

PIANO DI BACINO STRALCIO

per la difesa idraulica ed idrogeologica



REGIONE
LIGURIA

TORRENTE ARMEA E RIO FONTI

(Ambito di Bacino n° 4 – Argentina)



Autorità di Bacino
Distrettuale
dell'Appennino
Settentrionale



VERIFICHE IDRAULICHE

Rio Cascine

PRIMA APPROVAZIONE DEL PIANO

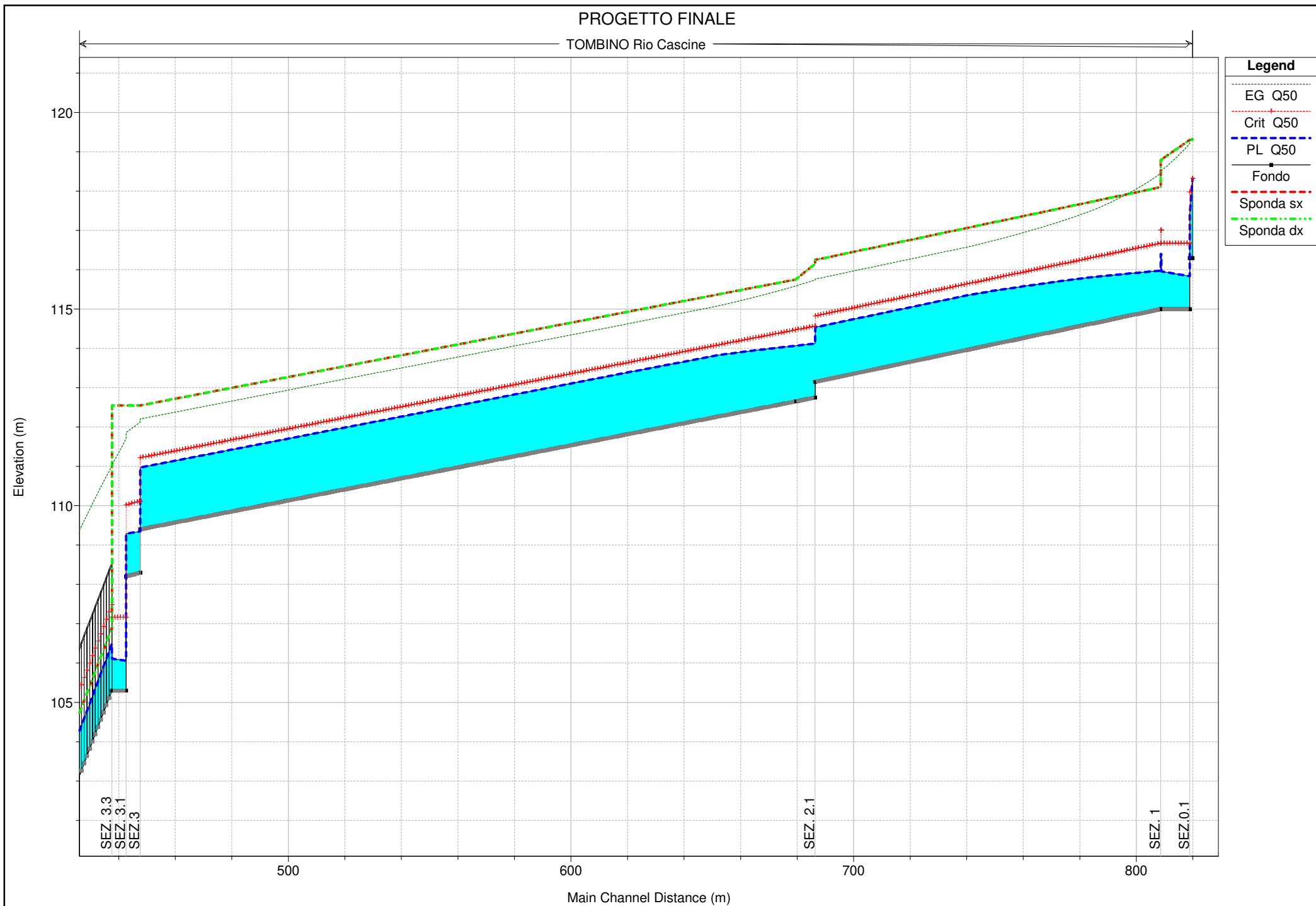
Delibera del Consiglio Provinciale di Imperia n. 94 del 18/02/2004

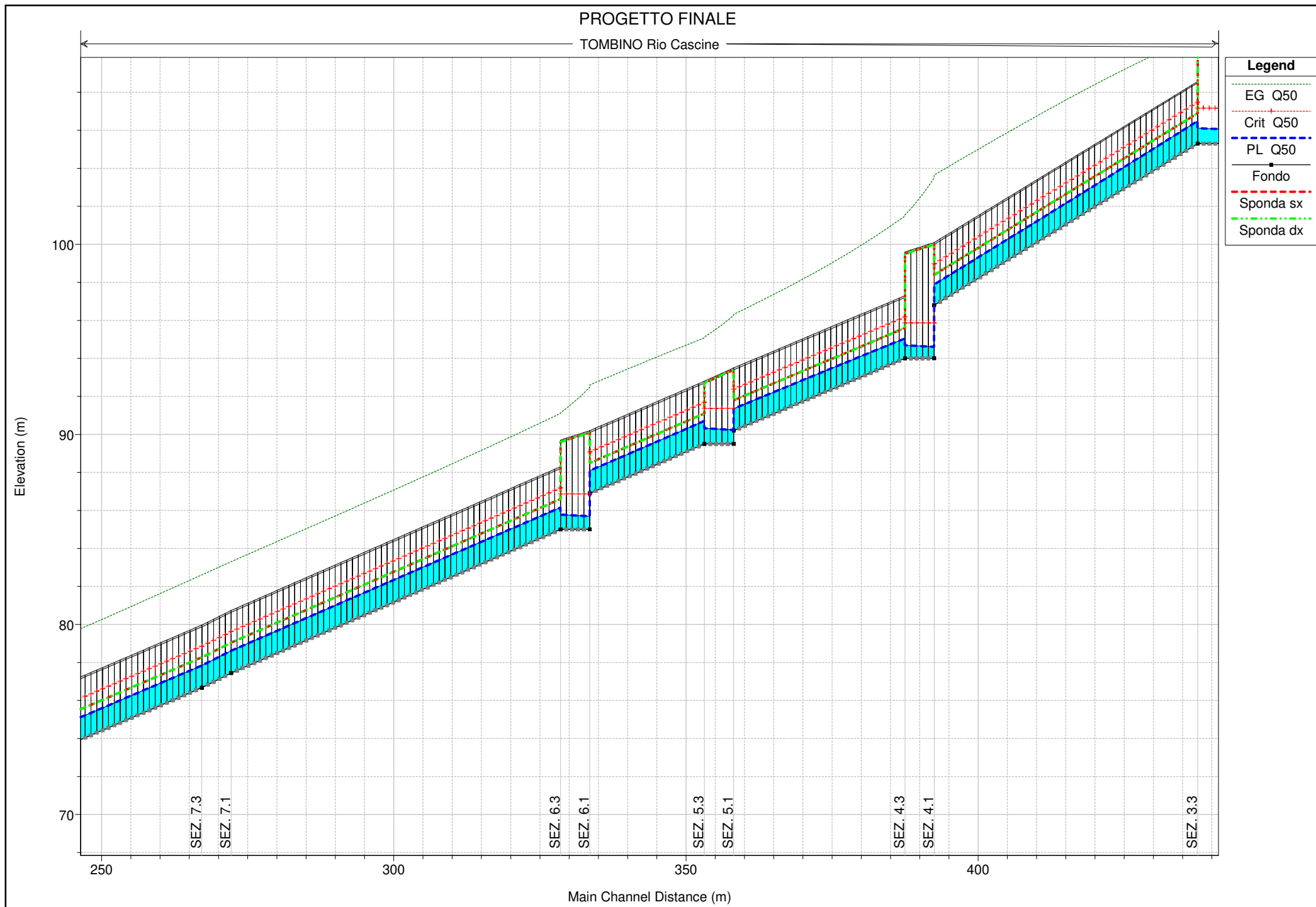
ULTIMA MODIFICA DELL'ELABORATO

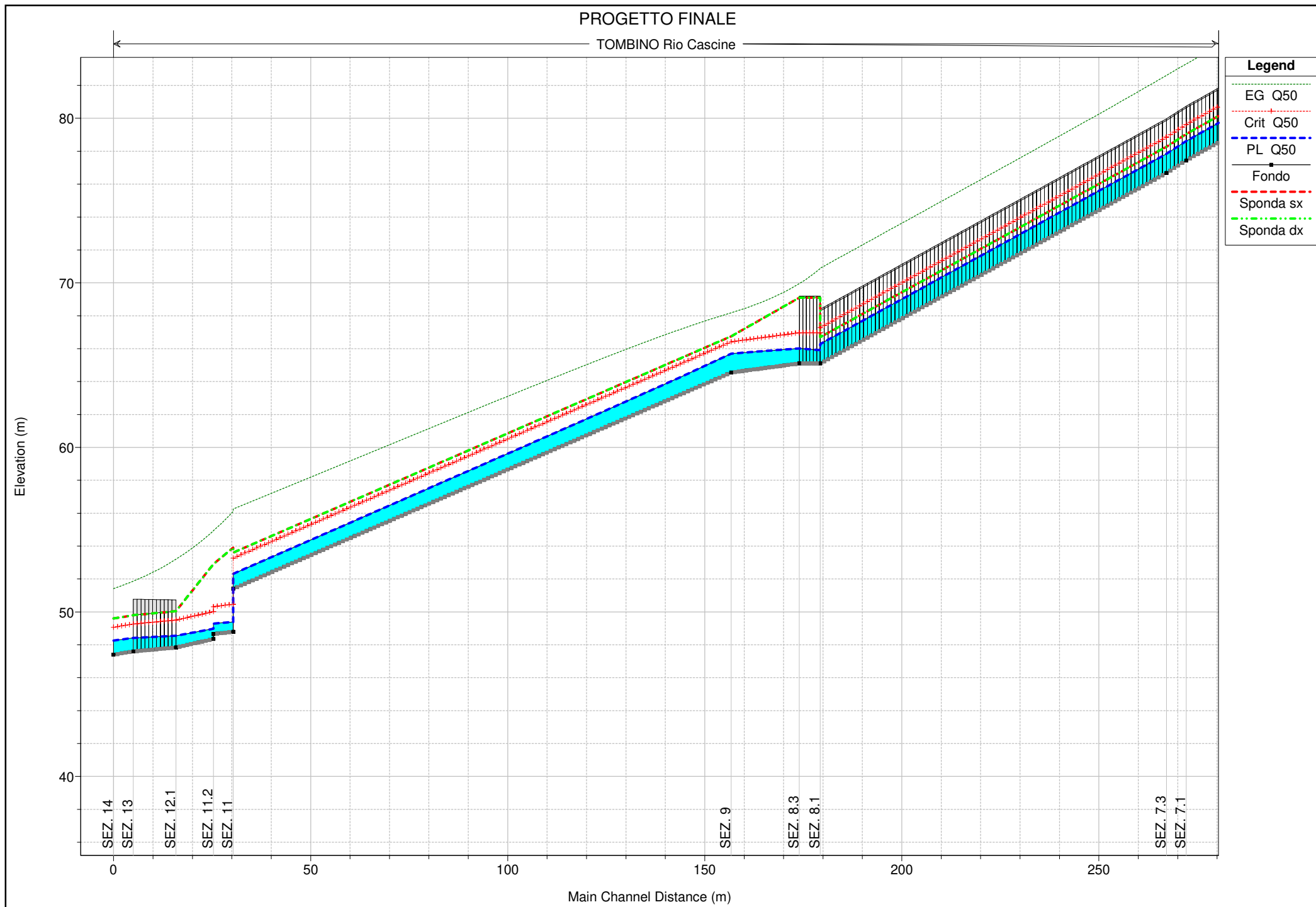
Decreto del Direttore Generale n. 708 del 09/02/2021

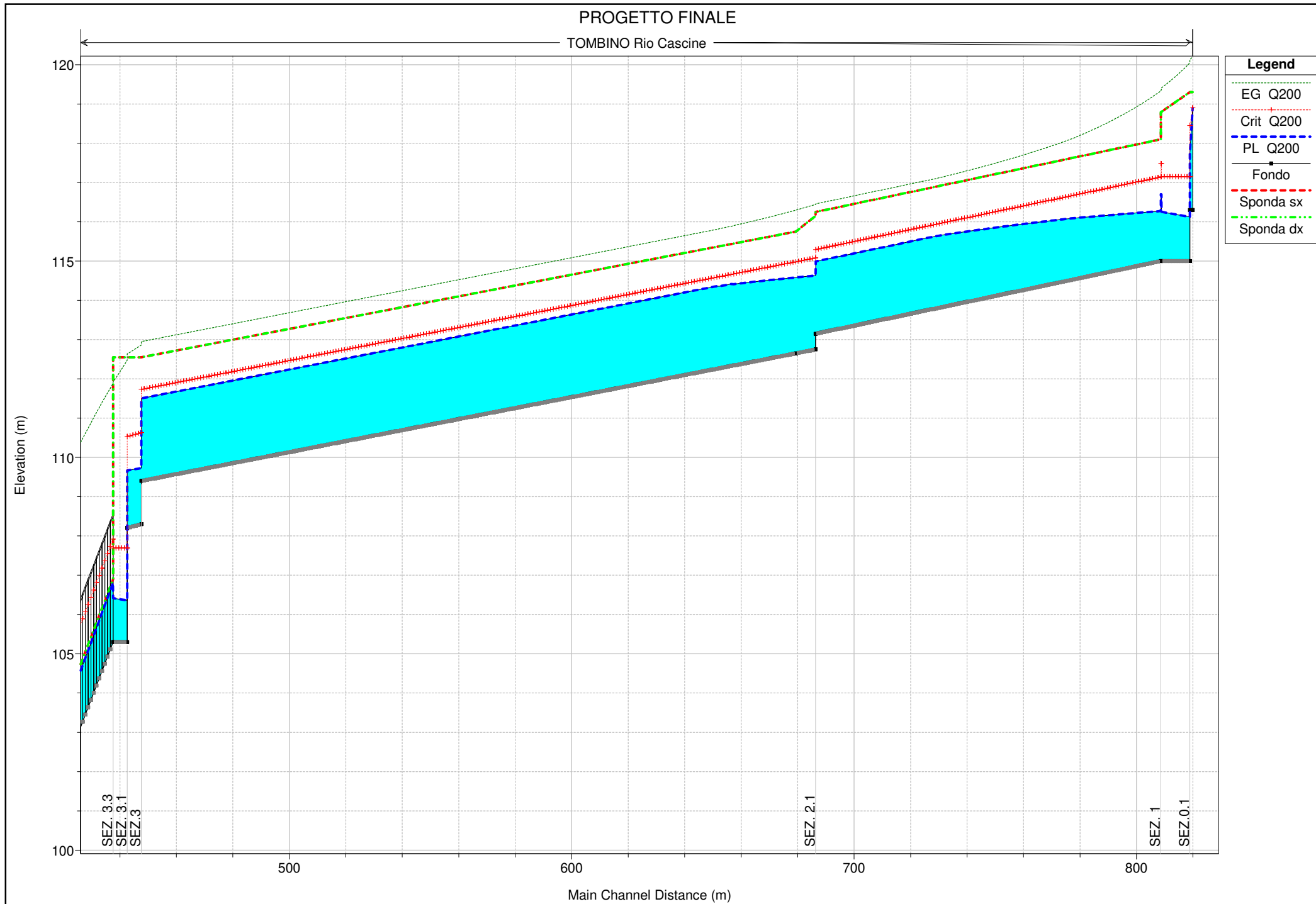
ENTRATA IN VIGORE

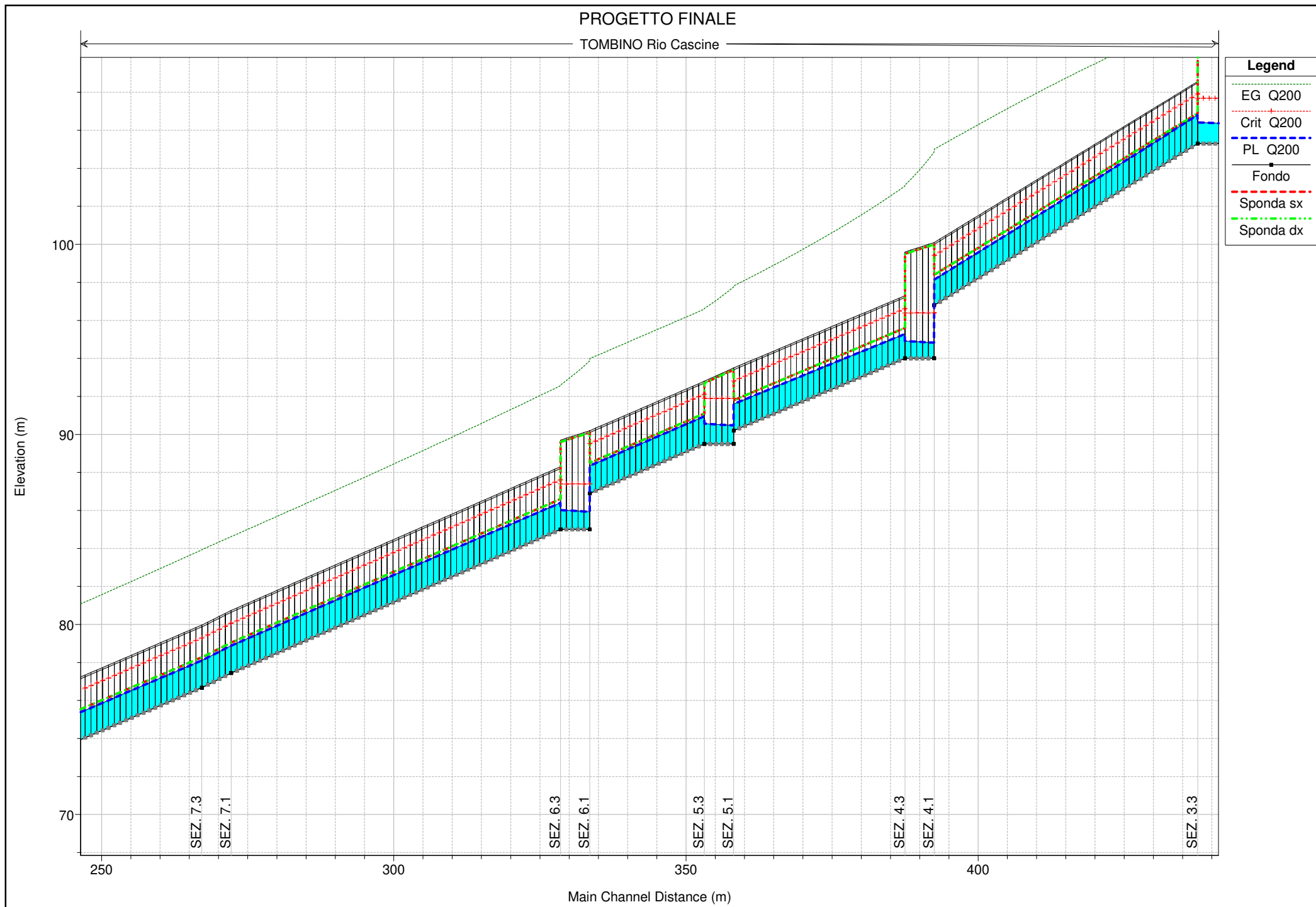
BURL n. 8 del 24/02/2021 – parte II

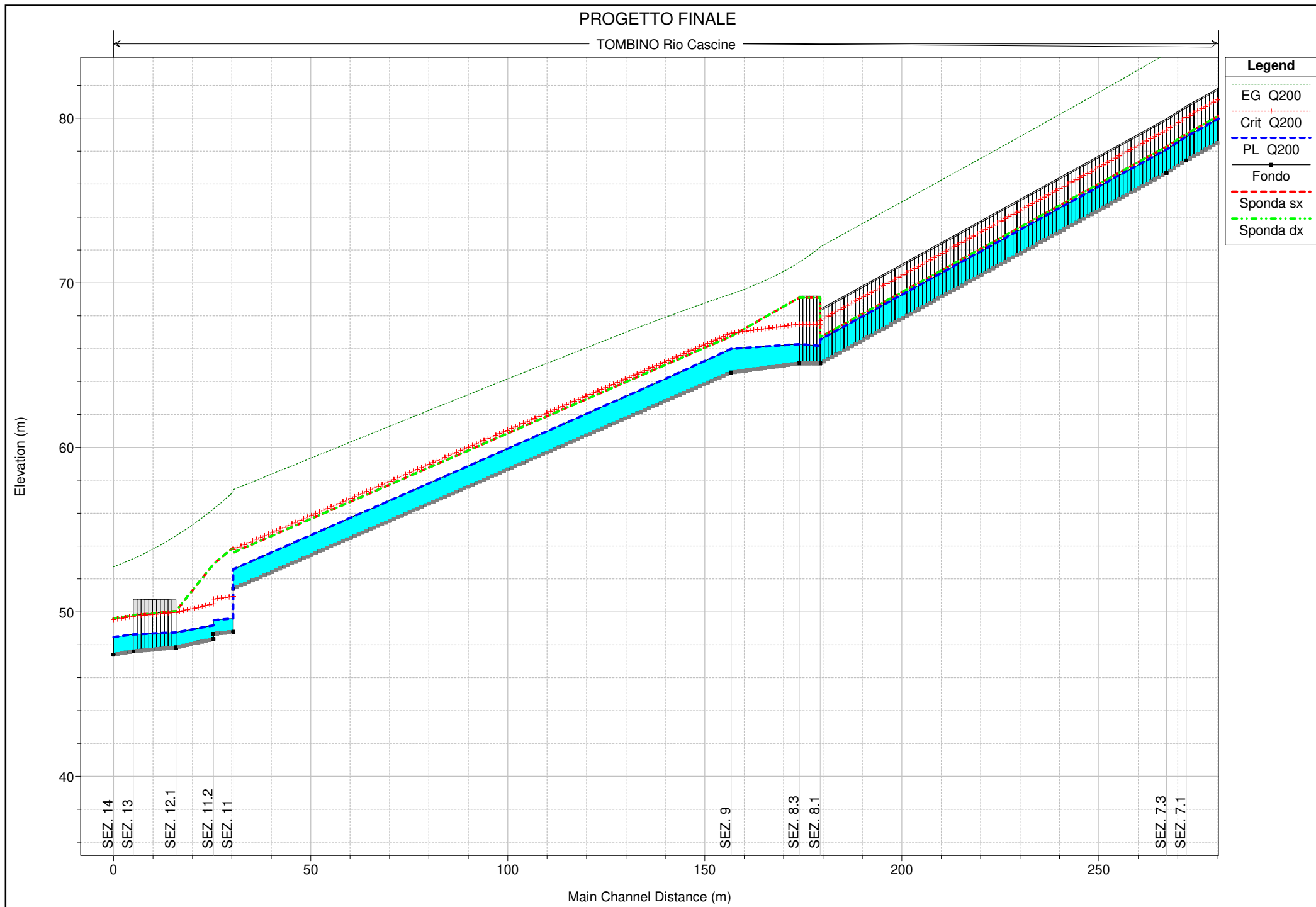


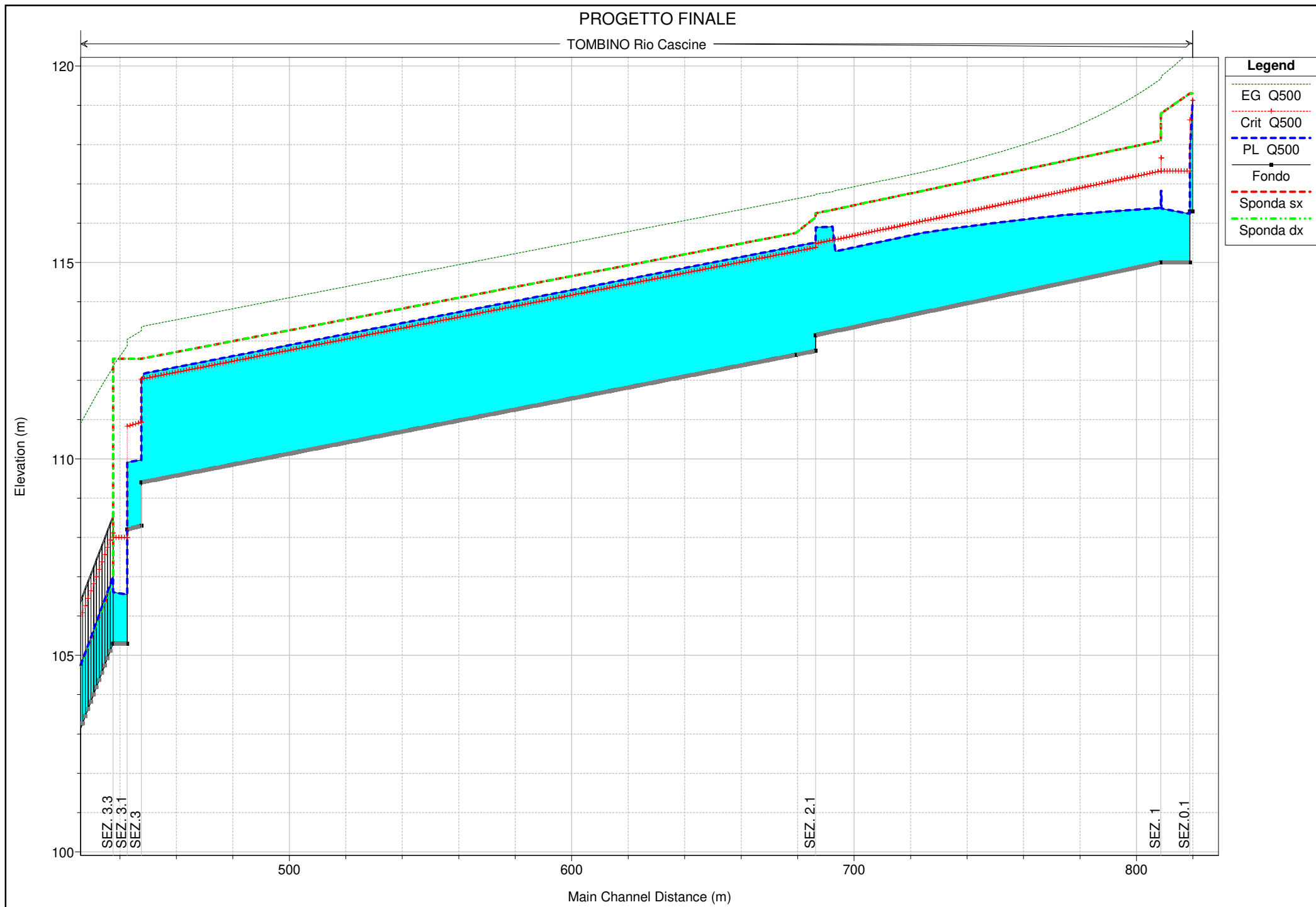


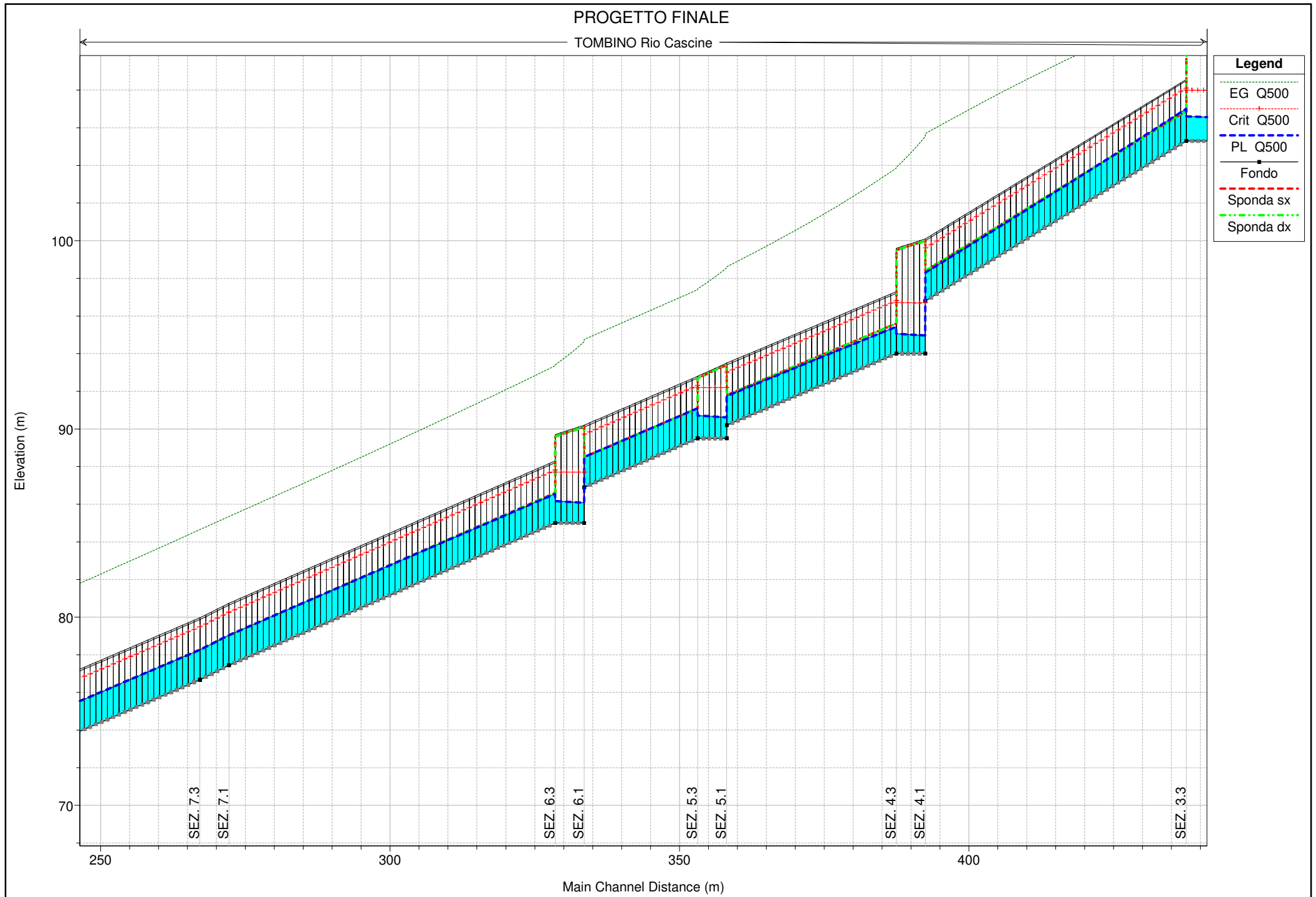


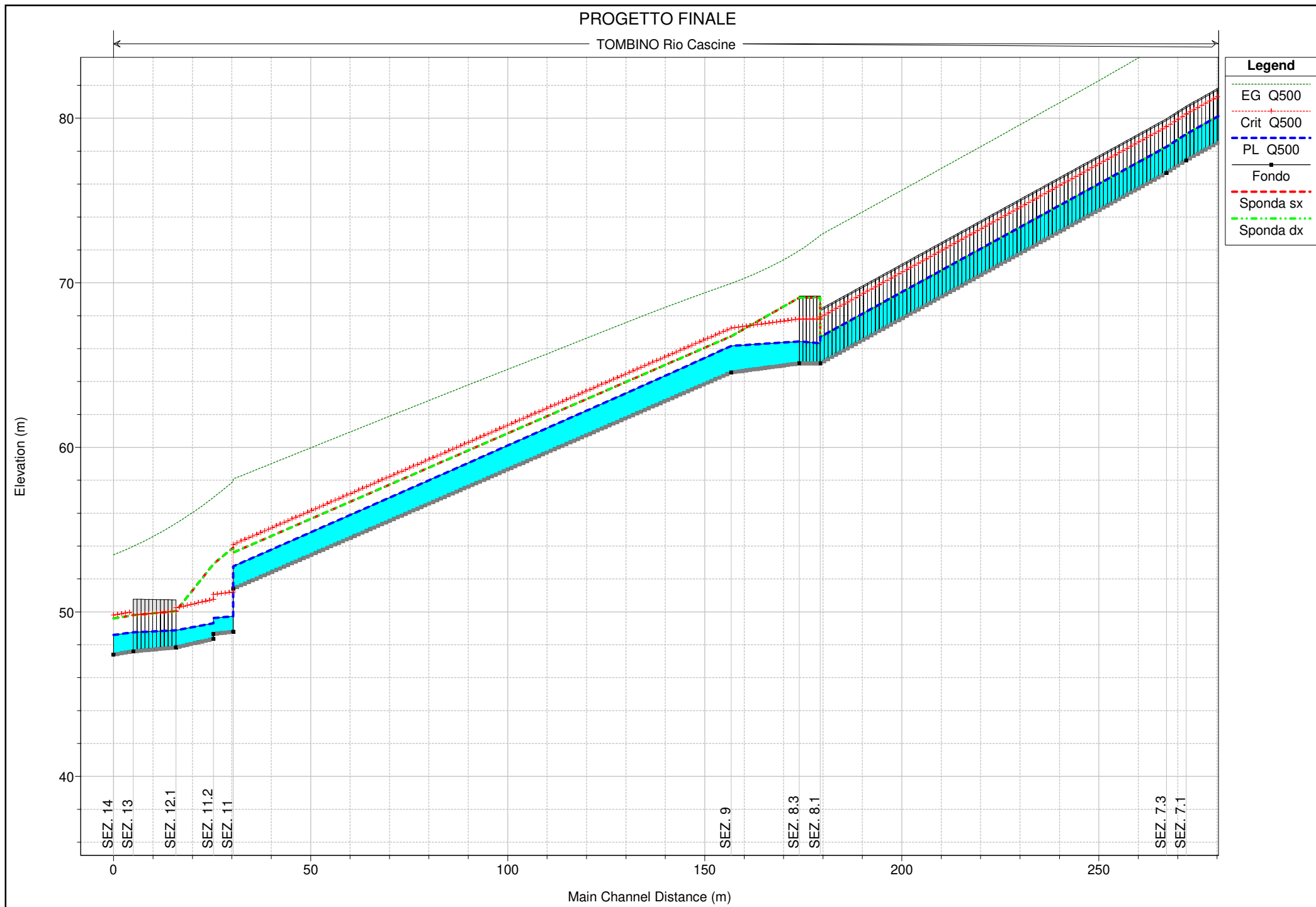


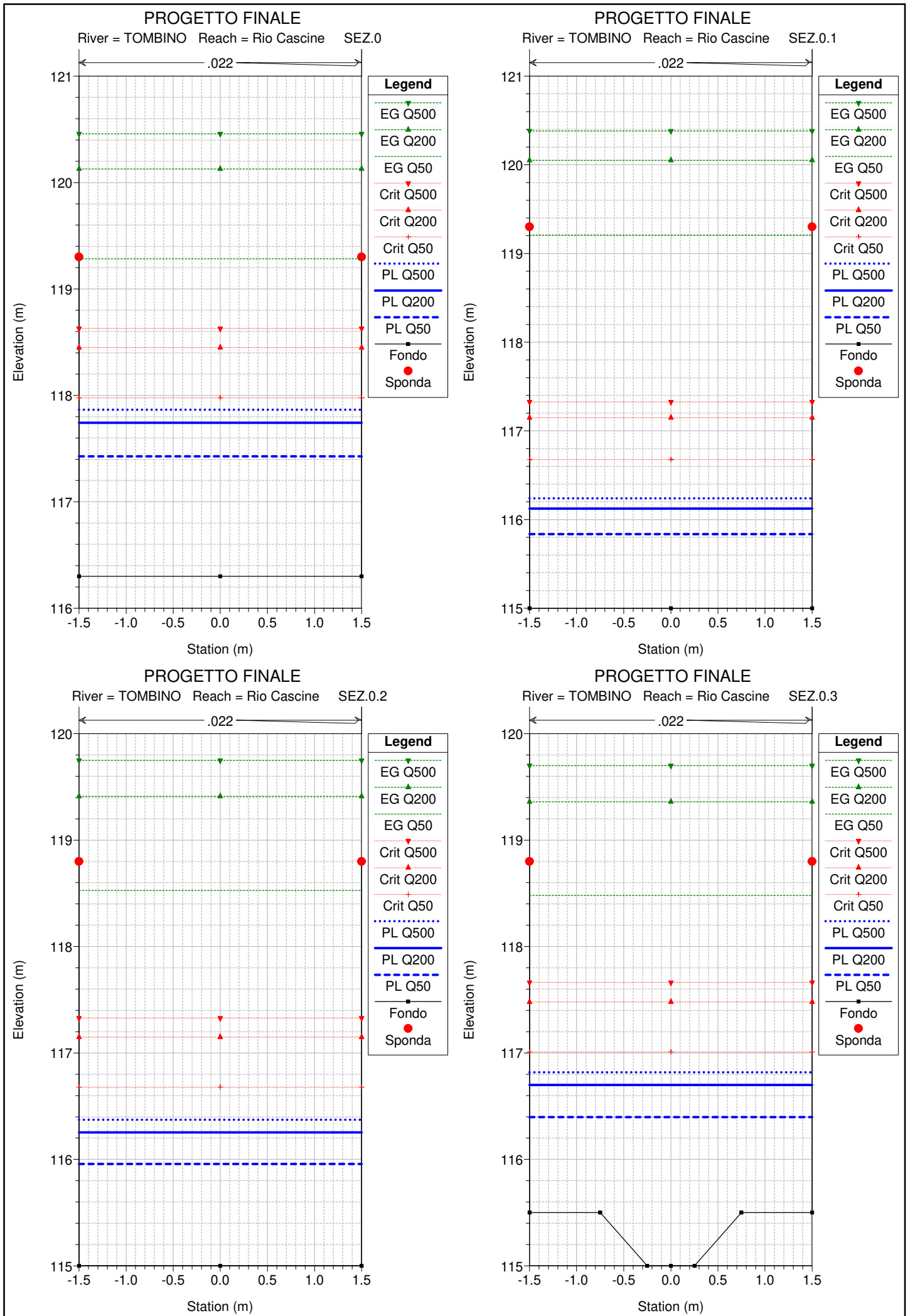


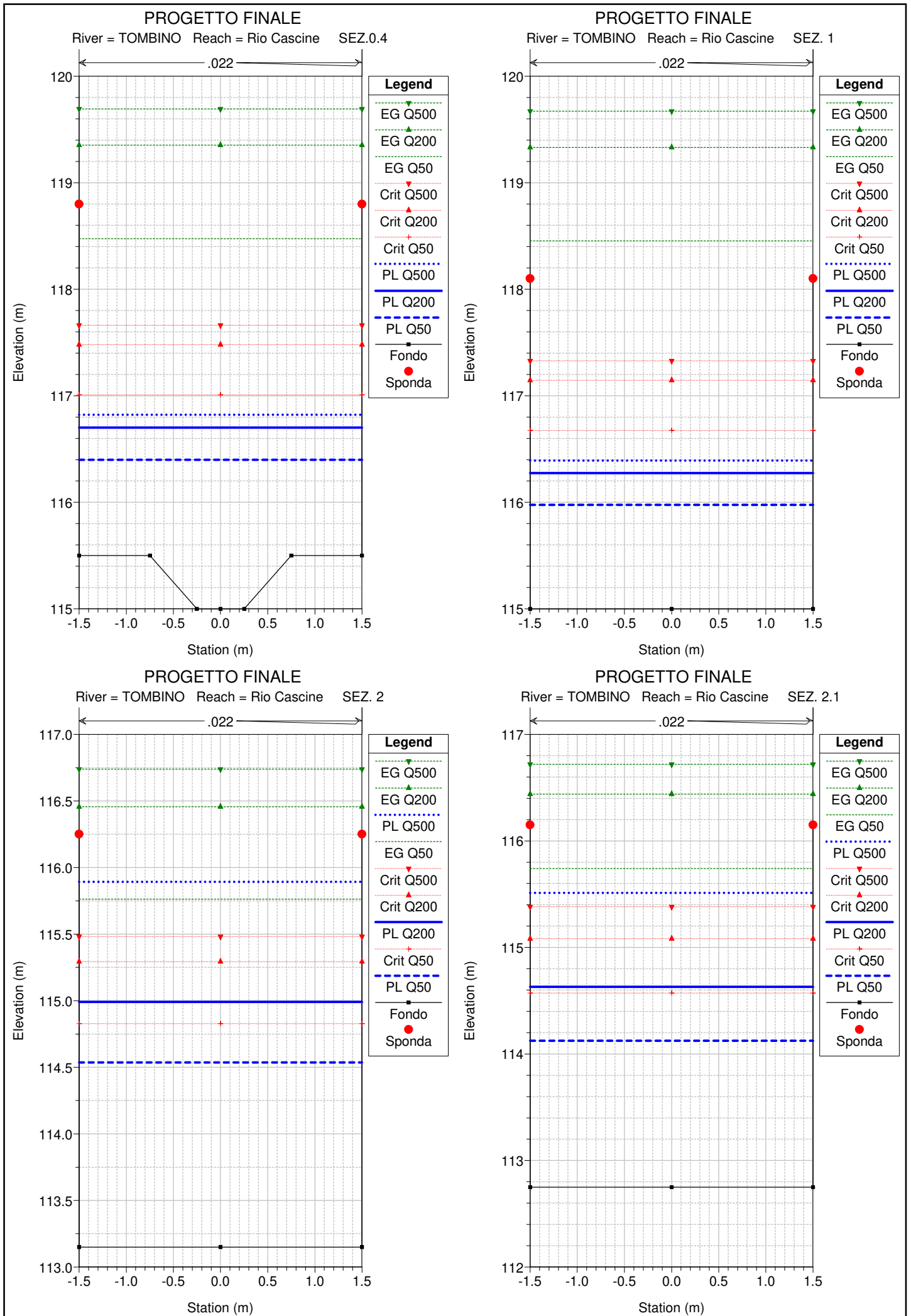


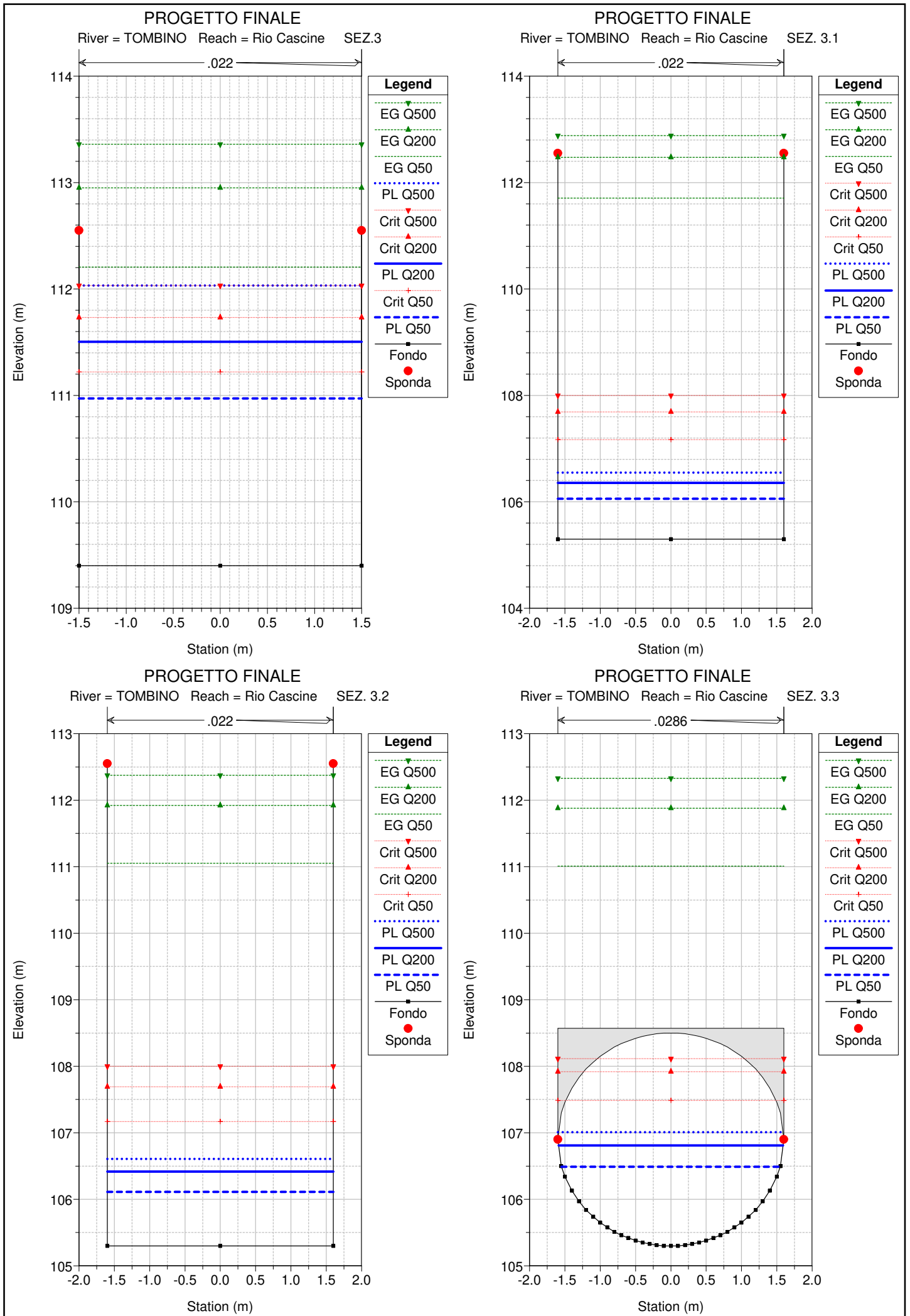


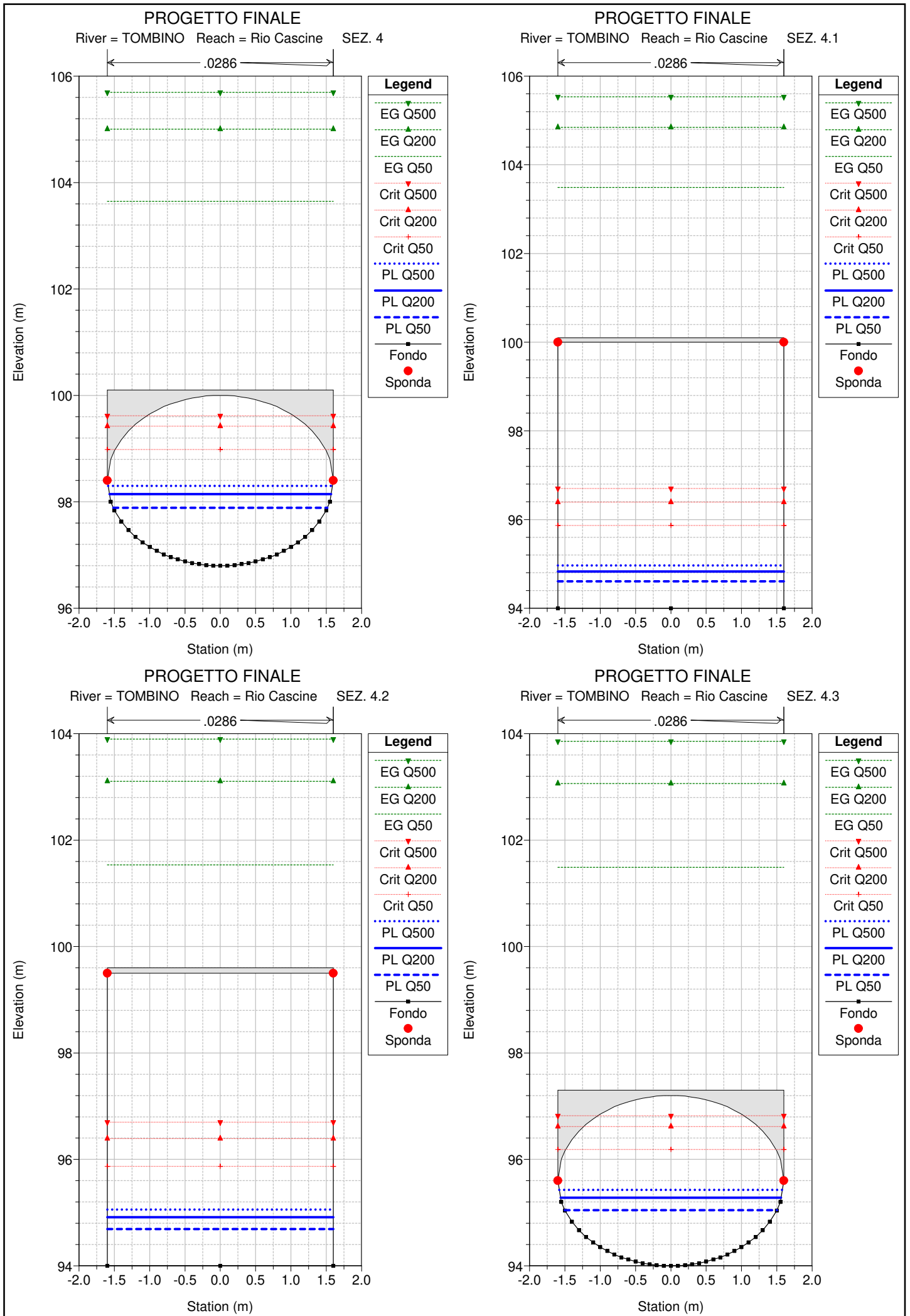


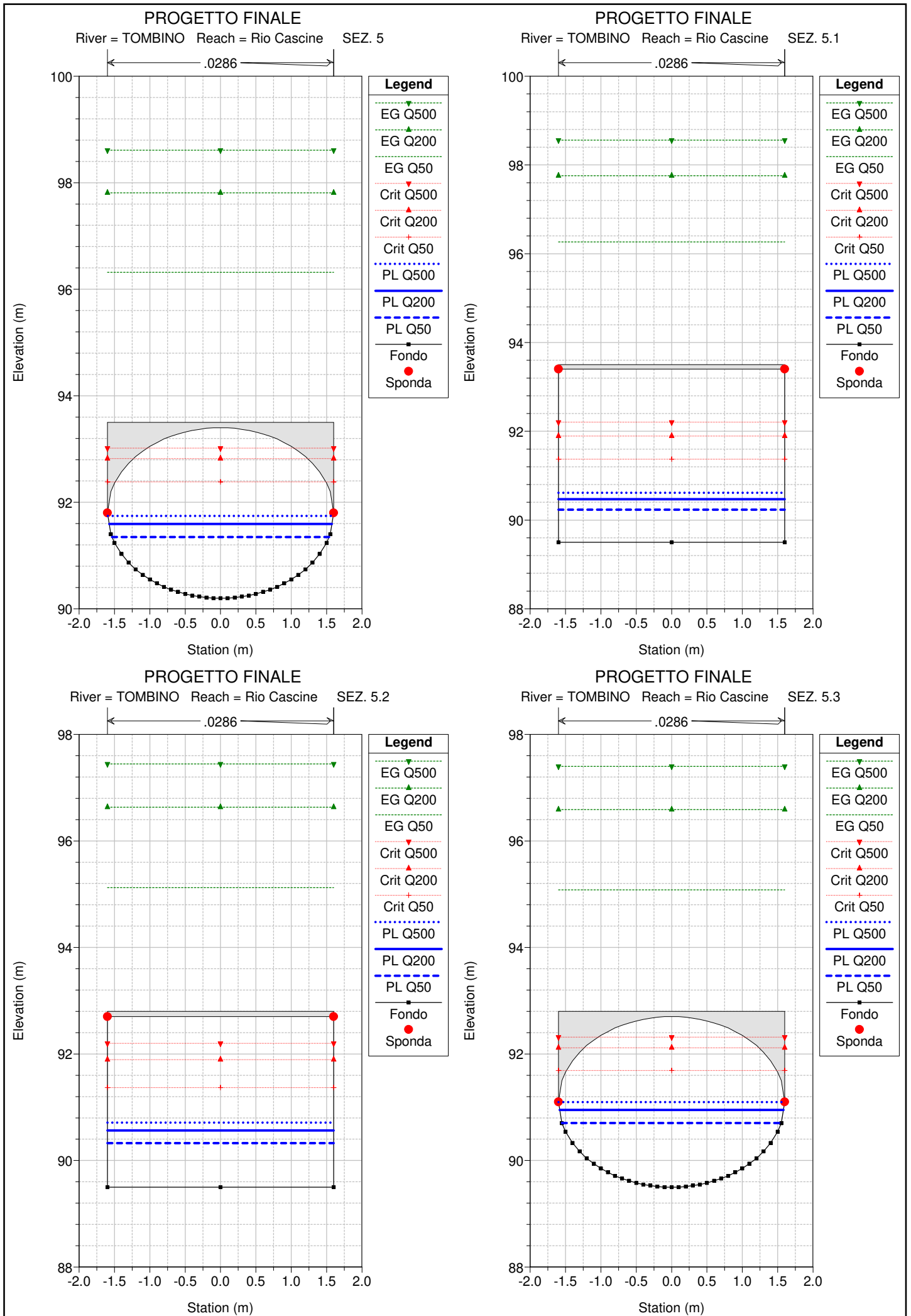


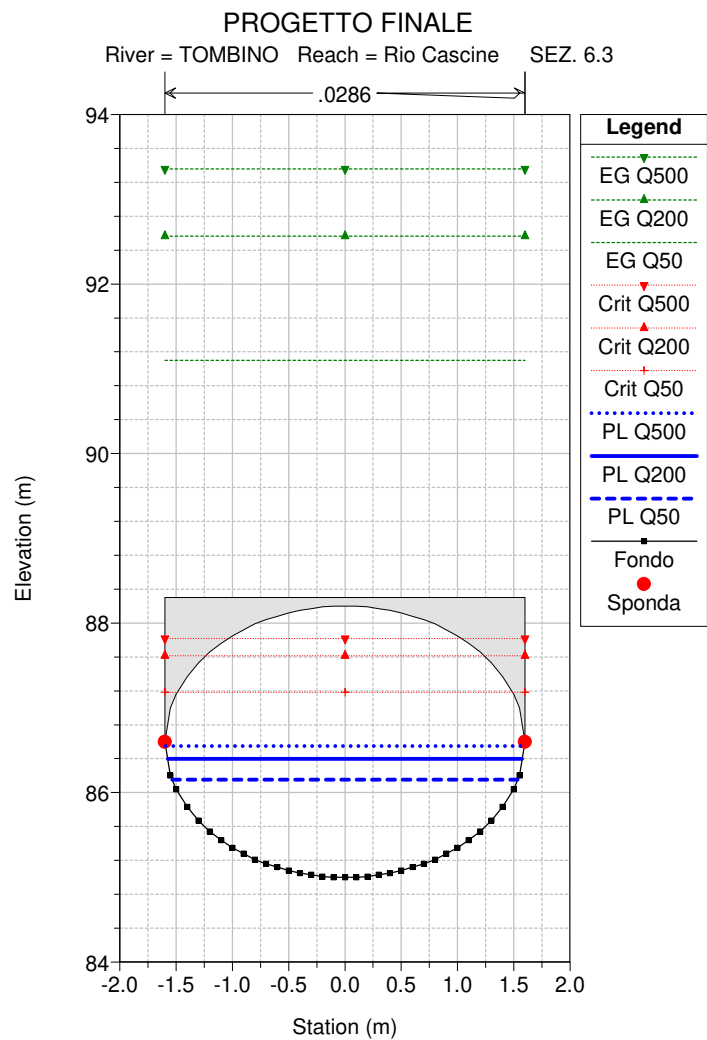
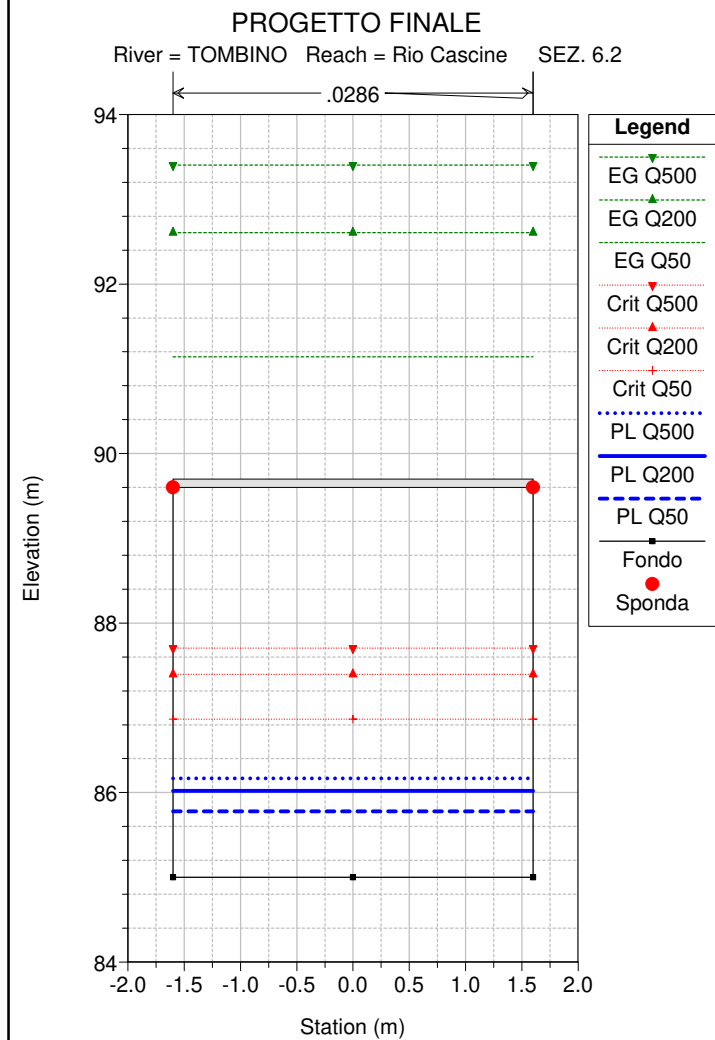
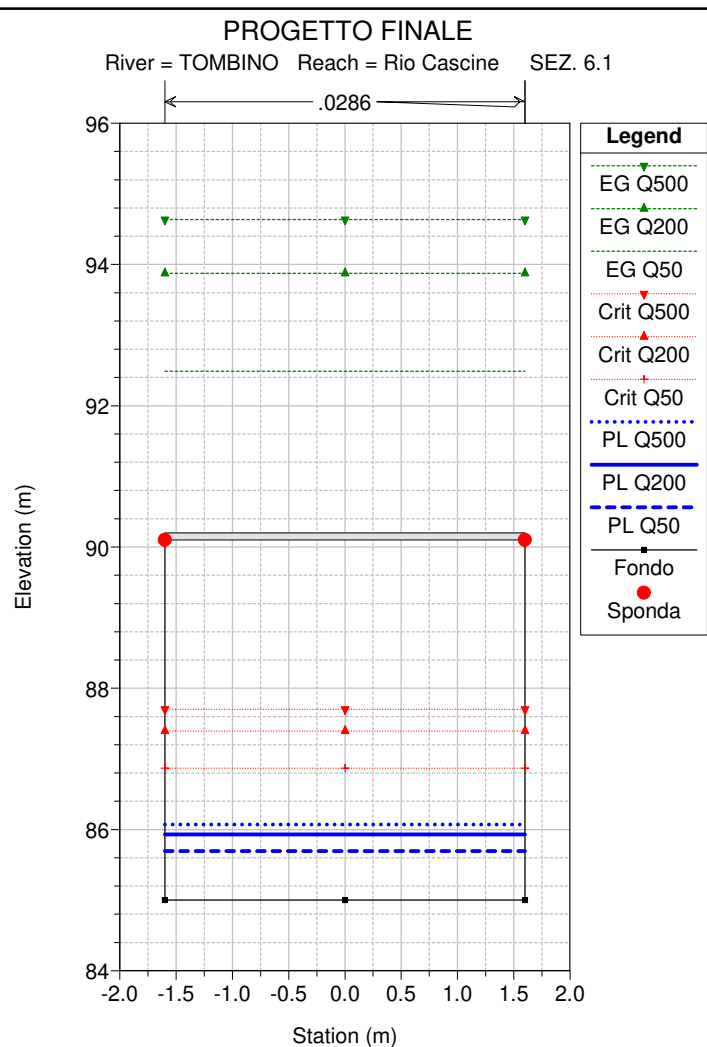
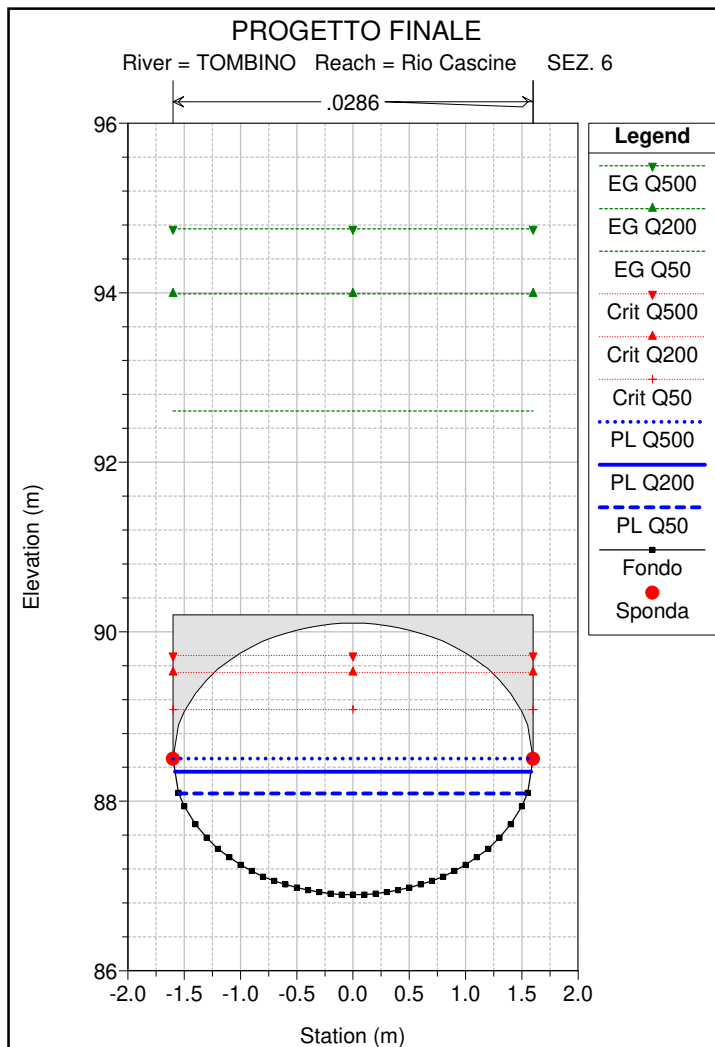


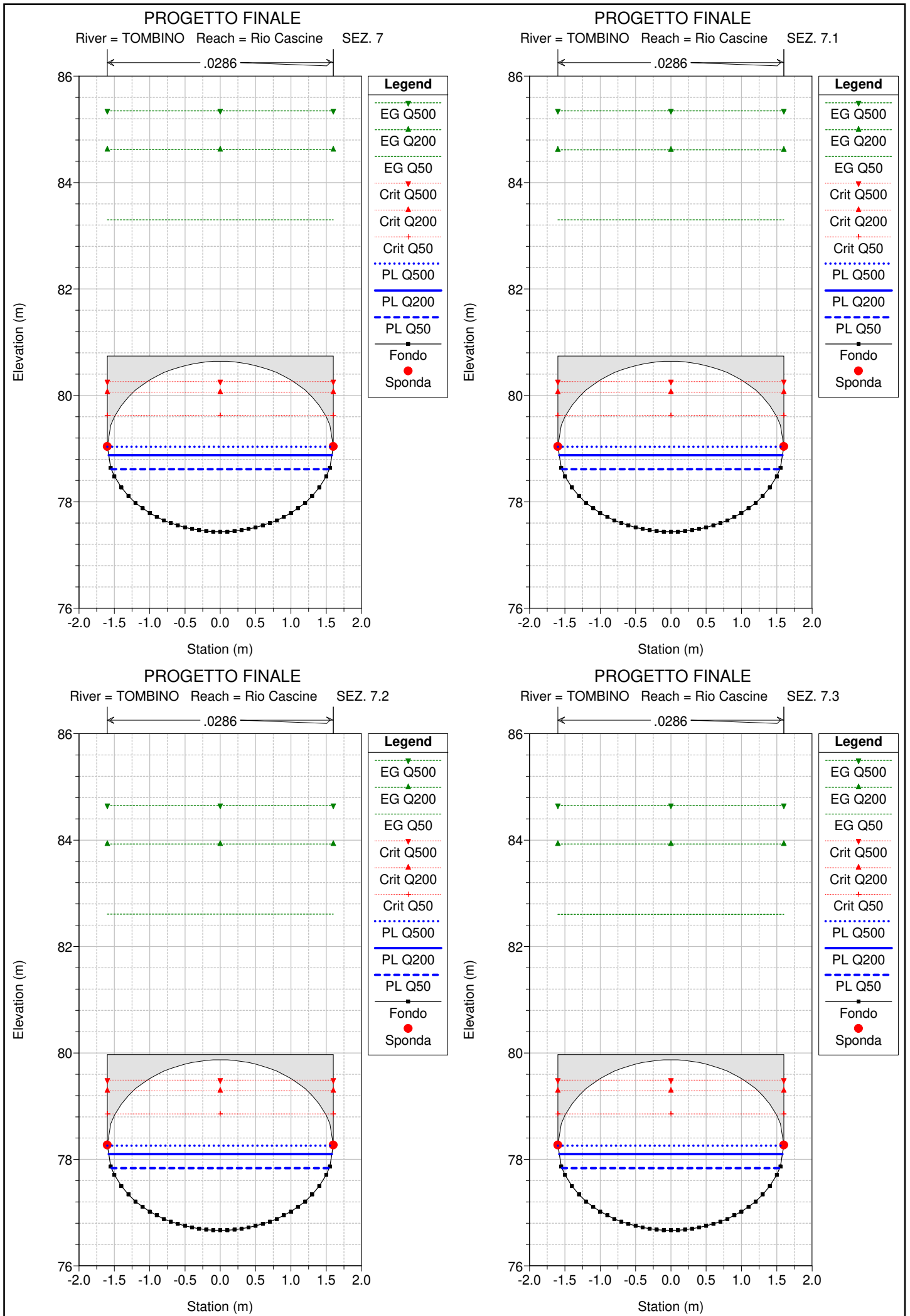


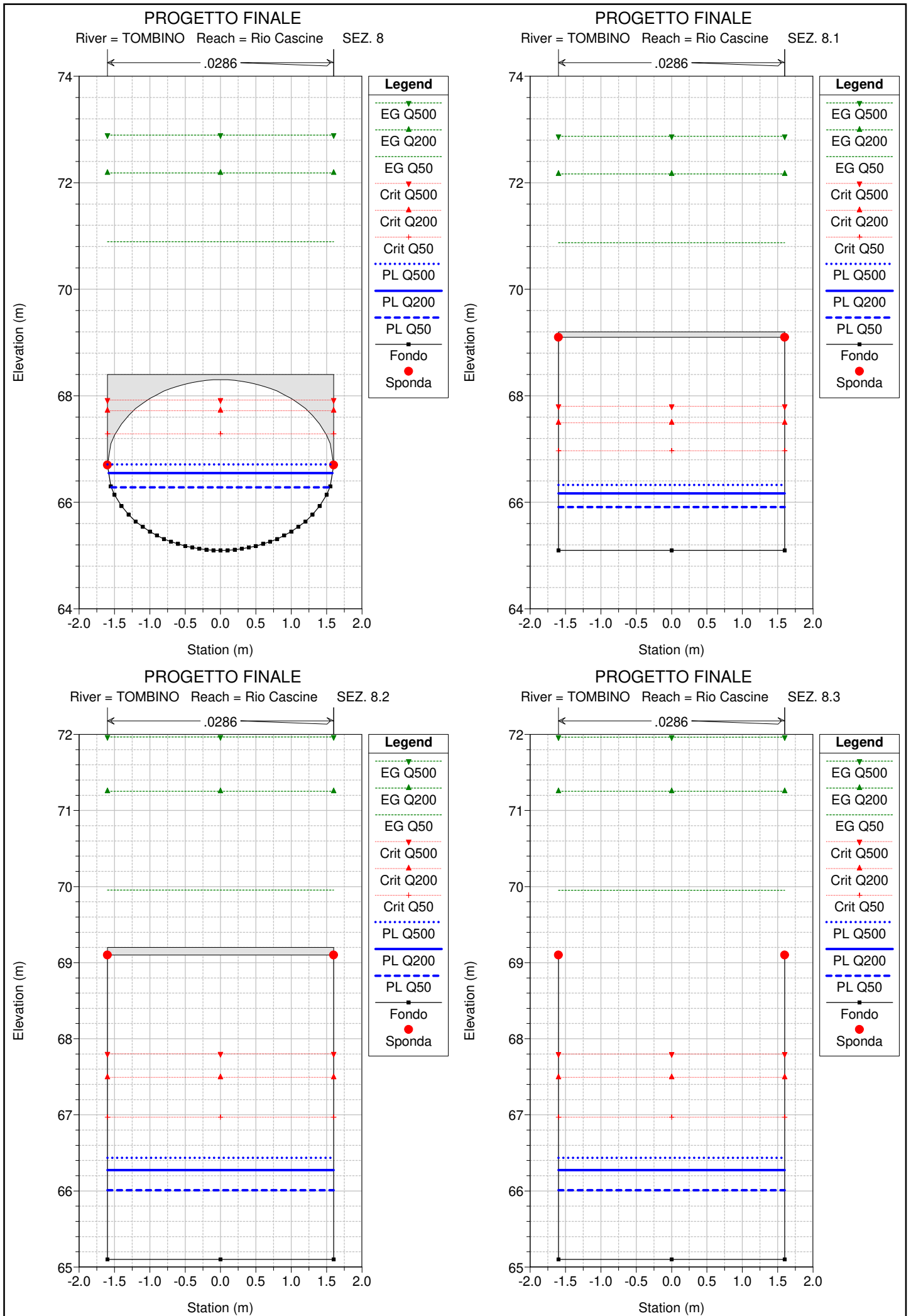


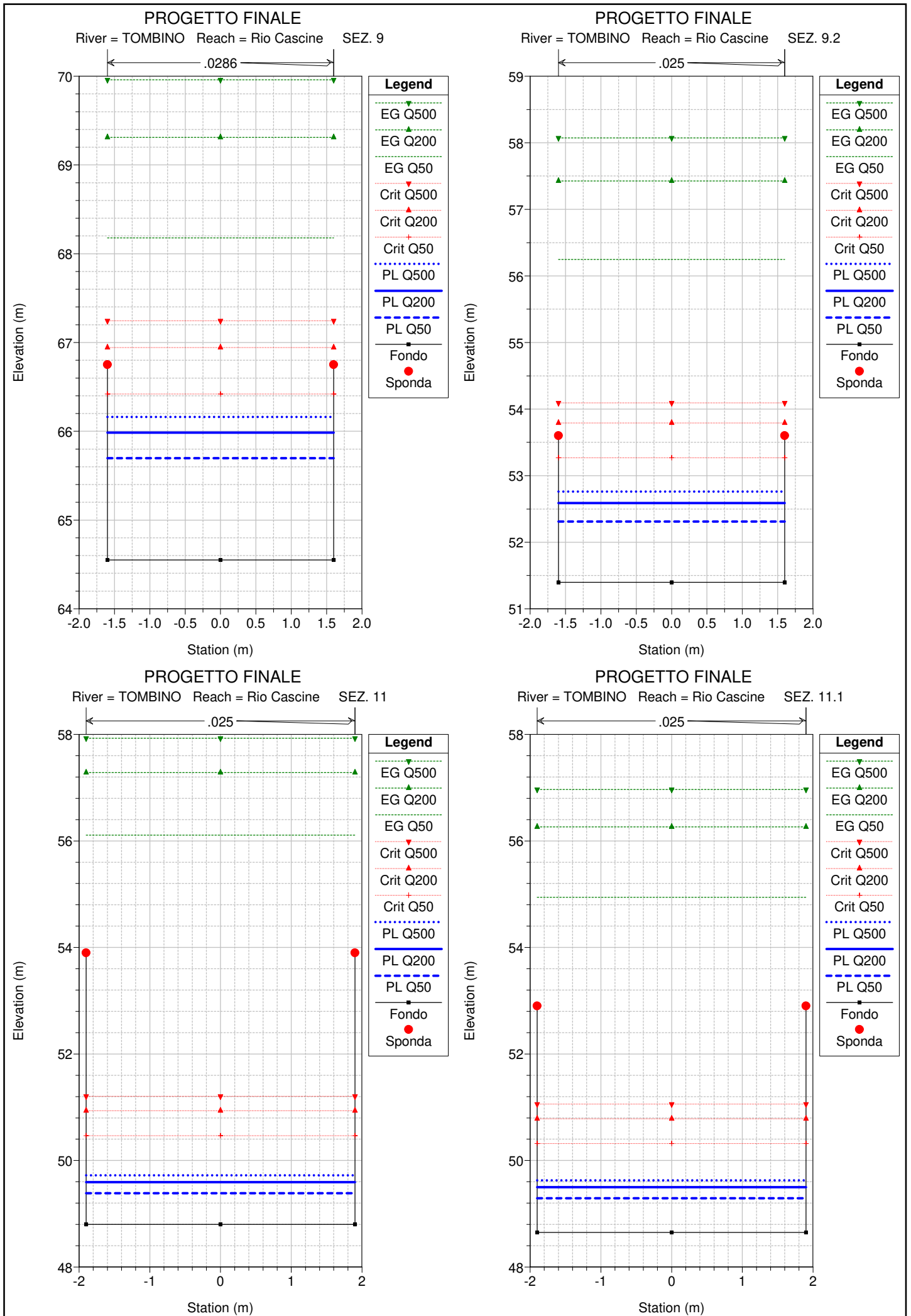


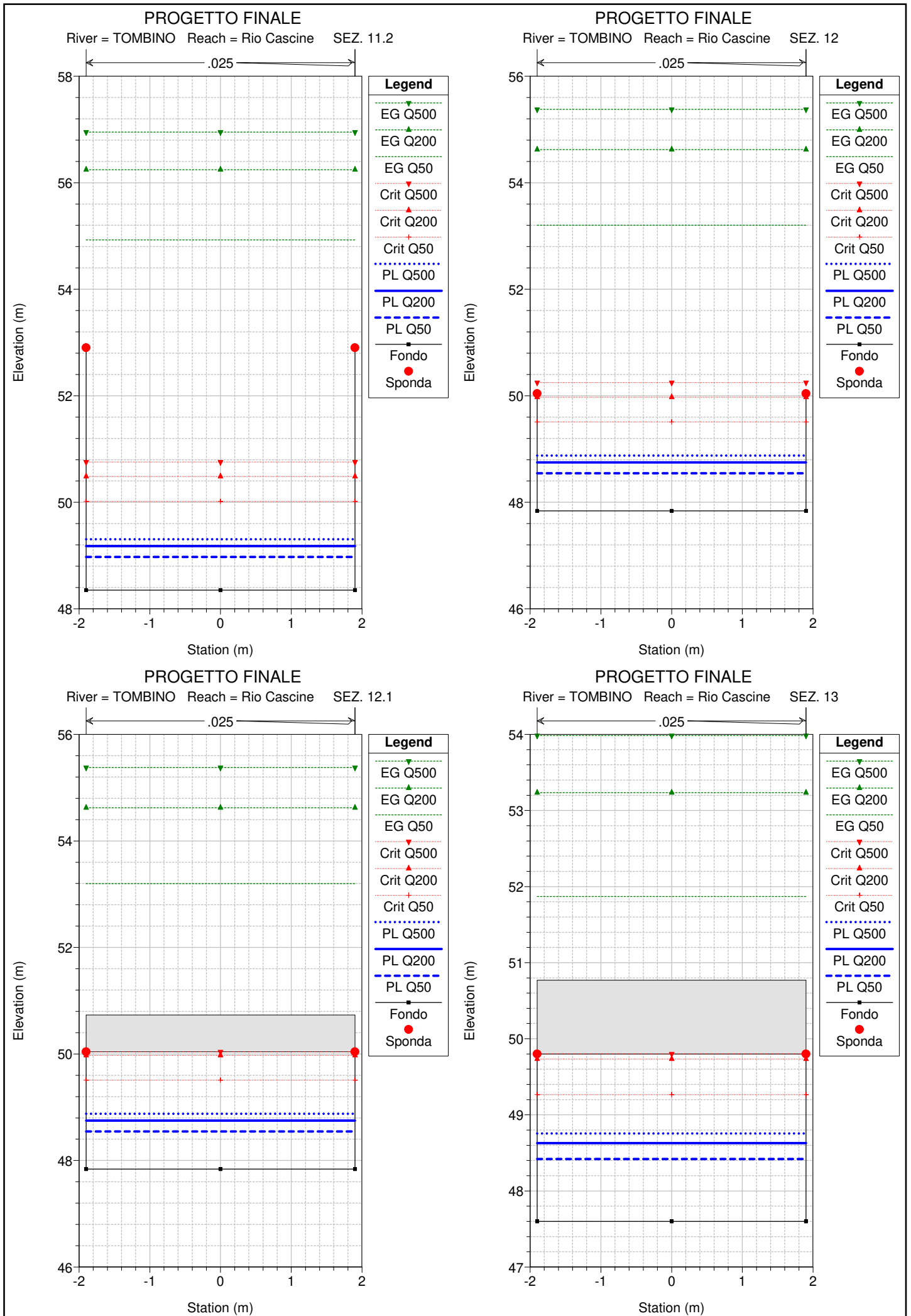


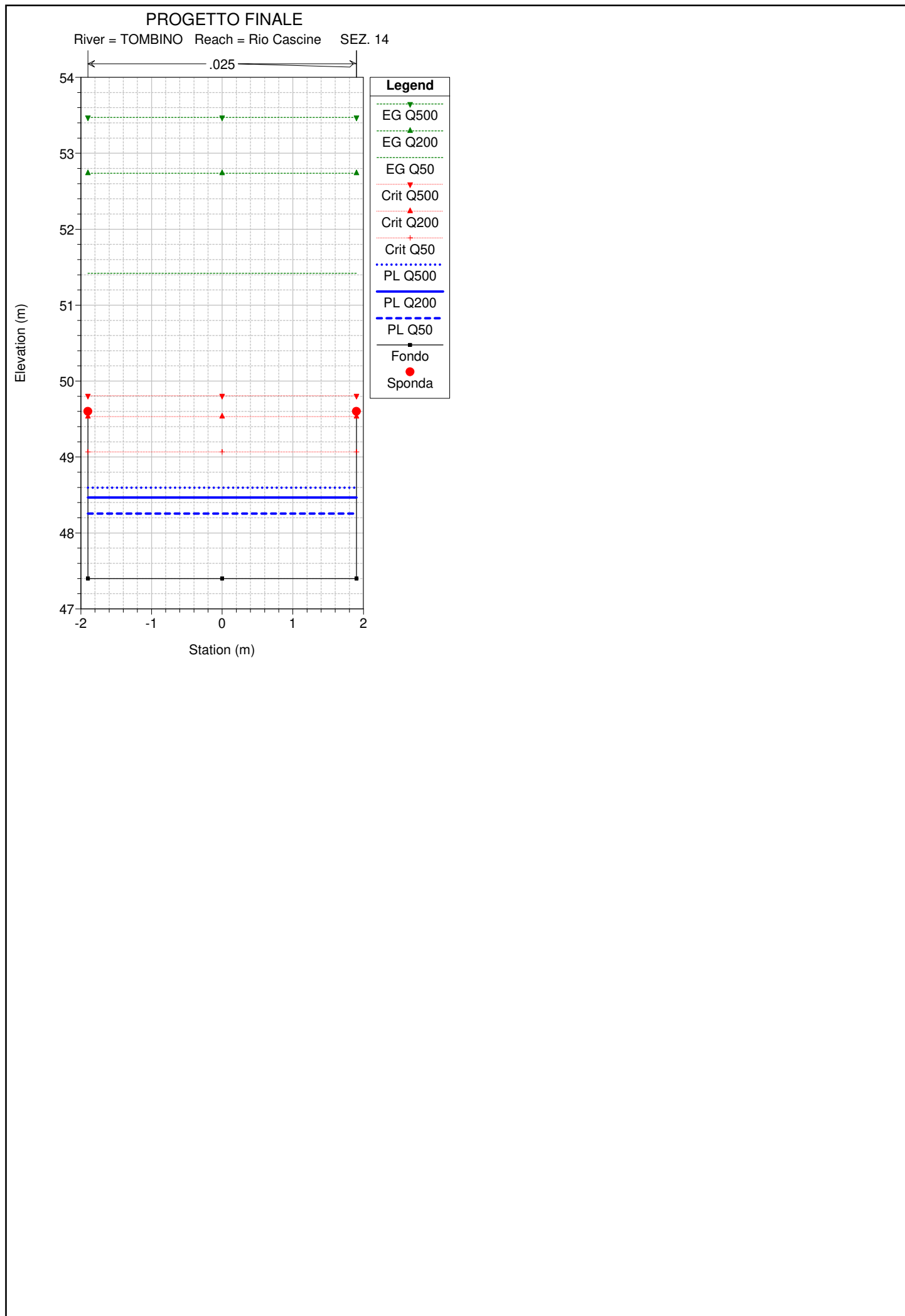












HEC-RAS Plan: AS BUILT River: TOMBINO Reach: Rio Cascine

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | LOB Elev (m) | L. Freeboard (m) | ROB Elev (m) | R. Freeboard (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------------|-----------|---------|-------------------|------------------|------------------|-----------------|---------------------|-----------------|---------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| Rio Cascine | 301 | Q50 | 20.40 | 116.30 | 118.32 | 119.30 | 0.98 | 119.30 | 0.98 | 118.32 | 119.35 | 0.014951 | 4.48 | 4.56 | 2.25 | 1.00 |
| Rio Cascine | 301 | Q200 | 29.60 | 116.30 | 118.90 | 119.30 | 0.40 | 119.30 | 0.40 | 118.90 | 120.21 | 0.017108 | 5.06 | 5.85 | 2.25 | 1.00 |
| Rio Cascine | 301 | Q500 | 33.50 | 116.30 | 119.13 | 119.30 | 0.17 | 119.30 | 0.17 | 119.13 | 120.54 | 0.017942 | 5.27 | 6.36 | 2.25 | 1.00 |
| Rio Cascine | 300 | Q50 | 20.40 | 116.30 | 117.43 | 119.30 | 1.87 | 119.30 | 1.87 | 117.98 | 119.28 | 0.031747 | 6.04 | 3.38 | 3.00 | 1.82 |
| Rio Cascine | 300 | Q200 | 29.60 | 116.30 | 117.74 | 119.30 | 1.56 | 119.30 | 1.56 | 118.45 | 120.13 | 0.034118 | 6.84 | 4.33 | 3.00 | 1.82 |
| Rio Cascine | 300 | Q500 | 33.50 | 116.30 | 117.87 | 119.30 | 1.43 | 119.30 | 1.43 | 118.63 | 120.46 | 0.035093 | 7.13 | 4.70 | 3.00 | 1.82 |
| Rio Cascine | 299 | Q50 | 20.40 | 115.00 | 115.84 | 119.30 | 3.46 | 119.30 | 3.46 | 116.68 | 119.21 | 0.073341 | 8.13 | 2.51 | 3.00 | 2.84 |
| Rio Cascine | 299 | Q200 | 29.60 | 115.00 | 116.12 | 119.30 | 3.18 | 119.30 | 3.18 | 117.15 | 120.05 | 0.067202 | 8.78 | 3.37 | 3.00 | 2.64 |
| Rio Cascine | 299 | Q500 | 33.50 | 115.00 | 116.24 | 119.30 | 3.06 | 119.30 | 3.06 | 117.33 | 120.38 | 0.065930 | 9.01 | 3.72 | 3.00 | 2.59 |
| Rio Cascine | 298 | Q50 | 20.40 | 115.00 | 115.96 | 118.80 | 2.84 | 118.80 | 2.84 | 116.68 | 118.53 | 0.049872 | 7.10 | 2.87 | 3.00 | 2.32 |
| Rio Cascine | 298 | Q200 | 29.60 | 115.00 | 116.25 | 118.80 | 2.55 | 118.80 | 2.55 | 117.15 | 119.41 | 0.049798 | 7.87 | 3.76 | 3.00 | 2.24 |
| Rio Cascine | 298 | Q500 | 33.50 | 115.00 | 116.37 | 118.80 | 2.43 | 118.80 | 2.43 | 117.33 | 119.75 | 0.049999 | 8.14 | 4.12 | 3.00 | 2.22 |
| Rio Cascine | 297 | Q50 | 20.40 | 115.00 | 116.40 | 118.80 | 2.40 | 118.80 | 2.40 | 117.01 | 118.48 | 0.037994 | 6.39 | 3.19 | 3.00 | 1.98 |
| Rio Cascine | 297 | Q200 | 29.60 | 115.00 | 116.70 | 118.80 | 2.10 | 118.80 | 2.10 | 117.48 | 119.36 | 0.040268 | 7.22 | 4.10 | 3.00 | 1.97 |
| Rio Cascine | 297 | Q500 | 33.50 | 115.00 | 116.82 | 118.80 | 1.98 | 118.80 | 1.98 | 117.66 | 119.70 | 0.041116 | 7.52 | 4.46 | 3.00 | 1.97 |
| Rio Cascine | 296 | Q50 | 20.40 | 115.00 | 116.40 | 118.80 | 2.40 | 118.80 | 2.40 | 117.01 | 118.47 | 0.037755 | 6.38 | 3.20 | 3.00 | 1.97 |
| Rio Cascine | 296 | Q200 | 29.60 | 115.00 | 116.70 | 118.80 | 2.10 | 118.80 | 2.10 | 117.48 | 119.35 | 0.040063 | 7.21 | 4.10 | 3.00 | 1.97 |
| Rio Cascine | 296 | Q500 | 33.50 | 115.00 | 116.82 | 118.80 | 1.98 | 118.80 | 1.98 | 117.66 | 119.69 | 0.040920 | 7.50 | 4.46 | 3.00 | 1.96 |
| Rio Cascine | 290 | Q50 | 20.40 | 115.00 | 115.98 | 118.10 | 2.12 | 118.10 | 2.12 | 116.68 | 118.45 | 0.047405 | 6.97 | 2.93 | 3.00 | 2.25 |
| Rio Cascine | 290 | Q200 | 29.60 | 115.00 | 116.27 | 118.10 | 1.83 | 118.10 | 1.83 | 117.14 | 119.33 | 0.047714 | 7.74 | 3.82 | 3.00 | 2.19 |
| Rio Cascine | 290 | Q500 | 33.50 | 115.00 | 116.39 | 118.10 | 1.71 | 118.10 | 1.71 | 117.33 | 119.67 | 0.048062 | 8.02 | 4.18 | 3.00 | 2.17 |
| Rio Cascine | 240 | Q50 | 20.40 | 113.15 | 114.54 | 116.25 | 1.71 | 116.25 | 1.71 | 114.83 | 115.76 | 0.018015 | 4.90 | 4.16 | 3.00 | 1.33 |
| Rio Cascine | 240 | Q200 | 29.60 | 113.15 | 114.99 | 116.25 | 1.26 | 116.25 | 1.26 | 115.29 | 116.46 | 0.017941 | 5.36 | 5.52 | 3.00 | 1.26 |
| Rio Cascine | 240 | Q500 | 33.50 | 113.15 | 115.89 | 116.25 | 0.36 | 116.25 | 0.36 | 115.48 | 116.74 | 0.008358 | 4.07 | 8.23 | 3.00 | 0.78 |
| Rio Cascine | 239 | Q50 | 23.20 | 112.75 | 114.12 | 116.15 | 2.03 | 116.15 | 2.03 | 114.57 | 115.74 | 0.023919 | 5.63 | 4.12 | 3.00 | 1.53 |
| Rio Cascine | 239 | Q200 | 33.60 | 112.75 | 114.63 | 116.15 | 1.52 | 116.15 | 1.52 | 115.08 | 116.44 | 0.021848 | 5.96 | 5.64 | 3.00 | 1.39 |
| Rio Cascine | 239 | Q500 | 40.30 | 112.75 | 115.51 | 116.15 | 0.64 | 116.15 | 0.64 | 115.38 | 116.72 | 0.011900 | 4.87 | 8.28 | 3.00 | 0.93 |
| Rio Cascine | 238 | Q50 | 23.20 | 112.65 | 114.07 | 115.75 | 1.68 | 115.75 | 1.68 | 114.47 | 115.59 | 0.021994 | 5.46 | 4.25 | 3.00 | 1.46 |
| Rio Cascine | 238 | Q200 | 33.60 | 112.65 | 114.58 | 115.75 | 1.17 | 115.75 | 1.17 | 114.98 | 116.30 | 0.020418 | 5.80 | 5.79 | 3.00 | 1.33 |
| Rio Cascine | 238 | Q500 | 40.30 | 112.65 | 115.41 | 115.75 | 0.34 | 115.75 | 0.34 | 115.28 | 116.62 | 0.011896 | 4.86 | 8.28 | 3.00 | 0.93 |
| Rio Cascine | 220 | Q50 | 23.20 | 109.40 | 110.97 | 112.55 | 1.58 | 112.55 | 1.58 | 111.22 | 112.21 | 0.016679 | 4.92 | 4.71 | 3.00 | 1.25 |
| Rio Cascine | 220 | Q200 | 33.60 | 109.40 | 111.50 | 112.55 | 1.05 | 112.55 | 1.05 | 111.73 | 112.95 | 0.016388 | 5.33 | 6.31 | 3.00 | 1.17 |
| Rio Cascine | 220 | Q500 | 40.30 | 109.40 | 112.03 | 112.55 | 0.52 | 112.55 | 0.52 | 112.03 | 113.36 | 0.013397 | 5.10 | 7.90 | 3.00 | 1.00 |
| Rio Cascine | 210 | Q50 | 23.20 | 108.30 | 109.35 | 112.55 | 3.20 | 112.55 | 3.20 | 110.12 | 112.13 | 0.050293 | 7.39 | 3.14 | 3.00 | 2.30 |
| Rio Cascine | 210 | Q200 | 33.60 | 108.30 | 109.73 | 112.55 | 2.82 | 112.55 | 2.82 | 110.63 | 112.86 | 0.045169 | 7.84 | 4.28 | 3.00 | 2.10 |
| Rio Cascine | 210 | Q500 | 40.30 | 108.30 | 109.97 | 112.55 | 2.58 | 112.55 | 2.58 | 110.93 | 113.26 | 0.042696 | 8.03 | 5.02 | 3.00 | 1.98 |
| Rio Cascine | 200 | Q50 | 23.20 | 108.20 | 109.29 | 112.55 | 3.26 | 112.55 | 3.26 | 110.02 | 111.86 | 0.045198 | 7.11 | 3.26 | 3.00 | 2.18 |

HEC-RAS Plan: AS BUILT River: TOMBINO Reach: Rio Cascine (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | LOB Elev (m) | L. Freeboard (m) | ROB Elev (m) | R. Freeboard (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------------|-----------|---------|-------------------|------------------|------------------|-----------------|---------------------|-----------------|---------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| Rio Cascine | 200 | Q200 | 33.60 | 108.20 | 109.67 | 112.55 | 2.88 | 112.55 | 2.88 | 110.53 | 112.63 | 0.041898 | 7.63 | 4.41 | 3.00 | 2.01 |
| Rio Cascine | 200 | Q500 | 40.30 | 108.20 | 109.92 | 112.55 | 2.63 | 112.55 | 2.63 | 110.83 | 113.04 | 0.039960 | 7.83 | 5.15 | 3.00 | 1.91 |
| Rio Cascine | 189 | Q50 | 25.60 | 105.30 | 106.06 | 112.55 | 6.49 | 112.55 | 6.49 | 107.17 | 111.71 | 0.129816 | 10.53 | 2.43 | 3.20 | 3.86 |
| Rio Cascine | 189 | Q200 | 37.10 | 105.30 | 106.36 | 112.55 | 6.19 | 112.55 | 6.19 | 107.69 | 112.48 | 0.105953 | 10.95 | 3.39 | 3.20 | 3.40 |
| Rio Cascine | 189 | Q500 | 44.50 | 105.30 | 106.55 | 112.55 | 6.00 | 112.55 | 6.00 | 108.00 | 112.88 | 0.096587 | 11.15 | 3.99 | 3.20 | 3.19 |
| Rio Cascine | 188 | Q50 | 25.60 | 105.30 | 106.11 | 112.55 | 6.44 | 112.55 | 6.44 | 107.17 | 111.05 | 0.106830 | 9.84 | 2.60 | 3.20 | 3.49 |
| Rio Cascine | 188 | Q200 | 37.10 | 105.30 | 106.42 | 112.55 | 6.13 | 112.55 | 6.13 | 107.69 | 111.92 | 0.091482 | 10.39 | 3.57 | 3.20 | 3.14 |
| Rio Cascine | 188 | Q500 | 44.50 | 105.30 | 106.61 | 112.55 | 5.94 | 112.55 | 5.94 | 108.00 | 112.37 | 0.084876 | 10.63 | 4.18 | 3.20 | 2.97 |
| Rio Cascine | 187 | Q50 | 25.60 | 105.30 | 106.49 | 106.90 | 0.41 | 106.90 | 0.41 | 107.49 | 111.01 | 0.129320 | 9.41 | 2.72 | 3.09 | 3.21 |
| Rio Cascine | 187 | Q200 | 37.10 | 105.30 | 106.81 | 106.90 | 0.09 | 106.90 | 0.09 | 107.92 | 111.88 | 0.115514 | 9.97 | 3.72 | 3.18 | 2.94 |
| Rio Cascine | 187 | Q500 | 44.50 | 105.30 | 107.01 | 106.90 | -0.11 | 106.90 | -0.11 | 108.12 | 112.33 | 0.109336 | 10.22 | 4.36 | 3.17 | 2.50 |
| Rio Cascine | 170 | Q50 | 25.60 | 96.80 | 97.89 | 98.40 | 0.51 | 98.40 | 0.51 | 98.98 | 103.65 | 0.180837 | 10.63 | 2.41 | 3.03 | 3.81 |
| Rio Cascine | 170 | Q200 | 37.10 | 96.80 | 98.14 | 98.40 | 0.26 | 98.40 | 0.26 | 99.42 | 105.00 | 0.173823 | 11.60 | 3.20 | 3.14 | 3.67 |
| Rio Cascine | 170 | Q500 | 44.50 | 96.80 | 98.30 | 98.40 | 0.10 | 98.40 | 0.10 | 99.62 | 105.70 | 0.169328 | 12.04 | 3.70 | 3.18 | 3.56 |
| Rio Cascine | 169 | Q50 | 25.60 | 94.00 | 94.61 | 100.00 | 5.39 | 100.00 | 5.39 | 95.87 | 103.49 | 0.426473 | 13.20 | 1.94 | 3.20 | 5.41 |
| Rio Cascine | 169 | Q200 | 37.10 | 94.00 | 94.83 | 100.00 | 5.17 | 100.00 | 5.17 | 96.39 | 104.84 | 0.360687 | 14.02 | 2.65 | 3.20 | 4.92 |
| Rio Cascine | 169 | Q500 | 44.50 | 94.00 | 94.97 | 100.00 | 5.03 | 100.00 | 5.03 | 96.70 | 105.53 | 0.333242 | 14.40 | 3.09 | 3.20 | 4.68 |
| Rio Cascine | 168 | Q50 | 25.60 | 94.00 | 94.69 | 99.50 | 4.81 | 99.50 | 4.81 | 95.87 | 101.53 | 0.290212 | 11.59 | 2.21 | 3.20 | 4.45 |
| Rio Cascine | 168 | Q200 | 37.10 | 94.00 | 94.91 | 99.50 | 4.59 | 99.50 | 4.59 | 96.39 | 103.11 | 0.270463 | 12.68 | 2.93 | 3.20 | 4.23 |
| Rio Cascine | 168 | Q500 | 44.50 | 94.00 | 95.06 | 99.50 | 4.44 | 99.50 | 4.44 | 96.70 | 103.90 | 0.259266 | 13.17 | 3.38 | 3.20 | 4.09 |
| Rio Cascine | 167 | Q50 | 25.60 | 94.00 | 95.04 | 95.60 | 0.55 | 95.60 | 0.55 | 96.19 | 101.49 | 0.211433 | 11.24 | 2.28 | 3.00 | 4.12 |
| Rio Cascine | 167 | Q200 | 37.10 | 94.00 | 95.28 | 95.60 | 0.32 | 95.60 | 0.32 | 96.62 | 103.06 | 0.206621 | 12.35 | 3.00 | 3.12 | 4.02 |
| Rio Cascine | 167 | Q500 | 44.50 | 94.00 | 95.43 | 95.60 | 0.17 | 95.60 | 0.17 | 96.82 | 103.86 | 0.201986 | 12.86 | 3.46 | 3.16 | 3.92 |
| Rio Cascine | 150 | Q50 | 25.60 | 90.20 | 91.35 | 91.80 | 0.45 | 91.80 | 0.45 | 92.38 | 96.32 | 0.147343 | 9.87 | 2.59 | 3.07 | 3.43 |
| Rio Cascine | 150 | Q200 | 37.10 | 90.20 | 91.60 | 91.80 | 0.20 | 91.80 | 0.20 | 92.82 | 97.81 | 0.152111 | 11.04 | 3.36 | 3.15 | 3.41 |
| Rio Cascine | 150 | Q500 | 44.50 | 90.20 | 91.75 | 91.80 | 0.05 | 91.80 | 0.05 | 93.02 | 98.61 | 0.153325 | 11.61 | 3.83 | 3.19 | 3.38 |
| Rio Cascine | 149 | Q50 | 25.60 | 89.50 | 90.24 | 93.40 | 3.16 | 93.40 | 3.16 | 91.37 | 96.26 | 0.241159 | 10.87 | 2.35 | 3.20 | 4.05 |
| Rio Cascine | 149 | Q200 | 37.10 | 89.50 | 90.47 | 93.40 | 2.93 | 93.40 | 2.93 | 91.89 | 97.76 | 0.229138 | 11.96 | 3.10 | 3.20 | 3.88 |
| Rio Cascine | 149 | Q500 | 44.50 | 89.50 | 90.61 | 93.40 | 2.79 | 93.40 | 2.79 | 92.20 | 98.56 | 0.223181 | 12.48 | 3.57 | 3.20 | 3.78 |
| Rio Cascine | 148 | Q50 | 25.60 | 89.50 | 90.32 | 92.70 | 2.38 | 92.70 | 2.38 | 91.37 | 95.12 | 0.173269 | 9.70 | 2.64 | 3.20 | 3.41 |
| Rio Cascine | 148 | Q200 | 37.10 | 89.50 | 90.56 | 92.70 | 2.14 | 92.70 | 2.14 | 91.90 | 96.63 | 0.177104 | 10.91 | 3.40 | 3.20 | 3.38 |
| Rio Cascine | 148 | Q500 | 44.50 | 89.50 | 90.71 | 92.70 | 1.99 | 92.70 | 1.99 | 92.20 | 97.44 | 0.177491 | 11.49 | 3.87 | 3.20 | 3.34 |
| Rio Cascine | 147 | Q50 | 25.60 | 89.50 | 90.70 | 91.10 | 0.40 | 91.10 | 0.40 | 91.69 | 95.08 | 0.123762 | 9.27 | 2.76 | 3.10 | 3.13 |
| Rio Cascine | 147 | Q200 | 37.10 | 89.50 | 90.95 | 91.10 | 0.15 | 91.10 | 0.15 | 92.12 | 96.59 | 0.133360 | 10.52 | 3.53 | 3.16 | 3.18 |
| Rio Cascine | 147 | Q500 | 44.50 | 89.50 | 91.10 | 91.10 | 0.00 | 91.10 | 0.00 | 92.32 | 97.40 | 0.136689 | 11.12 | 4.00 | 3.20 | 3.17 |
| Rio Cascine | 140 | Q50 | 25.60 | 86.90 | 88.09 | 88.50 | 0.41 | 88.50 | 0.41 | 89.08 | 92.60 | 0.129138 | 9.41 | 2.72 | 3.09 | 3.20 |
| Rio Cascine | 140 | Q200 | 37.10 | 86.90 | 88.35 | 88.50 | 0.15 | 88.50 | 0.15 | 89.52 | 93.99 | 0.133346 | 10.52 | 3.53 | 3.16 | 3.18 |

HEC-RAS Plan: AS BUILT River: TOMBINO Reach: Rio Cascine (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | LOB Elev (m) | L. Freeboard (m) | ROB Elev (m) | R. Freeboard (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------------|-----------|---------|-------------------|------------------|------------------|-----------------|---------------------|-----------------|---------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| Rio Cascine | 140 | Q500 | 44.50 | 86.90 | 88.50 | 88.50 | 0.00 | 88.50 | 0.00 | 89.72 | 94.75 | 0.135014 | 11.07 | 4.02 | 3.20 | 3.15 |
| Rio Cascine | 139 | Q50 | 25.60 | 85.00 | 85.69 | 90.10 | 4.41 | 90.10 | 4.41 | 86.87 | 92.49 | 0.287265 | 11.55 | 2.22 | 3.20 | 4.43 |
| Rio Cascine | 139 | Q200 | 37.10 | 85.00 | 85.93 | 90.10 | 4.17 | 90.10 | 4.17 | 87.39 | 93.87 | 0.258896 | 12.48 | 2.97 | 3.20 | 4.14 |
| Rio Cascine | 139 | Q500 | 44.50 | 85.00 | 86.07 | 90.10 | 4.03 | 90.10 | 4.03 | 87.70 | 94.63 | 0.247840 | 12.96 | 3.43 | 3.20 | 3.99 |
| Rio Cascine | 138 | Q50 | 25.60 | 85.00 | 85.78 | 89.60 | 3.82 | 89.60 | 3.82 | 86.87 | 91.14 | 0.203367 | 10.25 | 2.50 | 3.20 | 3.71 |
| Rio Cascine | 138 | Q200 | 37.10 | 85.00 | 86.02 | 89.60 | 3.58 | 89.60 | 3.58 | 87.40 | 92.61 | 0.198680 | 11.37 | 3.26 | 3.20 | 3.59 |
| Rio Cascine | 138 | Q500 | 44.50 | 85.00 | 86.17 | 89.60 | 3.43 | 89.60 | 3.43 | 87.70 | 93.40 | 0.196109 | 11.91 | 3.74 | 3.20 | 3.52 |
| Rio Cascine | 137 | Q50 | 25.60 | 85.00 | 86.15 | 86.60 | 0.45 | 86.60 | 0.45 | 87.18 | 91.10 | 0.146604 | 9.85 | 2.60 | 3.07 | 3.42 |
| Rio Cascine | 137 | Q200 | 37.10 | 85.00 | 86.40 | 86.60 | 0.20 | 86.60 | 0.20 | 87.61 | 92.56 | 0.150396 | 11.00 | 3.37 | 3.15 | 3.39 |
| Rio Cascine | 137 | Q500 | 44.50 | 85.00 | 86.55 | 86.60 | 0.05 | 86.60 | 0.05 | 87.82 | 93.36 | 0.151618 | 11.56 | 3.85 | 3.19 | 3.36 |
| Rio Cascine | 120 | Q50 | 25.60 | 77.44 | 78.61 | 79.04 | 0.43 | 79.04 | 0.43 | 79.62 | 83.30 | 0.135907 | 9.59 | 2.67 | 3.08 | 3.29 |
| Rio Cascine | 120 | Q200 | 37.10 | 77.44 | 78.88 | 79.04 | 0.16 | 79.04 | 0.16 | 80.06 | 84.62 | 0.136482 | 10.61 | 3.50 | 3.16 | 3.22 |
| Rio Cascine | 120 | Q500 | 44.50 | 77.44 | 79.04 | 79.04 | 0.00 | 79.04 | 0.00 | 80.26 | 85.35 | 0.136915 | 11.12 | 4.00 | 3.20 | 3.18 |
| Rio Cascine | 119 | Q50 | 25.60 | 77.44 | 78.61 | 79.04 | 0.43 | 79.04 | 0.43 | 79.62 | 83.30 | 0.135851 | 9.58 | 2.67 | 3.08 | 3.29 |
| Rio Cascine | 119 | Q200 | 37.10 | 77.44 | 78.88 | 79.04 | 0.16 | 79.04 | 0.16 | 80.06 | 84.61 | 0.136436 | 10.61 | 3.50 | 3.16 | 3.22 |
| Rio Cascine | 119 | Q500 | 44.50 | 77.44 | 79.04 | 79.04 | 0.00 | 79.04 | 0.00 | 80.26 | 85.35 | 0.136915 | 11.12 | 4.00 | 3.20 | 3.18 |
| Rio Cascine | 118 | Q50 | 25.60 | 76.67 | 77.84 | 78.27 | 0.43 | 78.27 | 0.43 | 78.86 | 82.61 | 0.139356 | 9.67 | 2.65 | 3.08 | 3.33 |
| Rio Cascine | 118 | Q200 | 37.10 | 76.67 | 78.10 | 78.27 | 0.17 | 78.27 | 0.17 | 79.29 | 83.93 | 0.139372 | 10.69 | 3.47 | 3.16 | 3.26 |
| Rio Cascine | 118 | Q500 | 44.50 | 76.67 | 78.26 | 78.27 | 0.01 | 78.27 | 0.01 | 79.49 | 84.65 | 0.139368 | 11.20 | 3.97 | 3.20 | 3.21 |
| Rio Cascine | 110 | Q50 | 25.60 | 76.67 | 77.84 | 78.27 | 0.43 | 78.27 | 0.43 | 78.86 | 82.61 | 0.139298 | 9.67 | 2.65 | 3.08 | 3.33 |
| Rio Cascine | 110 | Q200 | 37.10 | 76.67 | 78.10 | 78.27 | 0.17 | 78.27 | 0.17 | 79.29 | 83.93 | 0.139324 | 10.69 | 3.47 | 3.16 | 3.26 |
| Rio Cascine | 110 | Q500 | 44.50 | 76.67 | 78.26 | 78.27 | 0.01 | 78.27 | 0.01 | 79.49 | 84.65 | 0.139326 | 11.20 | 3.97 | 3.20 | 3.21 |
| Rio Cascine | 90 | Q50 | 25.60 | 65.10 | 66.28 | 66.70 | 0.42 | 66.70 | 0.42 | 67.29 | 70.89 | 0.132888 | 9.51 | 2.69 | 3.09 | 3.25 |
| Rio Cascine | 90 | Q200 | 37.10 | 65.10 | 66.55 | 66.70 | 0.15 | 66.70 | 0.15 | 67.72 | 72.18 | 0.133196 | 10.51 | 3.53 | 3.16 | 3.18 |
| Rio Cascine | 90 | Q500 | 44.50 | 65.10 | 66.71 | 66.70 | -0.01 | 66.70 | -0.01 | 67.92 | 72.89 | 0.133285 | 11.01 | 4.04 | 3.20 | 2.77 |
| Rio Cascine | 88.5 | Q50 | 25.60 | 65.10 | 65.91 | 69.20 | 3.29 | 69.20 | 3.29 | 66.97 | 70.87 | 0.181757 | 9.86 | 2.60 | 3.20 | 3.50 |
| Rio Cascine | 88.5 | Q200 | 37.10 | 65.10 | 66.17 | 69.20 | 3.03 | 69.20 | 3.03 | 67.49 | 72.16 | 0.174043 | 10.84 | 3.42 | 3.20 | 3.35 |
| Rio Cascine | 88.5 | Q500 | 44.50 | 65.10 | 66.33 | 69.20 | 2.87 | 69.20 | 2.87 | 67.80 | 72.87 | 0.170687 | 11.33 | 3.93 | 3.20 | 3.27 |
| Rio Cascine | 88 | Q50 | 25.60 | 65.10 | 66.01 | 69.20 | 3.19 | 69.20 | 3.19 | 66.97 | 69.95 | 0.130833 | 8.80 | 2.91 | 3.20 | 2.94 |
| Rio Cascine | 88 | Q200 | 37.10 | 65.10 | 66.27 | 69.20 | 2.93 | 69.20 | 2.93 | 67.49 | 71.25 | 0.134391 | 9.88 | 3.75 | 3.20 | 2.91 |
| Rio Cascine | 88 | Q500 | 44.50 | 65.10 | 66.44 | 69.20 | 2.76 | 69.20 | 2.76 | 67.80 | 71.96 | 0.135470 | 10.41 | 4.27 | 3.20 | 2.88 |
| Rio Cascine | 87 | Q50 | 25.60 | 65.10 | 66.01 | 69.10 | 3.09 | 69.10 | 3.09 | 66.97 | 69.95 | 0.130766 | 8.79 | 2.91 | 3.20 | 2.94 |
| Rio Cascine | 87 | Q200 | 37.10 | 65.10 | 66.27 | 69.10 | 2.83 | 69.10 | 2.83 | 67.49 | 71.25 | 0.134337 | 9.88 | 3.75 | 3.20 | 2.91 |
| Rio Cascine | 87 | Q500 | 44.50 | 65.10 | 66.44 | 69.10 | 2.66 | 69.10 | 2.66 | 67.80 | 71.96 | 0.135421 | 10.41 | 4.27 | 3.20 | 2.88 |
| Rio Cascine | 70 | Q50 | 25.60 | 64.55 | 65.70 | 66.75 | 1.05 | 66.75 | 1.05 | 66.42 | 68.18 | 0.068156 | 6.98 | 3.67 | 3.20 | 2.08 |
| Rio Cascine | 70 | Q200 | 37.10 | 64.55 | 65.99 | 66.75 | 0.76 | 66.75 | 0.76 | 66.94 | 69.31 | 0.077422 | 8.08 | 4.59 | 3.20 | 2.15 |
| Rio Cascine | 70 | Q500 | 44.50 | 64.55 | 66.16 | 66.75 | 0.59 | 66.75 | 0.59 | 67.24 | 69.96 | 0.081642 | 8.63 | 5.16 | 3.20 | 2.17 |

HEC-RAS Plan: AS BUILT River: TOMBINO Reach: Rio Cascine (Continued)

| Reach | River Sta | Profile | Q Total (m3/s) | Min Ch El (m) | W.S. Elev (m) | LOB Elev (m) | L. Freeboard (m) | ROB Elev (m) | R. Freeboard (m) | Crit W.S. (m) | E.G. Elev (m) | E.G. Slope (m/m) | Vel Chnl (m/s) | Flow Area (m2) | Top Width (m) | Froude # Chl |
|-------------|-----------|---------|-------------------|------------------|------------------|-----------------|---------------------|-----------------|---------------------|------------------|------------------|---------------------|-------------------|-------------------|------------------|--------------|
| Rio Cascine | 68 | Q50 | 25.60 | 51.40 | 52.31 | 53.60 | 1.29 | 53.60 | 1.29 | 53.27 | 56.25 | 0.099751 | 8.79 | 2.91 | 3.20 | 2.94 |
| Rio Cascine | 68 | Q200 | 37.10 | 51.40 | 52.59 | 53.60 | 1.01 | 53.60 | 1.01 | 53.79 | 57.43 | 0.098631 | 9.74 | 3.81 | 3.20 | 2.85 |
| Rio Cascine | 68 | Q500 | 44.50 | 51.40 | 52.76 | 53.60 | 0.84 | 53.60 | 0.84 | 54.09 | 58.07 | 0.098003 | 10.21 | 4.36 | 3.20 | 2.79 |
| Rio Cascine | 34 | Q50 | 25.60 | 48.80 | 49.39 | 53.90 | 4.51 | 53.90 | 4.51 | 50.47 | 56.11 | 0.240166 | 11.48 | 2.23 | 3.80 | 4.79 |
| Rio Cascine | 34 | Q200 | 37.10 | 48.80 | 49.60 | 53.90 | 4.30 | 53.90 | 4.30 | 50.93 | 57.28 | 0.203909 | 12.28 | 3.02 | 3.80 | 4.40 |
| Rio Cascine | 34 | Q500 | 44.50 | 48.80 | 49.72 | 53.90 | 4.18 | 53.90 | 4.18 | 51.21 | 57.93 | 0.189746 | 12.69 | 3.51 | 3.80 | 4.22 |
| Rio Cascine | 33 | Q50 | 25.60 | 48.65 | 49.29 | 52.90 | 3.61 | 52.90 | 3.61 | 50.32 | 54.94 | 0.185015 | 10.53 | 2.43 | 3.80 | 4.20 |
| Rio Cascine | 33 | Q200 | 37.10 | 48.65 | 49.50 | 52.90 | 3.40 | 52.90 | 3.40 | 50.78 | 56.26 | 0.169038 | 11.52 | 3.22 | 3.80 | 4.00 |
| Rio Cascine | 33 | Q500 | 44.50 | 48.65 | 49.63 | 52.90 | 3.27 | 52.90 | 3.27 | 51.06 | 56.97 | 0.161539 | 12.00 | 3.71 | 3.80 | 3.88 |
| Rio Cascine | 32 | Q50 | 25.60 | 48.35 | 48.97 | 52.90 | 3.93 | 52.90 | 3.93 | 50.02 | 54.92 | 0.199911 | 10.80 | 2.37 | 3.80 | 4.37 |
| Rio Cascine | 32 | Q200 | 37.10 | 48.35 | 49.18 | 52.90 | 3.72 | 52.90 | 3.72 | 50.48 | 56.25 | 0.180169 | 11.77 | 3.15 | 3.80 | 4.13 |
| Rio Cascine | 32 | Q500 | 44.50 | 48.35 | 49.31 | 52.90 | 3.59 | 52.90 | 3.59 | 50.76 | 56.95 | 0.171193 | 12.24 | 3.63 | 3.80 | 4.00 |
| Rio Cascine | 29 | Q50 | 25.60 | 47.84 | 48.54 | 50.04 | 1.50 | 50.04 | 1.50 | 49.51 | 53.20 | 0.138509 | 9.56 | 2.68 | 3.80 | 3.63 |
| Rio Cascine | 29 | Q200 | 37.10 | 47.84 | 48.75 | 50.04 | 1.29 | 50.04 | 1.29 | 49.97 | 54.62 | 0.137539 | 10.73 | 3.46 | 3.80 | 3.59 |
| Rio Cascine | 29 | Q500 | 44.50 | 47.84 | 48.88 | 50.04 | 1.16 | 50.04 | 1.16 | 50.25 | 55.38 | 0.135709 | 11.29 | 3.94 | 3.80 | 3.54 |
| Rio Cascine | 28 | Q50 | 25.60 | 47.84 | 48.55 | 50.04 | 1.49 | 50.04 | 1.49 | 49.51 | 53.20 | 0.138446 | 9.55 | 2.68 | 3.80 | 3.63 |
| Rio Cascine | 28 | Q200 | 37.10 | 47.84 | 48.75 | 50.04 | 1.29 | 50.04 | 1.29 | 49.97 | 54.62 | 0.137539 | 10.73 | 3.46 | 3.80 | 3.59 |
| Rio Cascine | 28 | Q500 | 44.50 | 47.84 | 48.88 | 50.04 | 1.16 | 50.04 | 1.16 | 50.04 | 55.38 | 0.135709 | 11.29 | 3.94 | 3.80 | 3.54 |
| Rio Cascine | 20 | Q50 | 25.60 | 47.60 | 48.42 | 49.80 | 1.38 | 49.80 | 1.38 | 49.27 | 51.87 | 0.089000 | 8.23 | 3.11 | 3.80 | 2.90 |
| Rio Cascine | 20 | Q200 | 37.10 | 47.60 | 48.63 | 49.80 | 1.17 | 49.80 | 1.17 | 49.73 | 53.23 | 0.096916 | 9.50 | 3.90 | 3.80 | 2.99 |
| Rio Cascine | 20 | Q500 | 44.50 | 47.60 | 48.76 | 49.80 | 1.04 | 49.80 | 1.04 | 49.80 | 53.98 | 0.099482 | 10.12 | 4.40 | 3.80 | 3.01 |
| Rio Cascine | 10 | Q50 | 25.60 | 47.40 | 48.26 | 49.60 | 1.35 | 49.60 | 1.35 | 49.07 | 51.42 | 0.078458 | 7.88 | 3.25 | 3.80 | 2.72 |
| Rio Cascine | 10 | Q200 | 37.10 | 47.40 | 48.47 | 49.60 | 1.13 | 49.60 | 1.13 | 49.53 | 52.74 | 0.086979 | 9.15 | 4.05 | 3.80 | 2.83 |
| Rio Cascine | 10 | Q500 | 44.50 | 47.40 | 48.60 | 49.60 | 1.00 | 49.60 | 1.00 | 49.81 | 53.47 | 0.090126 | 9.78 | 4.55 | 3.80 | 2.85 |