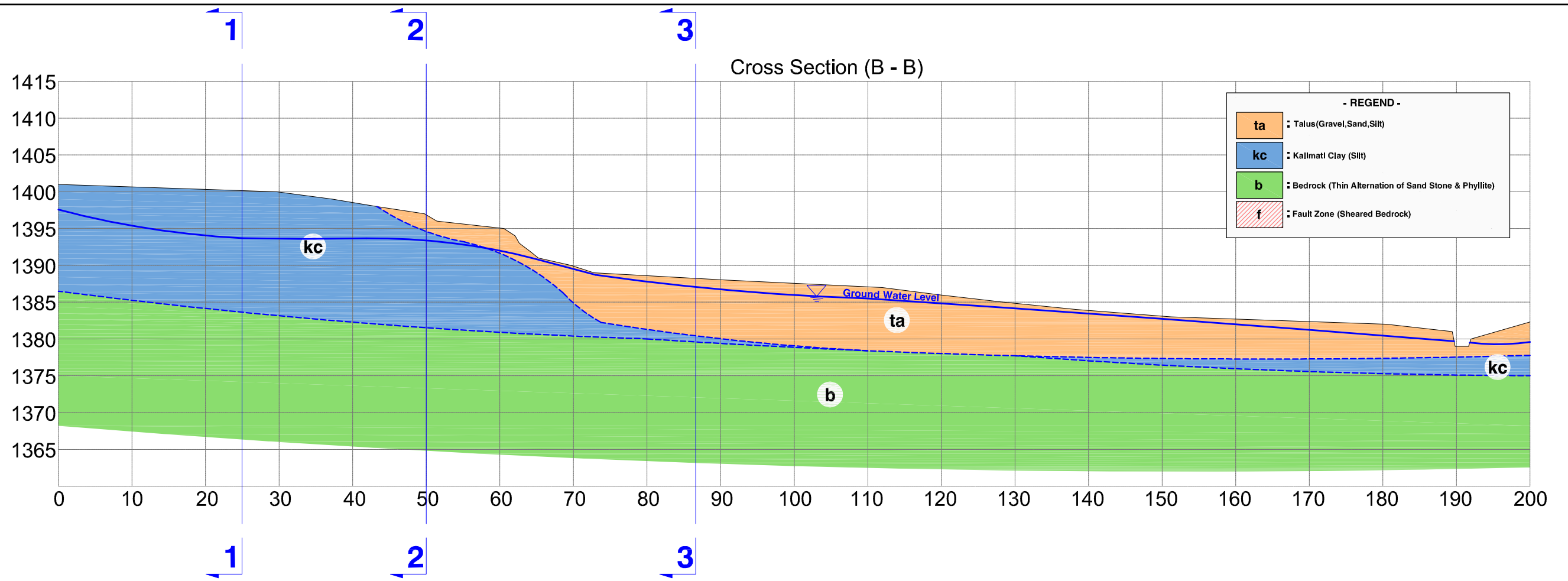
- REGEND -

| | |
|--|---|
| ta | : Talus(Gravel,Sand,Silt) |
| kc | : Kalimati Clay (Silt) |
| b | : Bedrock (Thin Alternation of Sand Stone & Phyllite) |
| f | : Fault Zone (Sheared Bedrock) |
| ● | : Boring |
| A | : Auger Boring |

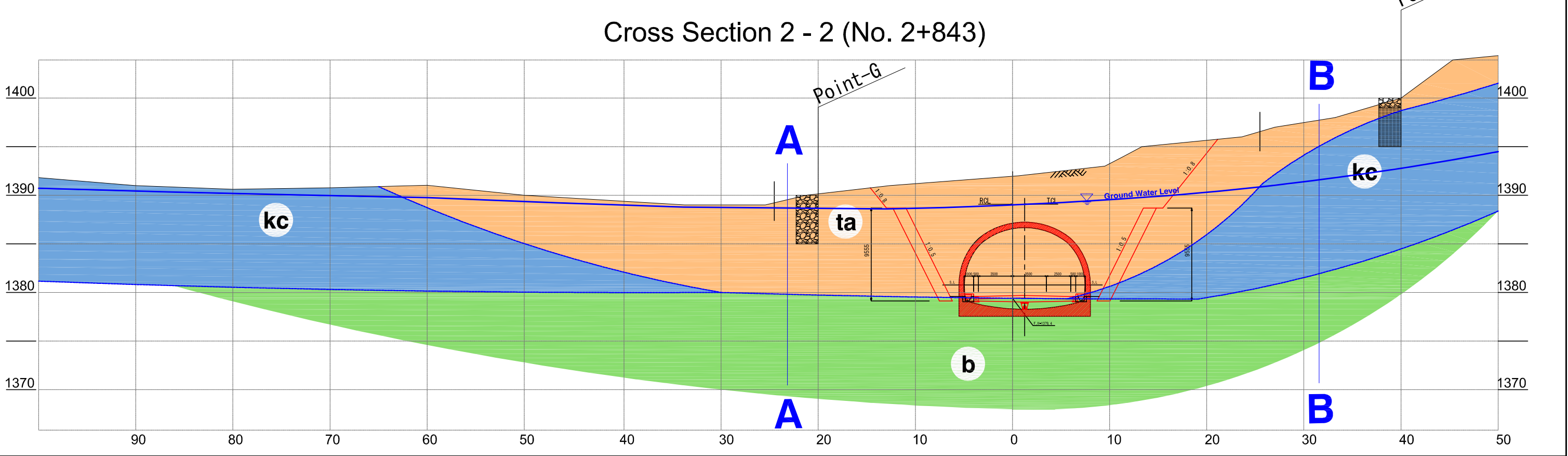
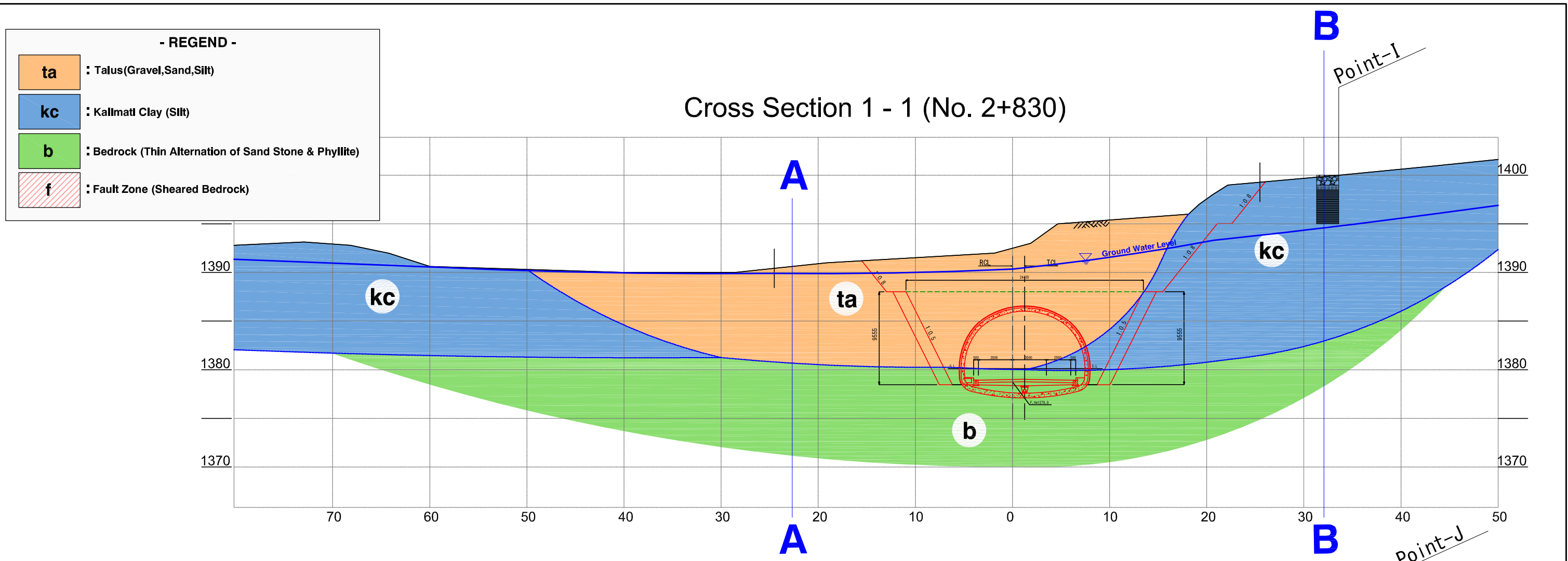
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| Clients: | Consultants: | Project Title: | Sheet Contents: | Scale: | SHT. NO. |
| Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Geological Plan and Cross Section of East Tunnel Portal (1) | 1:1000 |
| | | | | | App. 3 |



| | | | | | |
|--|--|--|---|---|-----------------|
| Clients: | Consultants: | Project Title: | Sheet Contents: | Scale: | SHT. NO. |
| Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Geological Plan and Cross Section of East Tunnel Portal (2) | 1:1000 |
| | | | | | App. 4 |



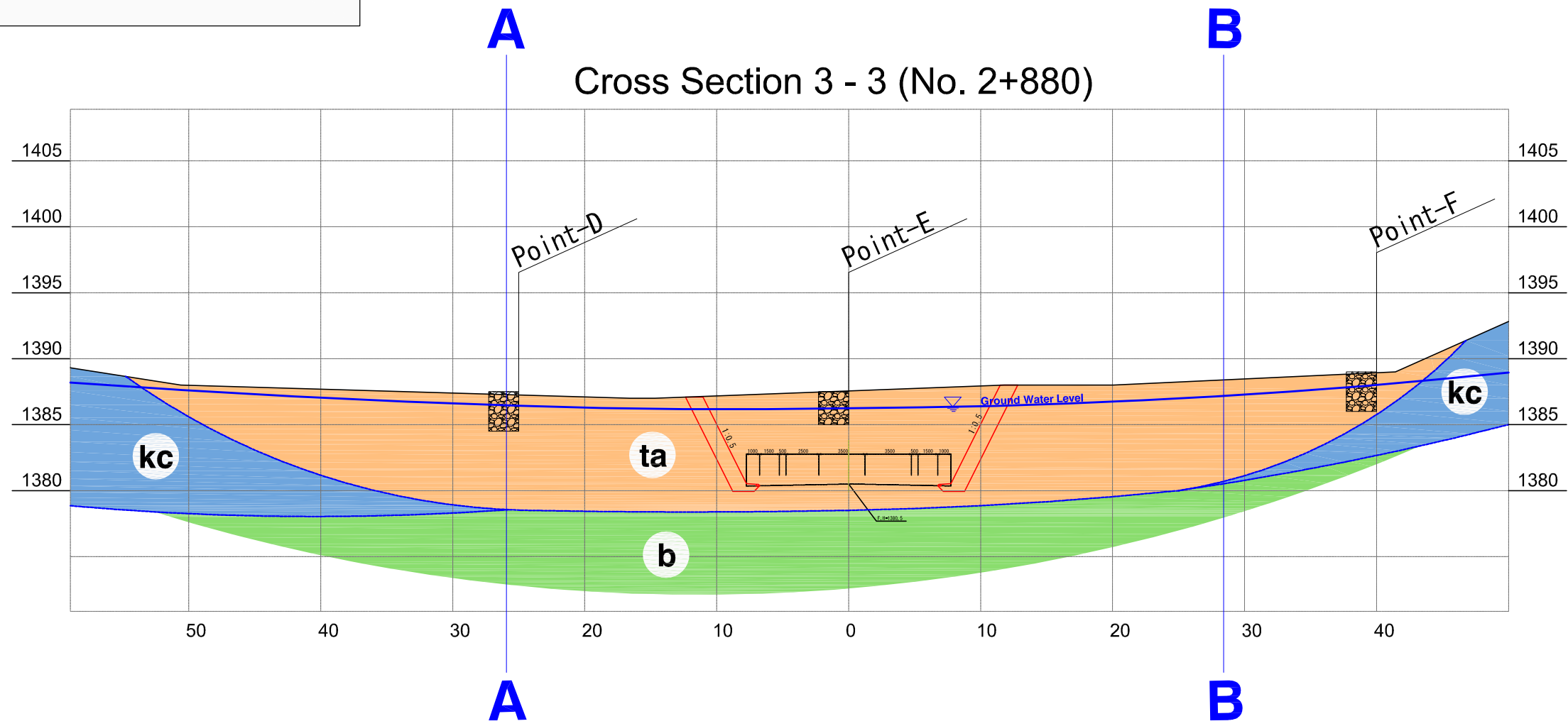
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| Clients: | Consultants: | Project Title: | Sheet Contents: | Scale: | SHT. NO. |
| Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Geological Plan and Cross Section of East Tunnel Portal (3) | 1:600 |
| | | | | | (App. 5) |



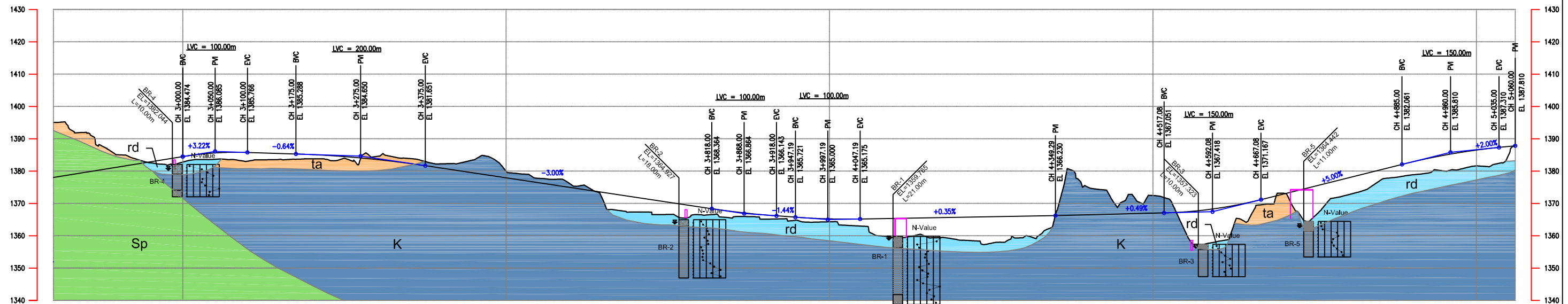
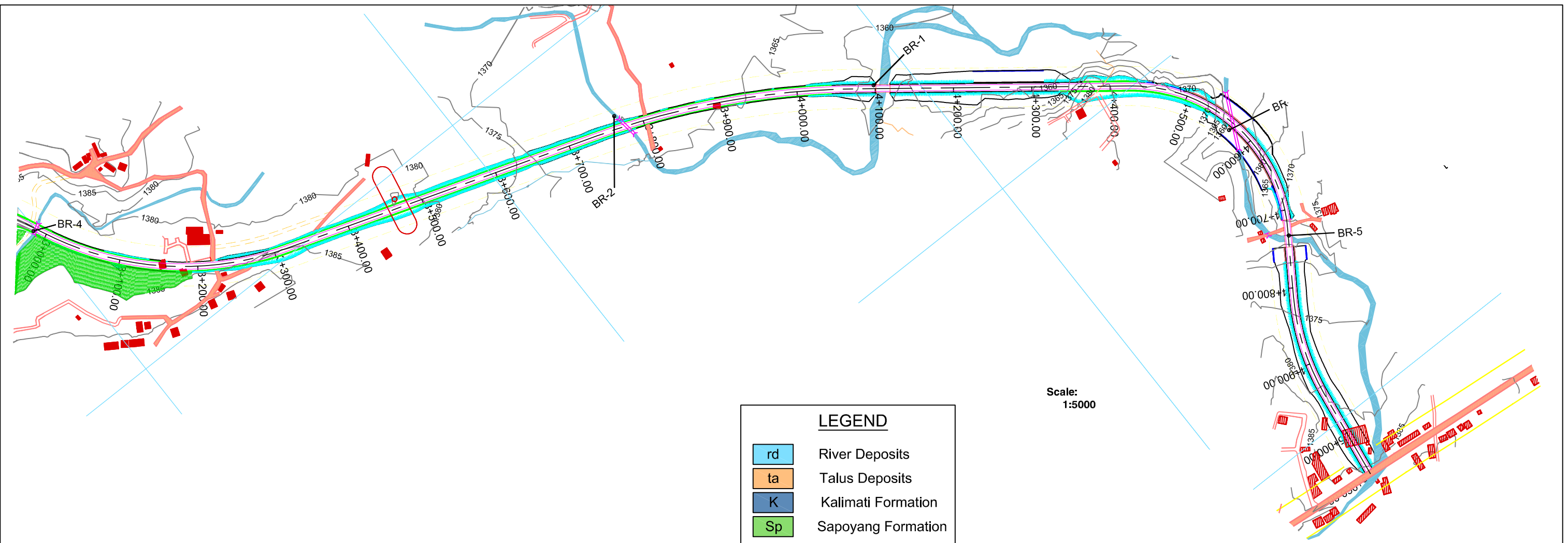
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|--|--|--|---|---|-----------------|
| Clients: | Consultants: | Project Title: | Sheet Contents: | Scale: | SHT. NO. |
| Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Geological Plan and Cross Section of East Tunnel Portal (4) | 1:400 |
| | | | | | App. 6 |

- REGEND -

| | |
|-----------|---|
| ta | : Talus(Gravel,Sand,Silt) |
| kc | : Kallmatl Clay (Silt) |
| b | : Bedrock (Thin Alternation of Sand Stone & Phyllite) |
| f | : Fault Zone (Sheared Bedrock) |



| | | | | | | |
|---|---|---|---|--|------------------------|---|
| Clients: Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants: CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in the Nepal | Sheet Contents: Geological Plan and Cross Section of East Tunnel Portal (5) | Scale: 1:400 | SHT. NO. <div style="border: 1px solid black; border-radius: 50%; width: 30px; height: 30px; text-align: center; line-height: 30px; margin: 0 auto;">App. 7</div> |
|---|---|---|---|--|------------------------|---|

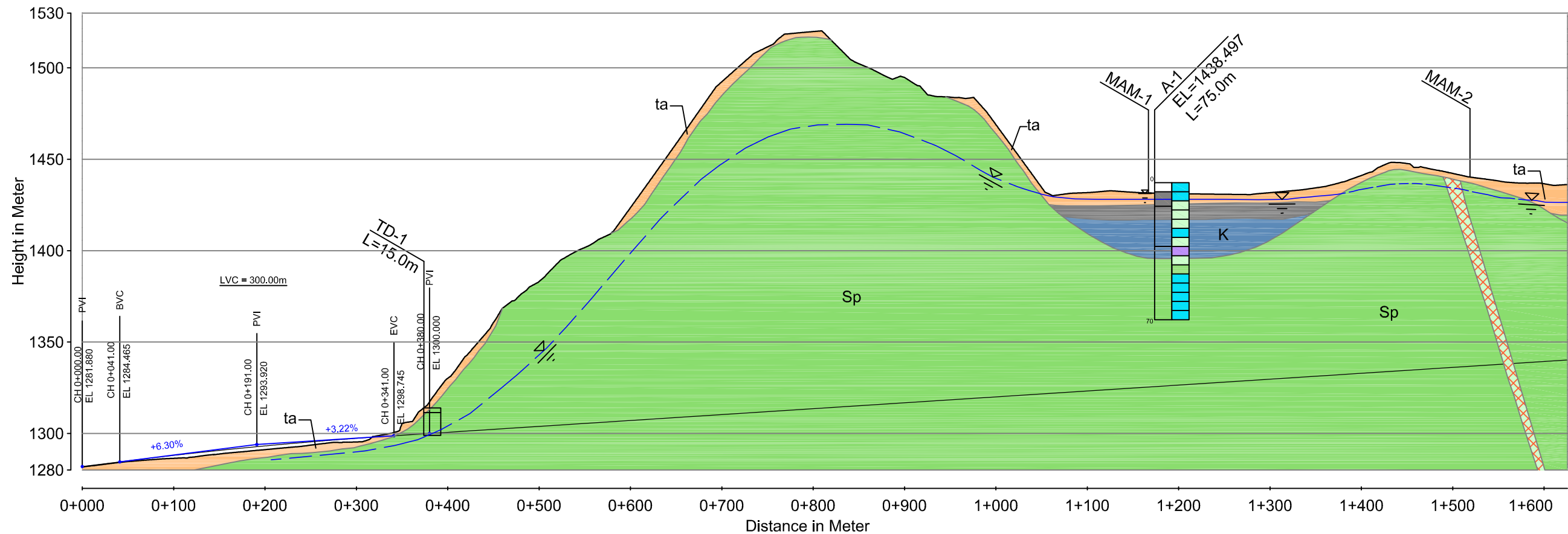
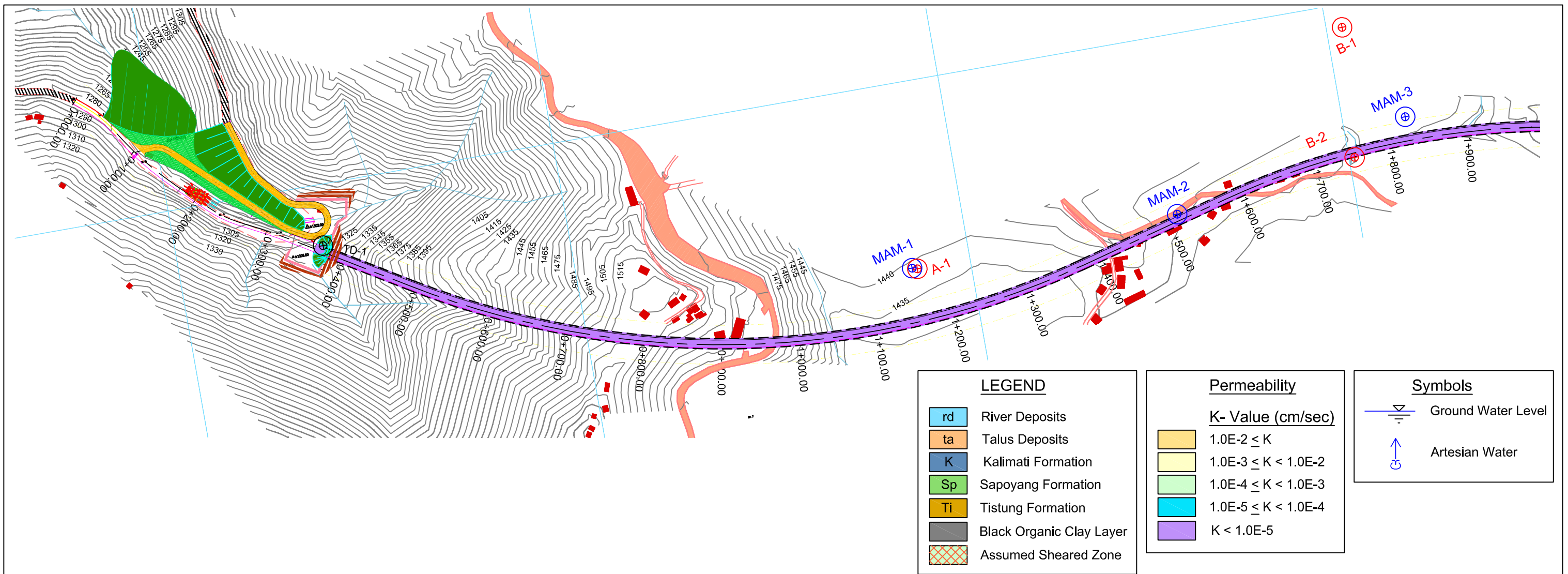


| | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| DESIGN LEVEL (m) | 1376.026 | 1381.250 | 1384.474 | 1385.786 | 1385.091 | 1383.568 | 1380.901 | 1377.902 | 1374.902 | 1371.903 | 1368.904 | 1366.428 | 1365.209 | 1365.359 | 1365.708 | 1366.058 | 1366.478 | 1366.967 | 1368.490 | 1372.813 | 1377.812 | 1382.788 | 1386.488 | 1387.810 |
| EXISTING LEVEL (m) | 1385.050 | 1385.048 | 1382.776 | 1383.046 | 1383.802 | 1384.522 | 1382.244 | 1379.908 | 1375.880 | 1367.344 | 1366.490 | 1365.105 | 1364.311 | 1359.386 | 1356.665 | 1359.519 | 1374.974 | 1372.430 | 1358.221 | 1373.145 | 1372.576 | 1378.808 | 1381.615 | 1387.898 |
| CHAINAGE (km) | 2+800.00 | 2+900.00 | 3+000.00 | 3+100.00 | 3+200.00 | 3+300.00 | 3+400.00 | 3+500.00 | 3+600.00 | 3+700.00 | 3+800.00 | 3+900.00 | 4+000.00 | 4+100.00 | 4+200.00 | 4+300.00 | 4+400.00 | 4+500.00 | 4+600.00 | 4+700.00 | 4+800.00 | 4+900.00 | 5+000.00 | 5+060.00 |

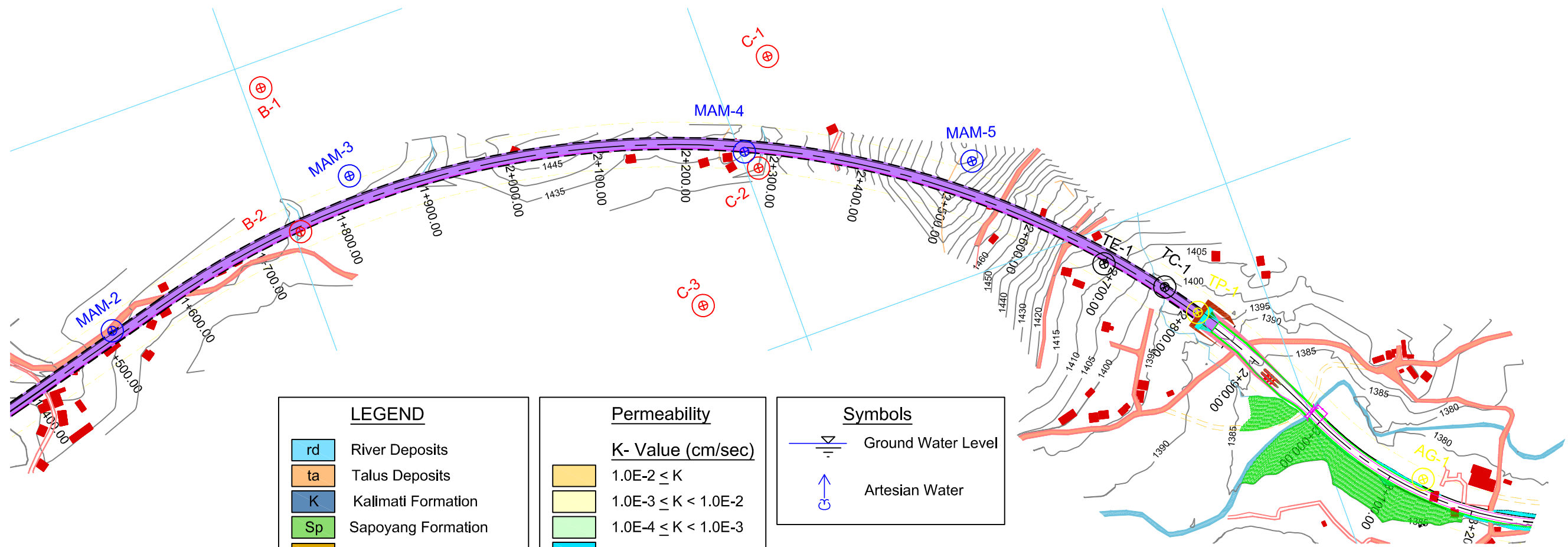
CHAINAGE : 2+800.00 - 5+060.00

Scale:
Vertical: 1:1250
Horizontal: 1:6250

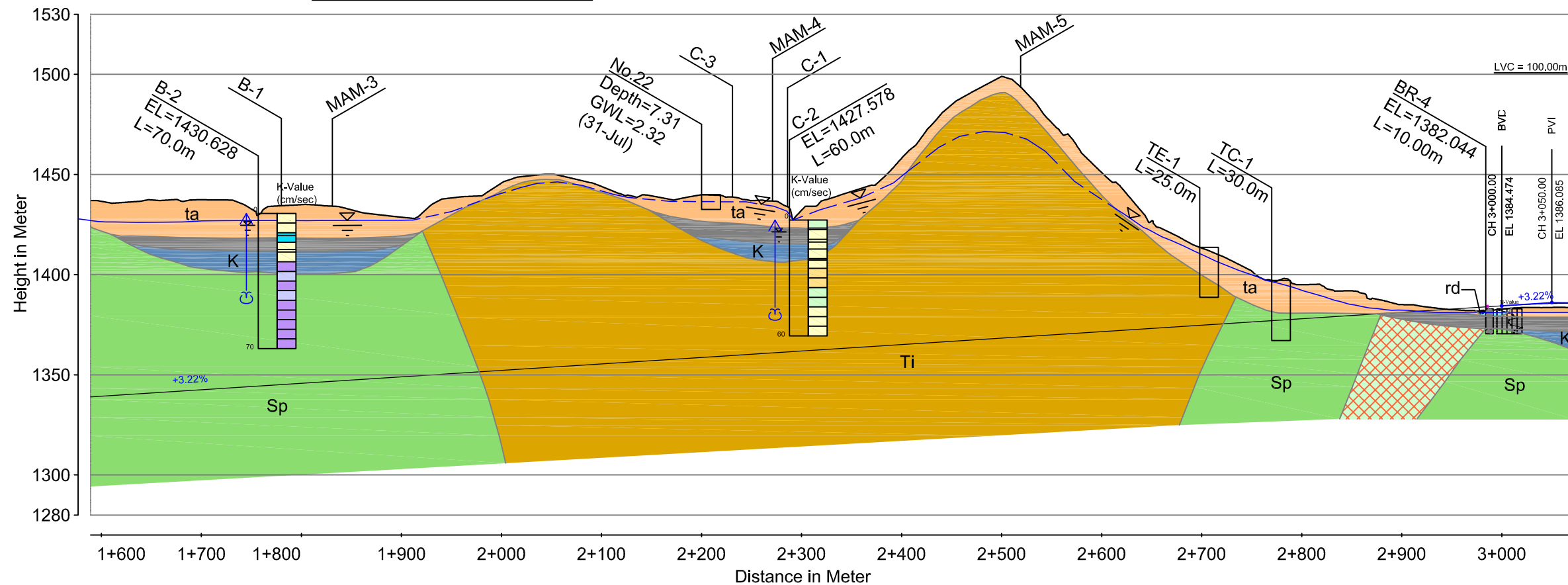
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|---|---|---|---|---------------------------|--------------------------|
| Clients: Japan International Cooperation Agency Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants: CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Sheet Contents: Geological Profile of Approach Road | Scale: As Shown | SHT. NO. App.8 |
|---|---|---|---|---------------------------|--------------------------|

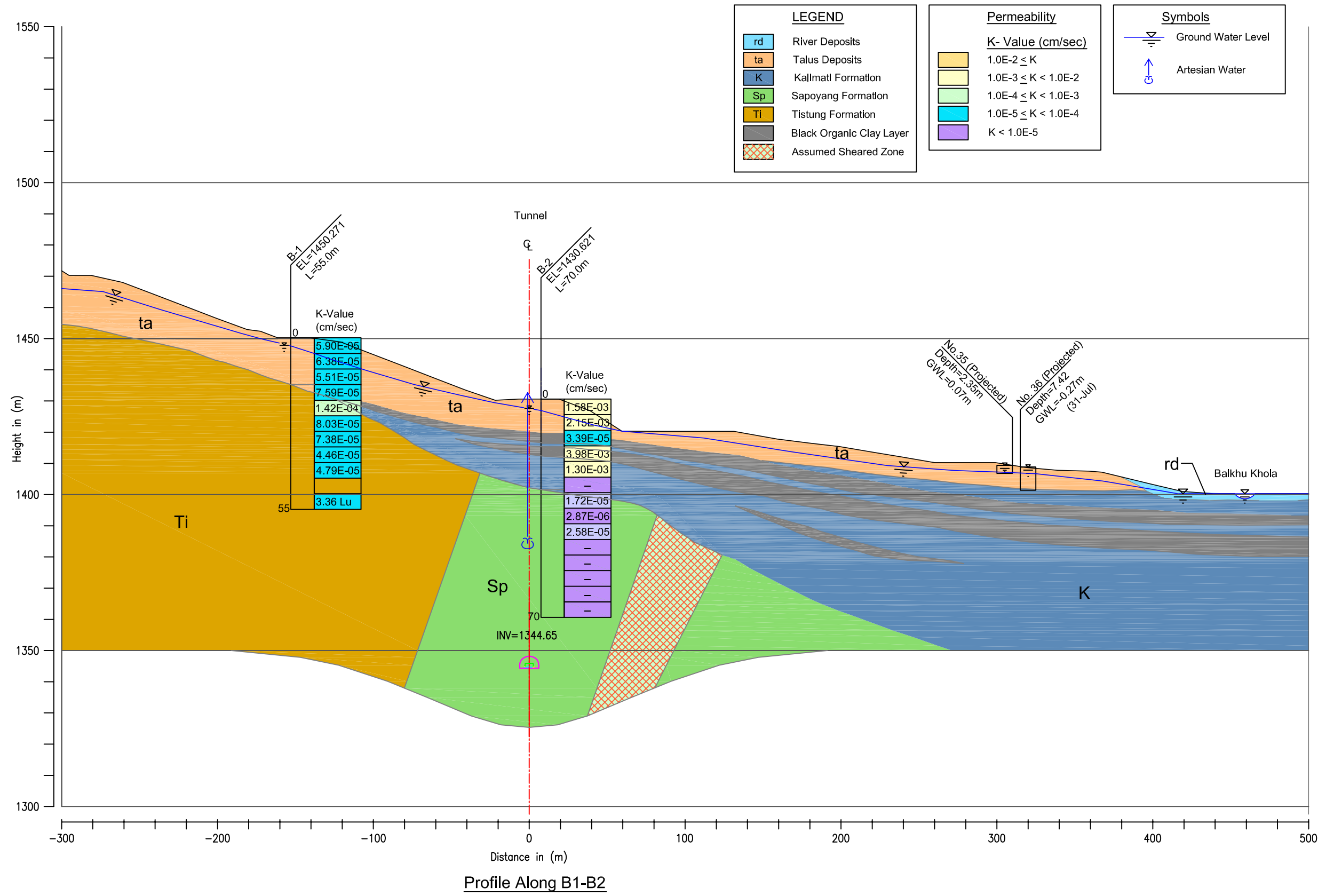


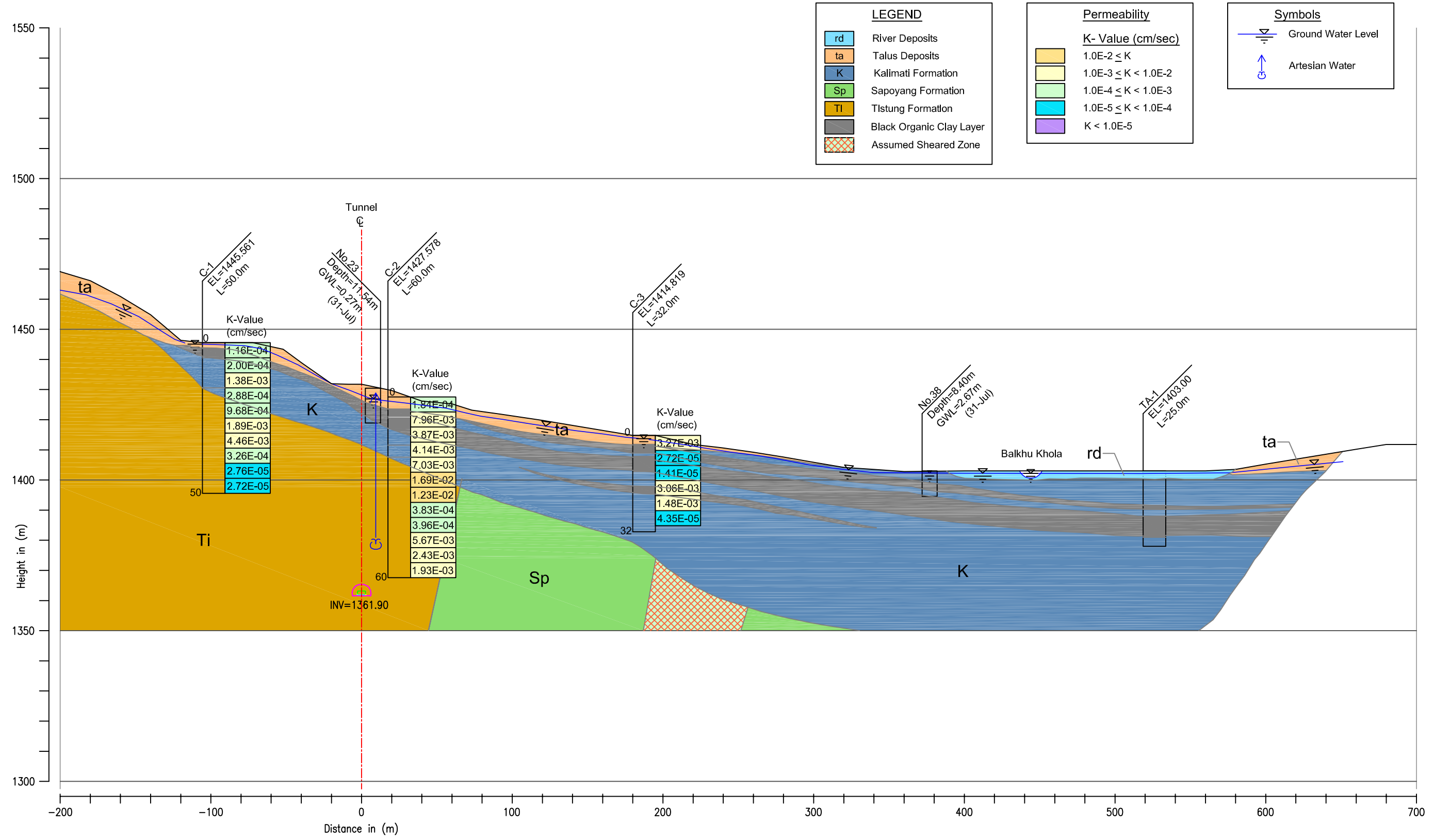
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|--|--|---|---|--|-----------------|
| Clients: | Consultants: | Project Title: | Sheet Contents: | Scale: | SHT. NO. |
| Japan International Cooperation Agency Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | CTI Engineering International Co., Ltd. Tonichi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Hydrogeological Profile along the Tunnel (West) | Vertical = 1:2500 Horizontal = 1:5000 | App.9a |



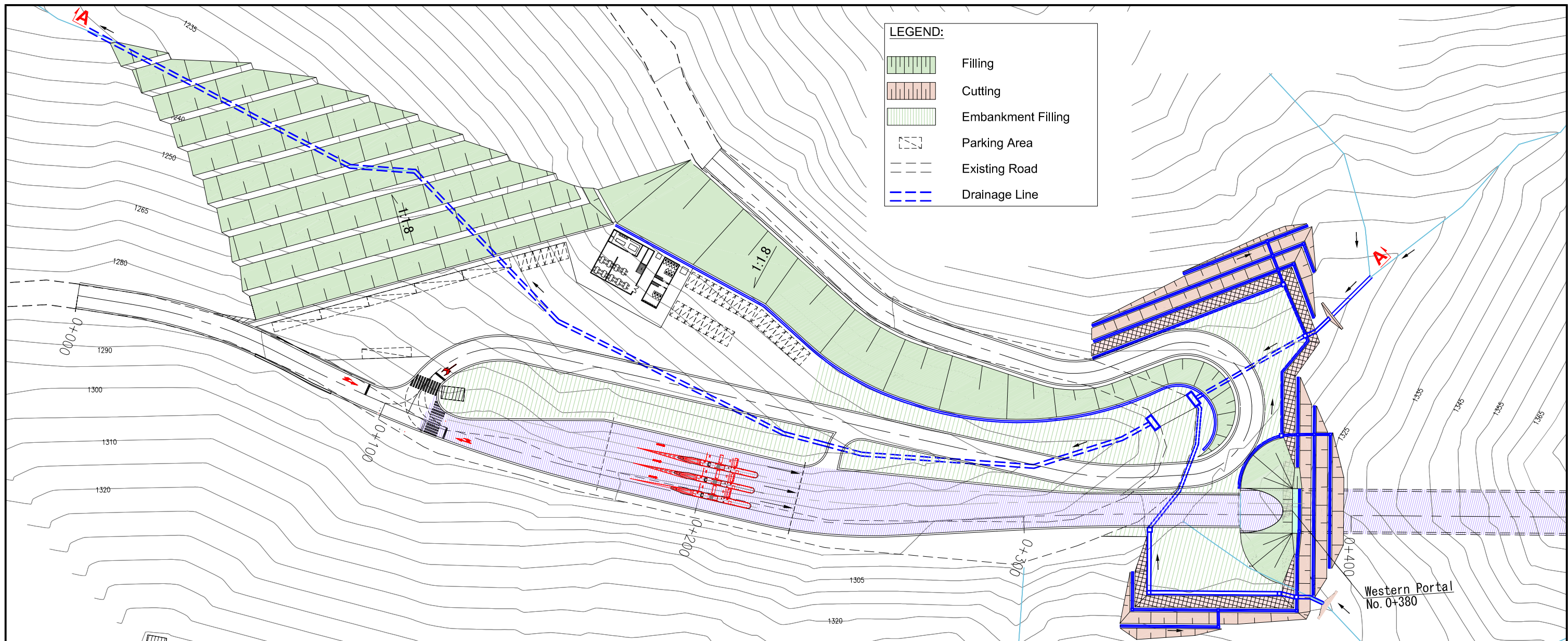
| LEGEND | | Permeability | | Symbols | |
|--------|--------------------------|---------------------|-------------------|---------|--------------------|
| rd | River Deposits | 1.0E-2 ≤ K | K- Value (cm/sec) | | Ground Water Level |
| ta | Talus Deposits | 1.0E-3 ≤ K < 1.0E-2 | | | Artesian Water |
| K | Kallimati Formation | 1.0E-4 ≤ K < 1.0E-3 | | | |
| Sp | Sapoyang Formation | 1.0E-5 ≤ K < 1.0E-4 | | | |
| Ti | Tistung Formation | K < 1.0E-5 | | | |
| | Black Organic Clay Layer | | | | |
| | Assumed Sheared Zone | | | | |



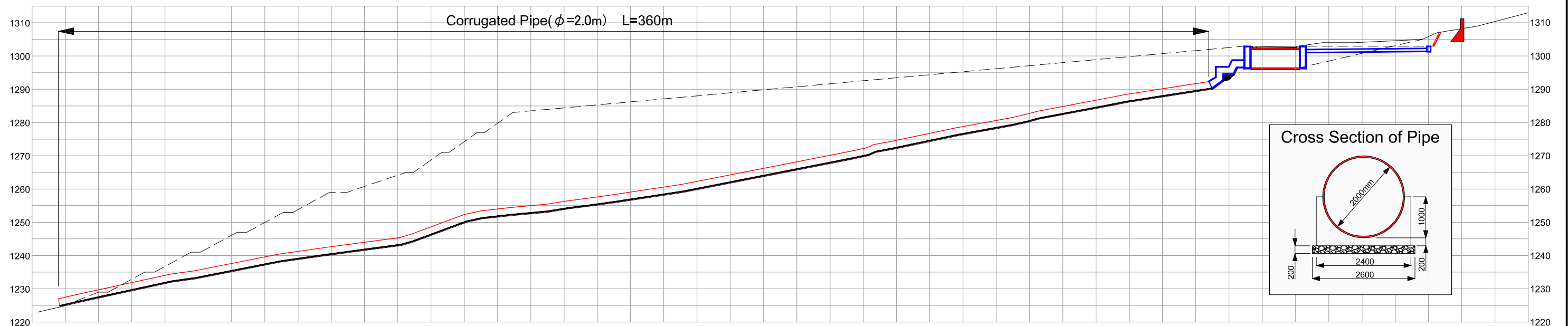









Profile Along C1-C2

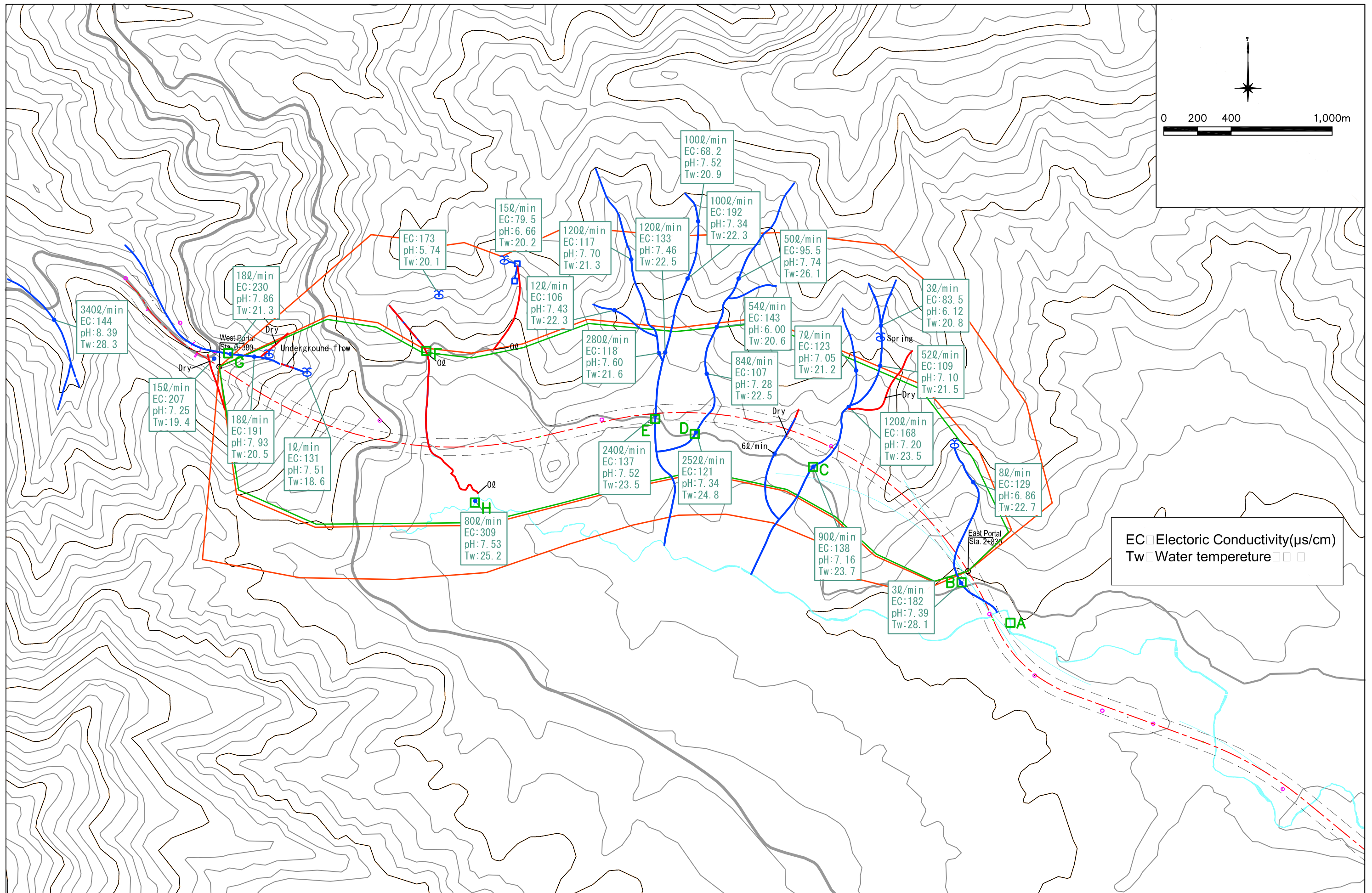


Plan of Corrugated Pipe

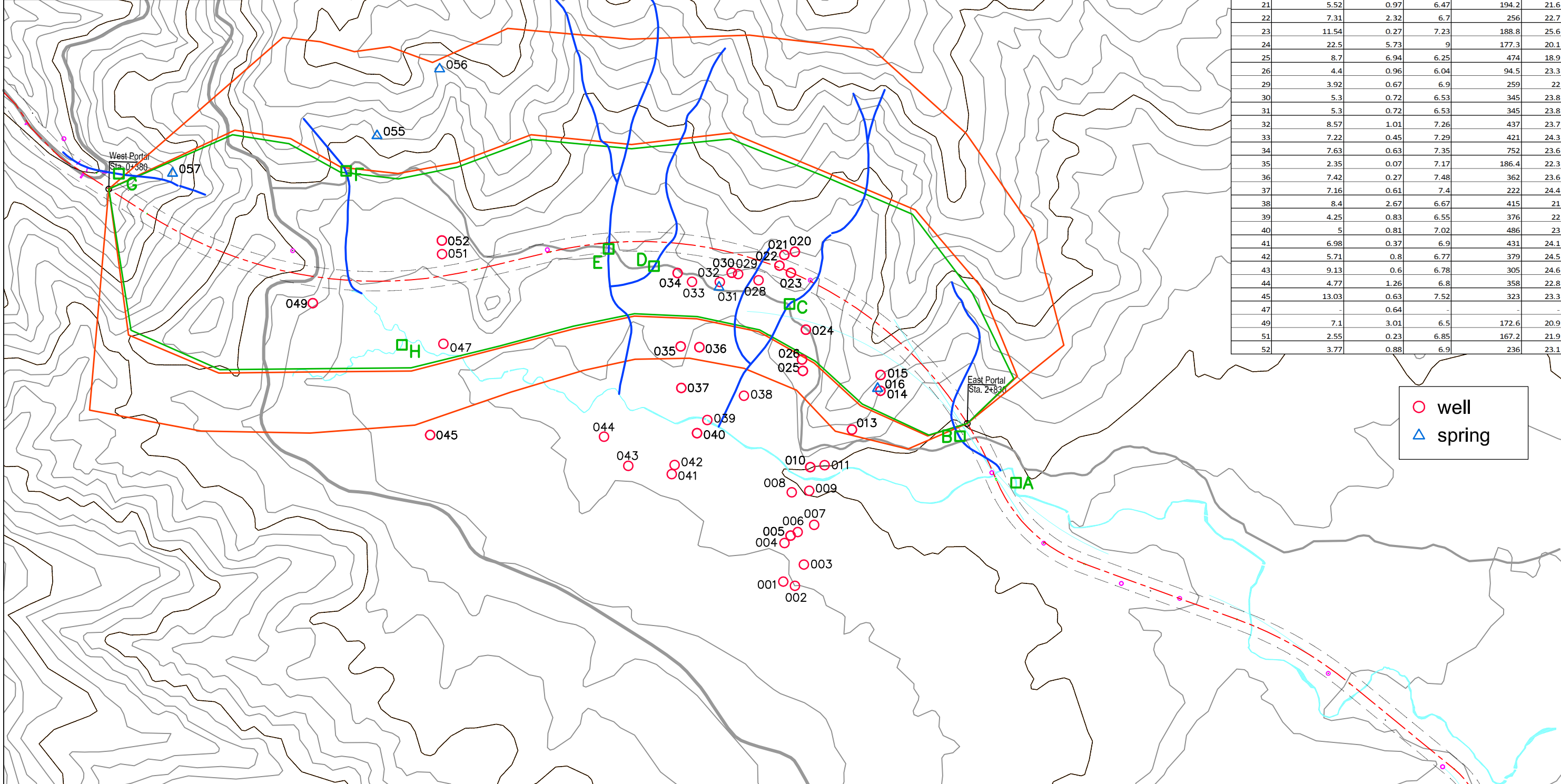
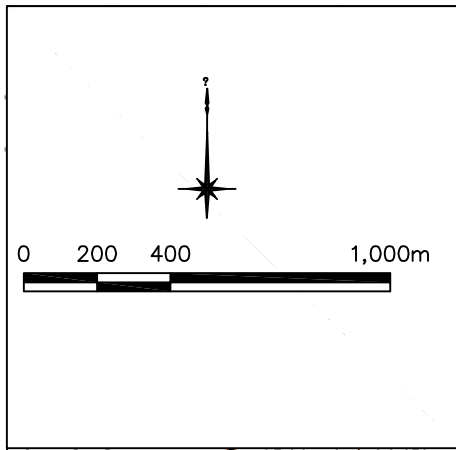


Profile of Corrugated Pipe (A-A)

| | | | | | | |
|---|---|---|--|---|-------------------------|---------------------------|
| Clients:  Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants:  CTI Engineering International Co., Ltd.  Tonichi Engineering Consultants, Inc.  Metropolitan Expressway Co., Ltd.  Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Sheet Contents: West Portal Drainage Plan | Scale: 1:1200 | SHT. NO. App.10 |
|---|---|---|--|---|-------------------------|---------------------------|

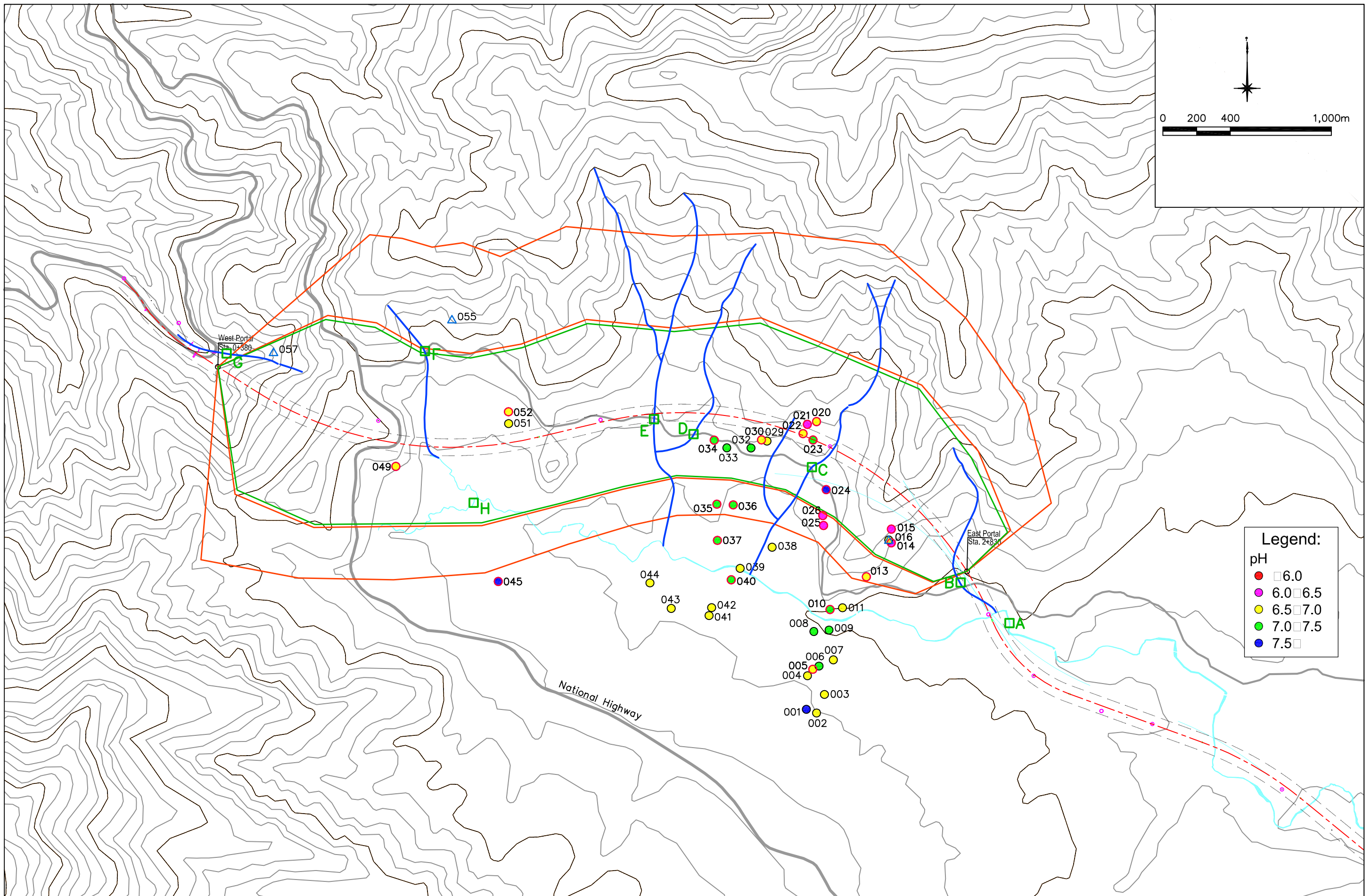








| | | | | | |
|---|--|--|--|---------------------------|----------------------------|
| Clients: Japan International Cooperation Agency Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants: CTI Engineering International Co., Ltd. Tonchi Engineering Consultants, Inc. Metropolitan Expressway Co., Ltd. Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction In Nepal | Sheet Contents: Hydrological Exploration Results | Scale: As Shown | SHT. NO. App.11a |
|---|--|--|--|---------------------------|----------------------------|

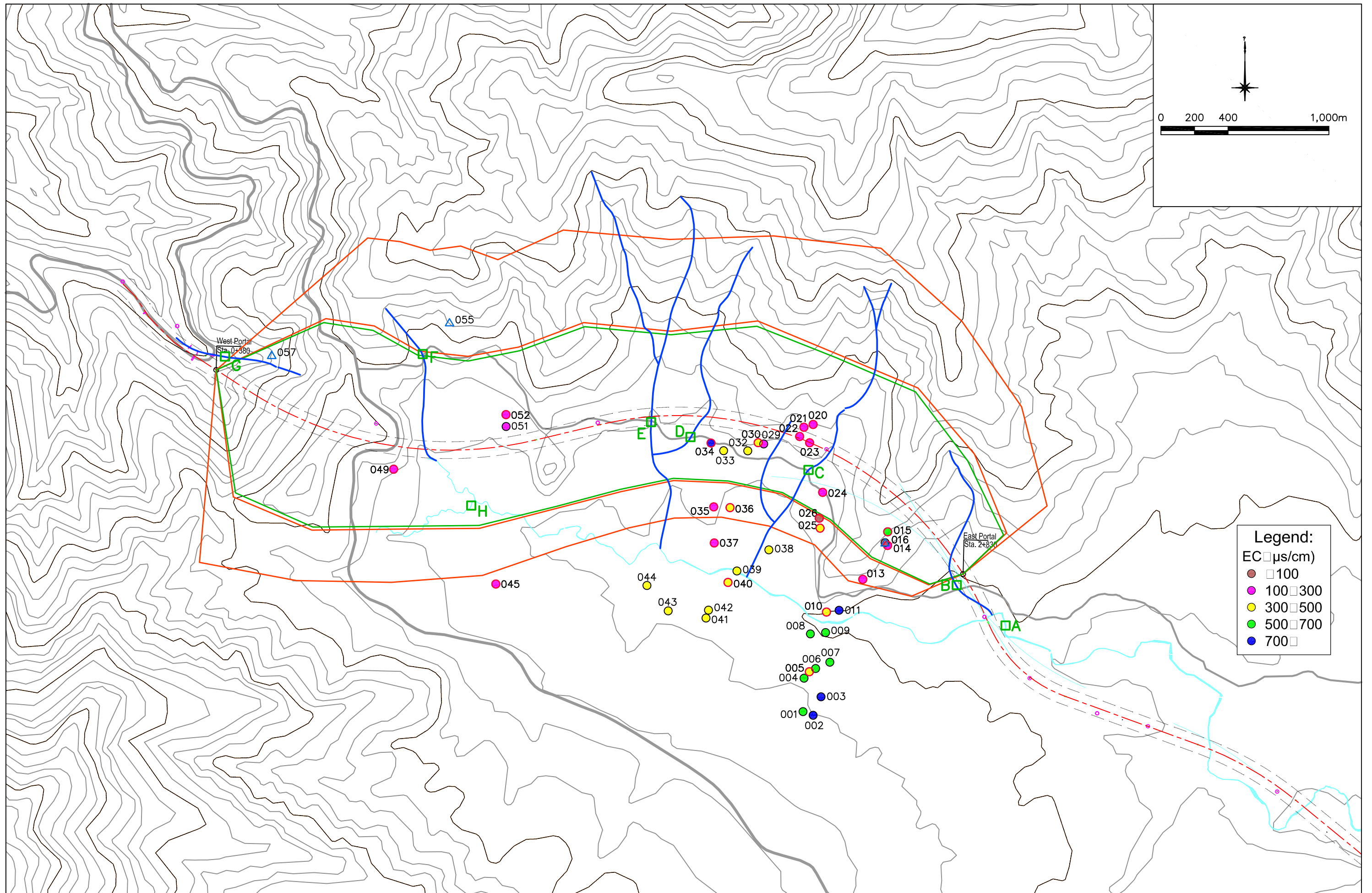







| No | Depth of the well (m) | WL (GL-m) | pH | EC (μS/cm) | Tw (°C) |
|----|-----------------------|-----------|------|------------|---------|
| 1 | 7.02 | 0.44 | 7.55 | 647 | 26.7 |
| 2 | 5.75 | 0.66 | 6.87 | 799 | 21 |
| 3 | 4.3 | 0.84 | 6.99 | 733 | 24.3 |
| 4 | 7.67 | 0.8 | 6.7 | 557 | 21.5 |
| 5 | 8.68 | 3.56 | 6.73 | 322 | 20.2 |
| 6 | 10.69 | 1.67 | 7.17 | 696 | 22.5 |
| 7 | 2.5 | 0.26 | 6.92 | 686 | 25.4 |
| 8 | 7.29 | 1.77 | 7.42 | 424 | 22.7 |
| 9 | 7.74 | 3.86 | 7.18 | 519 | 20.8 |
| 10 | 8.62 | 3.67 | 7.06 | 434 | 20.6 |
| 11 | 6.62 | 1.82 | 6.62 | 860 | 29.8 |
| 13 | 3.86 | 2.36 | 6.62 | 202 | 21.2 |
| 14 | 9.37 | 3.32 | 6.2 | 221 | 20.5 |
| 15 | 10.56 | 7.07 | 6.39 | 566 | 21 |
| 20 | 8.58 | 3.38 | 6.6 | 287 | 20.4 |
| 21 | 5.52 | 0.97 | 6.47 | 194.2 | 21.6 |
| 22 | 7.31 | 2.32 | 6.7 | 256 | 22.7 |
| 23 | 11.54 | 0.27 | 7.23 | 188.8 | 25.6 |
| 24 | 22.5 | 5.73 | 9 | 177.3 | 20.1 |
| 25 | 8.7 | 6.94 | 6.25 | 474 | 18.9 |
| 26 | 4.4 | 0.96 | 6.04 | 94.5 | 23.3 |
| 29 | 3.92 | 0.67 | 6.9 | 259 | 22 |
| 30 | 5.3 | 0.72 | 6.53 | 345 | 23.8 |
| 31 | 5.3 | 0.72 | 6.53 | 345 | 23.8 |
| 32 | 8.57 | 1.01 | 7.26 | 437 | 23.7 |
| 33 | 7.22 | 0.45 | 7.29 | 421 | 24.3 |
| 34 | 7.63 | 0.63 | 7.35 | 752 | 23.6 |
| 35 | 2.35 | 0.07 | 7.17 | 186.4 | 22.3 |
| 36 | 7.42 | 0.27 | 7.48 | 362 | 23.6 |
| 37 | 7.16 | 0.61 | 7.4 | 222 | 24.4 |
| 38 | 8.4 | 2.67 | 6.67 | 415 | 21 |
| 39 | 4.25 | 0.83 | 6.55 | 376 | 22 |
| 40 | 5 | 0.81 | 7.02 | 486 | 23 |
| 41 | 6.98 | 0.37 | 6.9 | 431 | 24.1 |
| 42 | 5.71 | 0.8 | 6.77 | 379 | 24.5 |
| 43 | 9.13 | 0.6 | 6.78 | 305 | 24.6 |
| 44 | 4.77 | 1.26 | 6.8 | 358 | 22.8 |
| 45 | 13.03 | 0.63 | 7.52 | 323 | 23.3 |
| 47 | - | 0.64 | - | - | - |
| 49 | 7.1 | 3.01 | 6.5 | 172.6 | 20.9 |
| 51 | 2.55 | 0.23 | 6.85 | 167.2 | 21.9 |
| 52 | 3.77 | 0.88 | 6.9 | 236 | 23.1 |

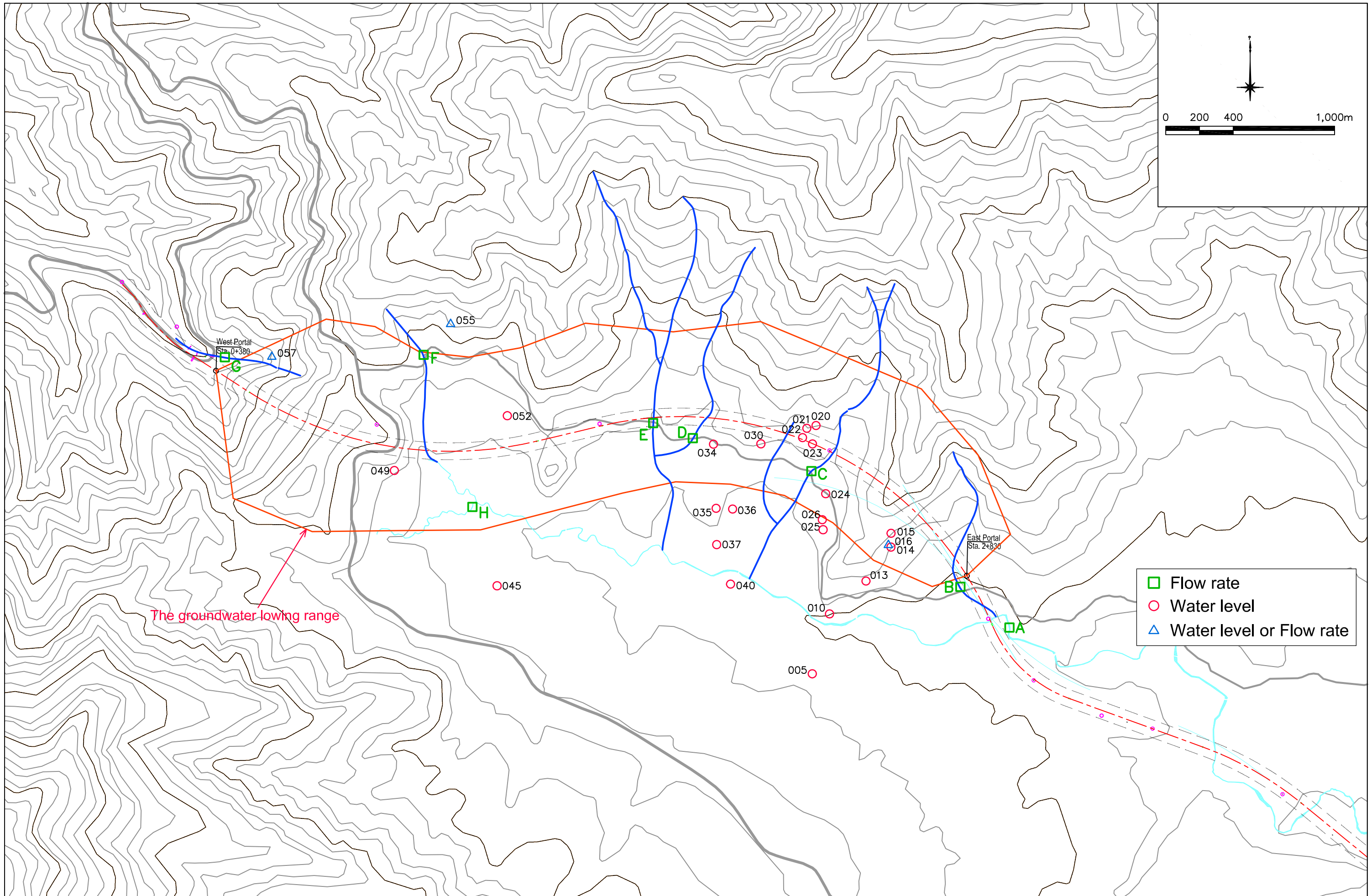
○ well
△ spring









| | | | | | | |
|---|--|---|--|---|---------------------------|----------------------------|
| Clients:  Japan International Cooperation Agency |  Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants:  CTI Engineering International Co., Ltd.  Tonichi Engineering Consultants, Inc.  Metropolitan Expressway Co., Ltd.  Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Sheet Contents: Water Quality of the Well | Scale: As Shown | SHT. NO. App.11c |
|---|--|---|--|---|---------------------------|----------------------------|



| | | | | | | |
|---|---|---|--|--|---------------------------|----------------------------|
| Clients:  Japan International Cooperation Agency | Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants:  CTI Engineering International Co., Ltd.  Tonichi Engineering Consultants, Inc.  Metropolitan Expressway Co., Ltd.  Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Sheet Contents: Water Quality of the Well (EC) | Scale: As Shown | SHT. NO. App.11d |
|---|---|---|--|--|---------------------------|----------------------------|



| | | | | | | |
|---|--|---|--|---|---------------------------|----------------------------|
| Clients:  Japan International Cooperation Agency |  Department of Roads Ministry of Physical Infrastructure and Transport Federal Democratic Republic of Nepal | Consultants:  CTI Engineering International Co., Ltd.  Tonichi Engineering Consultants, Inc.  Metropolitan Expressway Co., Ltd.  Oriental Consultants, Co., Ltd. | Project Title: Preparatory survey for Nagdhunga Tunnel Construction in Nepal | Sheet Contents: The Groundwater Lowering Range due to the Tunnel Excavation and Water Source Location Map | Scale: As Shown | SHT. NO. App.11e |
|---|--|---|--|---|---------------------------|----------------------------|