



# **PROVINCIA DI SAVONA**

**DIFESA DEL SUOLO E TUTELA AMBIENTALE  
SERVIZIO PIANI DI BACINO E LAVORI IDRAULICI**

## **VERIFICHE IDRAULICHE**

**Bacino: ARRESTRA**

**TORRENTE ARRESTRA**

---

| <b>ELABORAZIONE</b>              | <b>C.T.P.</b> | <b>D.G.P.</b> | <b>DATA</b> | <b>Rev.</b> |
|----------------------------------|---------------|---------------|-------------|-------------|
| Ufficio Pianificazione di Bacino |               |               | 2009        | 1           |

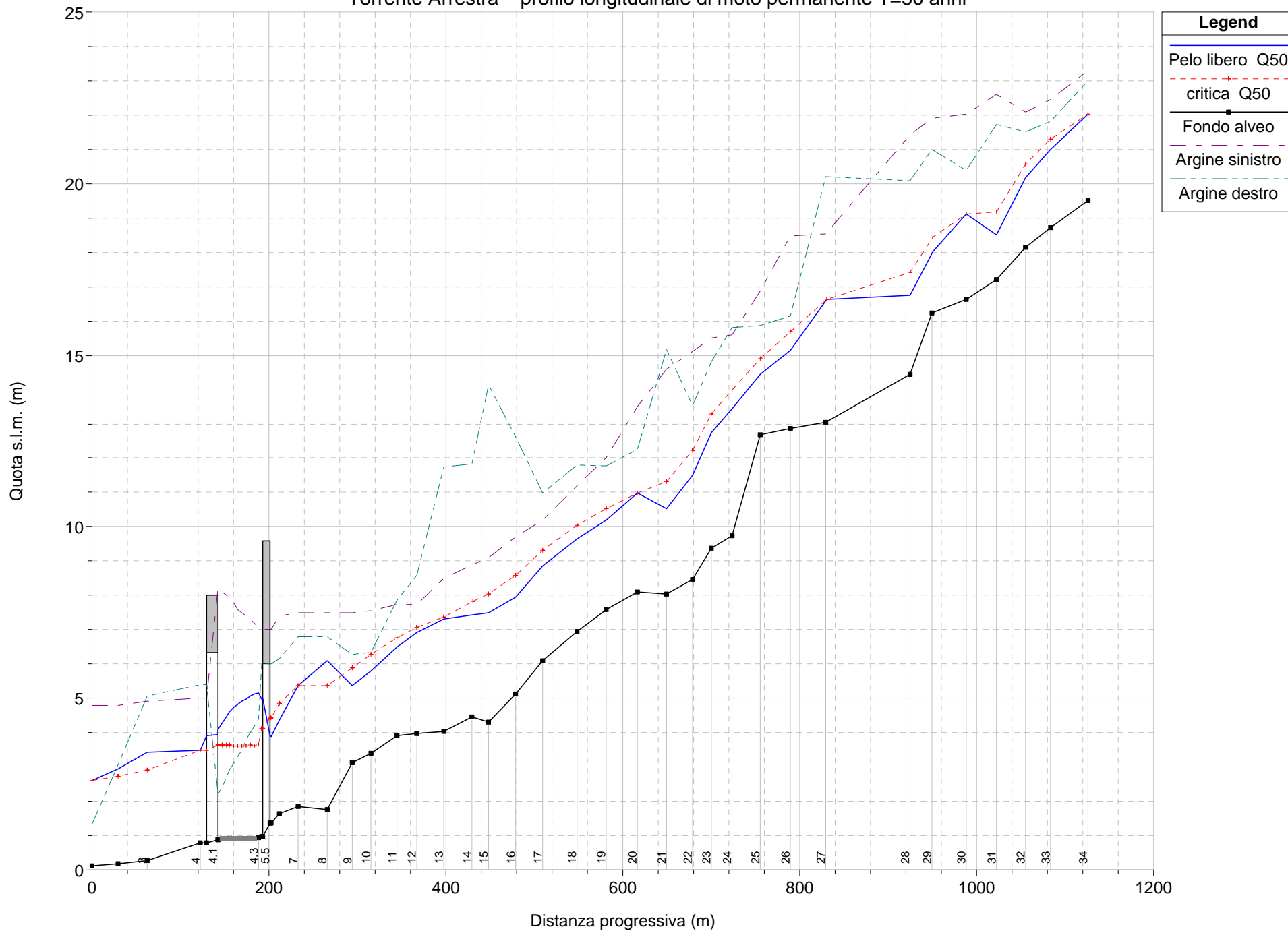


**PROFILI DI RIGURGITO IN CONDIZIONI DI MOTO  
PERMANENTE PER LE PORTATE T=50, 200, 500 ANNI**

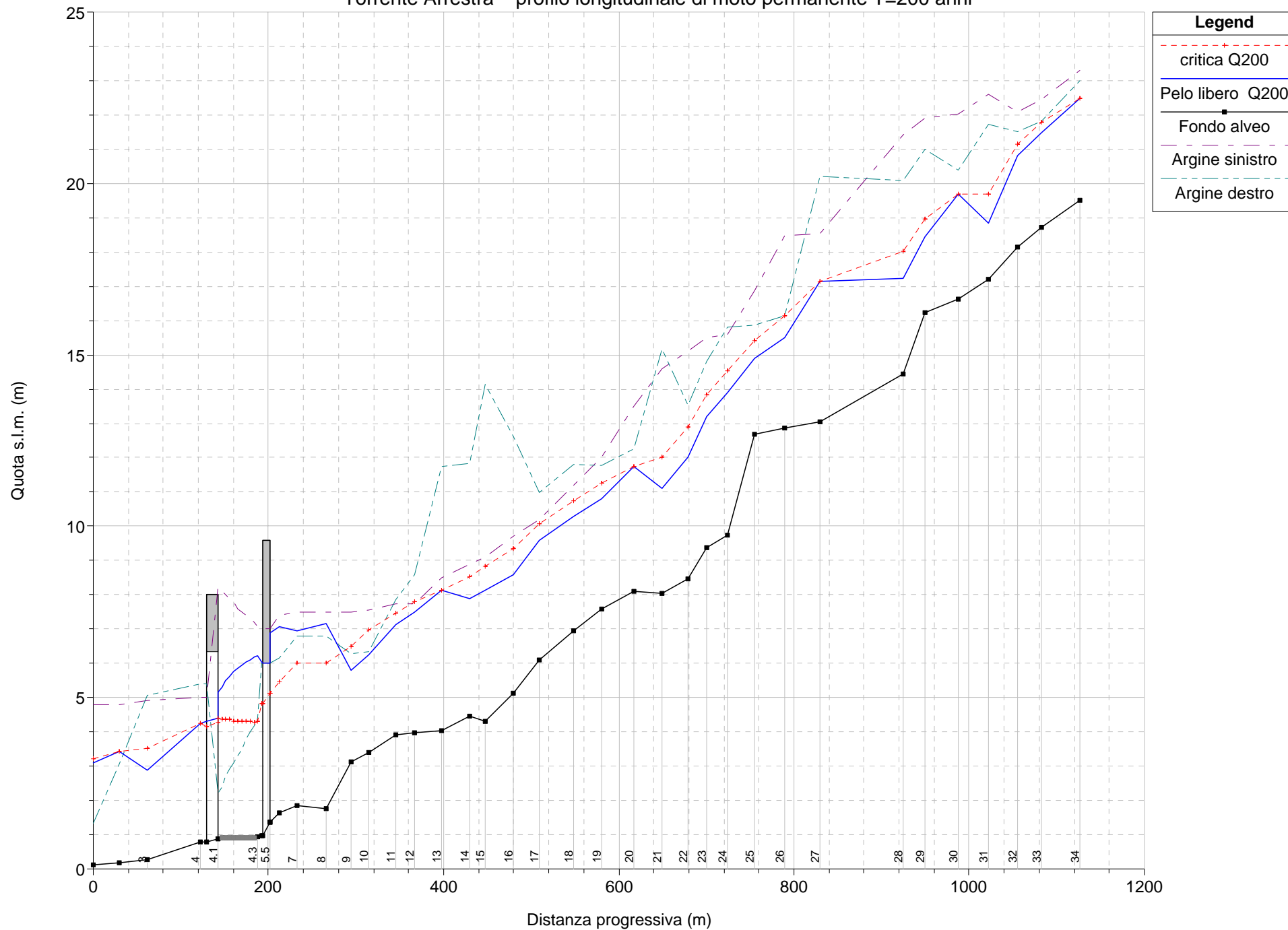
**ARRESTRA**



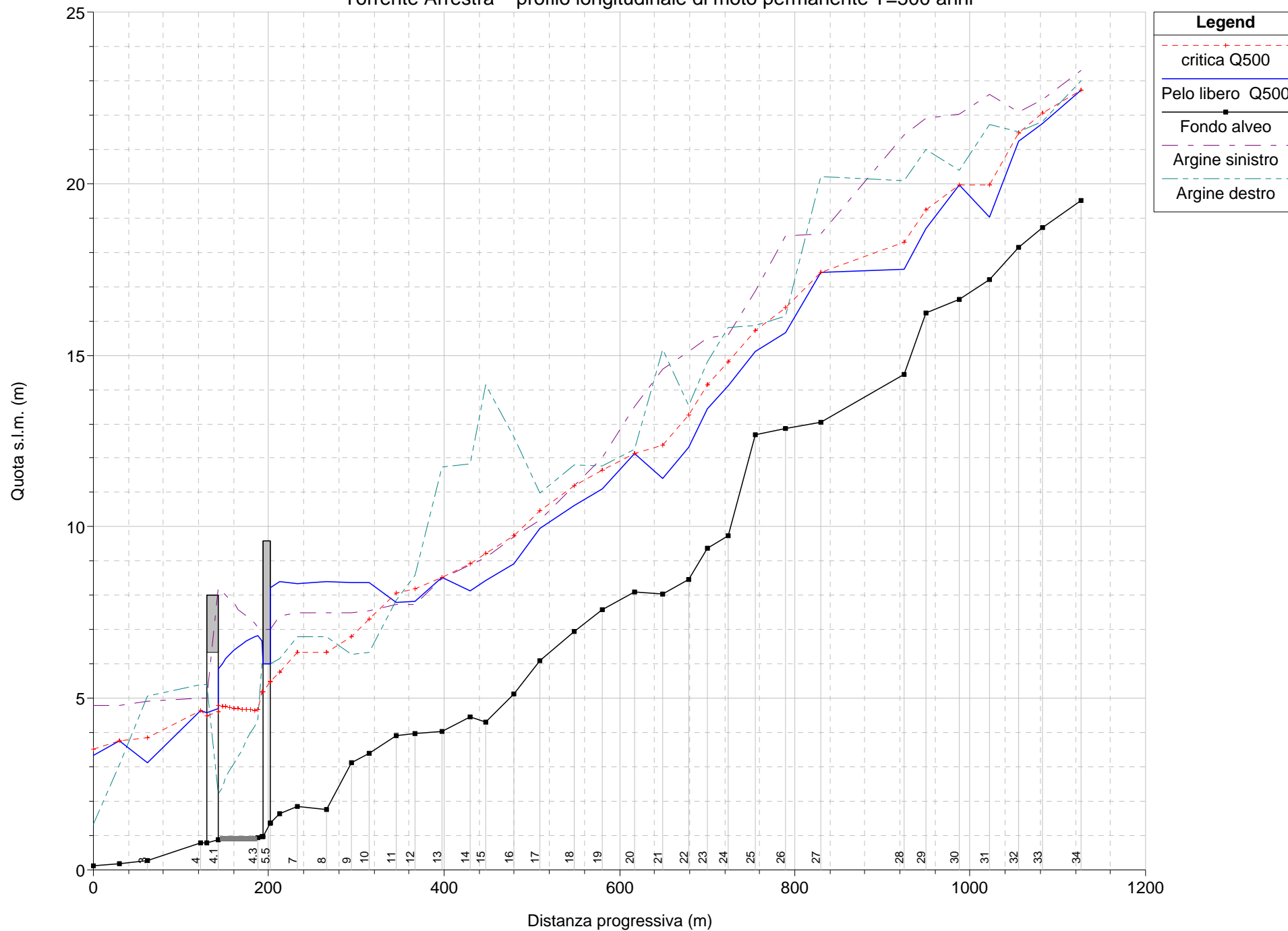
Torrente Arrestra – profilo longitudinale di moto permanente T=50 anni



Torrente Arrestra – profilo longitudinale di moto permanente T=200 anni



Torrente Arrestra – profilo longitudinale di moto permanente T=500 anni







**GEOMETRIA DELLE SEZIONI ED ALTEZZA DEL PELO  
LIBERO IN CONDIZIONI DI MOTO PERMANENTE  
PER LE PORTATE T=50, 200, 500 ANNI**

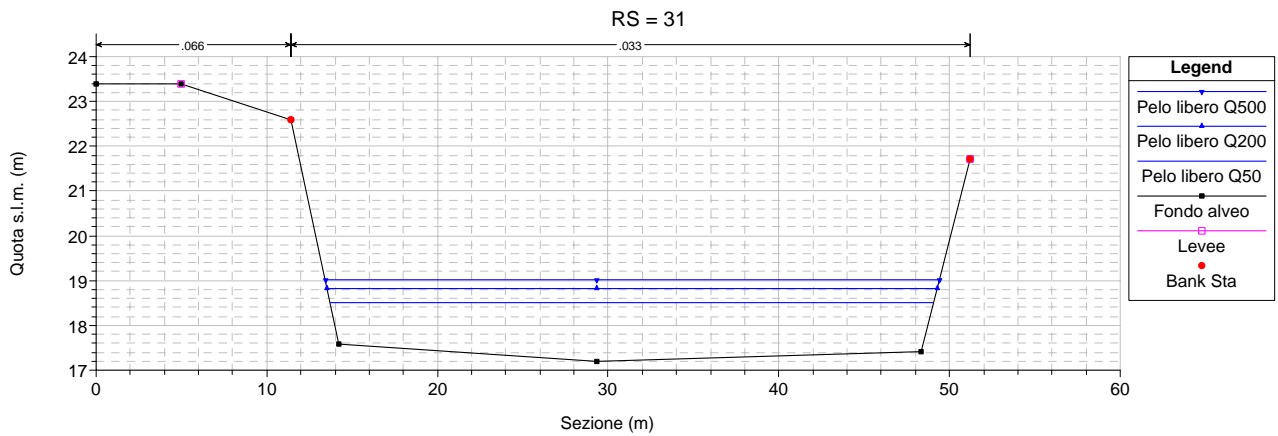
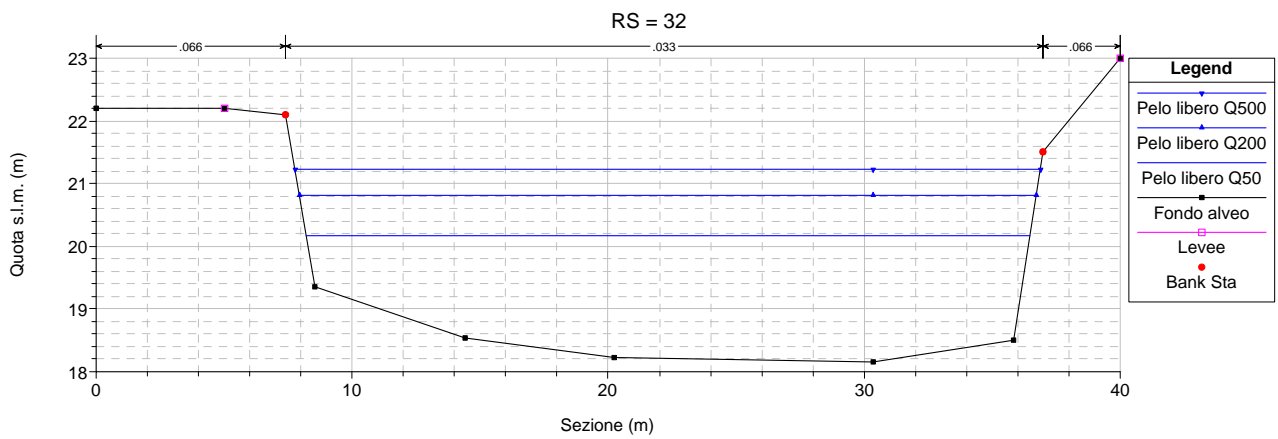
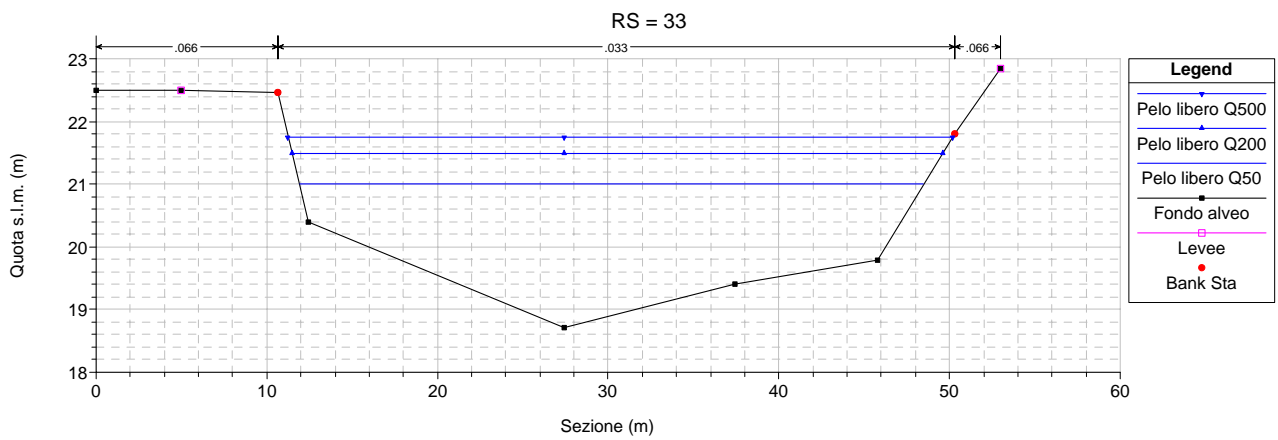
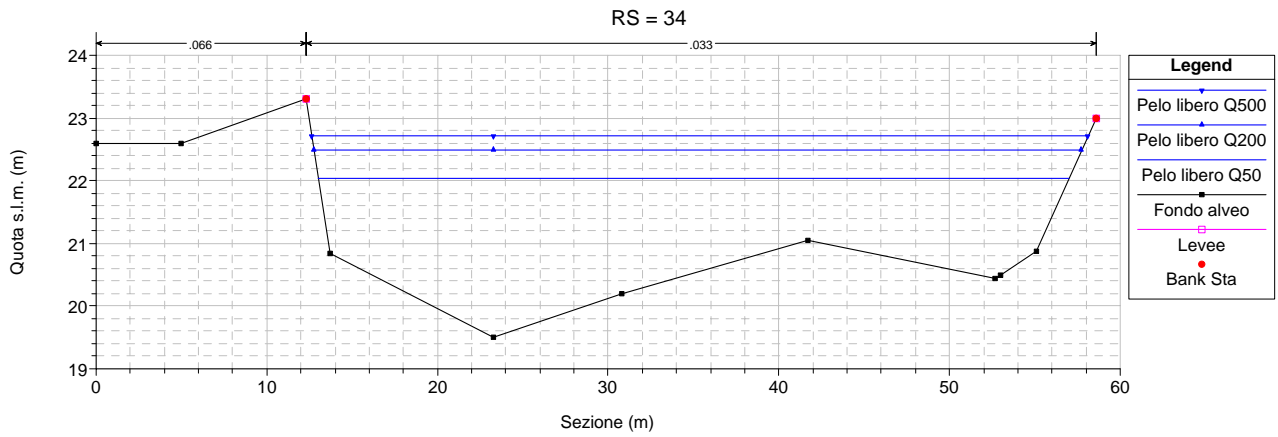
**ARRESTRA**

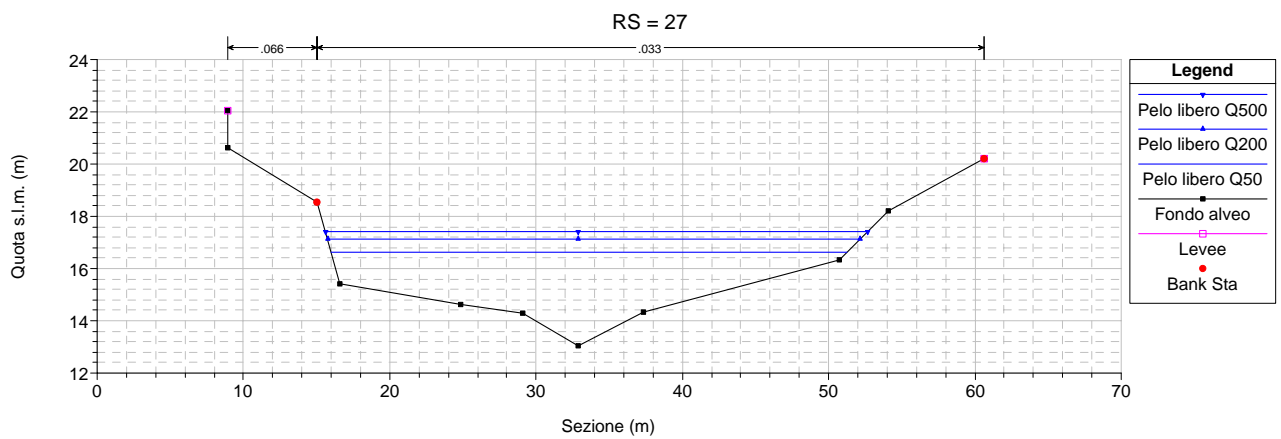
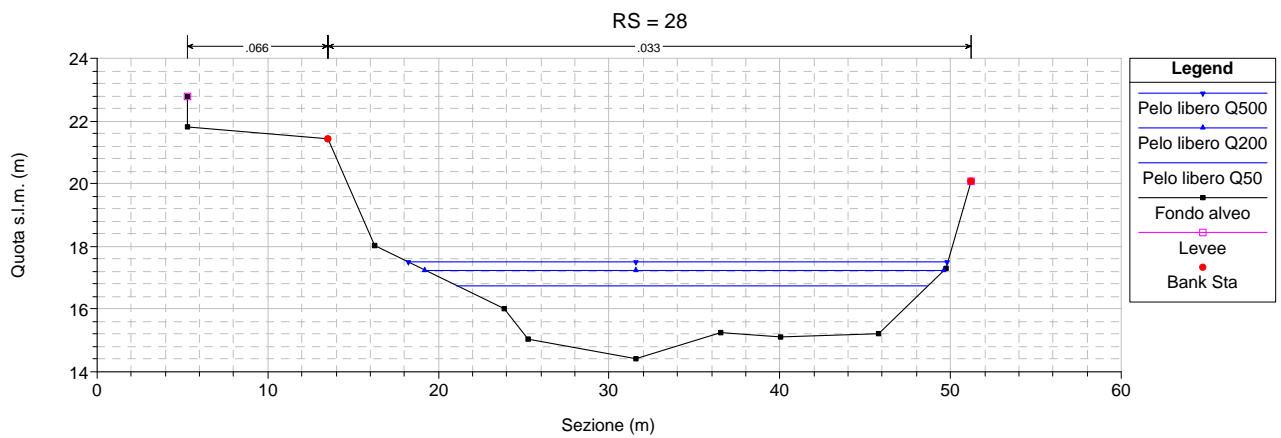
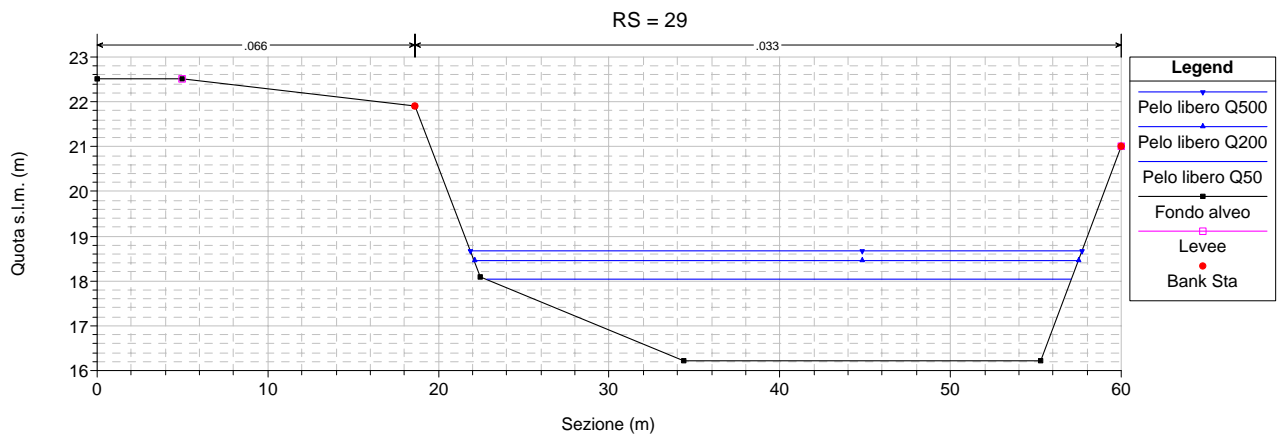
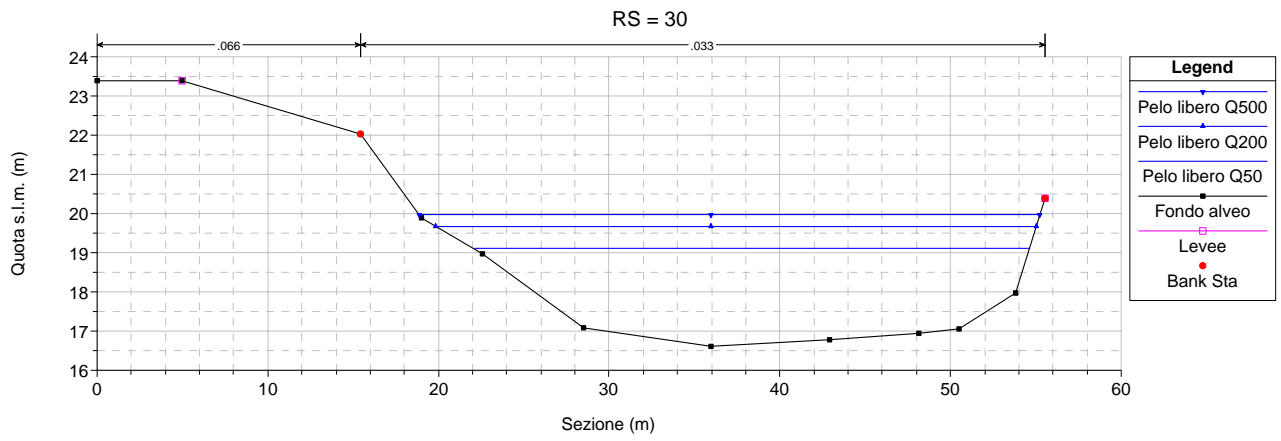
DALLA SEZ. 34  
ALLA SEZ. 1

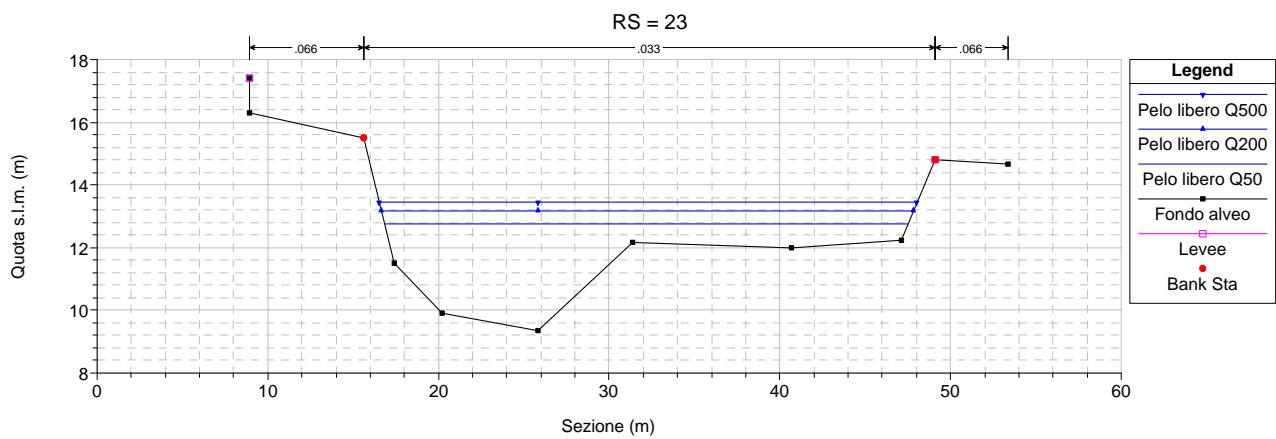
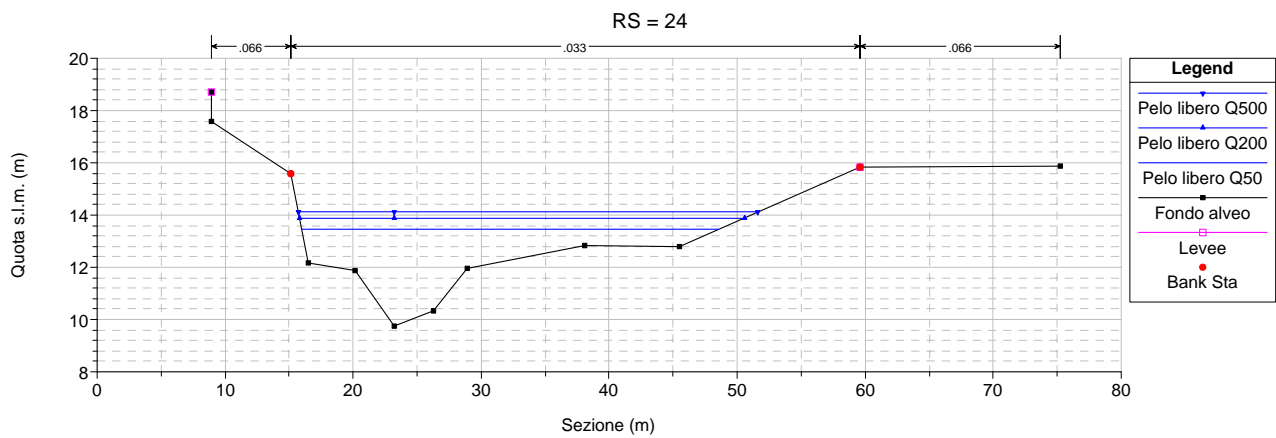
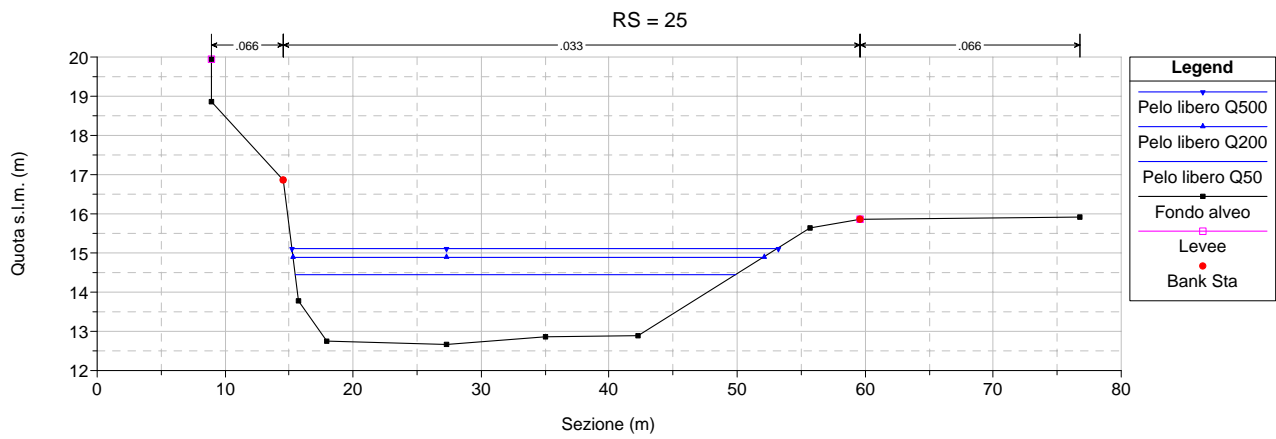
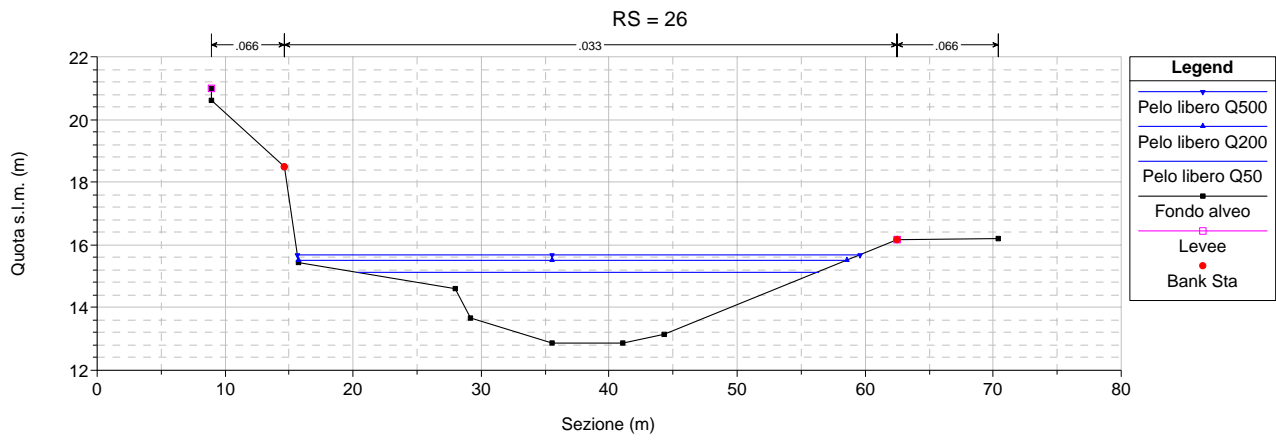


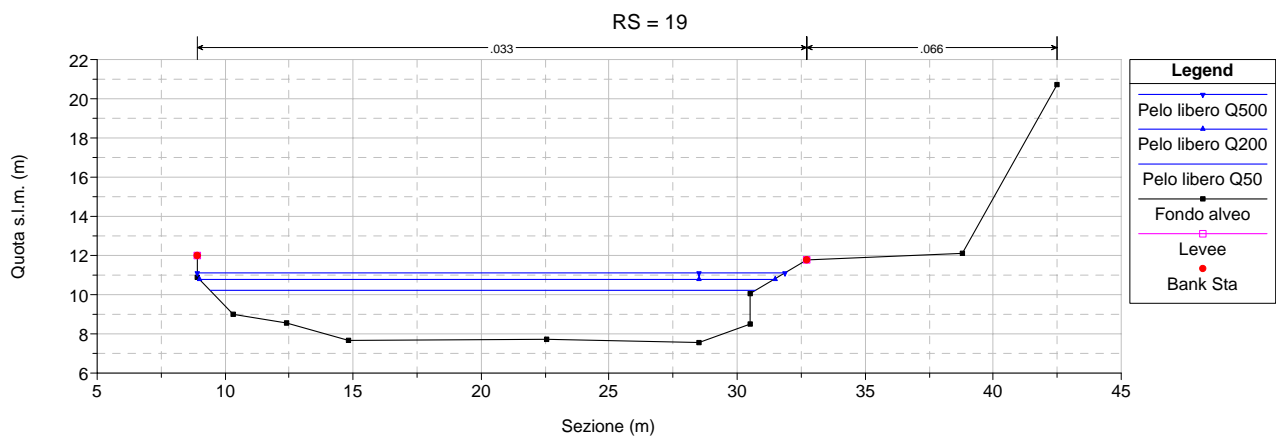
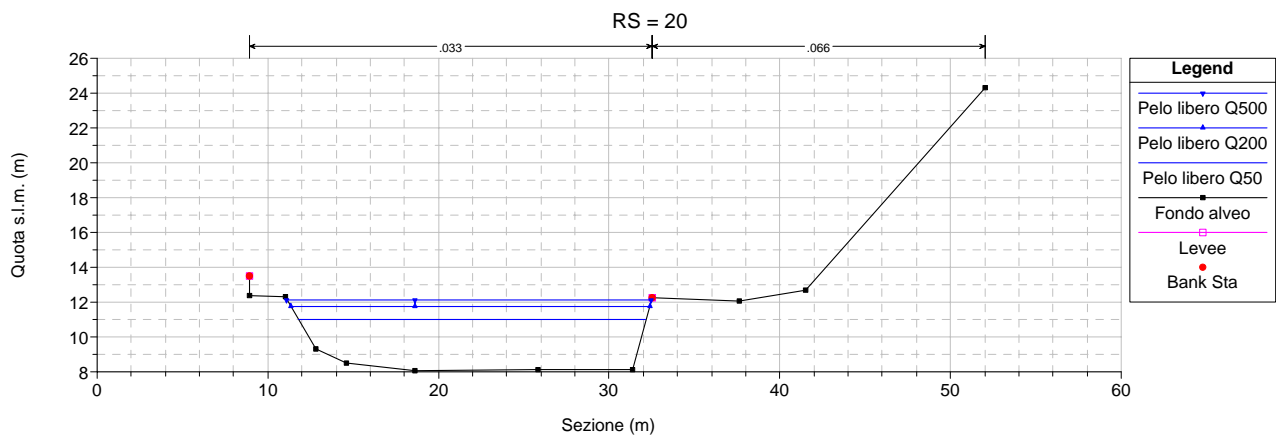
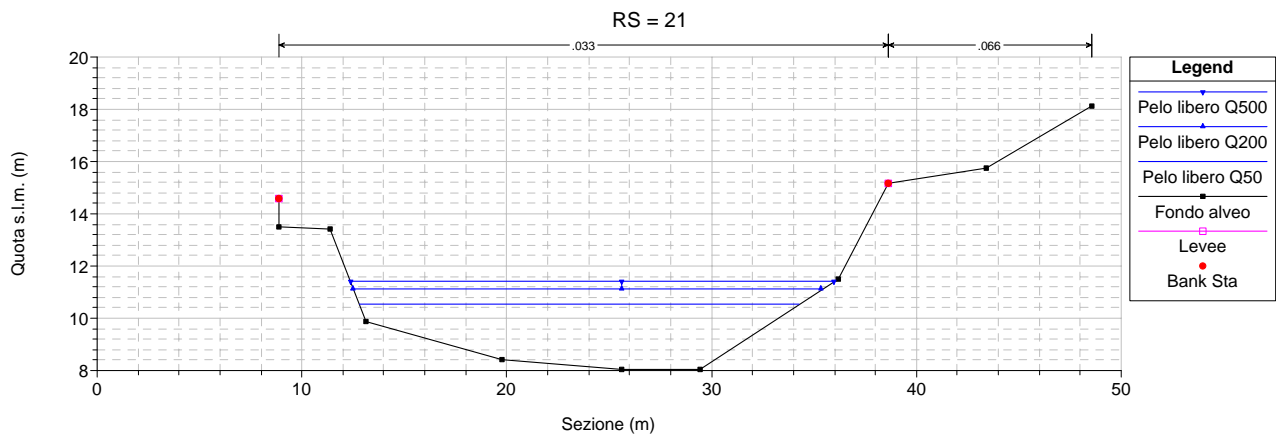
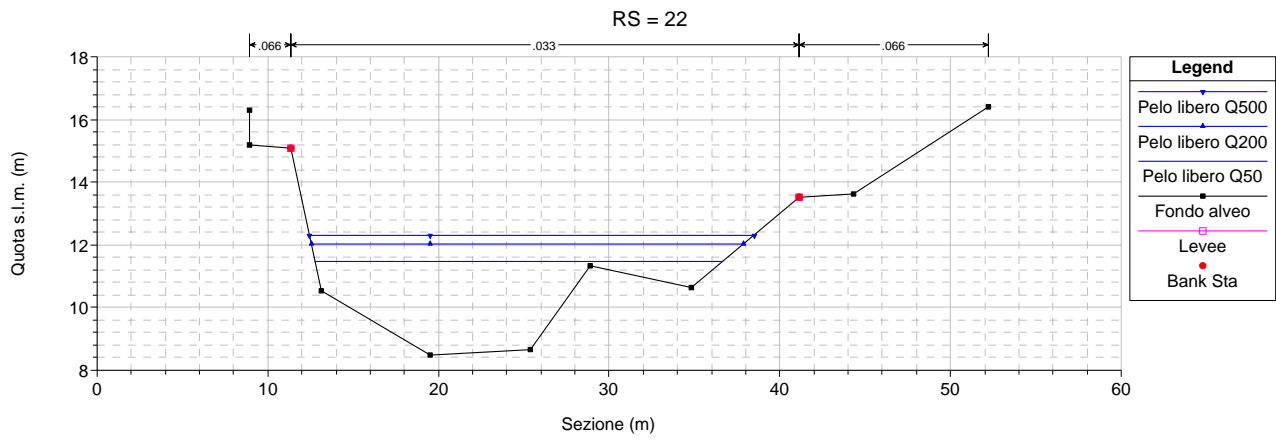
# TORRENTE ARRESTRA

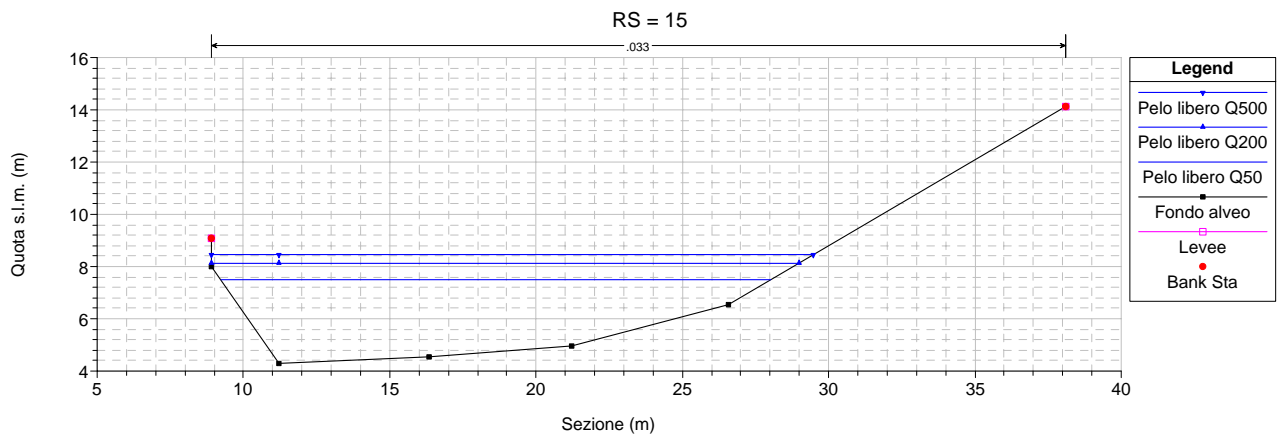
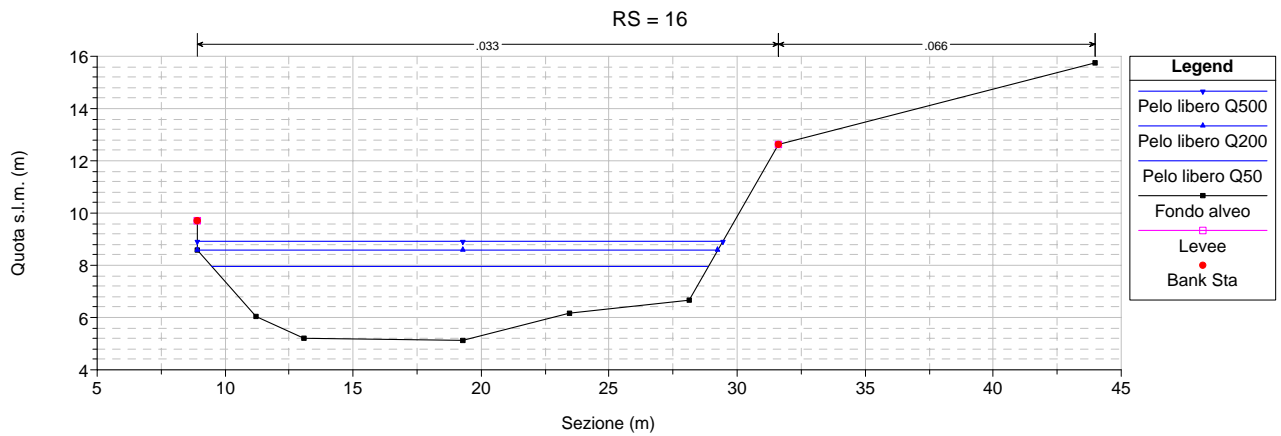
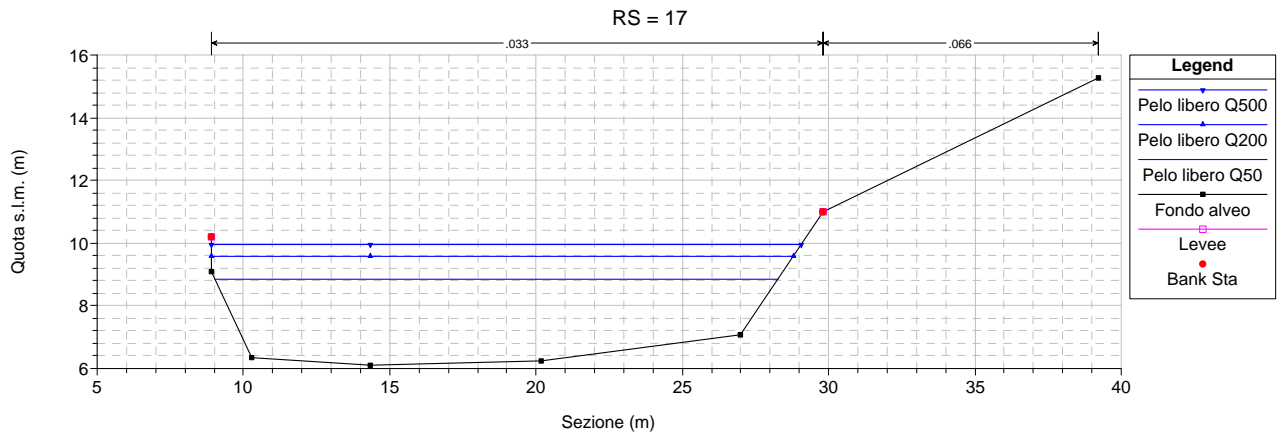
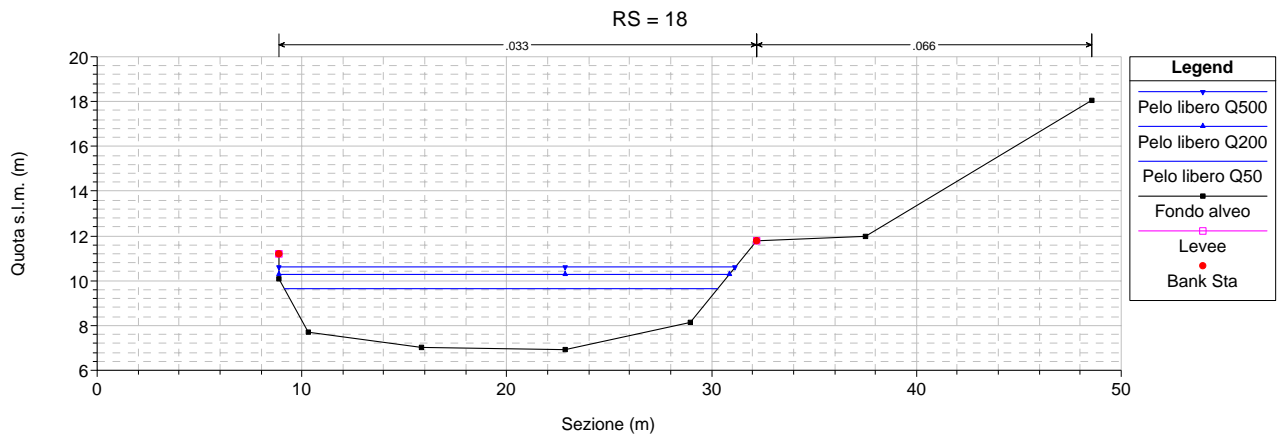
## Sezioni trasversali

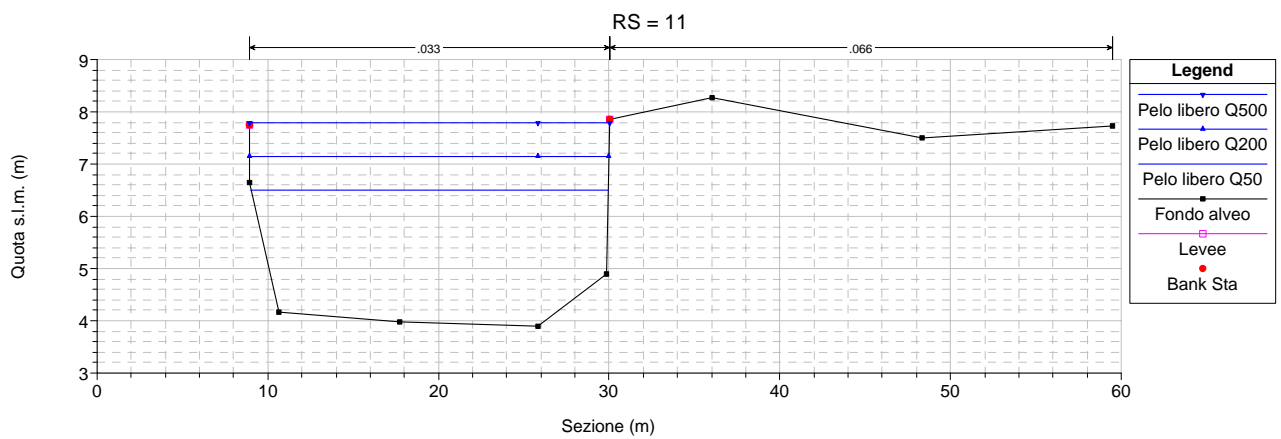
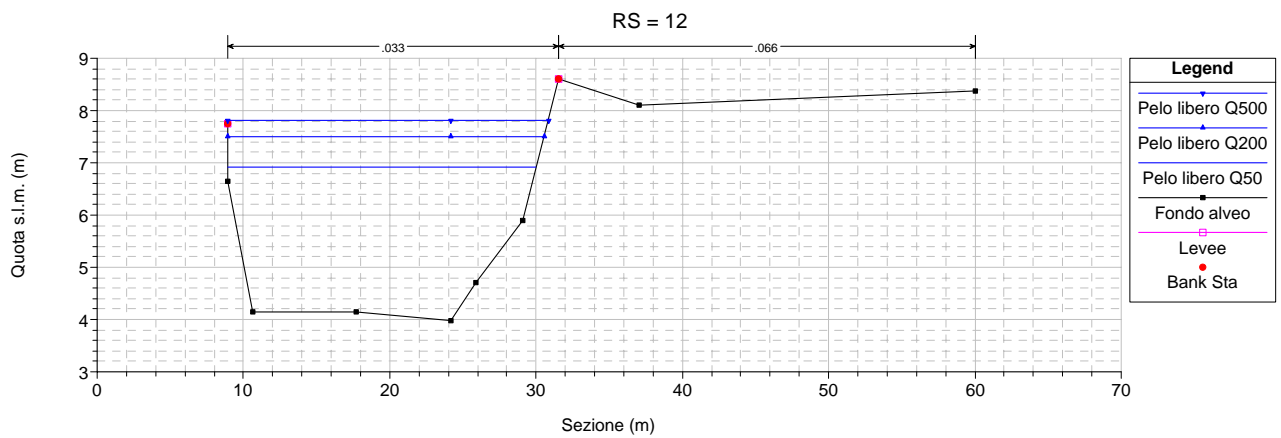
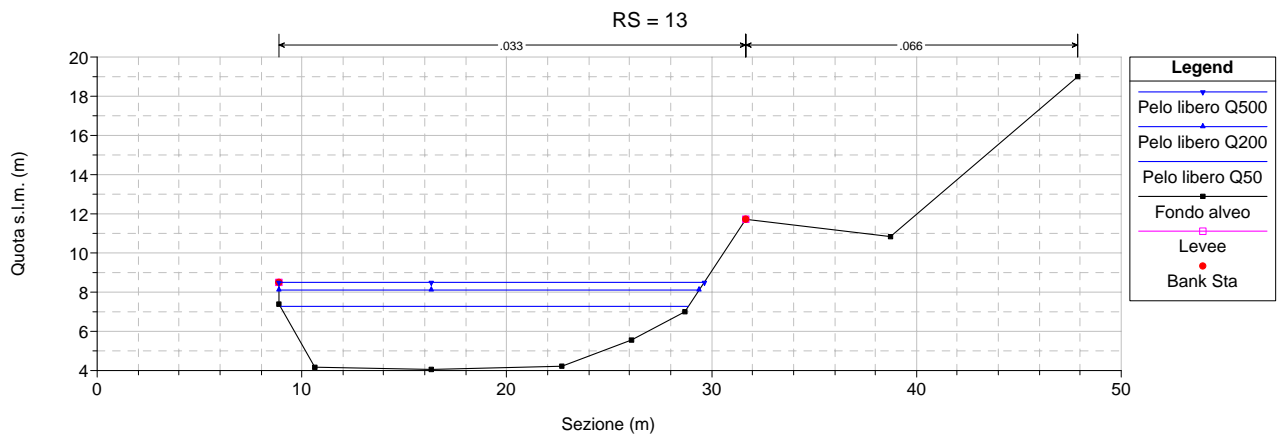
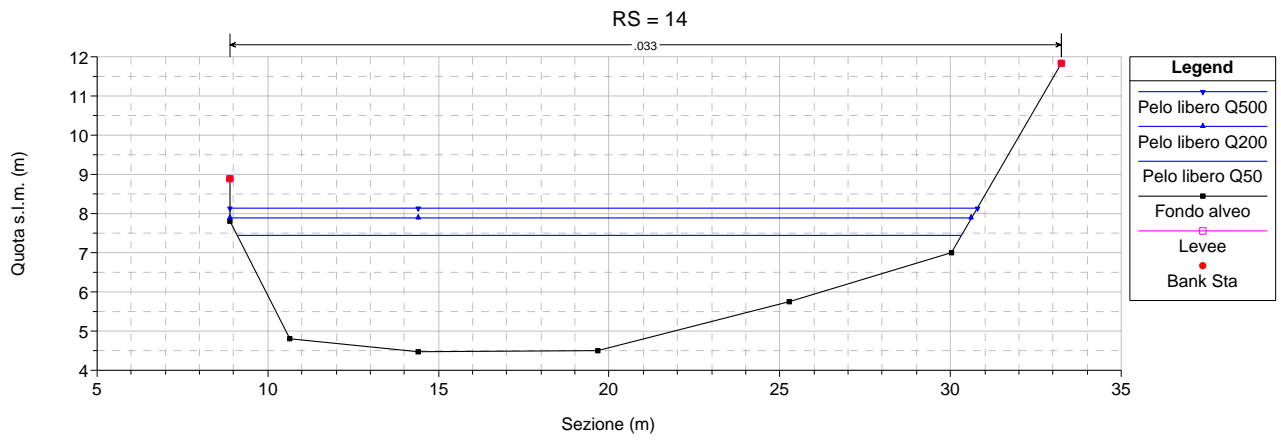




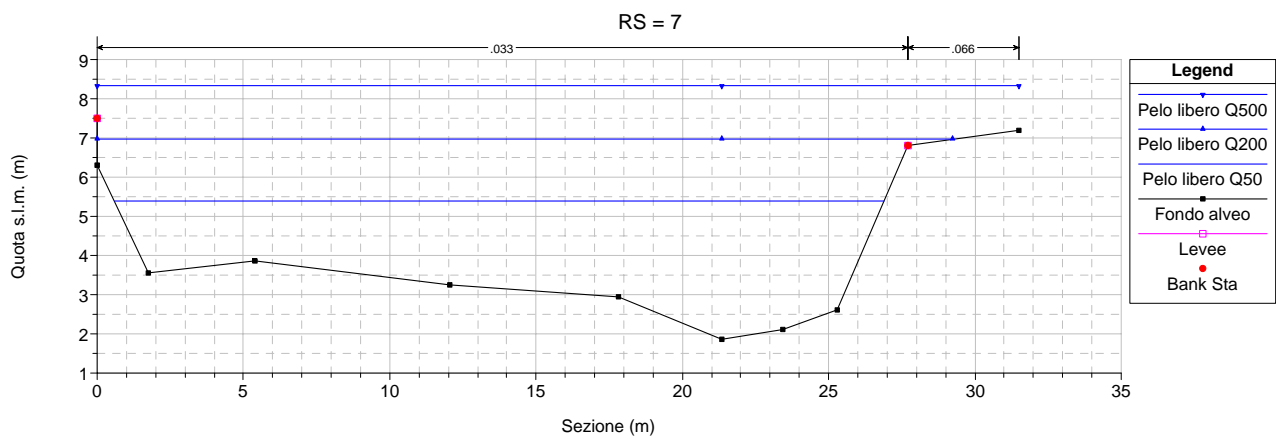
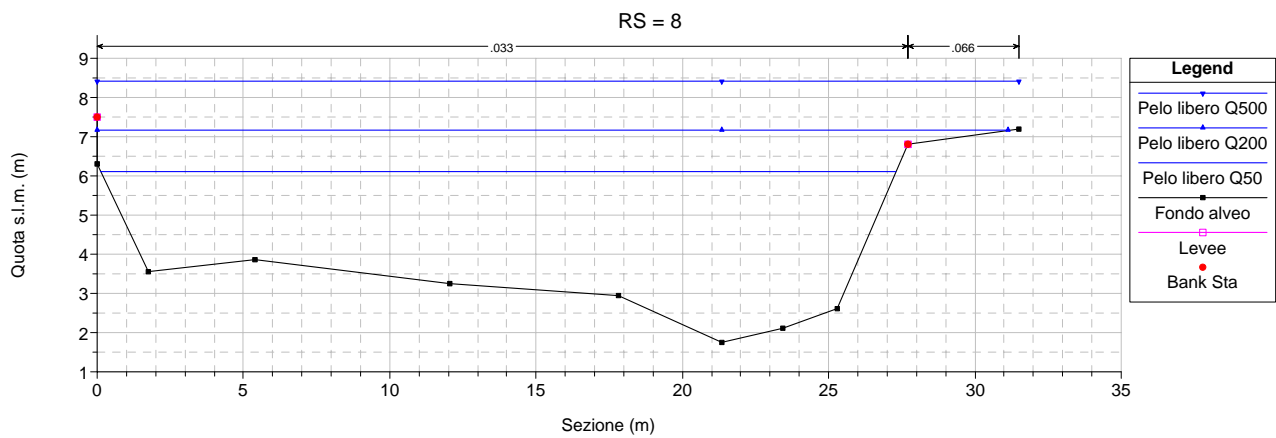
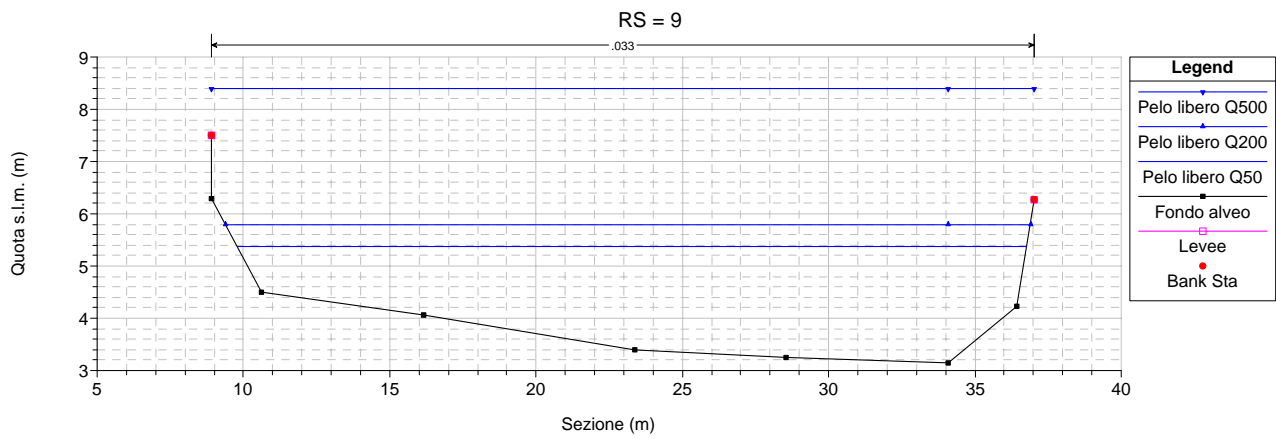
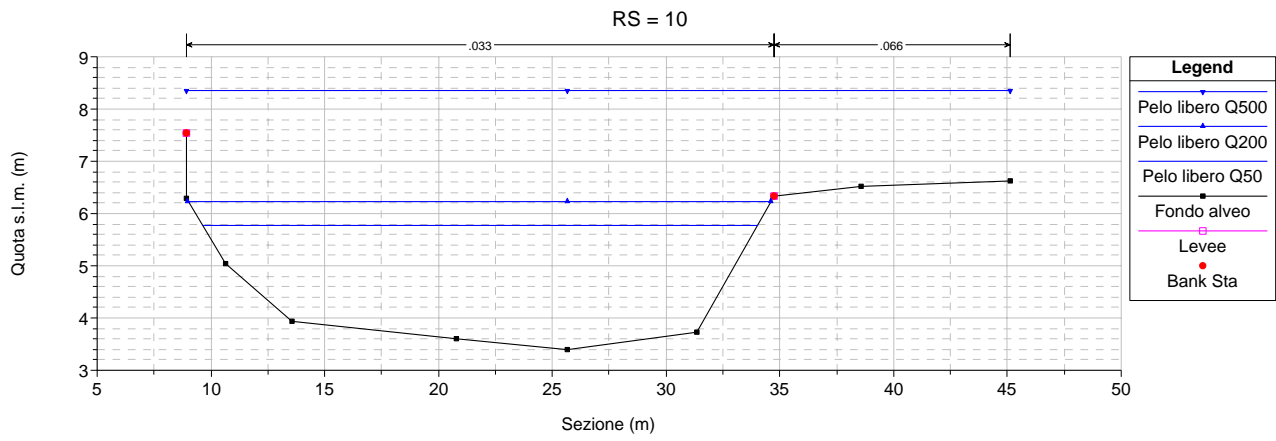


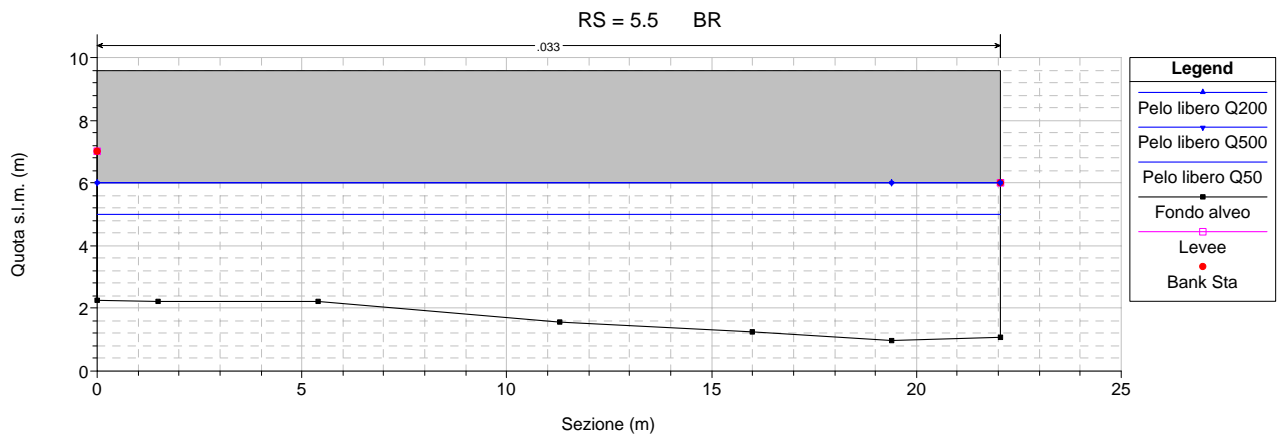
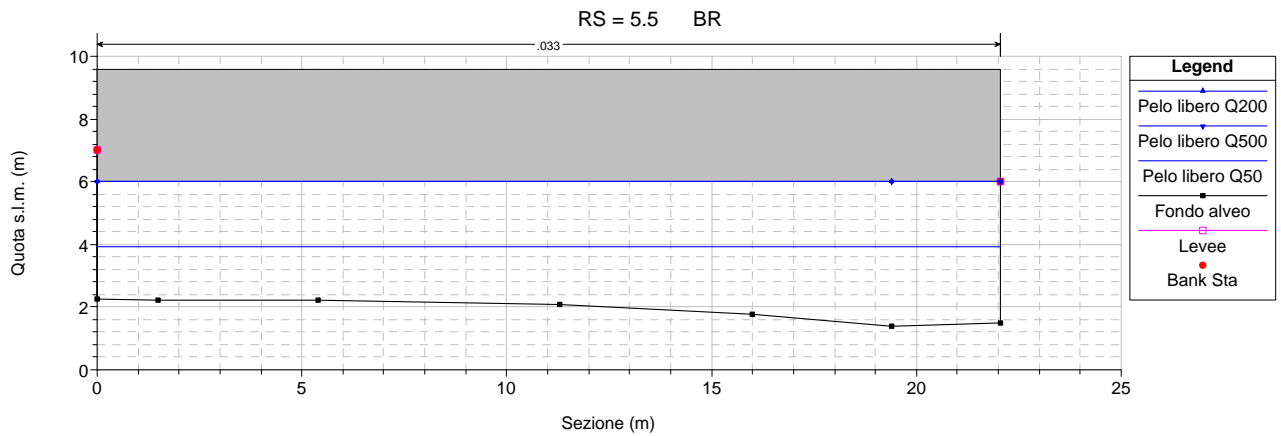
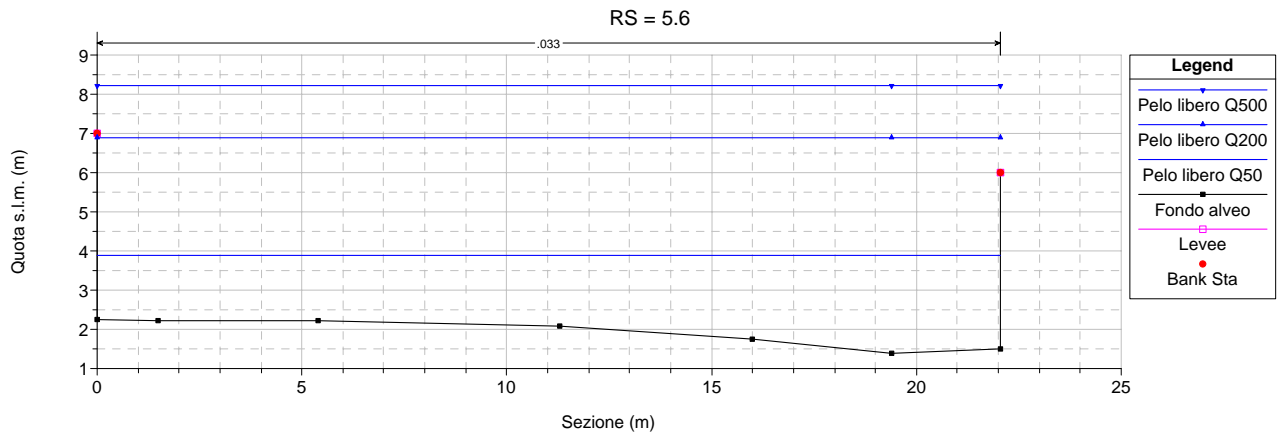
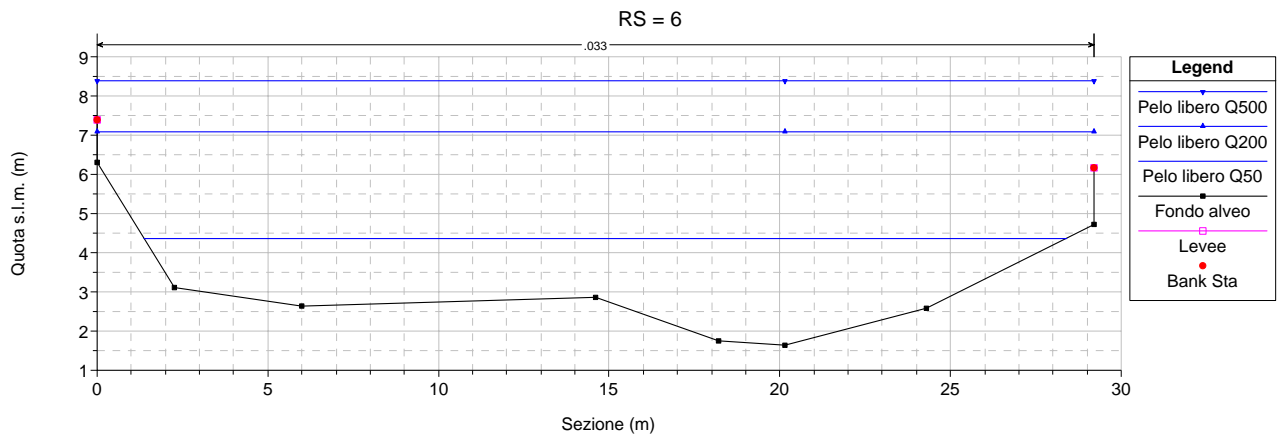


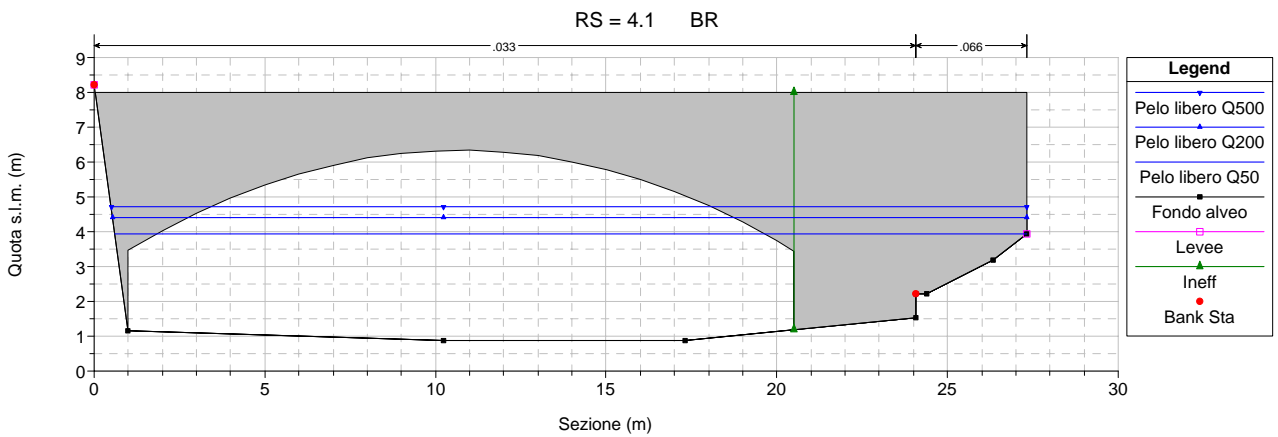
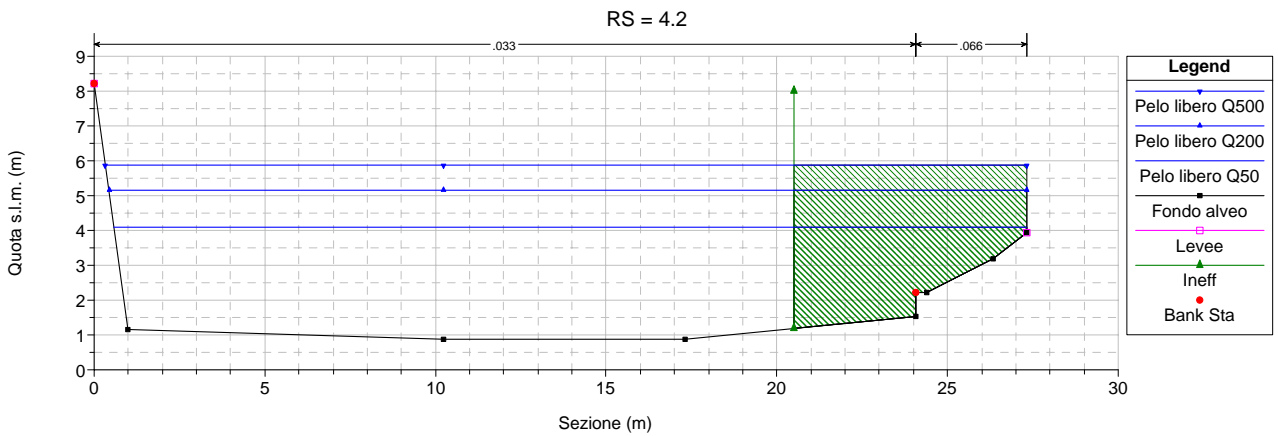
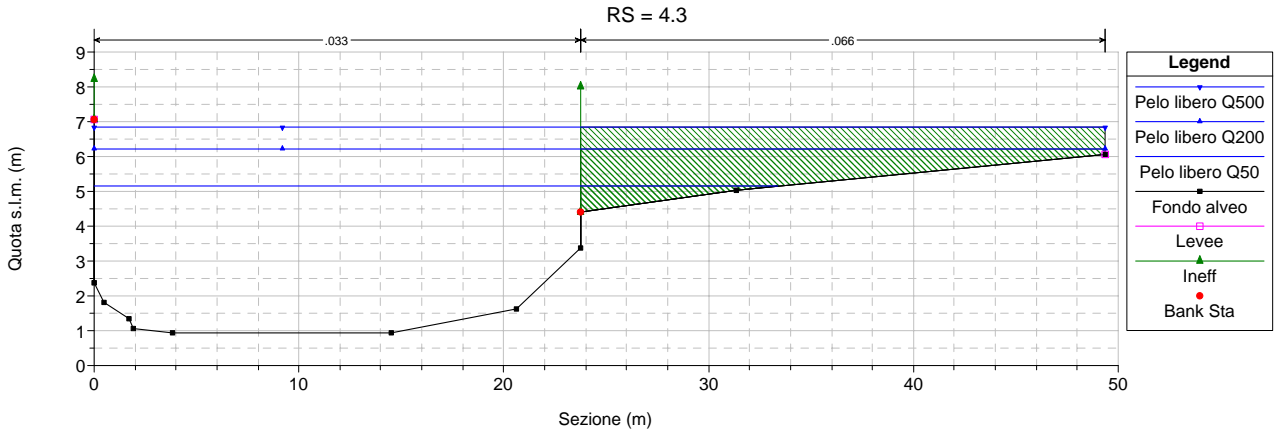
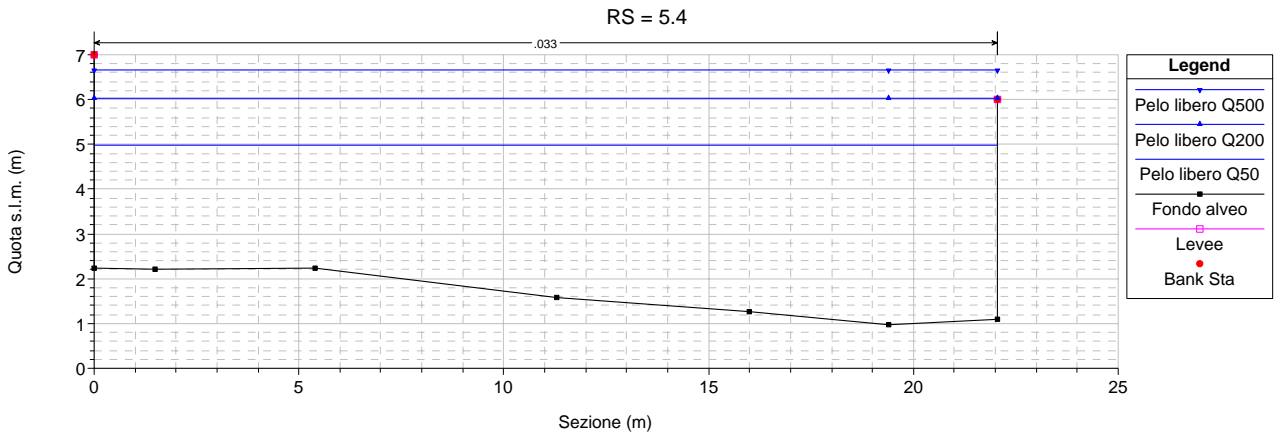


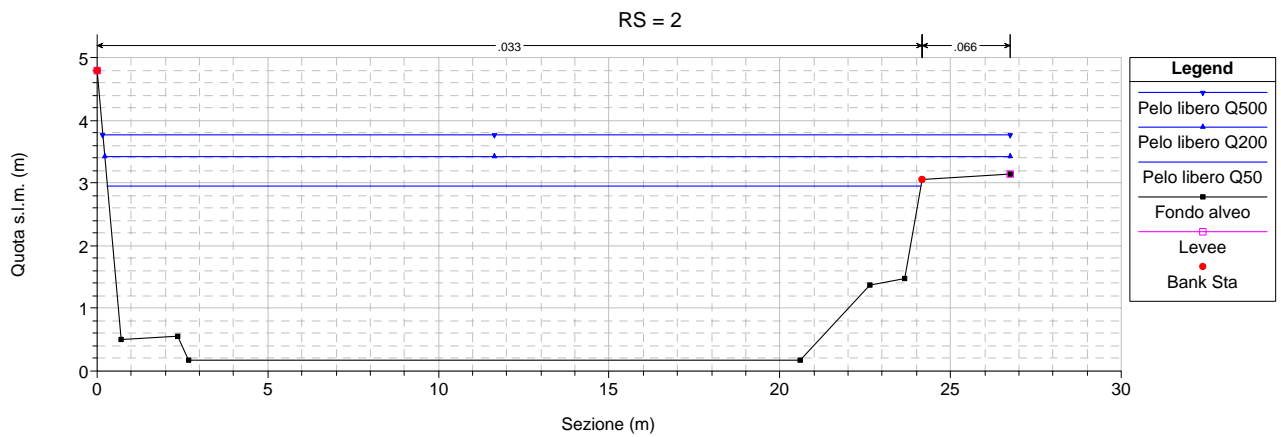
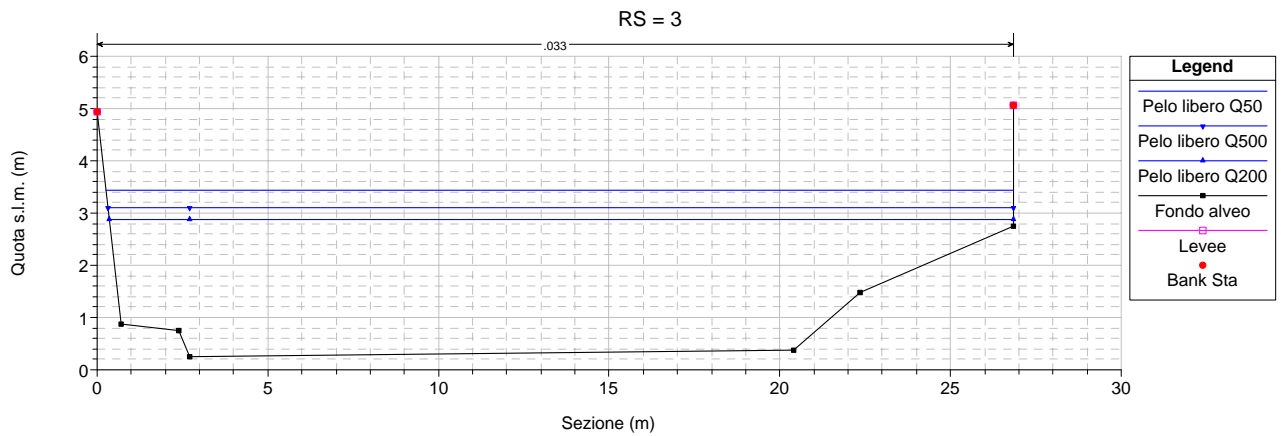
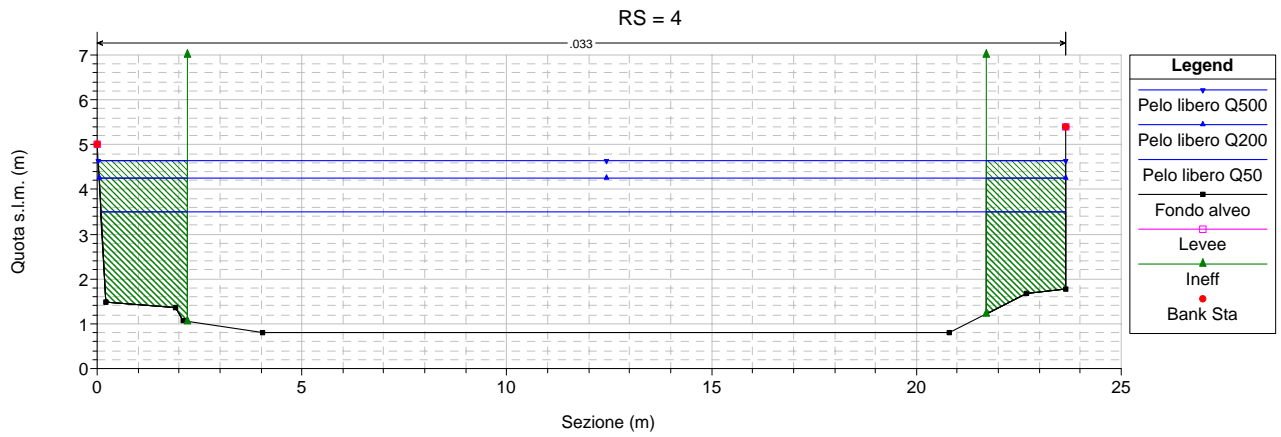
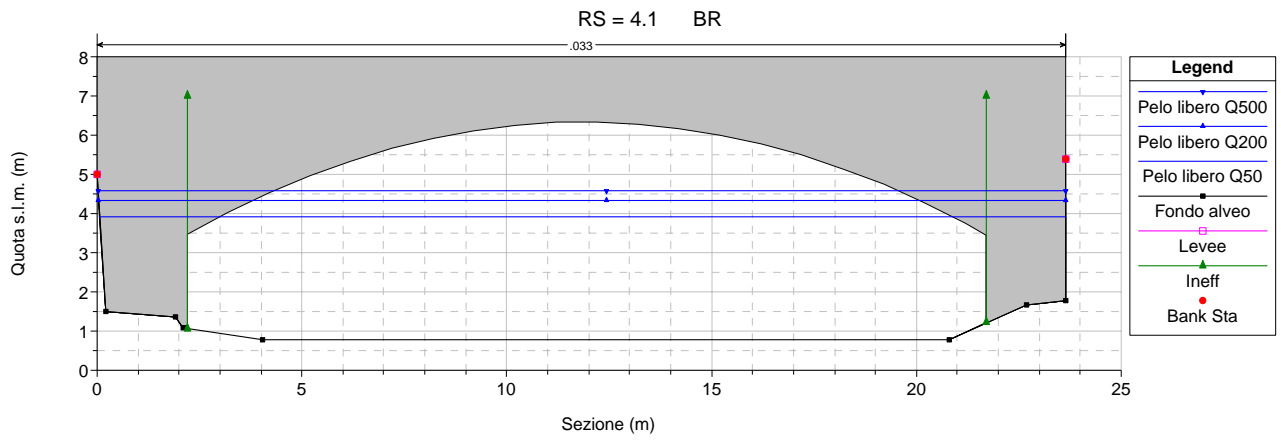


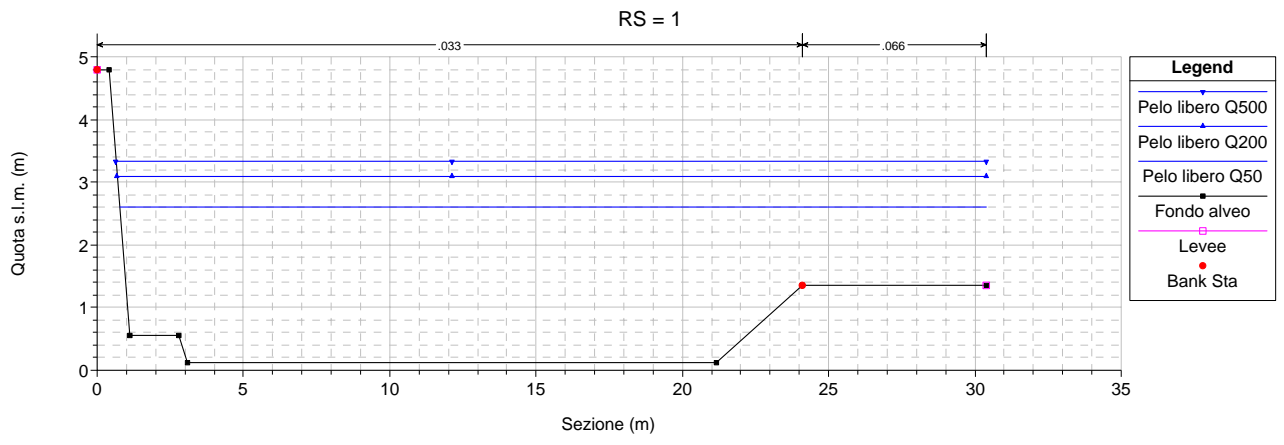














**MODELLAZIONE IDRAULICA IN CONDIZIONI DI MOTO  
PERMANENTE:  
TABELLE DELLE GRANDEZZE IDRAULICHE SIGNIFICATIVE  
PER LE PORTATE T=50, 200, 500 ANNI**

**ARRESTRA**

**T. Arrestra T=50 anni**

| Sezioni | Portata totale (m <sup>3</sup> /s) | Fondo alveo (m) | Argine sinistro (m) | Argine destro (m) | Pelo libero (m) | Profondità critica (m) | Energia (m) | Velocità (m/s) | Area bagnata (m <sup>2</sup> ) | N° Froude |
|---------|------------------------------------|-----------------|---------------------|-------------------|-----------------|------------------------|-------------|----------------|--------------------------------|-----------|
| 34      | 270                                | 19.51           | 23.3                | 23                | 22.04           | 22.04                  | 22.82       | 3.92           | 68.89                          | 1         |
| 33      | 270                                | 18.71           | 22.46               | 21.8              | 21              | 21.29                  | 22.25       | 4.96           | 54.46                          | 1.3       |
| 32      | 270                                | 18.15           | 22.1                | 21.5              | 20.18           | 20.57                  | 21.75       | 5.55           | 48.62                          | 1.35      |
| 31      | 270                                | 17.2            | 22.59               | 21.72             | 18.51           | 19.19                  | 20.81       | 6.72           | 40.19                          | 2.01      |
| 30      | 270                                | 16.62           | 22.04               | 20.4              | 19.1            | 19.1                   | 20.06       | 4.34           | 62.26                          | 1         |
| 29      | 270                                | 16.22           | 21.91               | 21                | 18.03           | 18.44                  | 19.52       | 5.4            | 49.98                          | 1.43      |
| 28      | 270                                | 14.43           | 21.42               | 20.09             | 16.76           | 17.42                  | 18.88       | 6.45           | 41.84                          | 1.67      |
| 27      | 270                                | 13.04           | 18.54               | 20.2              | 16.62           | 16.62                  | 17.53       | 4.22           | 63.99                          | 1         |
| 26      | 270                                | 12.87           | 18.49               | 16.15             | 15.14           | 15.68                  | 16.85       | 5.79           | 46.63                          | 1.63      |
| 25      | 270                                | 12.68           | 16.86               | 15.86             | 14.44           | 14.89                  | 15.99       | 5.52           | 48.89                          | 1.48      |
| 24      | 270                                | 9.75            | 15.6                | 15.82             | 13.46           | 13.99                  | 15.23       | 5.91           | 45.72                          | 1.59      |
| 23      | 270                                | 9.37            | 15.5                | 14.81             | 12.74           | 13.28                  | 14.59       | 6.03           | 44.8                           | 1.59      |
| 22      | 270                                | 8.47            | 15.1                | 13.52             | 11.49           | 12.24                  | 13.94       | 6.94           | 38.91                          | 1.74      |
| 21      | 270                                | 8.05            | 14.6                | 15.16             | 10.54           | 11.32                  | 13.07       | 7.05           | 38.29                          | 1.68      |
| 20      | 270                                | 8.09            | 13.5                | 12.26             | 10.99           | 10.99                  | 12.3        | 5.06           | 53.33                          | 1         |
| 19      | 270                                | 7.58            | 12                  | 11.77             | 10.2            | 10.54                  | 11.85       | 5.7            | 47.4                           | 1.22      |
| 18      | 270                                | 6.94            | 11.2                | 11.8              | 9.66            | 10.03                  | 11.38       | 5.8            | 46.55                          | 1.25      |
| 17      | 270                                | 6.1             | 10.2                | 10.99             | 8.86            | 9.3                    | 10.77       | 6.12           | 44.12                          | 1.29      |
| 16      | 270                                | 5.12            | 9.7                 | 12.62             | 7.96            | 8.59                   | 10.2        | 6.63           | 40.72                          | 1.46      |
| 15      | 270                                | 4.3             | 9.1                 | 14.14             | 7.48            | 8.04                   | 9.57        | 6.4            | 42.22                          | 1.36      |
| 14      | 270                                | 4.46            | 8.9                 | 11.84             | 7.44            | 7.82                   | 9.17        | 5.82           | 46.38                          | 1.26      |
| 13      | 270                                | 4.05            | 8.5                 | 11.73             | 7.3             | 7.36                   | 8.69        | 5.23           | 51.6                           | 1.04      |
| 12      | 270                                | 3.97            | 7.75                | 8.6               | 6.91            | 7.07                   | 8.36        | 5.34           | 50.54                          | 1.1       |
| 11      | 270                                | 3.9             | 7.75                | 7.85              | 6.5             | 6.76                   | 8.08        | 5.58           | 48.38                          | 1.17      |
| 10      | 270                                | 3.39            | 7.55                | 6.33              | 5.78            | 6.27                   | 7.6         | 5.97           | 45.2                           | 1.4       |
| 9       | 270                                | 3.14            | 7.5                 | 6.27              | 5.38            | 5.88                   | 7.18        | 5.95           | 45.39                          | 1.46      |
| 8       | 270                                | 1.76            | 7.5                 | 6.8               | 6.11            | 5.37                   | 6.72        | 3.47           | 77.71                          | 0.66      |
| 7       | 270                                | 1.85            | 7.5                 | 6.8               | 5.38            | 5.38                   | 6.48        | 4.65           | 58.05                          | 1         |
| 6       | 270                                | 1.65            | 7.4                 | 6.16              | 4.37            | 4.86                   | 6.14        | 5.89           | 45.8                           | 1.45      |
| 5.6     | 270                                | 1.38            | 7                   | 6                 | 3.89            | 4.42                   | 5.9         | 6.29           | 42.95                          | 1.44      |
| 5.5     | Bridge                             |                 |                     |                   |                 |                        |             |                |                                |           |
| 5.4     | 270                                | 0.98            | 7                   | 6                 | 4.99            | 4.13                   | 5.67        | 3.67           | 73.5                           | 0.64      |
| 4.3     | 270                                | 0.93            | 7.06                | 4.41              | 5.14            | 3.66                   | 5.59        | 2.95           | 91.38                          | 0.48      |
| 4.2     | 270                                | 0.87            | 8.22                | 2.22              | 4.1             | 3.65                   | 5.08        | 4.37           | 61.84                          | 0.79      |
| 4.1     | Bridge                             |                 |                     |                   |                 |                        |             |                |                                |           |
| 4       | 270                                | 0.79            | 5.01                | 5.39              | 3.5             | 3.5                    | 4.85        | 5.14           | 52.49                          | 1         |
| 3       | 270                                | 0.26            | 4.93                | 5.06              | 3.44            | 2.91                   | 4.15        | 3.75           | 72.08                          | 0.73      |
| 2       | 270                                | 0.18            | 4.8                 | 3.06              | 2.95            | 2.73                   | 3.94        | 4.4            | 61.38                          | 0.88      |
| 1       | 270                                | 0.12            | 4.8                 | 1.35              | 2.6             | 2.6                    | 3.69        | 4.72           | 62.69                          | 0.98      |



**T. Arrestra T=200 anni**

| Sezioni | Portata totale (m <sup>3</sup> /s) | Fondo alveo (m) | Argine sinistro (m) | Argine destro (m) | Pelo libero (m) | Profondità critica (m) | Energia (m) | Velocità (m/s) | Area bagnata (m <sup>2</sup> ) | N° Froude |
|---------|------------------------------------|-----------------|---------------------|-------------------|-----------------|------------------------|-------------|----------------|--------------------------------|-----------|
| 34      | 390                                | 19.51           | 23.3                | 23                | 22.48           | 22.48                  | 23.47       | 4.4            | 88.62                          | 1         |
| 33      | 390                                | 18.71           | 22.46               | 21.8              | 21.49           | 21.79                  | 22.95       | 5.37           | 72.69                          | 1.24      |
| 32      | 390                                | 18.15           | 22.1                | 21.5              | 20.82           | 21.15                  | 22.55       | 5.82           | 66.98                          | 1.22      |
| 31      | 390                                | 17.2            | 22.59               | 21.72             | 18.83           | 19.69                  | 21.72       | 7.53           | 51.79                          | 2         |
| 30      | 390                                | 16.62           | 22.04               | 20.4              | 19.68           | 19.68                  | 20.83       | 4.77           | 81.8                           | 1         |
| 29      | 390                                | 16.22           | 21.91               | 21                | 18.45           | 18.95                  | 20.31       | 6.03           | 64.64                          | 1.43      |
| 28      | 390                                | 14.43           | 21.42               | 20.09             | 17.25           | 18.01                  | 19.71       | 6.96           | 56.03                          | 1.64      |
| 27      | 390                                | 13.04           | 18.54               | 20.2              | 17.14           | 17.14                  | 18.27       | 4.72           | 82.66                          | 1         |
| 26      | 390                                | 12.87           | 18.49               | 16.15             | 15.5            | 16.15                  | 17.59       | 6.4            | 60.91                          | 1.71      |
| 25      | 390                                | 12.68           | 16.86               | 15.86             | 14.89           | 15.41                  | 16.72       | 6              | 65.03                          | 1.44      |
| 24      | 390                                | 9.75            | 15.6                | 15.82             | 13.88           | 14.54                  | 16.03       | 6.49           | 60.07                          | 1.58      |
| 23      | 390                                | 9.37            | 15.5                | 14.81             | 13.19           | 13.84                  | 15.45       | 6.66           | 58.56                          | 1.55      |
| 22      | 390                                | 8.47            | 15.1                | 13.52             | 12.03           | 12.9                   | 14.87       | 7.47           | 52.2                           | 1.66      |
| 21      | 390                                | 8.05            | 14.6                | 15.16             | 11.11           | 12.01                  | 14.1        | 7.66           | 50.9                           | 1.64      |
| 20      | 390                                | 8.09            | 13.5                | 12.26             | 11.74           | 11.74                  | 13.38       | 5.67           | 68.8                           | 1         |
| 19      | 390                                | 7.58            | 12                  | 11.77             | 10.8            | 11.26                  | 12.92       | 6.46           | 60.42                          | 1.26      |
| 18      | 390                                | 6.94            | 11.2                | 11.8              | 10.28           | 10.75                  | 12.44       | 6.52           | 59.85                          | 1.26      |
| 17      | 390                                | 6.1             | 10.2                | 10.99             | 9.57            | 10.06                  | 11.87       | 6.71           | 58.13                          | 1.25      |
| 16      | 390                                | 5.12            | 9.7                 | 12.62             | 8.59            | 9.33                   | 11.33       | 7.33           | 53.21                          | 1.45      |
| 15      | 390                                | 4.3             | 9.1                 | 14.14             | 8.12            | 8.82                   | 10.72       | 7.14           | 54.62                          | 1.38      |
| 14      | 390                                | 4.46            | 8.9                 | 11.84             | 7.88            | 8.53                   | 10.37       | 7              | 55.72                          | 1.39      |
| 13      | 390                                | 4.05            | 8.5                 | 11.73             | 8.12            | 8.12                   | 9.78        | 5.72           | 68.17                          | 1         |
| 12      | 390                                | 3.97            | 7.75                | 8.6               | 7.5             | 7.8                    | 9.44        | 6.17           | 63.25                          | 1.15      |
| 11      | 390                                | 3.9             | 7.75                | 7.85              | 7.14            | 7.47                   | 9.16        | 6.29           | 62.03                          | 1.17      |
| 10      | 390                                | 3.39            | 7.55                | 6.33              | 6.24            | 6.98                   | 8.65        | 6.88           | 56.68                          | 1.48      |
| 9       | 390                                | 3.14            | 7.5                 | 6.27              | 5.79            | 6.48                   | 8.22        | 6.91           | 56.43                          | 1.54      |
| 8       | 390                                | 1.76            | 7.5                 | 6.8               | 7.16            | 6                      | 7.84        | 3.65           | 107.36                         | 0.59      |
| 7       | 390                                | 1.85            | 7.5                 | 6.8               | 6.96            | 6.01                   | 7.72        | 3.86           | 101.18                         | 0.65      |
| 6       | 390                                | 1.65            | 7.4                 | 6.16              | 7.08            | 5.45                   | 7.59        | 3.15           | 123.63                         | 0.49      |
| 5.6     | 390                                | 1.38            | 7                   | 6                 | 6.9             | 5.11                   | 7.55        | 3.57           | 109.3                          | 0.51      |
| 5.5     | Bridge                             |                 |                     |                   |                 |                        |             |                |                                |           |
| 5.4     | 390                                | 0.98            | 7                   | 6                 | 6.04            | 4.82                   | 6.87        | 4.03           | 96.65                          | 0.62      |
| 4.3     | 390                                | 0.93            | 7.06                | 4.41              | 6.21            | 4.31                   | 6.78        | 3.35           | 116.58                         | 0.48      |
| 4.2     | 390                                | 0.87            | 8.22                | 2.22              | 5.15            | 4.4                    | 6.28        | 4.71           | 82.74                          | 0.74      |
| 4.1     | Bridge                             |                 |                     |                   |                 |                        |             |                |                                |           |
| 4       | 390                                | 0.79            | 5.01                | 5.39              | 4.25            | 4.25                   | 5.97        | 5.81           | 67.08                          | 1         |
| 3       | 390                                | 0.26            | 4.93                | 5.06              | 2.88            | 3.53                   | 5.24        | 6.79           | 57.4                           | 1.47      |
| 2       | 390                                | 0.18            | 4.8                 | 3.06              | 3.41            | 3.41                   | 4.89        | 5.38           | 73.17                          | 0.99      |
| 1       | 390                                | 0.12            | 4.8                 | 1.35              | 3.09            | 3.21                   | 4.61        | 5.58           | 77.25                          | 1.06      |

### T. Arrestra T=500 anni

| Sezioni | Portata<br>totale<br>(m <sup>3</sup> /s) | Fondo<br>alveo<br>(m) | Argine<br>sinistro<br>(m) | Argine<br>destro<br>(m) | Pelo<br>libero<br>(m) | Profondità<br>critica<br>(m) | Energia<br>(m) | Velocità<br>(m/s) | Area<br>bagnata<br>(m <sup>2</sup> ) | N°<br>Froude |
|---------|--|-----------------------|---------------------------|-------------------------|-----------------------|------------------------------|----------------|-------------------|--------------------------------------|--------------|
| 34      | 460                                      | 19.51                 | 23.3                      | 23                      | 22.72                 | 22.72                        | 23.81          | 4.63              | 99.39                                | 1            |
| 33      | 460                                      | 18.71                 | 22.46                     | 21.8                    | 21.75                 | 22.05                        | 23.32          | 5.55              | 82.9                                 | 1.21         |
| 32      | 460                                      | 18.15                 | 22.1                      | 21.5                    | 21.22                 | 21.47                        | 22.97          | 5.85              | 78.69                                | 1.14         |
| 31      | 460                                      | 17.2                  | 22.59                     | 21.72                   | 19.01                 | 19.96                        | 22.2           | 7.9               | 58.21                                | 1.98         |
| 30      | 460                                      | 16.62                 | 22.04                     | 20.4                    | 19.97                 | 19.97                        | 21.24          | 4.99              | 92.17                                | 1            |
| 29      | 460                                      | 16.22                 | 21.91                     | 21                      | 18.68                 | 19.23                        | 20.71          | 6.31              | 72.85                                | 1.41         |
| 28      | 460                                      | 14.43                 | 21.42                     | 20.09                   | 17.5                  | 18.3                         | 20.15          | 7.21              | 63.78                                | 1.62         |
| 27      | 460                                      | 13.04                 | 18.54                     | 20.2                    | 17.41                 | 17.41                        | 18.67          | 4.96              | 92.77                                | 1            |
| 26      | 460                                      | 12.87                 | 18.49                     | 16.15                   | 15.67                 | 16.39                        | 17.98          | 6.74              | 68.21                                | 1.73         |
| 25      | 460                                      | 12.68                 | 16.86                     | 15.86                   | 15.12                 | 15.71                        | 17.12          | 6.27              | 73.4                                 | 1.44         |
| 24      | 460                                      | 9.75                  | 15.6                      | 15.82                   | 14.11                 | 14.82                        | 16.44          | 6.77              | 67.97                                | 1.57         |
| 23      | 460                                      | 9.37                  | 15.5                      | 14.81                   | 13.43                 | 14.14                        | 15.88          | 6.93              | 66.34                                | 1.53         |
| 22      | 460                                      | 8.47                  | 15.1                      | 13.52                   | 12.32                 | 13.24                        | 15.34          | 7.7               | 59.72                                | 1.62         |
| 21      | 460                                      | 8.05                  | 14.6                      | 15.16                   | 11.41                 | 12.37                        | 14.61          | 7.92              | 58.05                                | 1.61         |
| 20      | 460                                      | 8.09                  | 13.5                      | 12.26                   | 12.14                 | 12.14                        | 13.95          | 5.96              | 77.24                                | 1            |
| 19      | 460                                      | 7.58                  | 12                        | 11.77                   | 11.1                  | 11.64                        | 13.48          | 6.83              | 67.31                                | 1.27         |
| 18      | 460                                      | 6.94                  | 11.2                      | 11.8                    | 10.6                  | 11.2                         | 13             | 6.86              | 67.03                                | 1.26         |
| 17      | 460                                      | 6.1                   | 10.2                      | 10.99                   | 9.96                  | 10.47                        | 12.45          | 6.99              | 65.83                                | 1.23         |
| 16      | 460                                      | 5.12                  | 9.7                       | 12.62                   | 8.92                  | 9.73                         | 11.91          | 7.67              | 60.01                                | 1.43         |
| 15      | 460                                      | 4.3                   | 9.1                       | 14.14                   | 8.45                  | 9.22                         | 11.32          | 7.51              | 61.24                                | 1.39         |
| 14      | 460                                      | 4.46                  | 8.9                       | 11.84                   | 8.14                  | 8.91                         | 10.99          | 7.48              | 61.47                                | 1.43         |
| 13      | 460                                      | 4.05                  | 8.5                       | 11.73                   | 8.52                  | 8.52                         | 10.36          | 6.02              | 76.44                                | 1            |
| 12      | 460                                      | 3.97                  | 7.75                      | 8.6                     | 7.82                  | 8.19                         | 10.01          | 6.56              | 70.14                                | 1.17         |
| 11      | 460                                      | 3.9                   | 7.75                      | 7.85                    | 7.79                  | 8.08                         | 9.67           | 6.08              | 75.6                                 | 1.03         |
| 10      | 460                                      | 3.39                  | 7.55                      | 6.33                    | 8.36                  | 7.31                         | 9.12           | 3.94              | 130.65                               | 0.6          |
| 9       | 460                                      | 3.14                  | 7.5                       | 6.27                    | 8.39                  | 6.8                          | 9.03           | 3.55              | 129.44                               | 0.53         |
| 8       | 460                                      | 1.76                  | 7.5                       | 6.8                     | 8.41                  | 6.33                         | 8.94           | 3.23              | 146.85                               | 0.46         |
| 7       | 460                                      | 1.85                  | 7.5                       | 6.8                     | 8.33                  | 6.34                         | 8.88           | 3.28              | 144.11                               | 0.47         |
| 6       | 460                                      | 1.65                  | 7.4                       | 6.16                    | 8.4                   | 5.77                         | 8.81           | 2.84              | 161.99                               | 0.38         |
| 5.6     | 460                                      | 1.38                  | 7                         | 6                       | 8.21                  | 5.48                         | 8.77           | 3.33              | 138.17                               | 0.42         |
| 5.5     | Bridge                                   |                       |                           |                         |                       |                              |                |                   |                                      |              |
| 5.4     | 460                                      | 0.98                  | 7                         | 6                       | 6.67                  | 5.19                         | 7.55           | 4.16              | 110.64                               | 0.59         |
| 4.3     | 460                                      | 0.93                  | 7.06                      | 4.41                    | 6.84                  | 4.66                         | 7.46           | 3.49              | 131.64                               | 0.47         |
| 4.2     | 460                                      | 0.87                  | 8.22                      | 2.22                    | 5.86                  | 4.79                         | 7.01           | 4.74              | 97.08                                | 0.69         |
| 4.1     | Bridge                                   |                       |                           |                         |                       |                              |                |                   |                                      |              |
| 4       | 460                                      | 0.79                  | 5.01                      | 5.39                    | 4.65                  | 4.65                         | 6.57           | 6.14              | 74.92                                | 1            |
| 3       | 460                                      | 0.26                  | 4.93                      | 5.06                    | 3.11                  | 3.85                         | 5.79           | 7.25              | 63.48                                | 1.49         |
| 2       | 460                                      | 0.18                  | 4.8                       | 3.06                    | 3.77                  | 3.77                         | 5.4            | 5.67              | 82.58                                | 0.99         |
| 1       | 460                                      | 0.12                  | 4.8                       | 1.35                    | 3.33                  | 3.53                         | 5.1            | 6.04              | 84.46                                | 1.1          |