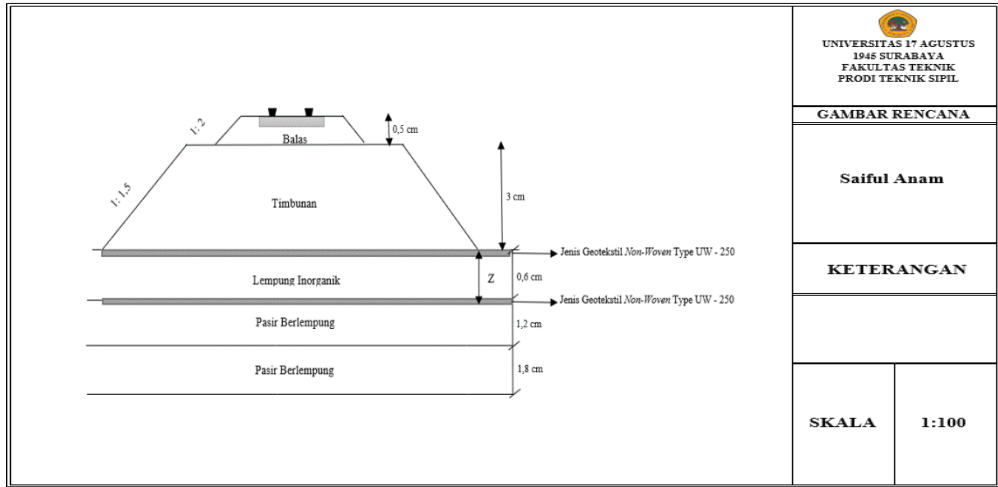
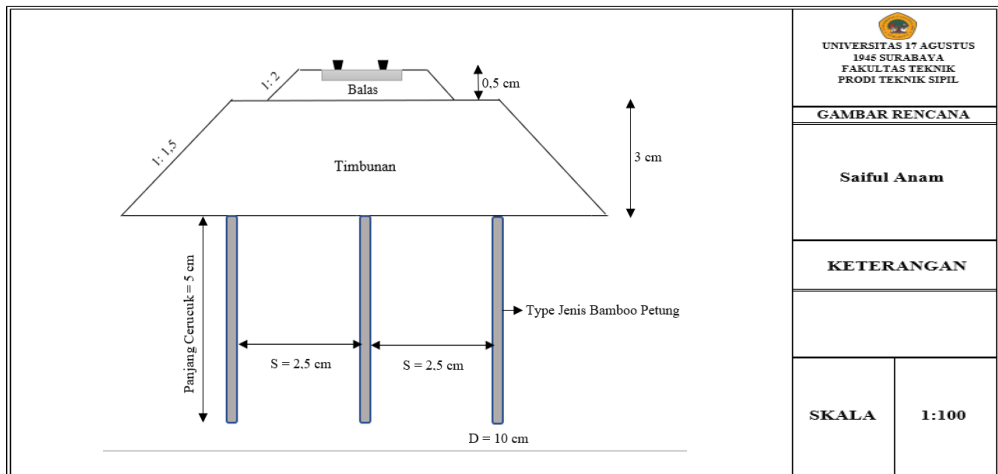


# LAMPIRAN 1



Gambar Potongan Melintang Menggunakan Perkuatan Geotekstil



Gambar Potongan Melintang Menggunakan Perkuatan Cerucuk

## LAMPIRAN 2



Gambar Tanah Lunak Yang akan Dilakukan Perbaikan KM 51+000 – KM 52+500



Gambar Perbaikan Tanah Dengan Replecement Soil KM 51+000 – KM 52+500

## LAMPIRAN 3



### PT. TUNAS SATRIA MULTIKARYA

Jalan Raya Kembaran no. 15, RT 006, RW 002, Desa  
Kembaran, Kecamatan Kembaran, Banyumas,  
Jawa Tengah, Telp 085878193615, 081228090577

Bore No : BH - 1

Project : Pembangunan Jalur Ganda Kereta Api Mojokerto –  
Sepanjang (Paket 9)

Client : PT. Modern Surya Jaya

Location : Jl. Mojoanyar-Bangsals, Ds. Damarsih, Kecamatan Mojoanyar  
Kabupaten Mojokerto Jawa Timur

KM : 51+000 s/d 52+500

### Data tanah

Diameter Bore : 73 mm

Diameter Casing : 89 mm

Dites Oleh : Darno

Tanggal : 25 September 2021

| Kedalaman<br>(m) | Jenis Tanah                 | γ Tanah<br>(t/m <sup>2</sup> ) | γ Sat<br>Tanah<br>(t/m <sup>2</sup> ) | Kadar<br>Air (ω)<br>(%) | Berat Volume<br>Kering (γ <sub>s</sub> )<br>(t/m <sup>2</sup> ) | Kohesi<br>C | φ  | Batas Cair<br>LL<br>(%) | Batas Plastis<br>PL<br>(%) | Indeks<br>Plastis (PI)<br>(%) | Wc<br>(%) | Cc    | eo    | Cs    |
|------------------|-----------------------------|--------------------------------|---------------------------------------|-------------------------|---|-------------|----|-------------------------|----------------------------|-------------------------------|-----------|-------|-------|-------|
| 1,2 m            | Lempung Inorganik / Halus   | 1,5                            | 1,655                                 | 54,16                   | 2,48  | 2,00        | 28 | 78,21                   | 34,15                      | 48,6                          | 40,25     | 0,953 | 1,036 | 0,15  |
| 2,4 m            | Pasir Berlempung / Berlanau | 1,65                           | 1,67                                  | 40,22                   | 2,56  | 2,00        | 28 | 67,53                   | 29,16                      | 43,24                         | 20,56     | 0,932 | 0,542 | 0,136 |
| 3,6 m            | Pasir Berlempung / Berlanau | 1,65                           | 1,693                                 | 26,25                   | 2,68  | 2,00        | 29 | 69,4                    | 32,26                      | 43,16                         | 25,4      | 0,897 | 0,661 | 0,128 |
| 4,8 m            | Pasir Berlempung / Berlanau | 1,6                            | 1,662                                 | 25,13                   | 2,7   | 2,00        | 33 | 68,9                    | 31,62                      | 42,86                         | 23,24     | 0,842 | 0,482 | 0,122 |
| 6 m              | Pasir Berlempung / Berlanau | 1,6                            | 1,666                                 | 19,14                   | 2,84  | 2,00        | 29 | 68,4                    | 33,5                       | 42,76                         | 30,62     | 0,821 | 0,432 | 0,119 |
| 7,2 m            | Pasir Padat                 | 1,8                            | 1,751                                 | 18,54                   | 2,92  | 2,00        | 35 | 64,8                    | 32,72                      | 42,35                         | 29,83     | 0,792 | 0,396 | 0,112 |



- Perhitungan Penurunan Sc Akibat Beban Timbunan Tanah Replement Soil

| No | Tebal Lapisan | H | Z   | yt   | ysat  | y'    | eo    | Cc    | Cs    | B1  | B2  | $\alpha 1$ | $\alpha 2$ | $\Delta P$ | P'o   | $\Delta P_f$ | P'c   | $\Delta P + P'o$ | Sc    |       |
|----|---------------|---|-----|------|-------|-------|-------|-------|-------|-----|-----|------------|------------|------------|-------|--------------|-------|------------------|-------|-------|
| 1  | 1             | 3 | 0,6 | 1,7  | 1,8   | 0,8   | 1,036 | 0,953 | 0,15  | 3,5 | 3,5 | 4,828      | 80,272     | 2,658      | 1,020 | 1,0          | 1,220 | 3,678            | 0,679 |       |
| 2  | 1             | 3 | 1,8 | 1,65 | 1,67  | 0,67  | 0,542 | 0,932 | 0,136 | 3,5 | 3,5 | 12,787     | 62,783     | 1,878      | 6,540 | 1,0          | 6,740 | 8,418            | 0,176 |       |
| 3  | 1             | 3 | 3   | 1,65 | 1,693 | 0,693 | 0,661 | 0,897 | 0,128 | 3,5 | 3,5 | 17,402     | 49,398     | 1,315      | 6,156 | 1,0          | 6,356 | 7,471            | 0,115 |       |
| 4  | 1             | 3 | 4,2 | 1,6  | 1,662 | 0,662 | 0,482 | 0,842 | 0,122 | 3,5 | 3,5 | 19,231     | 39,805     | 0,944      | 7,029 | 1,0          | 7,229 | 7,973            | 0,073 |       |
| 5  | 1             | 3 | 5,4 | 1,6  | 1,666 | 0,666 | 0,432 | 0,821 | 0,119 | 3,5 | 3,5 | 19,401     | 32,949     | 0,704      | 7,580 | 1,0          | 7,780 | 8,284            | 0,048 |       |
| 6  | 1             | 3 | 6   | 1,8  | 1,751 | 0,751 | 0,396 | 0,792 | 0,108 | 3,5 | 3,5 | 19,142     | 30,256     | 0,617      | 8,396 | 1,0          | 8,596 | 9,013            | 0,036 |       |
|    |               |   |     |      |       |       |       |       |       |     |     |            |            |            |       |              |       |                  |       | 1,127 |

- Perhitungan Penurunan Sc Akibat Beban Lalu Lintas (Kereta Api) Tanah Replement Soil

| No | Tebal Lapisan | H | Z   | yt   | ysat  | y'    | eo    | Cc    | Cs    | B1  | B2  | $\alpha 1$ | $\alpha 2$ | $\Delta P$ | P'o   | $\Delta P_f$ | P'c   | $\Delta P + P'o$ | Sc    |       |
|----|---------------|---|-----|------|-------|-------|-------|-------|-------|-----|-----|------------|------------|------------|-------|--------------|-------|------------------|-------|-------|
| 1  | 1             | 3 | 0,6 | 1,7  | 1,8   | 0,8   | 1,036 | 0,953 | 0,15  | 3,5 | 3,5 | 9,191      | 71,075     | 7,750      | 1,020 | 1,0          | 1,220 | 8,770            | 1,209 |       |
| 2  | 1             | 3 | 1,8 | 1,65 | 1,67  | 0,67  | 0,542 | 0,932 | 0,136 | 3,5 | 3,5 | 15,026     | 56,049     | 4,650      | 6,540 | 1,0          | 6,740 | 11,190           | 0,400 |       |
| 3  | 1             | 3 | 3   | 1,65 | 1,693 | 0,693 | 0,661 | 0,897 | 0,128 | 3,5 | 3,5 | 11,863     | 44,186     | 2,325      | 6,156 | 1,0          | 6,356 | 8,481            | 0,204 |       |
| 4  | 1             | 3 | 4,2 | 1,6  | 1,662 | 0,662 | 0,482 | 0,842 | 0,122 | 3,5 | 3,5 | 19,468     | 36,092     | 1,163      | 7,029 | 1,0          | 7,229 | 8,192            | 0,094 |       |
| 5  | 1             | 3 | 5,4 | 1,6  | 1,666 | 0,666 | 0,432 | 0,821 | 0,119 | 3,5 | 3,5 | 28,794     | 30,242     | 0,581      | 7,580 | 1,0          | 7,780 | 8,162            | 0,037 |       |
| 6  | 1             | 3 | 6   | 1,8  | 1,751 | 0,751 | 0,396 | 0,792 | 0,108 | 3,5 | 3,5 | 18,262     | 25,924     | 0,291      | 8,396 | 1,0          | 8,596 | 8,687            | 0,009 |       |
|    |               |   |     |      |       |       |       |       |       |     |     |            |            |            |       |              |       |                  |       | 1,952 |

## LAMPIRAN 4

Tabel Data Tanah Sondir (PT. Modern Surya Jaya KM 51+000 – KM 52+500)

| Kedalaman<br>D<br>(m) | Jml Hamb.<br>JHP<br>(kg/cm) | Hamb. Pelekat<br>HP<br>(kg/cm) | Shaft Friction<br>qf<br>(kg/cm <sup>2</sup> ) | Skin Friction<br>fs<br>(kg/cm <sup>2</sup> ) | Friction Ratio<br>fr<br>(%) | Tekanan Konus<br>qc<br>(MPa) | Jenis Tanah<br>(Schmertmann, 1978) | Taksiran Parameter Tanah |                                   |               |                             |
|-----------------------|-----------------------------|--------------------------------|---|--|-----------------------------|------------------------------|------------------------------------|--------------------------|-----------------------------------|---------------|-----------------------------|
|                       |                             |                                |   |  |                             |                              |                                    | Jenis                    | $\gamma$<br>(ton/m <sup>3</sup> ) | $\phi$<br>(°) | Cu<br>(kg/cm <sup>2</sup> ) |
| 0,00                  | 0                           | 0                              | 0,0   | 0,00   | 0,00                        | 0,00                         | Lempung Berpasir/Berlanau          | Kohesif                  | 1,50                              |               | 1,25                        |
| 0,20                  | 8                           | 8                              | 4,0   | 0,27   | 3,41                        | 0,78                         | Lempung Berpasir/Berlanau          | Kohesif                  | 1,50                              |               | 1,25                        |
| 0,40                  | 16                          | 8                              | 4,0   | 0,27   | 4,55                        | 0,59                         | Lempung Inorganik - Medium         | Kohesif                  | 1,50                              |               | 1,25                        |
| 0,60                  | 22                          | 6                              | 3,0   | 0,20   | 4,09                        | 0,49                         | Lempung Inorganik - Halus          | Kohesif                  | 1,50                              |               | 1,25                        |
| 0,80                  | 30                          | 8                              | 4,0   | 0,27   | 2,73                        | 0,98                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 28,00         |                             |
| 1,00                  | 36                          | 6                              | 3,0   | 0,20   | 2,05                        | 0,98                         | Pasir Lepas                        | non-Kohesif              | 1,60                              | 28,00         |                             |
| 1,20                  | 48                          | 12                             | 6,0   | 0,40   | 3,41                        | 1,18                         | Lempung Berpasir/Berlanau          | Kohesif                  | 1,55                              |               | 1,25                        |
| 1,40                  | 58                          | 10                             | 5,0   | 0,33   | 2,27                        | 1,47                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 28,00         |                             |
| 1,60                  | 70                          | 12                             | 6,0   | 0,40   | 2,73                        | 1,47                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 28,00         |                             |
| 1,80                  | 90                          | 20                             | 10,0  | 0,67   | 2,73                        | 2,45                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 2,00                  | 110                         | 20                             | 10,0  | 0,67   | 2,27                        | 2,94                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 2,20                  | 140                         | 30                             | 15,0  | 1,00   | 2,92                        | 3,43                         | Pasir Berlempung                   | non-Kohesif              | 1,65                              | 29,00         |                             |
| 2,40                  | 160                         | 20                             | 10,0  | 0,67   | 2,27                        | 2,94                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 2,60                  | 190                         | 30                             | 15,0  | 1,00   | 2,56                        | 3,92                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 2,80                  | 220                         | 30                             | 15,0  | 1,00   | 2,92                        | 3,43                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 3,00                  | 250                         | 30                             | 15,0  | 1,00   | 2,56                        | 3,92                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 3,20                  | 270                         | 20                             | 10,0  | 0,67   | 2,27                        | 2,94                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 3,40                  | 290                         | 20                             | 10,0  | 0,67   | 2,73                        | 2,45                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 3,60                  | 310                         | 20                             | 10,0  | 0,67   | 1,71                        | 3,92                         | Pasir Medium                       | non-Kohesif              | 1,70                              | 33,00         |                             |
| 3,80                  | 330                         | 20                             | 10,0  | 0,67   | 2,27                        | 2,94                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 4,00                  | 346                         | 16                             | 8,0   | 0,53   | 2,18                        | 2,45                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 4,20                  | 360                         | 14                             | 7,0   | 0,47   | 1,91                        | 2,45                         | Pasir Medium                       | non-Kohesif              | 1,70                              | 33,00         |                             |
| 4,40                  | 370                         | 10                             | 5,0   | 0,33   | 1,71                        | 1,96                         | Pasir Medium                       | non-Kohesif              | 1,70                              | 33,00         |                             |
| 4,60                  | 380                         | 10                             | 5,0   | 0,33   | 1,71                        | 1,96                         | Pasir Medium                       | non-Kohesif              | 1,70                              | 33,00         |                             |
| 4,80                  | 390                         | 10                             | 5,0   | 0,33   | 2,27                        | 1,47                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 5,00                  | 402                         | 12                             | 6,0   | 0,40   | 2,73                        | 1,47                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 5,20                  | 418                         | 16                             | 8,0   | 0,53   | 2,73                        | 1,96                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 5,40                  | 432                         | 14                             | 7,0   | 0,47   | 2,65                        | 1,76                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 5,60                  | 452                         | 20                             | 10,0  | 0,67   | 3,41                        | 1,96                         | Lempung Berpasir/Berlanau          | Kohesif                  | 1,60                              |               | 2,5                         |
| 5,80                  | 468                         | 16                             | 8,0   | 0,53   | 2,73                        | 1,96                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 6,00                  | 484                         | 16                             | 8,0   | 0,53   | 2,48                        | 2,16                         | Pasir Berlempung                   | non-Kohesif              | 1,60                              | 29,00         |                             |
| 6,20                  | 504                         | 20                             | 10,0  | 0,67   | 2,73                        | 2,45                         | Pasir Berlempung                   | non-Kohesif              | 1,65                              | 29,00         |                             |
| 6,40                  | 544                         | 40                             | 20,0  | 1,34   | 2,27                        | 5,88                         | Pasir Berlempung                   | non-Kohesif              | 1,70                              | 29,00         |                             |
| 6,60                  | 574                         | 30                             | 15,0  | 1,00   | 1,02                        | 9,80                         | Pasir Padat                        | non-Kohesif              | 1,80                              | 35,00         |                             |
| 6,80                  | 614                         | 40                             | 20,0  | 1,34   | 1,19                        | 11,27                        | Pasir Padat                        | non-Kohesif              | 1,80                              | 35,00         |                             |
| 7,00                  | 654                         | 40                             | 20,0  | 1,34   | 0,70                        | 19,11                        | Pasir Padat                        | non-Kohesif              | 1,80                              | 35,00         |                             |
| 7,20                  | 654                         | 0                              | 0,0   | 0,00   | 0,00                        | 24,50                        | Pasir Padat                        | non-Kohesif              | 1,80                              | 35,00         |                             |

## LAMPIRAN 5

Untuk Data Tanah Timbunan yaitu menggunakan Tanah Timbunan Jenis Sirtu dengan spesifikasi sebagai berikut:

### **Sirtu**

Unit Weight:  $\gamma = 1,70 \text{ t/m}^3$

Stress-State: *Effective*

Saturated Unit Weight:  $\gamma_{\text{sat}} = 1,70 \text{ t/m}^3$

Data tersebut didapatkan berdasarkan hasil dari wawancara secara langsung kepada konsultan pengawas Bpk. Anang Istanto S.T.