

**COMUNE DI EMPOLI**  
**Città Metropolitana di FIRENZE**

**SECONDO REGOLAMENTO URBANISTICO**  
**PROGETTO UNITARIO CONVENZIONATO**  
**SCHEDA 14.4**

**SISTEMA DI FOGNATURA BIANCA**

Committente:

**COMPUTER GROSS SpA**

**CABEL HOLDING SpA**

Responsabile Unico del Procedimento:

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fognature bianche**

SCALA

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Progettazione:



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## INDICE GENERALE

<b>1. PREMESSA.....</b>	<b>3</b>
<b>2. NORMATIVA DI RIFERIMENTO.....</b>	<b>3</b>
<b>3. INQUADRAMENTO DELL'INTERVENTO.....</b>	<b>4</b>
<b>4. DIMENSIONAMENTO DEL SISTEMA DI FOGNATURA BIANCA.....</b>	<b>5</b>
4.1. Prescrizioni derivanti dal paragrafo 3.2.2 della Relazione Geologica di Fattibilità del Secondo RU comunale.....	5
4.2. Criteri progettuali.....	5
4.3. Analisi idrologica.....	7
4.3.1. Afflussi meteorici.....	7
4.3.1.1. Pluviometria.....	7
4.3.1.2. Ietogrammi di pioggia.....	8
4.3.1.3. Ragguaglio delle precipitazioni all'area di bacino.....	8
4.3.2. Modello di perdita idrologica.....	9
4.3.3. Trasformazione afflussi netti – deflussi.....	9
4.4. Analisi idraulica.....	10
4.4.1. Modello idraulico a moto vario di SWMM.....	11
4.4.2. Condizioni al contorno.....	11
4.4.3. Parametri di resistenza al moto.....	11
4.4.4. Caratteristiche della rete di drenaggio.....	12
4.5. Risultati del modello.....	14
<b>5. CONCLUSIONI.....</b>	<b>16</b>
<b>ALLEGATI.....</b>	<b>17</b>
ALLEGATO 1. Planimetria aree scolanti stato attuale.....	17
ALLEGATO 2. Planimetria aree scolanti stato di progetto.....	18
ALLEGATO 3. Modello SWMM TR 20 anni durata di pioggia 1 ora sbocco libero nel Fosso Pratella.....	19
ALLEGATO 3.1. Planimetria modello SWMM.....	19
ALLEGATO 3.2. File di input modello SWMM con caratteristiche rete di calcolo.....	20
ALLEGATO 3.3. Risultati modello SWMM TR 20 anni Tp 1 ora.....	25
ALLEGATO 4. Modello SWMM TR 20 anni durate di pioggia 0.2 – 6 ore sbocco libero nel Fosso Pratella.....	31
ALLEGATO 4.1. Planimetria modello SWMM.....	31
ALLEGATO 4.2. File di input modello SWMM con caratteristiche rete di calcolo.....	32

ALLEGATO 4.3. Risultati modello SWMM TR 20 anni Tp 0.2 ore.....	37
ALLEGATO 4.4. Risultati modello SWMM TR 20 anni Tp 0.4 ore.....	43
ALLEGATO 4.5. Risultati modello SWMM TR 20 anni Tp 0.6 ore.....	49
ALLEGATO 4.6. Risultati modello SWMM TR 20 anni Tp 0.8 ore.....	55
ALLEGATO 4.7. Risultati modello SWMM TR 20 anni Tp 1.2 ore.....	61
ALLEGATO 4.8. Risultati modello SWMM TR 20 anni Tp 1.4 ore.....	67
ALLEGATO 4.9. Risultati modello SWMM TR 20 anni Tp 1.6 ore.....	73
ALLEGATO 4.10. Risultati modello SWMM TR 20 anni Tp 1.8 ore.....	79
ALLEGATO 4.11. Risultati modello SWMM TR 20 anni Tp 2.0 ore.....	85
ALLEGATO 4.12. Risultati modello SWMM TR 20 anni Tp 3.0 ore.....	91
ALLEGATO 4.13. Risultati modello SWMM TR 20 anni Tp 6.0 ore.....	95
ALLEGATO 5. Modello SWMM TR 20 anni durate di pioggia 0.4, 1, 3 e 6 ore sbocco rigurgitato nel Fosso Pratella .....	99
ALLEGATO 5.1. File di input modello SWMM con caratteristiche rete di calcolo.....	99
ALLEGATO 5.2. Risultati modello SWMM TR 20 anni Tp 0.4 ore.....	104
ALLEGATO 5.3. Risultati modello SWMM TR 20 anni Tp 1.0 ore.....	109
ALLEGATO 5.4. Risultati modello SWMM TR 20 anni Tp 3.0 ore.....	115
ALLEGATO 5.5. Risultati modello SWMM TR 20 anni Tp 6 ore.....	120

## 1. PREMESSA

La presente indagine di carattere idrologico-idraulico è redatta dal sottoscritto Ing. PAOLO PUCCI (H.S. INGEGNERIA srl) su incarico di COMPUTER GROSS Spa e CABEL HOLDING Spa per il dimensionamento del sistema di fognatura meteorica a servizio del Progetto Unitario Convenzionato del Secondo Regolamento Urbanistico Scheda 14.4.

Il Comune di Empoli ha approvato con Deliberazione del Consiglio Comunale n.90 del 19 Novembre 2018 la “Variante al Piano Strutturale e al Regolamento Urbanistico ai sensi dell’art.222 della LRT 65/2014 relativa alle aree produttive #EMPOLIFAIMPRESA”. Nella suddetta Variante risulta inserita la Scheda n.14.4 relativa al Progetto Unitario Convenzionato (di seguito PUC) in questione, che si colloca nell’UTOE n.14 “La piana agricola”, già in gran parte occupato dal complesso produttivo e direzionale COMPUTER GROSS – CABEL.

Nel presente studio si provvede a dimensionare il sistema di fognatura bianca per le opere di nuova realizzazione, con riferimento specifico a quanto prescritto al paragrafo 3.2.2 “Misure per il contenimento dell’impermeabilizzazione del territorio” della Relazione Geologica di Fattibilità a supporto del Secondo RU comunale.

Le informazioni relative alle aree drenate dalla nuova fognatura in progetto sono state fornite direttamente dai progettisti incaricati dalla Committenza Arch. Fabio Alfaroli e Ing. Alberto Casini; i medesimi hanno anche fornito i rilievi in termini di quote altimetriche del punto di scarico della nuova fognatura nel reticolo idrografico superficiale e le quote di progetto degli elementi componenti il PUC (opere di urbanizzazione, fabbricati, ecc.).

Il dimensionamento del sistema di fognatura bianca è stato effettuato, in conformità alla letteratura tecnica in materia, con riferimento ad eventi pluviometrici con tempo di ritorno 20 anni.

La documentazione progettuale riferita al presente studio sulla fognatura bianca è la seguente:

- 2019-PUC-144-REL-001 Relazione dei calcoli idraulici fognature bianche
- 2019-PUC-144-TAV-001 Planimetria di progetto del sistema principale di fognatura bianca
- 2019-PUC-144-TAV-002 Profili longitudinali
- 2019-PUC-144-TAV-003 Particolari

## 2. NORMATIVA DI RIFERIMENTO

- Scheda Norma 14.4 di cui all’Allegato F alla Deliberazione del Consiglio Comunale n.90 del 19 Novembre 2018 di approvazione della “Variante al Piano Strutturale e al Regolamento Urbanistico ai sensi dell’art.222 della LRT 65/2014 relativa alle aree produttive #EMPOLIFAIMPRESA”
- Paragrafo 3.2.2 “Misure per il contenimento dell’impermeabilizzazione del territorio” della Relazione Geologica di Fattibilità a supporto del Secondo RU comunale.

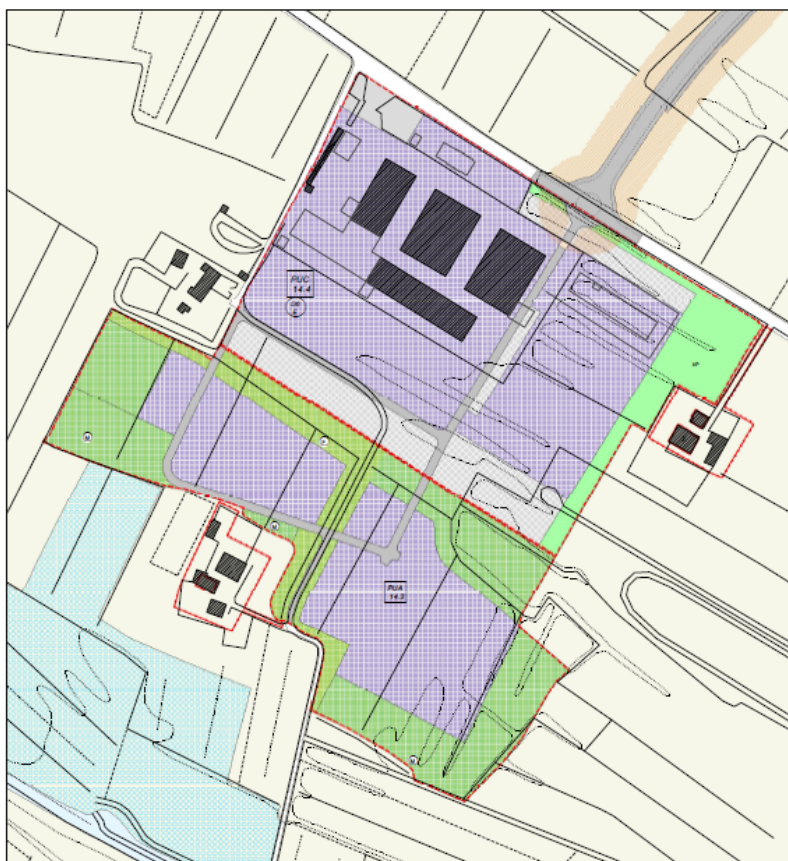
### 3. INQUADRAMENTO DELL'INTERVENTO

L'area individuata dal PUC 14.4 si colloca in fregio a Via della Piovola, a Sud-Est rispetto al centro di Empoli. Il comparto risulta già in gran parte occupato dal complesso produttivo e direzionale in attività COMPUTER GROSS – CABEL.

Morfologicamente l'area si presenta come pianeggiante, con quote del piano campagna di circa 30 m slm.

Nella figura seguente si riporta un estratto dalla scheda relativa al PUC in oggetto desunta dalla Variante Aree Industriali del Comune di Empoli.

PUA 14.3 - PUC 12.11 - ESTRATTO CARTOGRAFICO R.U. scala 1:5.000




 PERIMETRO PUA/PUC

Figura 1: perimetro PUC 14.4

## 4. DIMENSIONAMENTO DEL SISTEMA DI FOGNATURA BIANCA

### 4.1. Prescrizioni derivanti dal paragrafo 3.2.2 della Relazione Geologica di Fattibilità del Secondo RU comunale

Il paragrafo 3.2.2 “Misure per il contenimento dell’impermeabilizzazione del territorio” della Relazione Geologica di Fattibilità del Secondo RU comunale, Gennaio 2013, prescrive quanto segue:

“[...]

*Tutte le trasformazioni (con esclusione degli interventi sulla viabilità) comportanti la realizzazione di superfici impermeabili o parzialmente permeabili, devono prevedere il totale smaltimento con reinfiltrazione nei terreni delle acque meteoriche provenienti dai manti di copertura degli edifici e dalle altre superfici totalmente impermeabilizzate o semipermeabili, ove queste ultime non siano suscettibili, in ragione delle utilizzazioni in atto o previste, di contaminare tali acque. Lo smaltimento delle acque dovrà avvenire nel suolo pertinenziale così da favorire l’infiltrazione nei terreni delle acque, e solo, in subordine, nel reticolo idrografico superficiale o in pubblica fognatura, comunque contenendo l’entità media delle portate scaricate, prevedendo la realizzazione di vasche volano e/o di altri idonei accorgimenti, entro il limite massimo coincidente con quello fornito dall’area nella situazione pre-intervento, valutato tenendo conto di una pioggia oraria con tempo di ritorno ventennale.*

[...]”

Nel caso in esame lo smaltimento delle acque è previsto nel reticolo idrografico superficiale posto a Sud del comparto individuato dal PUC 14.4, ed in particolare nel fosso individuato dal codice MV36467 del reticolo idrografico di cui alla L.R. 79/2012 aggiornato con DGRT 899/2018 (Fosso Pratella).

### 4.2. Criteri progettuali

In relazione alla prescrizione del Secondo RU comunale descritta al paragrafo precedente, si è quindi progettato un sistema di raccolta e laminazione delle acque meteoriche che sia in grado, con riferimento ad eventi con tempo di ritorno 20 anni e durata 1 ora, di limitare la portata uscente al valore massimo che si aveva in condizioni pre-intervento.

Tale obiettivo è stato raggiunto effettuando un sovradimensionamento delle tubazioni di raccolta e smaltimento delle acque, in maniera tale da avere una volumetria adeguata al contenimento delle acque, che verranno scaricate nel fosso mediante una bocca tarata in grado di limitare il valore massimo di portata a quello pre-intervento con riferimento all’evento critico sopra descritto.

Per quanto concerne i dati pluviometrici si è fatto riferimento alle curve di possibilità pluviometrica Regione Toscana Aggiornamento al 2012, elaborate nell’ambito dell’Accordo di collaborazione tra Regione Toscana e Università di Firenze di cui alla DGRT 1133/2012.

Le superfici scolanti afferenti al nuovo sistema di raccolta e smaltimento delle acque meteoriche in progetto sono state indicate da parte dei progettisti del PUC incaricati dalla Committenza, così come le caratteristiche delle superfici in termini di permeabilità sia allo stato attuale che di progetto. Le aree scolanti sono individuate planimetricamente in allegato al presente documento.

In funzione delle aree scolanti di stato attuale è stata determinata la portata massima per eventi con tempo di ritorno 20 anni e durata 1 ora, assunta come limite massimo per lo scarico post-intervento con riferimento allo stesso evento pluviometrico.

Il sistema di fognatura di progetto è stato quindi dimensionato al fine di garantire, con

riferimento all'evento ventennale di durata oraria, una portata massima scaricata inferiore a quella pre-intervento. Il sistema è stato poi verificato sotto il profilo idraulico anche con riferimento ad altre durate di precipitazione, sempre per eventi con tempo di ritorno 20 anni.

Le caratteristiche della rete sono state definite allo scopo di soddisfare i seguenti obiettivi progettuali:

- garantire nel caso di sbocco libero nel recettore una portata massima per eventi ventennali di durata oraria non superiore a quella di stato preintervento;
- garantire nel caso di piena trentennale del recettore e contemporaneo evento di pioggia ventennale l'assenza di esondazioni per fuoriuscita dai pozzetti della rete di drenaggio.

Nel seguito del presente documento si descrivono nel dettaglio i criteri di calcolo assunti, le simulazioni effettuate ed i risultati ottenuti.

Per l'esecuzione delle analisi idrologiche ed idrauliche si è impiegato il software SWMM 5.1 (Storm Water Management Model) prodotto dalla Environmental Protection Agency (EPA) americana.

## 4.3. Analisi idrologica

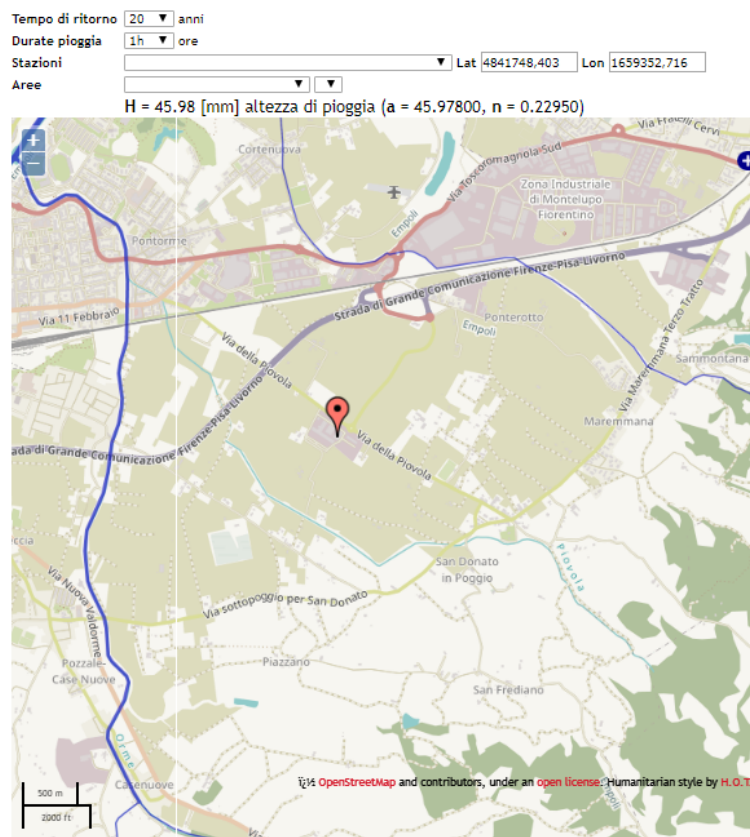
### 4.3.1. Afflussi meteorici

#### 4.3.1.1. Pluviometria

Per i dati pluviometrici si è fatto riferimento alle curve di possibilità pluviometrica Regione Toscana Aggiornamento al 2012, elaborate nell'ambito dell'Accordo di collaborazione tra Regione Toscana e Università di Firenze di cui alla DGRT 1133/2012. Nella figura seguente si riporta la curva di possibilità pluviometrica per eventi con tempo di ritorno 20 anni relativa al PUC di interesse.

##### Analisi di Frequenza Regionale delle Precipitazioni Estreme - LSPP - Aggiornamento al 2012

Nell'ambito dell'accordo di collaborazione tra Regione Toscana e Università di Firenze di cui alla DGRT 1133/2012, al fine di procedere ad un'implementazione e un aggiornamento del quadro conoscitivo idrologico del territorio toscano, si è provveduto ad effettuare un aggiornamento dell'analisi di frequenza regionale delle precipitazioni estreme fino all'anno 2012 compreso (Referente: Prof. Enrica caporali Dipartimento di Ingegneria civile e Ambientale UNI FI).



La curva di possibilità pluviometrica assume quindi la seguente forma:

$$h = 45.978 \cdot t^{0.2295}$$

con h altezza di pioggia attesa in mm e t durata della precipitazione in ore.

#### 4.3.1.2. Ietogrammi di pioggia

La curva di possibilità pluviometrica non descrive la variazione temporale dell'altezza di pioggia all'interno di un intervallo di assegnata durata  $t$ , fornendo solo l'intensità media di precipitazione. A parità di tempo di ritorno e di durata di pioggia possono aversi infinite realizzazioni dello ietogramma, a ciascuna delle quali sono associate differenti onde di piena.

Conformemente a quanto indicato al paragrafo 3.2.2 della Relazione Geologica di Fattibilità, si sono considerati ietogrammi ad intensità costante.

Per la rete oggetto di studio, e per le finalità della presente indagine, si sono impiegati ietogrammi di durate pari a 0.2 – 0.4 – 0.6 – 0.8 – 1 – 1.2 – 1.4 – 1.6 – 1.8 – 2 – 3 – 6 ore.

Poiché la curva di possibilità pluviometrica indicata al paragrafo precedente, secondo quanto riportato nella relazione a supporto dell'aggiornamento delle curve di cui alla DGRT 1133/2012 è valida per piogge di durata pari al minimo a 0.5 ore, per le precipitazioni di durata inferiore (0.2 e 0.4 ore) si è fatto riferimento alla bibliografia in materia; in particolare si può stimare che il rapporto tra pioggia massima di durata assegnata e massima pioggia oraria attesa sulla base dell'osservazione di numerosi eventi di pioggia intensi in Italia e nel mondo sia pari al 65%. Osservando che applicando direttamente la curva di possibilità pluviometrica si ottengono valori superiori e quindi cautelativi, si è deciso di applicare, a ovvio favore di sicurezza, la curva di possibilità pluviometrica anche per le durate di 0.2 e 0.4 ore.

Nella seguente tabella si riportano le altezze di pioggia attese per assegnata durata e tempo di ritorno impiegate per la definizione degli ietogrammi di pioggia ad intensità costante:

t [min]	t [ore]	h, TR20 [mm]
12	0.2	31.78
24	0.4	37.26
36	0.6	40.89
48	0.8	43.68
60	1	45.98
72	1.2	47.94
84	1.4	49.67
96	1.6	51.21
108	1.8	52.62
120	2	53.91
180	3	59.16
360	6	69.36

Tabella 1: altezze di pioggia attese per eventi con TR20 anni e durate 0.2-6 ore

#### 4.3.1.3. Ragguaglio delle precipitazioni all'area di bacino

In generale la curva di possibilità pluviometrica dedotta per una certa località non può essere assunta valida in tutta l'area  $A$  del bacino stesso. La stima dell'altezza di precipitazione di assegnata durata e tempo di ritorno può essere condotta moltiplicando l'altezza di pioggia puntuale di pari durata e tempo di ritorno per un fattore di ragguaglio  $r < 1$ :

$$h_A(t, T_R) = r \cdot h(d, T_R)$$

Il valore del coefficiente di ragguaglio dipende dalla durata della precipitazione e dall'area considerata. In generale occorre cautela nell'utilizzo dei fattori di ragguaglio delle piogge all'area. La World Meteorological Organization (WMO) consiglia di non effettuare alcun ragguaglio delle piogge all'area per aree inferiori a circa 25 Km<sup>2</sup>.

Considerando le ridotte dimensioni dei bacini in esame si è deciso cautelativamente di non effettuare alcun ragguaglio delle precipitazioni all'area.

#### 4.3.2. Modello di perdita idrologica

Il software SWMM effettua il calcolo delle perdite idrologiche in maniera separata per le aree permeabili e per le aree impermeabili del bacino.

Sulle aree impermeabili sono possibili solo perdite per intercezione e per invaso nelle depressioni superficiali del terreno (depression storage).

Per le parti permeabili del bacino si è assunta un'altezza di perdita pari a 3 mm, mentre per le parti impermeabili si è assunta un'altezza di perdita pari a 2 mm, concordemente con le indicazioni in merito riportate in letteratura tecnica.

La suddivisione in aree permeabili ed impermeabili è stata definita in coerenza con lo stato attuale e con lo di progetto. Sulle aree permeabili alle perdite per depression storage si sommano le perdite per infiltrazione, valutate nel caso in esame con il metodo del CN.

Sulla base della carta pedologica della Regione Toscana si è osservato che i suoli del PUC rientrano nella classe idrologica C. Pertanto, per la scelta dei coefficienti CN, si è assunto a favore di sicurezza un valore di 84 per le aree a verde e di 90 per le aree semipermeabili (pavimentazioni in autobloccanti).

#### 4.3.3. Trasformazione afflussi netti – deflussi

Per la trasformazione afflussi netti – deflussi SWMM utilizza il modello NLR (Non Linear Reservoir, ovvero invaso non lineare).

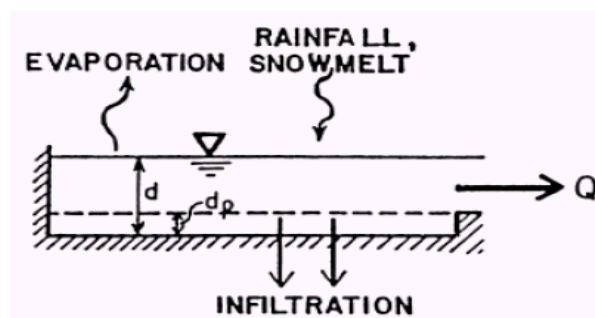


Figura 3: rappresentazione concettuale del modello di trasformazione afflussi deflussi di SWMM (estratto da SWMM user manual)

La superficie di ogni sottobacino è schematizzata come un invaso non lineare in cui le portate in ingresso sono legate alle precipitazioni e ad eventuali apporti da sottobacini a monte. Le portate in uscita dal sottobacino sono invece legate ai fenomeni di infiltrazione, evapotraspirazione e deflusso superficiale. La capacità dell'invaso è data dall'altezza di perdita associata alle depression storage  $d_p$  (fisicamente corrispondenti all'invaso nelle depressioni superficiali ed all'intercezione). Si ha deflusso superficiale  $Q$  in uscita dal sottobacino solo quando l'altezza liquida  $d$  risulta maggiore a  $d_p$ . L'idrogramma in uscita viene simulato con lo schema cinematico di propagazione dei deflussi (kinematic wave). L'altezza liquida  $d$  sulla superficie del sottobacino viene aggiornata sulla base dell'equazione di

continuità ad ogni istante temporale di calcolo. In definitiva le equazioni alla base del modello di trasformazione afflussi netti – deflussi sono le seguenti:

$$\frac{dV}{dt} = \frac{d(Ad)}{dt} = A \frac{d(d)}{dt} \quad \text{equazione di continuità}$$

$$Q = \frac{W}{N} (d - d_p)^{5/3} \sqrt{S_0} \quad \text{equazione cinematica}$$

in cui, oltre ad i simboli riportati in figura, V è il volume invasato sulla superficie del sottobacino, A l'area del sottobacino, W la larghezza di deflusso superficiale (*overland flow width*) del sottobacino ed N il coefficiente di resistenza al moto per correnti di tipo overland, assunto pari a 0.014 per le aree impermeabili ed a 0.2 per le aree permeabili, come da indicazioni di letteratura. I valori della larghezza superficiale W sono stati ricavati sulla base della planimetria urbanistica di progetto per ciascun sottobacino. I parametri di trasformazione afflussi-deflussi per i diversi sottobacini esaminati sono riportati nella tabella seguente:

**Bacino di stato attuale:**

ID	Area [ha]	% area impermeabile	Width [m]	Pendenza [m/m]	n impermeabile	n permeabile	CN
S-ATTUALE	6.186	23.3	531	0.009	0.014	0.2	85.2

Tabella 2: caratteristiche bacino stato attuale

**Bacini stato di progetto:**

ID	Area [ha]	% area impermeabile	Width [m]	Pendenza [m/m]	n impermeabile	n permeabile	CN
S1	1.04	75.7	222	0.005	0.014	0.2	86.9
S2	1.596	100	206	0.005	0.014	0.2	86.9
S3	2.119	71.5	388	0.005	0.014	0.2	86.2
S4	0.188	40.5	180	0.005	0.014	0.2	88.9
S5	0.135	51.6	180	0.005	0.014	0.2	89.7
S6	0.187	40.7	180	0.005	0.014	0.2	88.8
S7	0.043	85.8	70	0.005	0.014	0.2	84
S8	0.108	92.8	200	0.005	0.014	0.2	84
S9	0.17	47.4	180	0.005	0.014	0.2	89.5
S10	0.131	53.4	180	0.005	0.014	0.2	88.6
S11	0.105	100	200	0.005	0.014	0.2	88.6
S12	0.169	43.9	180	0.005	0.014	0.2	89.2
S13	0.128	53	180	0.005	0.014	0.2	88.5
S14	0.067	100	72	0.005	0.014	0.2	88.5

Tabella 3: caratteristiche bacini stato di progetto

#### 4.4. Analisi idraulica

Sulla base degli idrogrammi determinati nello studio idrologico dell'area in esame si è passati successivamente alla modellazione idraulica del sistema di drenaggio. L'analisi idraulica è stata condotta a moto vario utilizzando il modello idraulico dynamic wave di SWMM. Di seguito si riporta sinteticamente la descrizione dei modelli matematici. Per ulteriori dettagli sulle equazioni e gli algoritmi

di calcolo si rimanda alla manualistica di SWMM.

#### 4.4.1. Modello idraulico a moto vario di SWMM

Le equazioni del moto vario (o equazioni di De Saint Venant) utilizzate in SWMM per la modellazione dei condotti di fognatura presentano la seguente forma:

equazione di continuità (conservazione della massa):

$$\frac{\partial Q}{\partial x} + \frac{\partial A}{\partial t} = 0$$

equazione di conservazione della quantità di moto:

$$\frac{\partial Q}{\partial t} + \frac{\partial (Q^2/A)}{\partial x} + gA \frac{\partial H}{\partial x} + gAS_f + gAh_L = 0$$

con Q portata defluente all'interno del generico condotto, g accelerazione di gravità, A area liquida,  $S_f$  pendenza della linea dell'energia (valutata sulla base del coefficiente di Manning n), H quota della linea piezometrica (somma della quota di fondo z e dell'altezza liquida y),  $h_L$  perdita localizzata per unità di lunghezza del condotto (valutata sulla base dei coefficienti di perdita concentrata K), x l'ascissa, t il tempo.

Alle suddette equazioni viene associata un'ulteriore equazione di continuità per la modellazione dei nodi del sistema di fognatura.

Le equazioni del moto vengono risolte con uno schema alle differenze finite di tipo esplicito, con un algoritmo iterativo di successiva approssimazione e con l'utilizzo anche di metodi di rilassamento.

Nel caso di corrente veloce viene utilizzata la tecnica LPI "Local Partial Inertia", mediante la quale si passa gradualmente dalla soluzione delle equazioni complete del moto alla soluzione del modello parabolico. Il modello matematico riesce così a garantire una buona stabilità di calcolo anche nei tratti interessati da corrente veloce o mista, pur mantenendo un'adeguata accuratezza di calcolo.

#### 4.4.2. Condizioni al contorno

Le analisi sono state condotte in corrispondenza di 2 distinti scenari:

1. sbocco libero nel Fosso Pratella: condizione al contorno di tipo Free;
2. sbocco nel Fosso Pratella in presenza di livelli di piena trentennali (condizioni di scarico rigurgitato). In tali condizioni si è imposta a valle una quota del pelo libero pari a -0.59 m nel sistema di riferimento del progetto. Tale dato è stato desunto dagli studi idraulici redatti da H.S. INGEGNERIA srl a supporto della Variante Aree Industriali per conto del Comune di Empoli. In corrispondenza dello sbocco nel Fosso è prevista l'installazione di un clapet, al fine di evitare all'interno della rete di fognatura il riflusso delle acque del Fosso nel caso di piena di quest'ultimo.

#### 4.4.3. Parametri di resistenza al moto

Per il coefficiente di scabrezza di Manning per le tubazioni in PEAD si è assunto un valore pari a 0.013.

#### **4.4.4. Caratteristiche della rete di drenaggio**

La rete di drenaggio, come già evidenziato, è stata dimensionata con tubazioni sovradimensionate rispetto alle necessità di collettamento delle acque per garantire un volume disponibile per la laminazione degli idrogrammi di piena, andando a limitare, con riferimento ad eventi ventennali di durata oraria, la portata defluente di stato di progetto al valore massimo individuato nella portata massima defluente nello stato pre-intervento.

Sulla base delle ipotesi di modellazione e dei metodi di calcolo descritti in precedenza si è provveduto alla definizione delle caratteristiche della rete in progetto. In particolare i dimensionamenti sono stati in primo luogo eseguiti sulla base dell'evento con tempo di ritorno 20 anni e durata 1 ora e poi verificati per varie durate di pioggia, variabili da 12 minuti fino a 6 ore, sempre con riferimento ad eventi ventennali.

Per il dimensionamento si è considerata la condizione di sbocco libero nel recettore, costituito dall'elemento MV36467 del reticolo idrografico di cui alla L.R. 79/2012 (Fosso Pratella). Dagli studi idraulici a supporto della Variante Aree Industriali redatti dalla scrivente H.S. INGEGNERIA srl su incarico del Comune di Empoli si ha un battente massimo rispetto al fondo alveo del fosso recettore in occasione di eventi con tempo di ritorno 30 anni pari a 1.23 m. Si è quindi valutata anche la contemporaneità dell'evento critico in fognatura e nel recettore, controllando che non vi siano rigurgiti dai pozzetti impiegati per la modellazione idraulica. Si osserva che con un battente costante di 1.23 m, corrispondente ad una quota di -0.59 m nel sistema di riferimento adottato per la progettazione urbanistica del comparto, si ha che il sistema fognario risulta interamente in pressione, ma in grado di scaricare comunque dallo sfioratore di sicurezza descritto nel seguito senza andare a determinare fuoriuscite di acqua dai pozzetti.

In sintesi, quindi, le caratteristiche della rete sono state definite allo scopo di soddisfare i seguenti obiettivi progettuali:

- garantire nel caso di sbocco libero nel recettore una portata massima per eventi ventennali di durata oraria non superiore a quella di stato preintervento;
- garantire nel caso di piena trentennale del recettore e contemporaneo evento di pioggia ventennale l'assenza di esondazioni per fuoriuscita dai pozzetti della rete di drenaggio.

I risultati delle simulazioni sono riportati in allegato al presente documento, unitamente alle caratteristiche della rete in progetto. Le caratteristiche dimensionali delle fognature sono sintetizzate anche nella tavola grafica allegata al presente documento.

Per gli elementi principali della rete di fognatura bianca è previsto l'impiego di collettori in PEAD SN16 con diametro nominale (esterno) 1200 e 1000 mm. La pendenza di tutti i collettori è pari all'uno per mille. In alcuni tratti, al fine di incrementare il volume di invaso disponibile per le acque, è prevista la posa affiancata di due collettori identici.

Lo scarico nel recettore sarà preceduto da un pozzetto all'interno del quale sarà realizzato un setto in calcestruzzo di altezza pari a quello della tubazione in ingresso, con una forometria circolare di 344mm di diametro interno (tubazione in PEAD DN400) che costituirà la bocca tarata di laminazione delle portate. Il setto di calcestruzzo avrà una lunghezza di 4 metri e al di sopra di esso dovrà essere presente una finestra di almeno 40cm di altezza con funzione di sfioratore di sicurezza (dimensioni minime 400x40cm) in maniera tale da garantire lo scarico delle acque anche in caso di occlusione della bocca tarata o per eventi più gravosi rispetto a quelli assunti in progetto. Lo scarico nel recettore avverrà poi mediante una doppia tubazione in PEAD DN 1200 dotata di clapet antiriflusso. L'immissione dovrà

essere realizzata mediante adeguato manufatto in c.a. in maniera tale da non ridurre la sezione libera di deflusso del corso d'acqua.

Lo scarico avverrà con quota pari a quella del fondo del recettore (-1.82 m con riferimento alle quote di progetto urbanistico).

Le caratteristiche della rete progettata sono riassunte nelle tabelle seguenti.

**Nodi di calcolo (pozzetti):**

ID	Quota di scorrimento [m]	Quota strada [m]	Massima altezza [m]
J1	-1.479	0	1.479
J2	-1.494	0	1.494
J3	-1.559	0	1.559
J4	-1.575	0	1.575
J5	-1.675	0	1.675
J6	-1.640	0	1.640
J7	-1.690	0	1.690
J8	-1.775	0	1.775
J9	-1.788	0	1.788
J10	-1.800	0	1.800
J11	-1.644	0	1.644
J12	-1.670	0	1.670
J13	-1.681	0	1.681
J14	-1.708	0	1.708
J15	-1.700	0	1.700
J16	-1.700	0	1.700
J17	-1.712	0	1.712
J18	-1.549	0	1.549
J19	-1.561	0	1.561
J20	-1.575	0	1.575
J21	-1.665	0	1.665
J22	-1.649	0	1.649
J23	-1.636	0	1.636
J25	-1.820	0	1.820
SCARICO	-1.820	0	1.820

Tabella 4: caratteristiche nodi di calcolo modello SWMM

**Tubazioni:**

ID	Pozzett o monte	Pozzett o valle	Lunghes za [m]	Quota di scorrim ento m onte [m]	Quota di scorrim ento valle [m]	Material e	Diametr o nominal e DN [mm]	Diametr o interno Di [mm]	Numero tubi identici	Pendenz a [m/m]	Ricoprim ento minimo [cm]
C1	J1	J2	15	-1.479	-1.494	PEAD	1000	852	1	0.001	55.3
C2	J2	J3	65	-1.494	-1.559	PEAD	1000	852	1	0.001	56.8
C3	J3	J4	16	-1.559	-1.575	PEAD	1000	852	1	0.001	63.3
C4	J4	J5	100	-1.575	-1.675	PEAD	1000	852	1	0.001	64.9
C5	J5	J7	15	-1.675	-1.690	PEAD	1000	852	2	0.001	74.9
C6	J7	J8	85	-1.690	-1.775	PEAD	1200	1030	2	0.001	57.5
C7	J8	J9	13	-1.775	-1.788	PEAD	1200	1030	2	0.001	66.0
C8	J9	J10	12	-1.788	-1.800	PEAD	1200	1030	2	0.001	67.3
C10	J15	J9	88	-1.700	-1.788	PEAD	1200	1030	2	0.001	58.5
C11	J16	J9	88	-1.700	-1.788	PEAD	1200	1030	2	0.001	58.5
C12	J17	J10	88	-1.712	-1.800	PEAD	1200	1030	2	0.001	59.7
C13	J14	J10	92	-1.708	-1.800	PEAD	1200	1030	2	0.001	59.3
C14	J11	J12	26	-1.644	-1.670	PEAD	1000	852	1	0.001	71.8
C15	J12	J13	11	-1.670	-1.681	PEAD	1000	852	1	0.001	74.4
C16	J13	J8	94	-1.681	-1.775	PEAD	1200	1030	2	0.001	56.6
C17	J20	J21	90	-1.575	-1.665	PEAD	1000	852	2	0.001	54.9
C18	J21	J5	10	-1.665	-1.675	PEAD	1000	852	2	0.001	73.9
C19	J19	J22	88	-1.561	-1.649	PEAD	1000	852	2	0.001	63.5
C20	J22	J21	16	-1.649	-1.665	PEAD	1000	852	2	0.001	72.3
C21	J18	J23	87	-1.549	-1.636	PEAD	1000	852	2	0.001	62.3
C22	J23	J22	13	-1.636	-1.649	PEAD	1000	852	2	0.001	71.0
C23	J6	J5	35	-1.640	-1.675	PEAD	1000	852	1	0.001	71.4
C25	J25	SCARIC O	3	-1.820	-1.820	PEAD	1200	1030	2	0.001	70.5

Tabella 5: caratteristiche tubazioni modello di calcolo SWMM

**Bocca tarata (elemento di modello ORIFICE C9):**

Quota del fondo: -1.80 m  
Diametro della luce circolare: 344 mm

**Sfioratore di sicurezza (elemento di modello WEIR R1):**

Quota stramazzo: -0.77 m  
Lunghezza dello stramazzo: 4 metri  
Altezza dello stramazzo: 0.4 metri

#### **4.5. Risultati del modello**

I risultati di dettaglio delle singole simulazioni effettuate sono riportati in allegato al presente documento. In particolare vengono riportati i seguenti risultati:

- TR20 anni, durata di pioggia 1 ora, scarico libero nel Fosso Pratella, Stato attuale
- TR20 anni, durata di pioggia 1 ora, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 0.2 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 0.4 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 0.6 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 0.8 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 1.2 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 1.4 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 1.6 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 1.8 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 2.0 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 3.0 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 6.0 ore, scarico libero nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 0.4 ore, scarico rigurgitato nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 1.0 ore, scarico rigurgitato nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 3.0 ore, scarico rigurgitato nel Fosso Pratella, Stato di progetto
- TR20 anni, durata di pioggia 6.0 ore, scarico rigurgitato nel Fosso Pratella, Stato di progetto

Il dimensionamento, come già indicato, in conformità a quanto indicato dalla “Relazione Geologica di Fattibilità” del secondo RU comunale, è stato effettuato con riferimento alla pioggia ventennale di durata oraria.

In tale condizione si ottiene quanto segue:

Portata massima stato pre-intervento:  $Q_{\max,att} = 220,19 \text{ l/s}$

Portata massima stato post-intervento:  $Q_{\max,prog} = 219,02 \text{ l/s}$

Si osserva quindi che il sistema progettato consente di limitare la portata massima immessa nel recettore al valore pre-intervento, con riferimento ad un evento ventennale di durata oraria.

Le restanti simulazioni eseguite per varie durate di precipitazione con scarico libero nel Fosso Pratella mostrano che la rete è in grado di smaltire in condizioni di sicurezza le portate massime attese.

Le simulazioni con scarico rigurgitato (simultaneità del massimo livello idrico con tempo di ritorno 30 anni nel Fosso Pratella ed evento ventennale sulla rete di fognatura di progetto) mostrano che la rete entra complessivamente in pressione, ma non si hanno rigurgiti con fuoriuscite di acqua dai nodi della rete, con quota del pelo libero che si attesta al massimo a circa -0.3 m, con riferimento al sistema di quote impiegato nella progettazione urbanistica.

## 5. CONCLUSIONI

Il sistema di fognatura bianca è stato dimensionato con riferimento ai seguenti obiettivi progettuali:

- garantire nel caso di sbocco libero nel recettore una portata massima per eventi ventennali di durata oraria non superiore a quella di stato preintervento, in conformità a quanto prescritto dalla “Relazione Geologica di Fattibilità” del secondo RU comunale;
- garantire nel caso di piena trentennale del recettore e contemporaneo evento di pioggia ventennale l'assenza di esondazioni per fuoriuscita dai pozzetti della rete di drenaggio.

Gli elementi principali della rete di fognatura bianca dimensionata per gli scopi indicati in precedenza verranno realizzati mediante l'impiego di tubazioni in PEAD SN16 DN1000 e DN1200. Al fine di incrementare la volumetria necessaria per la laminazione delle piene viene prevista in vari tratti la posa di due tubazioni identiche affiancate, come da tavole grafiche di progetto.

Le acque verranno addotte dalla rete ad un pozzetto di laminazione contenente una bocca tarata di 344mm di diametro, in grado di limitare la portata massima immessa nel recettore al valore pre-intervento, con riferimento ad un evento ventennale di durata oraria.

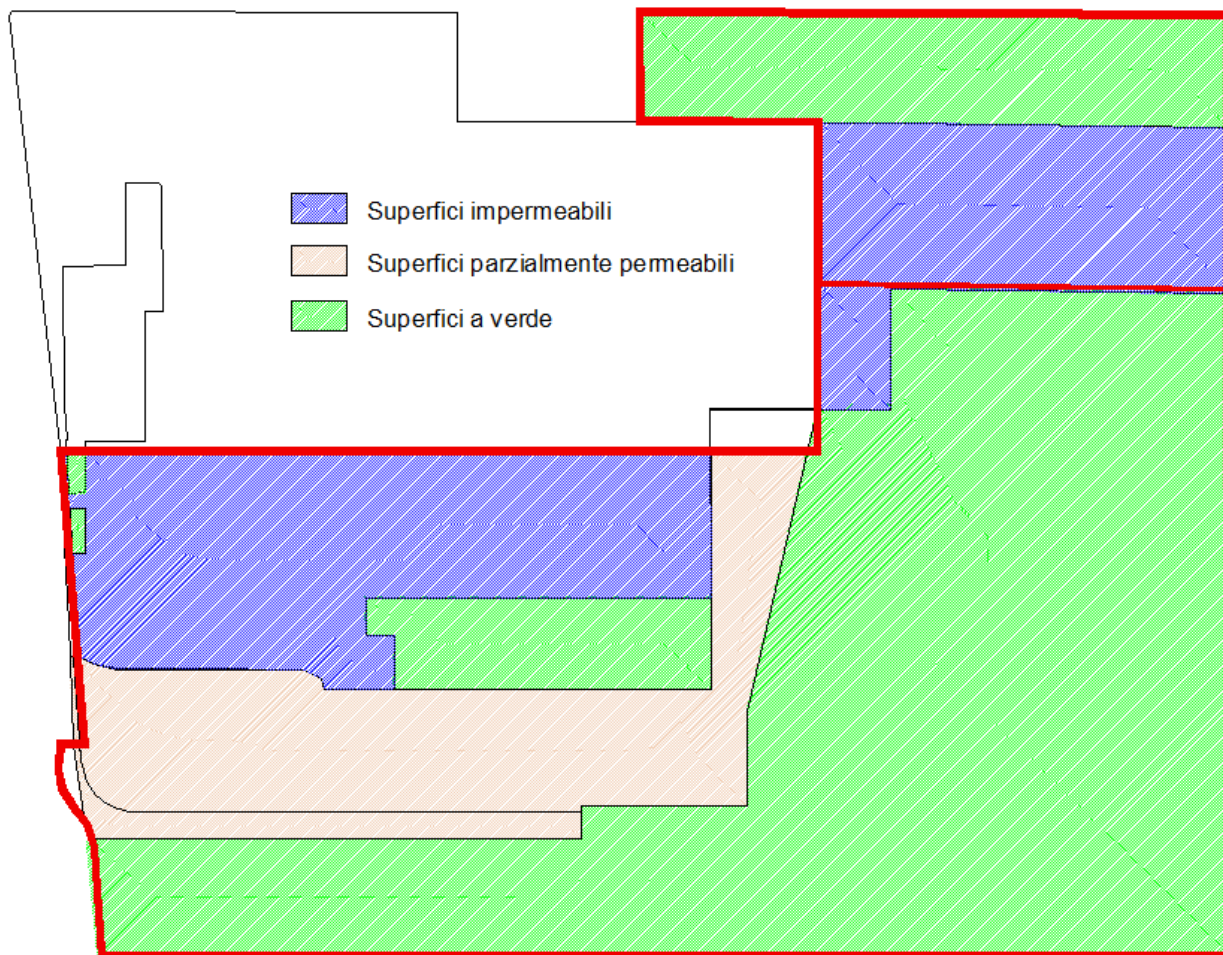
Le simulazioni eseguite per varie durate di precipitazione con scarico libero nel Fosso Pratella mostrano che la rete è in grado di smaltire in condizioni di sicurezza le portate massime attese.

Le simulazioni con scarico rigurgitato (simultaneità del massimo livello idrico con tempo di ritorno 30 anni nel Fosso Pratella ed evento ventennale sulla rete di fognatura di progetto) mostrano che la rete entra complessivamente in pressione, ma non si hanno rigurgiti con fuoriuscite di acqua dai nodi della rete, con quota del pelo libero che si attesta al massimo a circa -0.3 m, con riferimento al sistema di quote impiegato nella progettazione urbanistica.

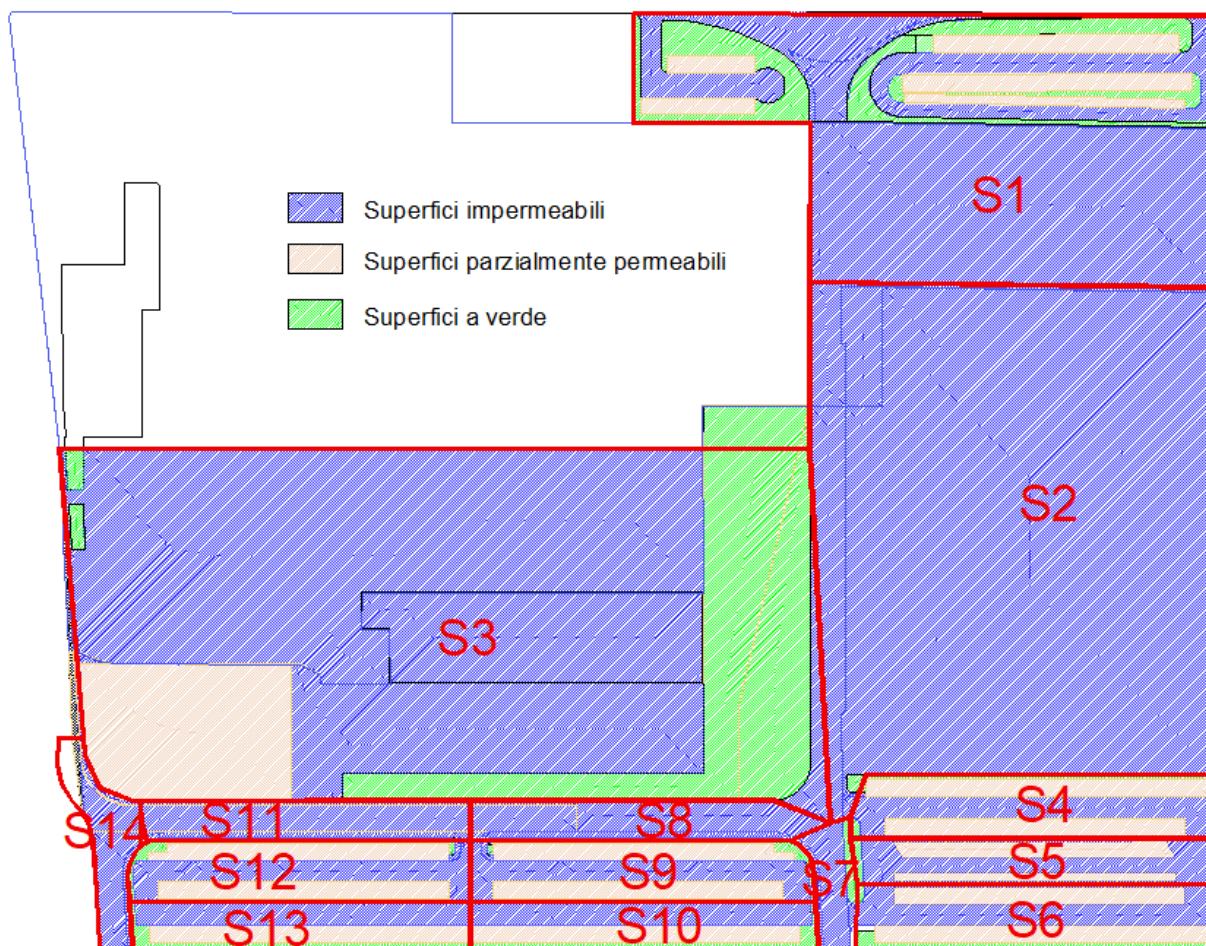
Si precisa che, essendo il recettore Fosso Pratella inserito nel reticolo idrografico regionale di cui alla L.R. 79/2012, dovrà essere presentata alla Regione Toscana specifica domanda di concessione area demanio idrico ai sensi del RD 523/1904.

## ALLEGATI

### ALLEGATO 1. Planimetria aree scolanti stato attuale

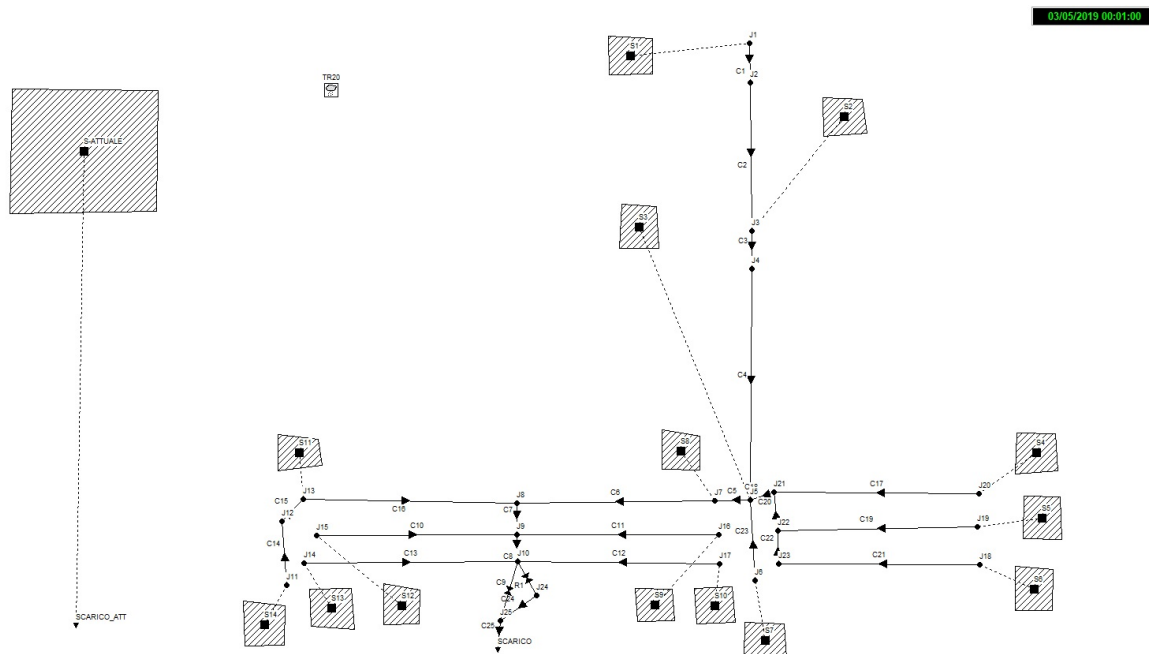


**ALLEGATO 2. Planimetria aree scolanti stato di progetto**



**ALLEGATO 3. Modello SWMM TR 20 anni durata di pioggia 1 ora sbocco libero nel Fosso Pratella**

**ALLEGATO 3.1. Planimetria modello SWMM**



**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

**ALLEGATO 3.2. File di input modello SWMM con caratteristiche rete di calcolo**

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option      Value
FLOW_UNITS    LPS
INFILTRATION  CURVE_NUMBER
FLOW_ROUTING  DYNWAVE
LINK_OFFSETS  DEPTH
MIN_SLOPE     0
ALLOW_PONDING NO
SKIP_STEADY_STATE NO

START_DATE    03/05/2019
START_TIME    00:00:00
REPORT_START_DATE 03/05/2019
REPORT_START_TIME 00:00:00
END_DATE      03/05/2019
END_TIME      06:00:00
SWEEP_START   01/01
SWEEP_END     12/31
DRY_DAYS      0
REPORT_STEP   00:01:00
WET_STEP      00:01:00
DRY_STEP      00:01:00
ROUTING_STEP  0:00:01

INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP    0.75
LENGTHENING_STEP 0
MIN_SURFAREA     1.14
MAX_TRIALS        8
HEAD_TOLERANCE    0.0015
SYS_FLOW_TOL      5
LAT_FLOW_TOL      5
MINIMUM_STEP      0.5
THREADS           1

[EVAPORATION]
;;Data Source Parameters
;;-----
CONSTANT      0.0
DRY_ONLY      NO

[RAINGAGES]
;;Name      Format      Interval SCF      Source
;;-----
TR20        VOLUME     1:00      1.0      TIMESERIES icTR20TP01.00h

[SUBCATCHMENTS]
;;Name      Rain Gage      Outlet      Area      %Imperv      Width      %Slope      CurbLen      SnowPack
;;-----
S1          TR20          J1          1.04      75.7      222      0.005      0
S2          TR20          J3          1.596     100      206      0.005      0
S3          TR20          J5          2.119     71.5      388      0.005      0
S4          TR20          J20         0.188     40.5      180      0.005      0
S5          TR20          J19         0.135     51.6      180      0.005      0
S6          TR20          J18         0.187     40.7      180      0.005      0
S7          TR20          J6          0.043     85.8      70       0.005      0
S8          TR20          J7          0.108     92.8      200      0.005      0
S9          TR20          J16         0.17      47.4      180      0.005      0
S10         TR20          J17         0.131     53.4      180      0.005      0
S11         TR20          J13         0.105     100      200      0.005      0
S12         TR20          J15         0.169     43.9      180      0.005      0
S13         TR20          J14         0.128     53       180      0.005      0
S14         TR20          J11         0.067     100      72       0.005      0
S-ATTUALE   TR20          SCARICO_ATT 6.186     23.3     531      0.009      0

[SUBAREAS]
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted
;;-----
S1             0.014      0.2      2      3      0      OUTLET
```

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

S2	0.014	0.2	2	3	0	OUTLET
S3	0.014	0.2	2	3	0	OUTLET
S4	0.014	0.2	2	3	0	OUTLET
S5	0.014	0.2	2	3	0	OUTLET
S6	0.014	0.2	2	3	0	OUTLET
S7	0.014	0.2	2	3	0	OUTLET
S8	0.014	0.2	2	3	0	OUTLET
S9	0.014	0.2	2	3	0	OUTLET
S10	0.014	0.2	2	3	0	OUTLET
S11	0.014	0.2	2	3	0	OUTLET
S12	0.014	0.2	2	3	0	OUTLET
S13	0.014	0.2	2	3	0	OUTLET
S14	0.014	0.2	2	3	0	OUTLET
S-ATTUALE	0.014	0.2	2	3	0	OUTLET

[INFILTRATION]			
;;Subcatchment	CurveNum		DryTime
;;-----			
S1	86.9	0	4
S2	86.9	0	4
S3	86.2	0	4
S4	88.9	0	4
S5	89.7	0	4
S6	88.8	0	4
S7	84	0	4
S8	84	0	4
S9	89.5	0	4
S10	88.6	0	4
S11	88.6	0	4
S12	89.2	0	4
S13	88.5	0	4
S14	88.5	0	4
S-ATTUALE	85.2	0	4

[JUNCTIONS]					
;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Aponded
;;-----					
J1	-1.479	1.479	0	0	0
J2	-1.494	1.494	0	0	0
J3	-1.559	1.559	0	0	0
J4	-1.575	1.575	0	0	0
J5	-1.675	1.675	0	0	0
J6	-1.64	1.64	0	0	0
J7	-1.69	1.69	0	0	0
J8	-1.775	1.775	0	0	0
J9	-1.788	1.788	0	0	0
J10	-1.8	1.8	0	0	0
J11	-1.644	1.644	0	0	0
J12	-1.67	1.67	0	0	0
J13	-1.681	1.681	0	0	0
J14	-1.708	1.708	0	0	0
J15	-1.7	1.7	0	0	0
J16	-1.7	1.7	0	0	0
J17	-1.712	1.712	0	0	0
J18	-1.549	1.549	0	0	0
J19	-1.561	1.561	0	0	0
J20	-1.575	1.575	0	0	0
J21	-1.665	1.665	0	0	0
J22	-1.649	1.649	0	0	0
J23	-1.636	1.636	0	0	0
J24	-1.78	1.78	0	0	0
J25	-1.82	1.82	0	0	0

[OUTFALLS]					
;;Name	Elevation	Type	Stage Data	Gated	Route To
;;-----					
SCARICO	-1.82	FREE		NO	
SCARICO_ATT	-1.82	FREE		NO	

[CONDUITS]								
;;Name	From Node	To Node	Length	Roughness	InOffset	OutOffset	InitFlow	
;;-----								
C1	J1	J2	15	0.013	0	0	0	0
C2	J2	J3	65	0.013	0	0	0	0
C3	J3	J4	16	0.013	0	0	0	0
C4	J4	J5	100	0.013	0	0	0	0
C5	J5	J7	15	0.013	0	0	0	0

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C6	J7	J8	85	0.013	0	0	0	0
C7	J8	J9	13	0.013	0	0	0	0
C8	J9	J10	12	0.013	0	0	0	0
C10	J15	J9	88	0.013	0	0	0	0
C11	J16	J9	88	0.013	0	0	0	0
C12	J17	J10	88	0.013	0	0	0	0
C13	J14	J10	92	0.013	0	0	0	0
C14	J11	J12	26	0.013	0	0	0	0
C15	J12	J13	11	0.013	0	0	0	0
C16	J13	J8	94	0.013	0	0	0	0
C17	J20	J21	90	0.013	0	0	0	0
C18	J21	J5	10	0.013	0	0	0	0
C19	J19	J22	88	0.013	0	0	0	0
C20	J22	J21	16	0.013	0	0	0	0
C21	J18	J23	87	0.013	0	0	0	0
C22	J23	J22	13	0.013	0	0	0	0
C23	J6	J5	35	0.013	0	0	0	0
C24	J24	J25	3	0.013	0	0	0	0
C25	J25	SCARICO	3	0.013	0	0	0	0

[ORIFICES]

;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
;;-----							
C9	J10	J25	SIDE	0	0.6401	NO	0

[WEIRS]

;;Name	From Node	To Node	Type	CrestHt	Qcoeff	Gated	EndCon
EndCoeff	Surcharge	RoadWidth	RoadSurf				
;;-----							
R1	J10	J24	TRANSVERSE	1.03	3.33	NO	0
YES							

[XSECTIONS]

;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
;;-----							
C1	CIRCULAR	0.852	0	0	0	1	
C2	CIRCULAR	0.852	0	0	0	1	
C3	CIRCULAR	0.852	0	0	0	1	
C4	CIRCULAR	0.852	0	0	0	1	
C5	CIRCULAR	0.852	0	0	0	2	
C6	CIRCULAR	1.03	0	0	0	2	
C7	CIRCULAR	1.03	0	0	0	2	
C8	CIRCULAR	1.03	0	0	0	2	
C10	CIRCULAR	1.03	0	0	0	2	
C11	CIRCULAR	1.03	0	0	0	2	
C12	CIRCULAR	1.03	0	0	0	2	
C13	CIRCULAR	1.03	0	0	0	2	
C14	CIRCULAR	0.852	0	0	0	1	
C15	CIRCULAR	0.852	0	0	0	1	
C16	CIRCULAR	1.03	0	0	0	2	
C17	CIRCULAR	0.852	0	0	0	2	
C18	CIRCULAR	0.852	0	0	0	2	
C19	CIRCULAR	0.852	0	0	0	2	
C20	CIRCULAR	0.852	0	0	0	2	
C21	CIRCULAR	0.852	0	0	0	2	
C22	CIRCULAR	0.852	0	0	0	2	
C23	CIRCULAR	0.852	0	0	0	1	
C24	CIRCULAR	1.03	0	0	0	1	
C25	CIRCULAR	1.03	0	0	0	2	
C9	CIRCULAR	0.344	0	0	0		
R1	RECT_OPEN	0.3	4	0	0		

[LOSSES]

;;Link	Kentry	Kexit	Kavg	Flap Gate	Seepage
;;-----					
C24	0	0	0	YES	0

[TIMESERIES]

;;Name	Date	Time	Value
;;-----			
icTR20TP01.00h		00:00	0
icTR20TP01.00h		01:00	45.98

[REPORT]

;;Reporting Options  
INPUT NO  
CONTROLS NO  
SUBCATCHMENTS ALL

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

NODES ALL  
LINKS ALL

[TAGS]

[MAP]

DIMENSIONS -2902.538 435.986 11345.445 8860.439  
Units None

[COORDINATES]

;;Node	X-Coord	Y-Coord
J1	6856.978	8396.770
J2	6868.512	7912.341
J3	6880.046	6078.431
J4	6880.046	5617.070
J5	6868.512	2768.166
J6	6926.182	1776.240
J7	6430.219	2756.632
J8	3985.006	2733.564
J9	3985.006	2341.407
J10	3996.540	2006.920
J11	1147.636	1718.570
J12	1089.965	2502.884
J13	1355.248	2779.700
J14	1366.782	1995.386
J15	1516.724	2329.873
J16	6476.355	2341.407
J17	6487.889	1983.852
J18	9694.348	1972.318
J19	9659.746	2433.679
J20	9682.814	2848.904
J21	7156.863	2860.438
J22	7202.999	2387.543
J23	7214.533	1983.852
J24	4227.220	1591.696
J25	3788.927	1280.277
SCARICO	3754.325	922.722
SCARICO_ATT	-1447.520	1222.607

[VERTICES]

;;Link	X-Coord	Y-Coord
--------	---------	---------

[Polygons]

;;Subcatchment	X-Coord	Y-Coord
S1	5657.439	8454.441
S1	5657.439	8016.148
S1	5126.874	8004.614
S1	5115.340	8477.509
S2	8241.061	7704.729
S2	8298.731	7289.504
S2	7768.166	7243.368
S2	7756.632	7727.797
S3	5703.576	6378.316
S3	5738.178	5870.819
S3	5253.749	5870.819
S3	5276.817	6412.918
S4	10628.604	3587.082
S4	10651.672	3125.721
S4	10132.641	3091.119
S4	10144.175	3598.616
S5	10686.275	2802.768
S5	10697.809	2283.737
S5	10224.913	2295.271
S5	10236.448	2814.302
S6	10594.002	1914.648
S6	10582.468	1407.151
S6	10132.641	1407.151
S6	10132.641	1949.250
S7	7283.737	1245.675
S7	7306.805	818.916
S7	6787.774	818.916
S7	6799.308	1257.209
S8	6245.675	3552.480
S8	6245.675	3137.255
S8	5772.780	3148.789
S8	5772.780	3633.218

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

S9	5899.654	1672.434
S9	5934.256	1280.277
S9	5472.895	1268.743
S9	5449.827	1683.968
S10	6637.832	1695.502
S10	6683.968	1257.209
S10	6199.539	1245.675
S10	6176.471	1683.968
S11	1539.792	3517.878
S11	1585.928	3194.925
S11	1043.829	3125.721
S11	1043.829	3575.548
S12	2797.001	1660.900
S12	2785.467	1245.675
S12	2347.174	1234.141
S12	2347.174	1741.638
S13	1943.483	1683.968
S13	1989.619	1176.471
S13	1447.520	1211.073
S13	1435.986	1672.434
S14	1136.101	1464.821
S14	1124.567	980.392
S14	640.138	968.858
S14	617.070	1522.491
S-ATTUALE	-432.526	7808.535
S-ATTUALE	-455.594	6320.646
S-ATTUALE	-2254.902	6297.578
S-ATTUALE	-2231.834	7831.603

[SYMBOLS]

;; Gage	X-Coord	Y-Coord
TR20	1712.803	7797.001

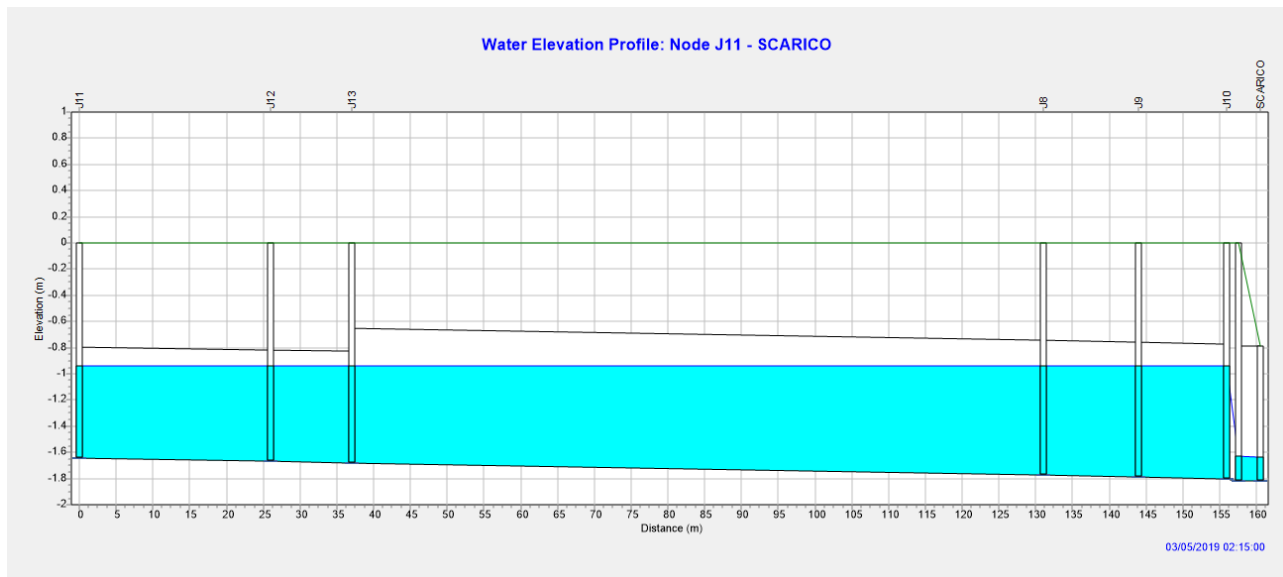
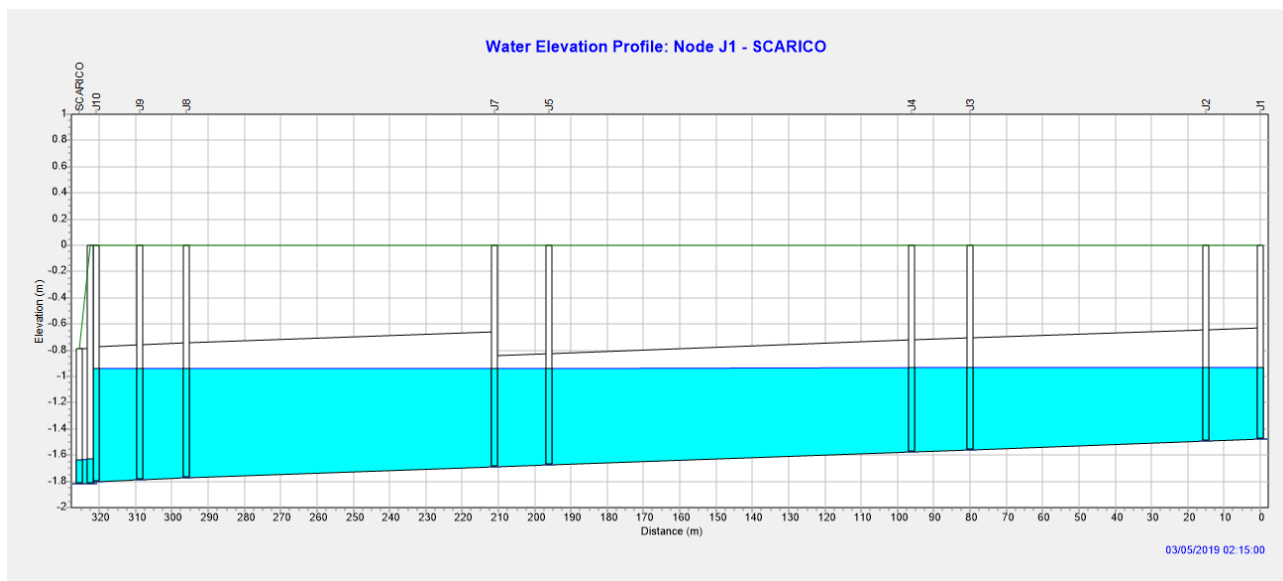
[PROFILES]

;; Name	Links
"PROFILO	" C1 C2 C3 C4 C5
"PROFILO	" C6 C7 C8 C9 C25

**Progetto:**  
**Elaborato:**  
**Data:**

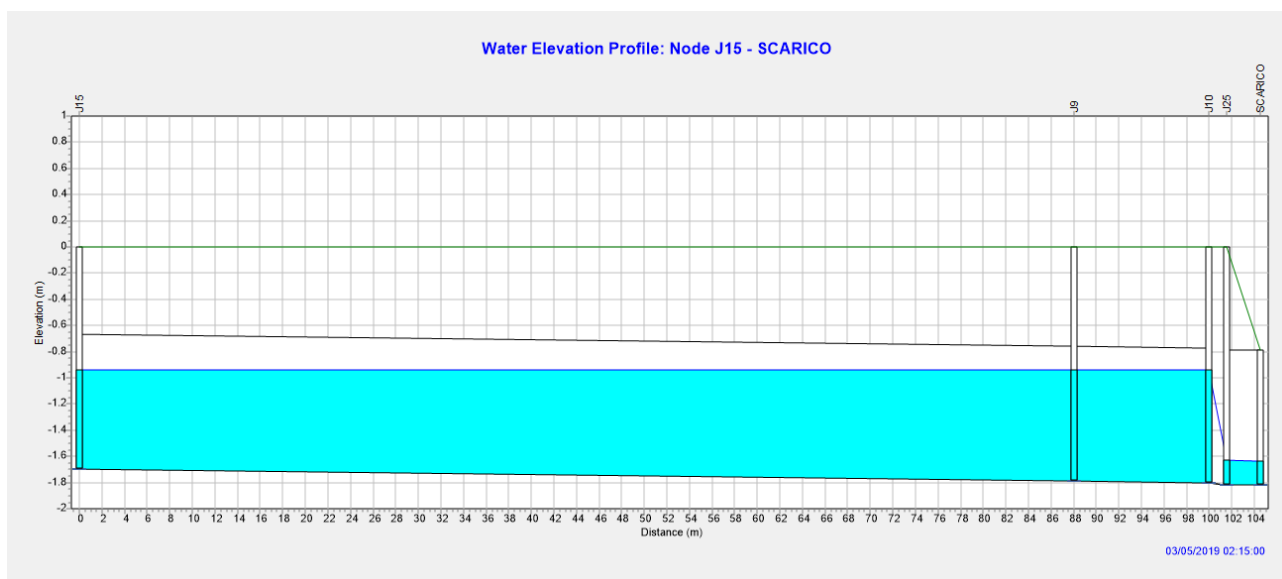
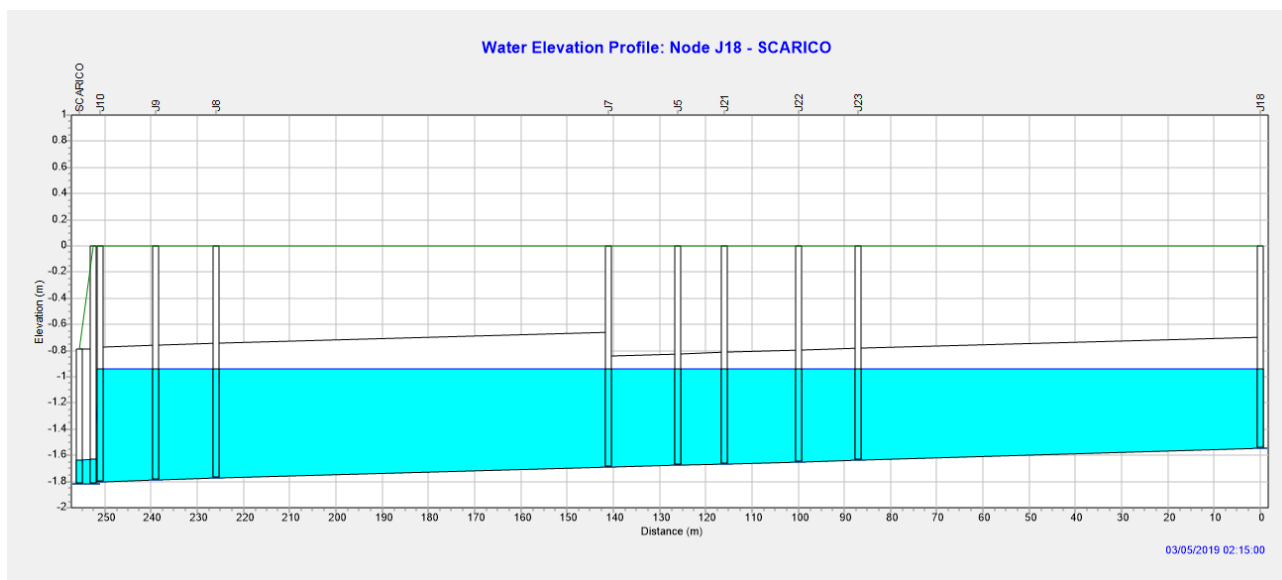
**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

**ALLEGATO 3.3. Risultati modello SWMM TR 20 anni Tp 1 ora**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume hectare-m	Depth mm
*****	-----	-----
Runoff Quantity Continuity		
*****		
Total Precipitation .....	0.569	45.980
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.251	20.282
Surface Runoff .....	0.294	23.786
Final Storage .....	0.024	1.917
Continuity Error (%) .....	-0.010	

	Volume hectare-m	Volume 10^6 ltr
*****	-----	-----
Flow Routing Continuity		
*****		
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.294	2.943
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.291	2.913
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.003	0.031
Continuity Error (%) .....	-0.071	

\*\*\*\*\*  
Time-Step Critical Elements  
\*\*\*\*\*  
None

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
All links are stable.

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
-----	-----	-----	-----	-----	-----	-----	-----	-----
S1	45.98	0.00	0.00	8.61	35.19	0.37	108.61	0.765

S2	45.98	0.00	0.00	0.00	42.46	0.68	180.76	0.923
S3	45.98	0.00	0.00	10.66	33.13	0.70	206.74	0.720
S4	45.98	0.00	0.00	18.00	26.49	0.05	16.90	0.576
S5	45.98	0.00	0.00	12.98	31.38	0.04	14.38	0.682
S6	45.98	0.00	0.00	17.93	26.49	0.05	16.83	0.576
S7	45.98	0.00	0.00	4.13	39.94	0.02	5.25	0.869
S8	45.98	0.00	0.00	2.00	42.03	0.05	13.51	0.914
S9	45.98	0.00	0.00	14.93	29.47	0.05	16.88	0.641
S10	45.98	0.00	0.00	13.07	31.25	0.04	13.92	0.680
S11	45.98	0.00	0.00	0.00	43.96	0.05	13.41	0.956
S12	45.98	0.00	0.00	16.27	28.13	0.05	16.17	0.612
S13	45.98	0.00	0.00	13.22	31.11	0.04	13.58	0.677
S14	45.98	0.00	0.00	0.00	43.92	0.03	8.56	0.955
S-ATTUALE	45.98	0.00	0.00	32.62	11.95	0.74	220.19	0.260

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.18	0.55	-0.93	0 02:15	0.55
J2	JUNCTION	0.19	0.56	-0.93	0 02:15	0.56
J3	JUNCTION	0.23	0.63	-0.93	0 02:15	0.63
J4	JUNCTION	0.24	0.64	-0.93	0 02:15	0.64
J5	JUNCTION	0.29	0.74	-0.94	0 02:15	0.74
J6	JUNCTION	0.26	0.70	-0.94	0 02:15	0.70
J7	JUNCTION	0.29	0.75	-0.94	0 02:17	0.75
J8	JUNCTION	0.35	0.84	-0.94	0 02:17	0.84
J9	JUNCTION	0.36	0.85	-0.94	0 02:17	0.85
J10	JUNCTION	0.37	0.86	-0.94	0 02:17	0.86
J11	JUNCTION	0.25	0.71	-0.94	0 02:17	0.71
J12	JUNCTION	0.27	0.73	-0.94	0 02:17	0.73
J13	JUNCTION	0.28	0.74	-0.94	0 02:17	0.74
J14	JUNCTION	0.30	0.77	-0.94	0 02:16	0.77
J15	JUNCTION	0.29	0.76	-0.94	0 02:18	0.76
J16	JUNCTION	0.29	0.76	-0.94	0 02:18	0.76
J17	JUNCTION	0.30	0.77	-0.94	0 02:15	0.77
J18	JUNCTION	0.20	0.61	-0.94	0 02:19	0.61
J19	JUNCTION	0.20	0.63	-0.93	0 02:16	0.63
J20	JUNCTION	0.21	0.64	-0.93	0 02:17	0.64
J21	JUNCTION	0.28	0.73	-0.94	0 02:15	0.73
J22	JUNCTION	0.26	0.71	-0.94	0 02:16	0.71
J23	JUNCTION	0.25	0.70	-0.94	0 02:16	0.70
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 02:17	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 02:17	0.18
SCARICO_ATT	OUTFALL	0.00	0.00	-1.82	0 00:00	0.00

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	108.61	108.61	0 02:00	0.366	0.366	-0.007
J2	JUNCTION	0.00	107.15	0 02:00	0	0.366	0.016
J3	JUNCTION	180.76	281.01	0 02:00	0.678	1.04	0.049
J4	JUNCTION	0.00	274.01	0 02:00	0	1.04	0.039
J5	JUNCTION	206.74	471.37	0 02:00	0.702	2.06	0.053
J6	JUNCTION	5.25	5.25	0 02:00	0.0172	0.0173	-0.090
J7	JUNCTION	13.51	400.16	0 01:59	0.0454	1.95	-0.026
J8	JUNCTION	0.00	378.03	0 02:01	0	2.04	0.413
J9	JUNCTION	0.00	327.06	0 02:00	0	2.16	0.410
J10	JUNCTION	0.00	266.80	0 02:00	0	2.24	0.467
J11	JUNCTION	8.56	8.56	0 02:00	0.0294	0.0294	-0.179
J12	JUNCTION	0.00	7.76	0 01:20	0	0.0296	0.189
J13	JUNCTION	13.41	31.22	0 01:58	0.0462	0.0968	-0.666
J14	JUNCTION	13.58	31.54	0 01:56	0.0398	0.0699	-0.130
J15	JUNCTION	16.17	29.59	0 01:35	0.0475	0.0696	-0.385

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J16	JUNCTION	16.88	30.26	0	01:46	0.0501	0.0703	-0.412
J17	JUNCTION	13.92	31.75	0	01:51	0.0409	0.0685	0.078
J18	JUNCTION	16.83	27.02	0	01:50	0.0495	0.0576	-1.035
J19	JUNCTION	14.38	26.82	0	01:58	0.0424	0.0529	-1.058
J20	JUNCTION	16.90	24.74	0	01:53	0.0498	0.0585	-0.799
J21	JUNCTION	0.00	79.63	0	01:58	0	0.419	0.253
J22	JUNCTION	0.00	57.52	0	01:58	0	0.254	0.297
J23	JUNCTION	0.00	29.98	0	01:47	0	0.104	0.604
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	219.02	0	02:17	0	2.18	0.022
SCARICO	OUTFALL	0.00	219.02	0	02:17	0	2.17	0.000
SCARICO_ATT	OUTFALL	220.19	220.19	0	02:00	0.739	0.739	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	81.65	123.29	219.02	2.175
SCARICO_ATT	82.76	41.34	220.19	0.739
System	82.20	164.63	422.96	2.913

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	107.15	0 02:00	0.51	0.22	0.65
C2	CONDUIT	100.29	0 02:00	0.38	0.20	0.70
C3	CONDUIT	274.01	0 02:00	0.88	0.55	0.75
C4	CONDUIT	263.80	0 02:00	0.90	0.53	0.81
C5	CONDUIT	386.65	0 01:59	0.82	0.39	0.87
C6	CONDUIT	378.03	0 02:01	0.72	0.23	0.77
C7	CONDUIT	327.06	0 02:00	0.67	0.20	0.82
C8	CONDUIT	266.80	0 02:00	0.50	0.16	0.83
C10	CONDUIT	17.73	0 01:35	0.27	0.01	0.78
C11	CONDUIT	17.20	0 01:35	0.27	0.01	0.78
C12	CONDUIT	20.15	0 01:29	0.27	0.01	0.79
C13	CONDUIT	20.63	0 01:32	0.27	0.01	0.79
C14	CONDUIT	7.76	0 01:20	0.31	0.02	0.85
C15	CONDUIT	7.30	0 01:18	0.28	0.01	0.87
C16	CONDUIT	18.90	0 01:18	0.30	0.01	0.77
C17	CONDUIT	14.68	0 02:13	0.22	0.01	0.80
C18	CONDUIT	73.79	0 01:55	0.31	0.07	0.86
C19	CONDUIT	13.73	0 02:47	0.26	0.01	0.79
C20	CONDUIT	57.52	0 01:58	0.27	0.06	0.85
C21	CONDUIT	17.50	0 02:28	0.28	0.02	0.77
C22	CONDUIT	29.98	0 01:47	0.21	0.03	0.83
C23	CONDUIT	3.62	0 01:37	0.14	0.01	0.85
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	219.02	0 02:17	1.07	0.42	0.18
C9	ORIFICE	219.02	0 02:17			1.00
R1	WEIR	0.00	0 00:00			0.00

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

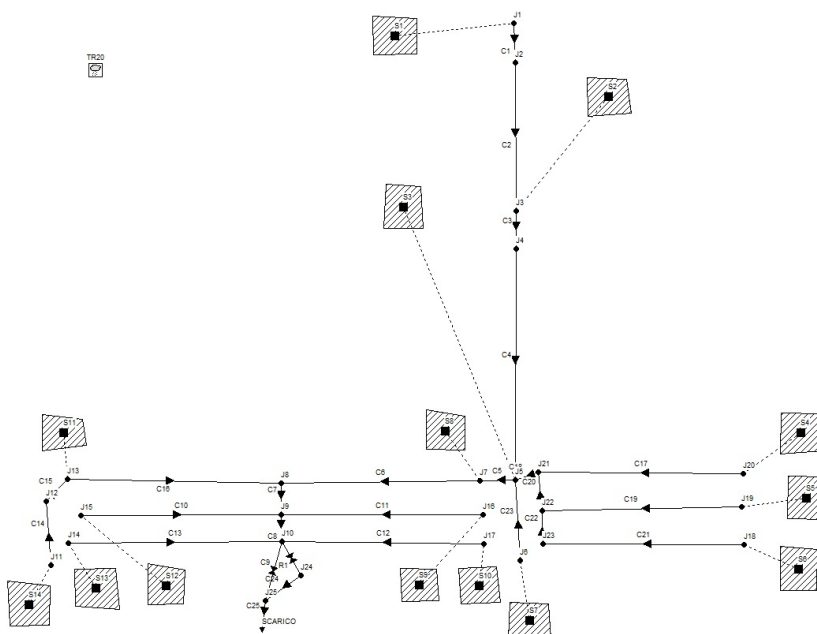
\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.17	0.00	0.00	0.82	0.00	0.00	0.00	0.24	0.00
C2	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.27	0.00
C3	1.00	0.17	0.00	0.00	0.82	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.17	0.00
C5	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.06	0.00
C7	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.02	0.00
C11	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.02	0.00
C12	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C13	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C14	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.07	0.00
C15	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.03	0.00
C16	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.06	0.00
C17	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.18	0.00
C18	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.19	0.00
C20	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.20	0.00
C22	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.05	0.00
C23	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.02	0.00
C24	1.00	0.18	0.03	0.00	0.79	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.18	0.00	0.00	0.81	0.02	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:33:48 2019  
Analysis ended on: Thu Mar 07 18:33:48 2019  
Total elapsed time: < 1 sec

**ALLEGATO 4.1. Planimetria modello SWMM**

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

**ALLEGATO 4.2. File di input modello SWMM con caratteristiche rete di calcolo**

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option      Value
FLOW_UNITS    LPS
INFILTRATION  CURVE_NUMBER
FLOW_ROUTING  DYNWAVE
LINK_OFFSETS  DEPTH
MIN_SLOPE     0
ALLOW_PONDING NO
SKIP_STEADY_STATE NO

START_DATE    03/05/2019
START_TIME    00:00:00
REPORT_START_DATE 03/05/2019
REPORT_START_TIME 00:00:00
END_DATE      03/05/2019
END_TIME      18:00:00
SWEEP_START   01/01
SWEEP_END     12/31
DRY_DAYS      0
REPORT_STEP   00:01:00
WET_STEP      00:01:00
DRY_STEP      00:01:00
ROUTING_STEP  0:00:01

INERTIAL_DAMPING PARTIAL
NORMAL_FLOW_LIMITED BOTH
FORCE_MAIN_EQUATION H-W
VARIABLE_STEP    0.75
LENGTHENING_STEP 0
MIN_SURFAREA     1.14
MAX_TRIALS        8
HEAD_TOLERANCE    0.0015
SYS_FLOW_TOL      5
LAT_FLOW_TOL      5
MINIMUM_STEP      0.5
THREADS           1

[EVAPORATION]
;;Data Source Parameters
;;-----
CONSTANT      0.0
DRY_ONLY      NO

[RAINGAGES]
;;Name      Format      Interval SCF      Source
;;-----
TR20        VOLUME     06:00      1.0      TIMESERIES icTR20TP06.00h

[SUBCATCHMENTS]
;;Name      Rain Gage      Outlet      Area      %Imperv      Width      %Slope      CurbLen      SnowPack
;;-----
S1          TR20          J1          1.04      75.7      222      0.005      0
S2          TR20          J3          1.596     100      206      0.005      0
S3          TR20          J5          2.119     71.5      388      0.005      0
S4          TR20          J20         0.188     40.5      180      0.005      0
S5          TR20          J19         0.135     51.6      180      0.005      0
S6          TR20          J18         0.187     40.7      180      0.005      0
S7          TR20          J6          0.043     85.8      70       0.005      0
S8          TR20          J7          0.108     92.8      200      0.005      0
S9          TR20          J16         0.17      47.4      180      0.005      0
S10         TR20          J17         0.131     53.4      180      0.005      0
S11         TR20          J13         0.105     100      200      0.005      0
S12         TR20          J15         0.169     43.9      180      0.005      0
S13         TR20          J14         0.128     53       180      0.005      0
S14         TR20          J11         0.067     100      72       0.005      0

[SUBAREAS]
;;Subcatchment N-Imperv N-Perv S-Imperv S-Perv PctZero RouteTo PctRouted
;;-----
S1          0.014      0.2      2      3      0      OUTLET
S2          0.014      0.2      2      3      0      OUTLET
```

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

S3	0.014	0.2	2	3	0	OUTLET
S4	0.014	0.2	2	3	0	OUTLET
S5	0.014	0.2	2	3	0	OUTLET
S6	0.014	0.2	2	3	0	OUTLET
S7	0.014	0.2	2	3	0	OUTLET
S8	0.014	0.2	2	3	0	OUTLET
S9	0.014	0.2	2	3	0	OUTLET
S10	0.014	0.2	2	3	0	OUTLET
S11	0.014	0.2	2	3	0	OUTLET
S12	0.014	0.2	2	3	0	OUTLET
S13	0.014	0.2	2	3	0	OUTLET
S14	0.014	0.2	2	3	0	OUTLET

[INFILTRATION]			
;;Subcatchment	CurveNum		DryTime
;;-----			
S1	86.9	0	4
S2	86.9	0	4
S3	86.2	0	4
S4	88.9	0	4
S5	89.7	0	4
S6	88.8	0	4
S7	84	0	4
S8	84	0	4
S9	89.5	0	4
S10	88.6	0	4
S11	88.6	0	4
S12	89.2	0	4
S13	88.5	0	4
S14	88.5	0	4

[JUNCTIONS]					
;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Aponded
;;-----					
J1	-1.479	1.479	0	0	0
J2	-1.494	1.494	0	0	0
J3	-1.559	1.559	0	0	0
J4	-1.575	1.575	0	0	0
J5	-1.675	1.675	0	0	0
J6	-1.64	1.64	0	0	0
J7	-1.69	1.69	0	0	0
J8	-1.775	1.775	0	0	0
J9	-1.788	1.788	0	0	0
J10	-1.8	1.8	0	0	0
J11	-1.644	1.644	0	0	0
J12	-1.67	1.67	0	0	0
J13	-1.681	1.681	0	0	0
J14	-1.708	1.708	0	0	0
J15	-1.7	1.7	0	0	0
J16	-1.7	1.7	0	0	0
J17	-1.712	1.712	0	0	0
J18	-1.549	1.549	0	0	0
J19	-1.561	1.561	0	0	0
J20	-1.575	1.575	0	0	0
J21	-1.665	1.665	0	0	0
J22	-1.649	1.649	0	0	0
J23	-1.636	1.636	0	0	0
J24	-1.78	1.78	0	0	0
J25	-1.82	1.82	0	0	0

[OUTFALLS]					
;;Name	Elevation	Type	Stage Data	Gated	Route To
;;-----					
SCARICO	-1.82	FREE		NO	

[CONDUITS]								
;;Name	From Node	To Node	Length	Roughness	InOffset	OutOffset	InitFlow	
MaxFlow								
;;-----								
C1	J1	J2	15	0.013	0	0	0	0
C2	J2	J3	65	0.013	0	0	0	0
C3	J3	J4	16	0.013	0	0	0	0
C4	J4	J5	100	0.013	0	0	0	0
C5	J5	J7	15	0.013	0	0	0	0
C6	J7	J8	85	0.013	0	0	0	0
C7	J8	J9	13	0.013	0	0	0	0
C8	J9	J10	12	0.013	0	0	0	0
C10	J15	J9	88	0.013	0	0	0	0

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C11	J16	J9	88	0.013	0	0	0	0
C12	J17	J10	88	0.013	0	0	0	0
C13	J14	J10	92	0.013	0	0	0	0
C14	J11	J12	26	0.013	0	0	0	0
C15	J12	J13	11	0.013	0	0	0	0
C16	J13	J8	94	0.013	0	0	0	0
C17	J20	J21	90	0.013	0	0	0	0
C18	J21	J5	10	0.013	0	0	0	0
C19	J19	J22	88	0.013	0	0	0	0
C20	J22	J21	16	0.013	0	0	0	0
C21	J18	J23	87	0.013	0	0	0	0
C22	J23	J22	13	0.013	0	0	0	0
C23	J6	J5	35	0.013	0	0	0	0
C24	J24	J25	3	0.013	0	0	0	0
C25	J25	SCARICO	3	0.013	0	0	0	0

[ORIFICES]							
;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
;;-----							
C9	J10	J25	SIDE	0	0.6401	NO	0

[WEIRS]								
;;Name	From Node	To Node	Type	CrestHt	Qcoeff	Gated	EndCon	
EndCoeff	Surcharge	RoadWidth	RoadSurf					
;;-----								
R1	J10	J24	TRANSVERSE	1.03	3.33	NO	0	0
YES								

[XSECTIONS]							
;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
;;-----							
C1	CIRCULAR	0.852	0	0	0	1	
C2	CIRCULAR	0.852	0	0	0	1	
C3	CIRCULAR	0.852	0	0	0	1	
C4	CIRCULAR	0.852	0	0	0	1	
C5	CIRCULAR	0.852	0	0	0	2	
C6	CIRCULAR	1.03	0	0	0	2	
C7	CIRCULAR	1.03	0	0	0	2	
C8	CIRCULAR	1.03	0	0	0	2	
C10	CIRCULAR	1.03	0	0	0	2	
C11	CIRCULAR	1.03	0	0	0	2	
C12	CIRCULAR	1.03	0	0	0	2	
C13	CIRCULAR	1.03	0	0	0	2	
C14	CIRCULAR	0.852	0	0	0	1	
C15	CIRCULAR	0.852	0	0	0	1	
C16	CIRCULAR	1.03	0	0	0	2	
C17	CIRCULAR	0.852	0	0	0	2	
C18	CIRCULAR	0.852	0	0	0	2	
C19	CIRCULAR	0.852	0	0	0	2	
C20	CIRCULAR	0.852	0	0	0	2	
C21	CIRCULAR	0.852	0	0	0	2	
C22	CIRCULAR	0.852	0	0	0	2	
C23	CIRCULAR	0.852	0	0	0	1	
C24	CIRCULAR	1.03	0	0	0	1	
C25	CIRCULAR	1.03	0	0	0	2	
C9	CIRCULAR	0.344	0	0	0		
R1	RECT_OPEN	0.3	4	0	0		

[LOSSES]					
;;Link	Kentry	Kexit	Kavg	Flap Gate	Seepage
;;-----					
C24	0	0	0	YES	0

[TIMESERIES]			
;;Name	Date	Time	Value
;;-----			
icTR20TP00.20h		00:00	0
icTR20TP00.20h		00:12	31.78
;			
icTR20TP00.40h		00:00	0
icTR20TP00.40h		00:24	37.26
;			
icTR20TP00.60h		00:00	0
icTR20TP00.60h		00:36	40.89
;			
icTR20TP00.80h		00:00	0
icTR20TP00.80h		00:48	43.68
;			

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

icTR20TP01.00h	00:00	0
icTR20TP01.00h	01:00	45.98
;		
icTR20TP01.20h	00:00	0
icTR20TP01.20h	01:12	47.94
;		
icTR20TP01.40h	00:00	0
icTR20TP01.40h	01:24	49.67
;		
icTR20TP01.60h	00:00	0
icTR20TP01.60h	01:36	51.21
;		
icTR20TP01.80h	00:00	0
icTR20TP01.80h	01:48	52.62
;		
icTR20TP02.00h	00:00	0
icTR20TP02.00h	02:00	53.91
;		
icTR20TP03.00h	00:00	0
icTR20TP03.00h	03:00	59.16
;		
icTR20TP06.00h	00:00	0
icTR20TP06.00h	06:00	69.36

[REPORT]  
;;Reporting Options  
INPUT NO  
CONTROLS NO  
SUBCATCHMENTS ALL  
NODES ALL  
LINKS ALL

[TAGS]

[MAP]  
DIMENSIONS 113.033 435.986 11201.846 8860.439  
Units None

[COORDINATES]

;;Node	X-Coord	Y-Coord
;;-----	-----	-----
J1	6856.978	8396.770
J2	6868.512	7912.341
J3	6880.046	6078.431
J4	6880.046	5617.070
J5	6868.512	2768.166
J6	6926.182	1776.240
J7	6430.219	2756.632
J8	3985.006	2733.564
J9	3985.006	2341.407
J10	3996.540	2006.920
J11	1147.636	1718.570
J12	1089.965	2502.884
J13	1355.248	2779.700
J14	1366.782	1995.386
J15	1516.724	2329.873
J16	6476.355	2341.407
J17	6487.889	1983.852
J18	9694.348	1972.318
J19	9659.746	2433.679
J20	9682.814	2848.904
J21	7156.863	2860.438
J22	7202.999	2387.543
J23	7214.533	1983.852
J24	4227.220	1591.696
J25	3788.927	1280.277
SCARICO	3754.325	922.722

[VERTICES]

;;Link	X-Coord	Y-Coord
;;-----	-----	-----

[Polygons]

;;Subcatchment	X-Coord	Y-Coord
;;-----	-----	-----
S1	5657.439	8454.441
S1	5657.439	8016.148
S1	5126.874	8004.614
S1	5115.340	8477.509

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
**Marzo 2019**

S2	8241.061	7704.729
S2	8298.731	7289.504
S2	7768.166	7243.368
S2	7756.632	7727.797
S3	5703.576	6378.316
S3	5738.178	5870.819
S3	5253.749	5870.819
S3	5276.817	6412.918
S4	10628.604	3587.082
S4	10651.672	3125.721
S4	10132.641	3091.119
S4	10144.175	3598.616
S5	10686.275	2802.768
S5	10697.809	2283.737
S5	10224.913	2295.271
S5	10236.448	2814.302
S6	10594.002	1914.648
S6	10582.468	1407.151
S6	10132.641	1407.151
S6	10132.641	1949.250
S7	7283.737	1245.675
S7	7306.805	818.916
S7	6787.774	818.916
S7	6799.308	1257.209
S8	6245.675	3552.480
S8	6245.675	3137.255
S8	5772.780	3148.789
S8	5772.780	3633.218
S9	5899.654	1672.434
S9	5934.256	1280.277
S9	5472.895	1268.743
S9	5449.827	1683.968
S10	6637.832	1695.502
S10	6683.968	1257.209
S10	6199.539	1245.675
S10	6176.471	1683.968
S11	1539.792	3517.878
S11	1585.928	3194.925
S11	1043.829	3125.721
S11	1043.829	3575.548
S12	2797.001	1660.900
S12	2785.467	1245.675
S12	2347.174	1234.141
S12	2347.174	1741.638
S13	1943.483	1683.968
S13	1989.619	1176.471
S13	1447.520	1211.073
S13	1435.986	1672.434
S14	1136.101	1464.821
S14	1124.567	980.392
S14	640.138	968.858
S14	617.070	1522.491

[SYMBOLS]

;;Gage	X-Coord	Y-Coord
TR20	1712.803	7797.001

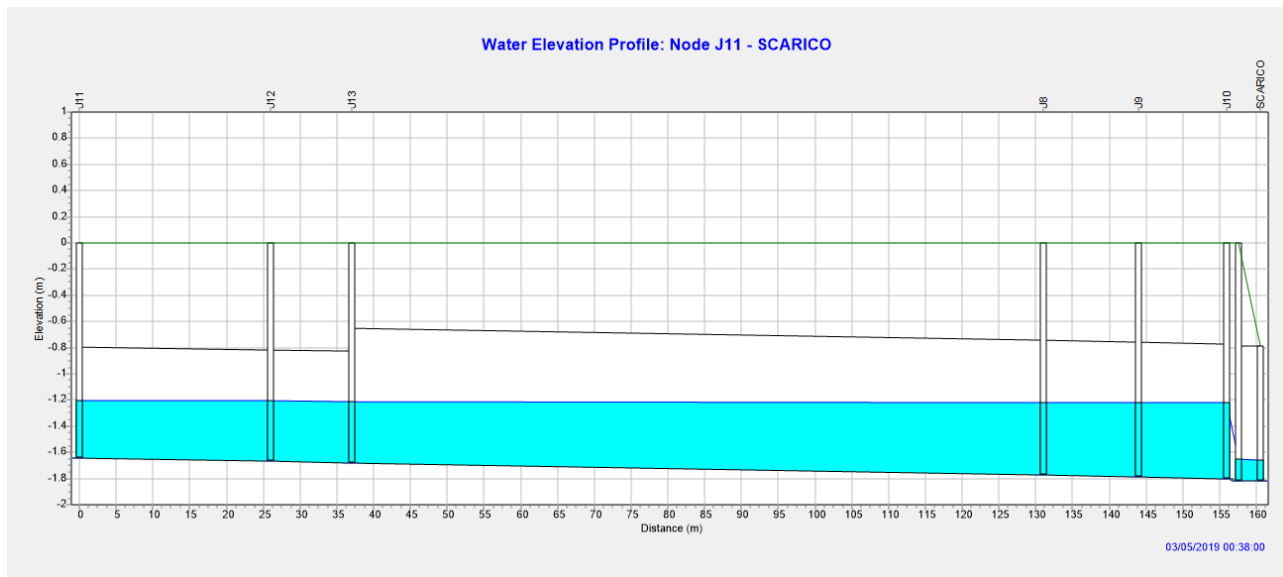
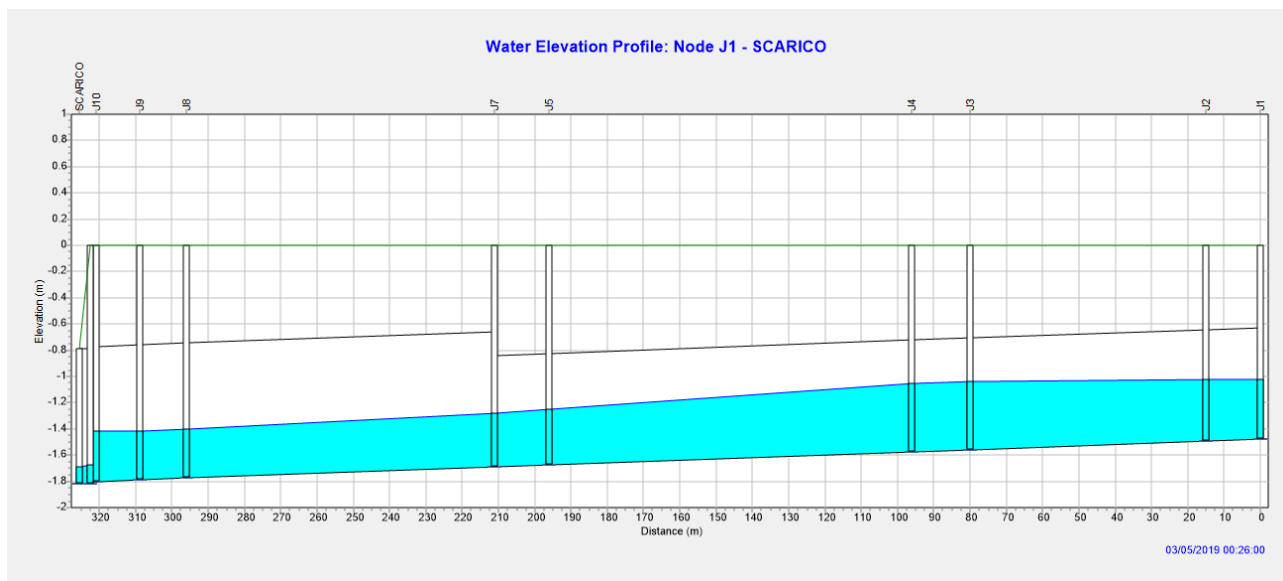
[PROFILES]

;;Name	Links
"PROFILO_J1-SCARICO"	C1 C2 C3 C4 C5
"PROFILO_J1-SCARICO"	C6 C7 C8 C9 C25
"PROFILO_J11-SCARICO"	C14 C15 C16 C7 C8
"PROFILO_J11-SCARICO"	C9 C25
"PROFILO_J18-SCARICO"	C21 C22 C20 C18 C5
"PROFILO_J18-SCARICO"	C6 C7 C8 C9 C25
"PROFILO_J15-SCARICO"	C10 C8 C9 C25

Progetto:  
Elaborato:  
Data:

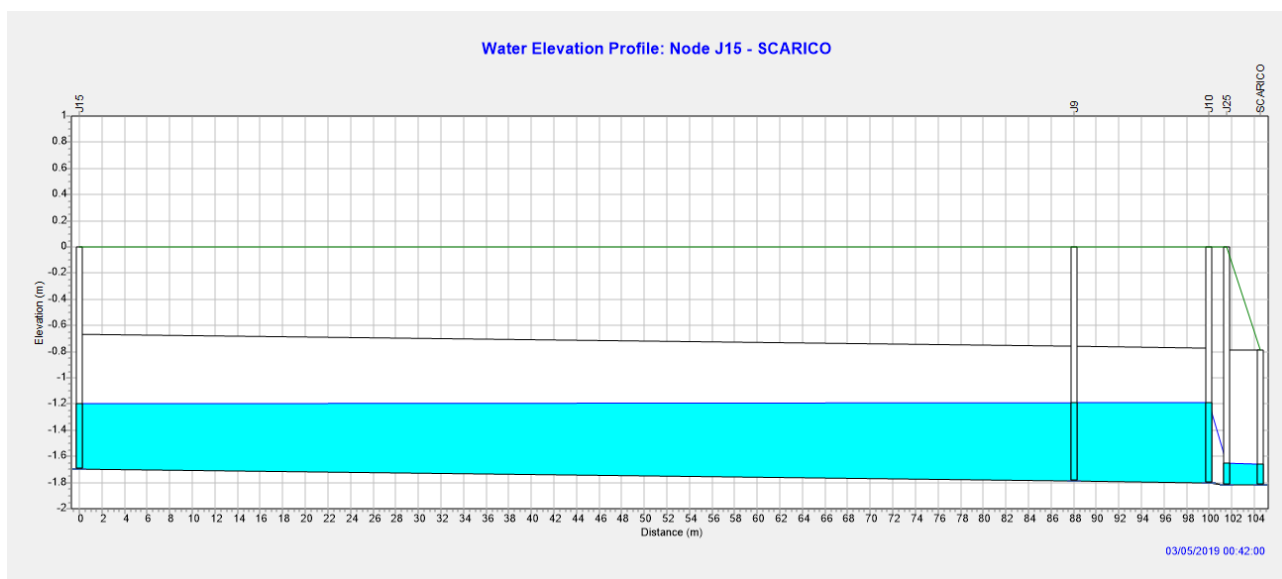
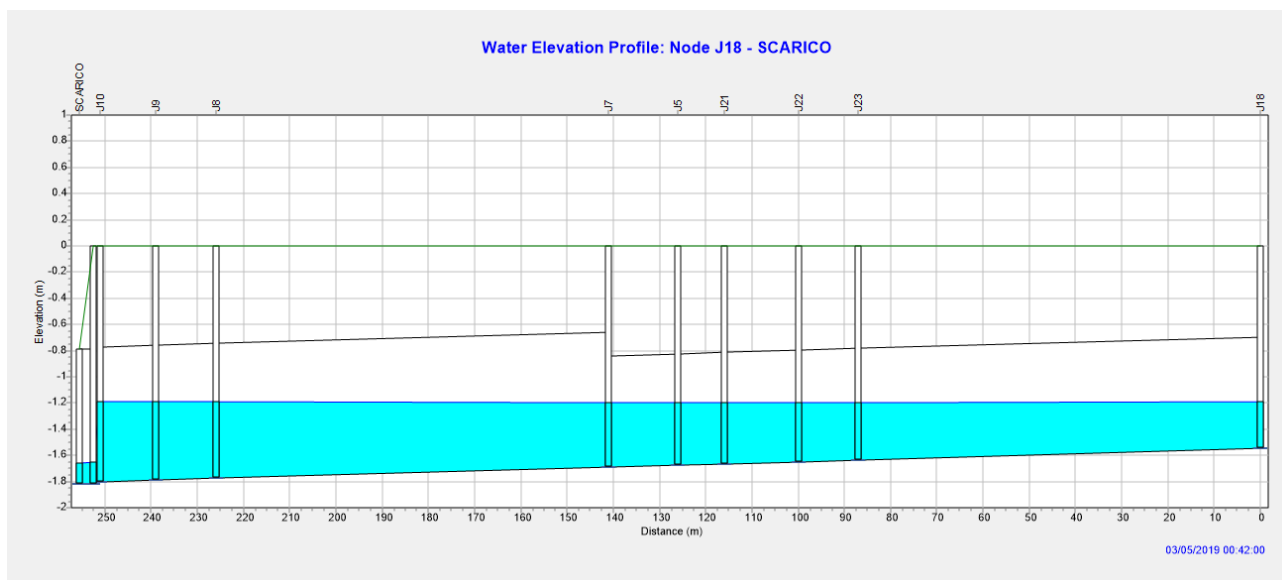
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.3. Risultati modello SWMM TR 20 anni Tp 0.2 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*  
Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO  
  Snowmelt ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.197	31.780
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.044	7.056
Surface Runoff .....	0.140	22.671
Final Storage .....	0.013	2.080
Continuity Error (%) .....	-0.084	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.140	1.402
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.140	1.397
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.001	0.006
Continuity Error (%) .....	-0.082	

Highest Continuity Errors  
Node J13 (-1.55%)  
Node J23 (1.32%)

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	31.78	0.00	0.00	7.42	22.49	0.23	201.27	0.708
S2	31.78	0.00	0.00	0.00	28.78	0.46	233.73	0.906
S3	31.78	0.00	0.00	8.79	21.17	0.45	364.98	0.666
S4	31.78	0.00	0.00	17.24	13.21	0.02	37.50	0.416
S5	31.78	0.00	0.00	13.50	16.99	0.02	34.83	0.534
S6	31.78	0.00	0.00	17.31	13.25	0.02	37.44	0.417
S7	31.78	0.00	0.00	3.86	26.10	0.01	16.74	0.821
S8	31.78	0.00	0.00	1.88	28.07	0.03	45.04	0.883
S9	31.78	0.00	0.00	14.91	15.47	0.03	39.54	0.487
S10	31.78	0.00	0.00	13.13	17.26	0.02	34.49	0.543
S11	31.78	0.00	0.00	0.00	29.85	0.03	45.54	0.939
S12	31.78	0.00	0.00	15.90	14.38	0.02	36.73	0.452
S13	31.78	0.00	0.00	13.34	17.14	0.02	33.54	0.539
S14	31.78	0.00	0.00	0.00	29.80	0.02	27.42	0.938

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.09	0.47	-1.01	0 00:24	0.47
J2	JUNCTION	0.10	0.48	-1.02	0 00:24	0.48
J3	JUNCTION	0.14	0.53	-1.03	0 00:25	0.53
J4	JUNCTION	0.14	0.52	-1.05	0 00:25	0.52
J5	JUNCTION	0.17	0.49	-1.18	0 00:47	0.49
J6	JUNCTION	0.14	0.46	-1.18	0 00:47	0.46
J7	JUNCTION	0.18	0.51	-1.18	0 00:46	0.51
J8	JUNCTION	0.22	0.59	-1.18	0 00:49	0.59
J9	JUNCTION	0.23	0.60	-1.18	0 00:49	0.60
J10	JUNCTION	0.24	0.62	-1.18	0 00:51	0.61
J11	JUNCTION	0.13	0.47	-1.18	0 00:45	0.46
J12	JUNCTION	0.15	0.49	-1.18	0 00:45	0.49
J13	JUNCTION	0.15	0.50	-1.18	0 00:45	0.50
J14	JUNCTION	0.17	0.52	-1.18	0 00:47	0.52
J15	JUNCTION	0.16	0.52	-1.18	0 00:45	0.52
J16	JUNCTION	0.16	0.52	-1.18	0 00:52	0.52
J17	JUNCTION	0.17	0.53	-1.18	0 00:47	0.53
J18	JUNCTION	0.09	0.37	-1.18	0 00:46	0.37
J19	JUNCTION	0.10	0.38	-1.18	0 00:46	0.38
J20	JUNCTION	0.10	0.40	-1.18	0 00:48	0.39
J21	JUNCTION	0.16	0.48	-1.18	0 00:47	0.48
J22	JUNCTION	0.14	0.47	-1.18	0 00:47	0.47
J23	JUNCTION	0.13	0.46	-1.18	0 00:47	0.45
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.09	0.17	-1.65	0 00:51	0.17
SCARICO	OUTFALL	0.08	0.16	-1.66	0 00:51	0.16

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	201.27	201.27	0 00:24	0.234	0.234	-0.022
J2	JUNCTION	0.00	197.74	0 00:24	0	0.234	-0.000
J3	JUNCTION	233.73	411.41	0 00:24	0.459	0.693	0.051
J4	JUNCTION	0.00	401.66	0 00:24	0	0.693	0.036
J5	JUNCTION	364.98	735.04	0 00:24	0.449	1.34	0.044
J6	JUNCTION	16.74	16.74	0 00:24	0.0112	0.0138	-0.240
J7	JUNCTION	45.04	666.80	0 00:27	0.0303	1.25	-0.124
J8	JUNCTION	0.00	660.75	0 00:28	0	1.34	0.327
J9	JUNCTION	0.00	516.67	0 00:27	0	1.44	0.221

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

J10	JUNCTION	0.00	348.00	0	00:29	0	1.49	0.215
J11	JUNCTION	27.42	27.42	0	00:24	0.02	0.0239	-0.343
J12	JUNCTION	0.00	25.57	0	00:22	0	0.0321	0.256
J13	JUNCTION	45.54	78.79	0	00:26	0.0313	0.0908	-1.527
J14	JUNCTION	33.54	83.58	0	00:23	0.0219	0.0628	-1.789
J15	JUNCTION	36.73	91.32	0	00:26	0.0243	0.0679	-1.573
J16	JUNCTION	39.54	89.64	0	00:26	0.0263	0.0688	-1.605
J17	JUNCTION	34.49	90.77	0	00:26	0.0226	0.0667	-1.609
J18	JUNCTION	37.44	59.36	0	00:22	0.0248	0.0411	-2.401
J19	JUNCTION	34.83	76.34	0	00:22	0.0229	0.036	-2.546
J20	JUNCTION	37.50	82.24	0	00:22	0.0248	0.0426	-1.684
J21	JUNCTION	0.00	257.30	0	00:23	0	0.284	0.344
J22	JUNCTION	0.00	187.41	0	00:23	0	0.175	0.589
J23	JUNCTION	0.00	96.74	0	00:23	0	0.0795	1.339
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	175.52	0	00:51	0	1.4	0.005
SCARICO	OUTFALL	0.00	175.53	0	00:51	0	1.4	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	95.81	67.53	175.53	1.397
System	95.81	67.53	175.53	1.397

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	197.74	0 00:24	0.78	0.40	0.55
C2	CONDUIT	185.33	0 00:24	0.53	0.37	0.59
C3	CONDUIT	401.66	0 00:24	1.11	0.81	0.62
C4	CONDUIT	399.00	0 00:25	1.24	0.81	0.55
C5	CONDUIT	654.69	0 00:27	1.10	0.66	0.59
C6	CONDUIT	660.75	0 00:28	1.05	0.40	0.53
C7	CONDUIT	516.67	0 00:27	1.00	0.31	0.58
C8	CONDUIT	348.00	0 00:29	0.70	0.21	0.59
C10	CONDUIT	78.15	0 00:26	0.39	0.05	0.54
C11	CONDUIT	74.96	0 00:26	0.40	0.05	0.54
C12	CONDUIT	78.70	0 00:26	0.40	0.05	0.55
C13	CONDUIT	74.86	0 00:29	0.39	0.05	0.55
C14	CONDUIT	25.57	0 00:22	0.43	0.05	0.56
C15	CONDUIT	23.53	0 00:21	0.40	0.05	0.58
C16	CONDUIT	63.34	0 00:29	0.44	0.04	0.53
C17	CONDUIT	48.28	0 00:25	0.31	0.05	0.51
C18	CONDUIT	242.86	0 00:23	0.59	0.25	0.57
C19	CONDUIT	43.36	0 00:22	0.38	0.04	0.49
C20	CONDUIT	186.22	0 00:23	0.53	0.19	0.56
C21	CONDUIT	35.35	0 00:30	0.42	0.04	0.48
C22	CONDUIT	96.74	0 00:23	0.41	0.10	0.54
C23	CONDUIT	12.45	0 00:22	0.16	0.03	0.56
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.08

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C25	CONDUIT	175.53	0	00:51	1.00	0.34	0.16
C9	ORIFICE	175.52	0	00:51			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up		Down	Sub	Sup	Up	Down	Norm	Inlet
		Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C1	1.00	0.03	0.00	0.00	0.96	0.00	0.00	0.00	0.58	0.00
C2	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.60	0.00
C3	1.00	0.03	0.00	0.00	0.96	0.01	0.00	0.00	0.08	0.00
C4	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.16	0.00
C5	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.41	0.00
C7	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.12	0.00
C8	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.35	0.00
C11	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.35	0.00
C12	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.33	0.00
C13	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.34	0.00
C14	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.41	0.00
C15	1.00	0.03	0.00	0.00	0.96	0.00	0.00	0.00	0.22	0.00
C16	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.39	0.00
C17	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.52	0.00
C18	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.53	0.00
C20	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.54	0.00
C22	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.30	0.00
C23	1.00	0.03	0.00	0.00	0.97	0.00	0.00	0.00	0.24	0.00
C24	1.00	0.04	0.26	0.00	0.70	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.04	0.00	0.00	0.71	0.25	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

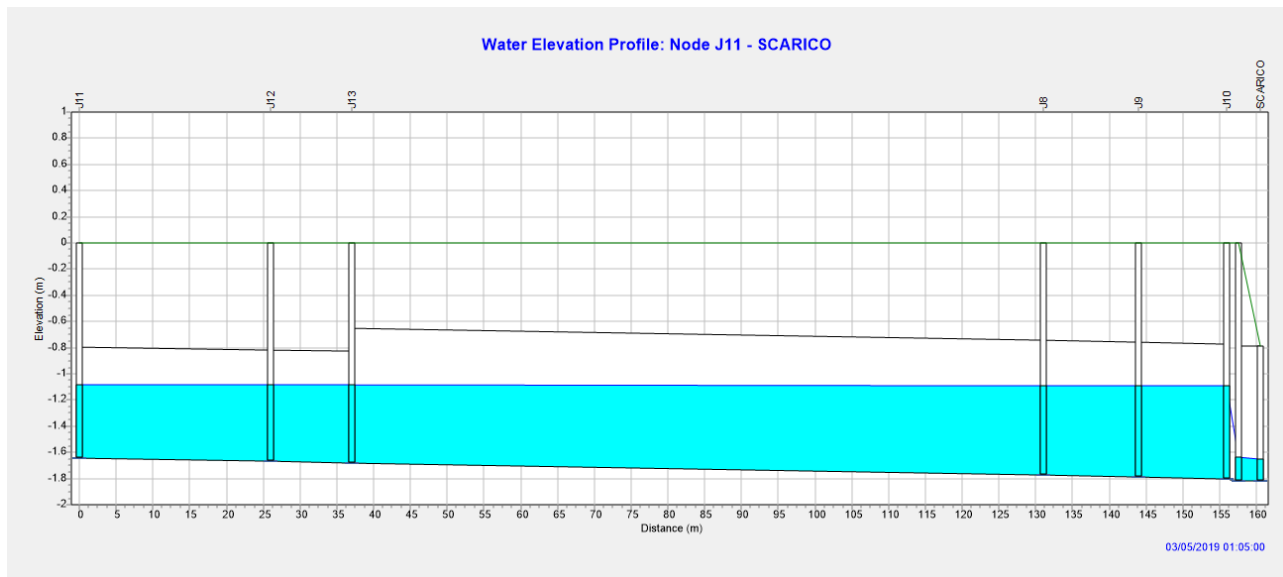
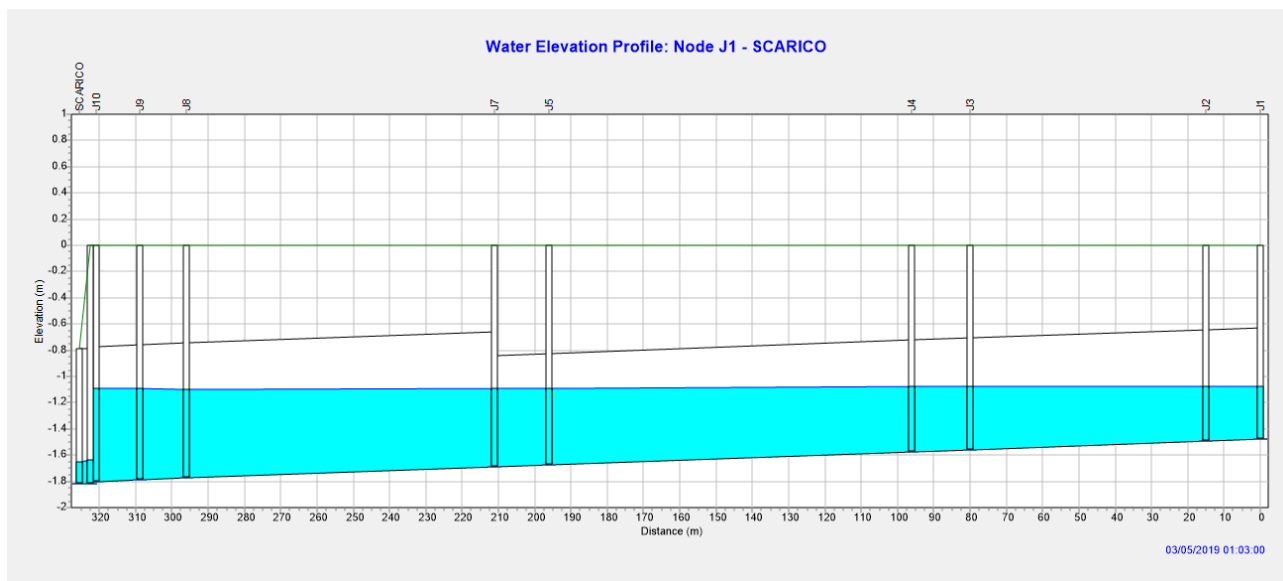
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:39:38 2019  
Analysis ended on: Thu Mar 07 18:39:39 2019  
Total elapsed time: 00:00:01

**Progetto:**  
**Elaborato:**  
**Data:**

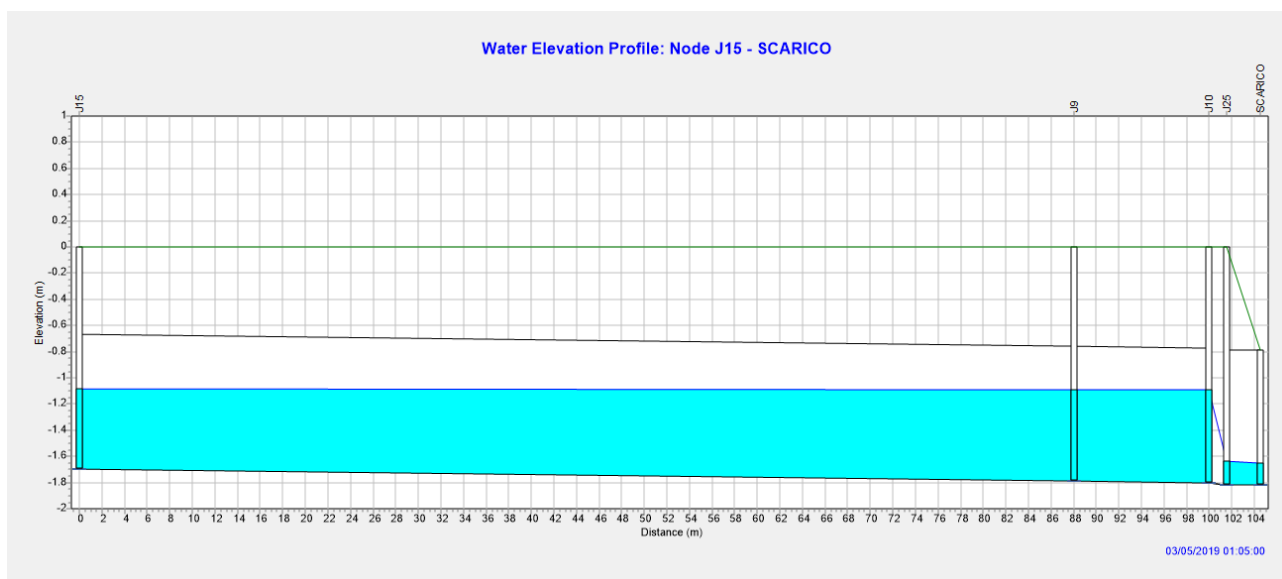
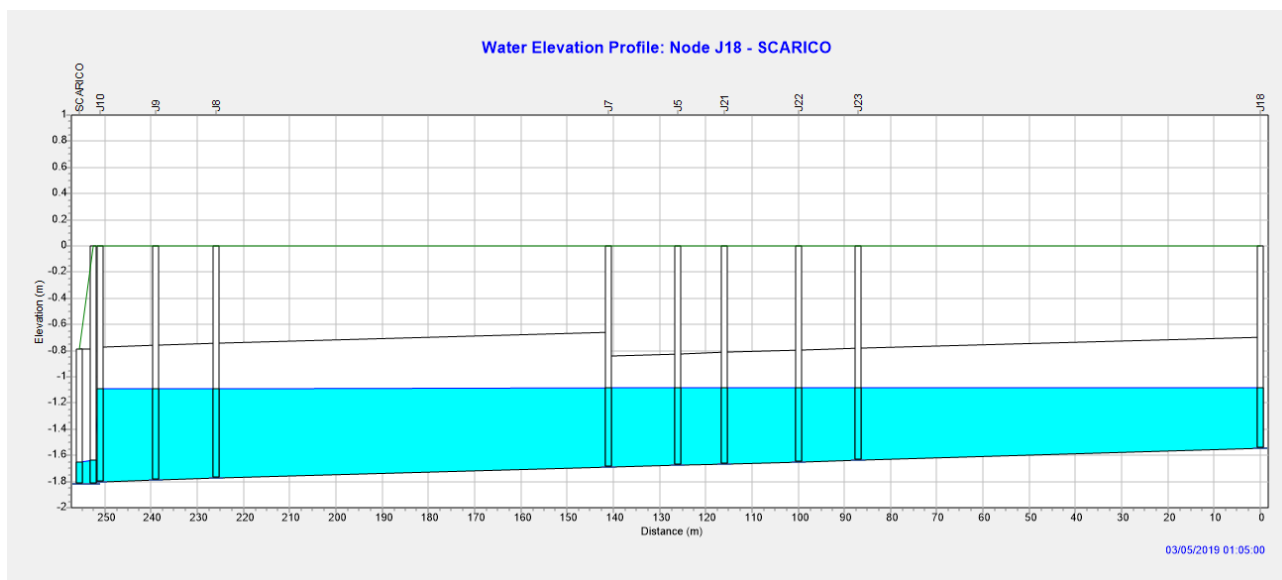
**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

**ALLEGATO 4.4. Risultati modello SWMM TR 20 anni Tp 0.4 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*  
Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO  
  Snowmelt ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.230	37.260
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.047	7.655
Surface Runoff .....	0.170	27.406
Final Storage .....	0.014	2.215
Continuity Error (%) .....	-0.042	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.170	1.695
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.169	1.690
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.001	0.007
Continuity Error (%) .....	-0.074	

Highest Continuity Errors  
Node J13 (-1.24%)

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	37.26	0.00	0.00	8.15	27.06	0.28	173.63	0.726
S2	37.26	0.00	0.00	0.00	34.15	0.55	238.63	0.917
S3	37.26	0.00	0.00	9.84	25.43	0.54	322.41	0.683
S4	37.26	0.00	0.00	18.19	17.53	0.03	25.65	0.471
S5	37.26	0.00	0.00	13.55	22.12	0.03	23.58	0.594
S6	37.26	0.00	0.00	18.27	17.56	0.03	25.58	0.471
S7	37.26	0.00	0.00	4.06	31.37	0.01	10.32	0.842
S8	37.26	0.00	0.00	1.92	33.44	0.04	27.14	0.898
S9	37.26	0.00	0.00	15.48	20.27	0.03	26.80	0.544
S10	37.26	0.00	0.00	13.44	22.21	0.03	23.12	0.596
S11	37.26	0.00	0.00	0.00	35.29	0.04	27.15	0.947
S12	37.26	0.00	0.00	16.74	19.00	0.03	25.09	0.510
S13	37.26	0.00	0.00	13.66	22.08	0.03	22.51	0.593
S14	37.26	0.00	0.00	0.00	35.24	0.02	17.20	0.946

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.12	0.47	-1.01	0 00:48	0.47
J2	JUNCTION	0.13	0.48	-1.01	0 00:48	0.48
J3	JUNCTION	0.17	0.54	-1.02	0 00:48	0.54
J4	JUNCTION	0.18	0.53	-1.04	0 00:48	0.53
J5	JUNCTION	0.21	0.60	-1.08	0 01:09	0.60
J6	JUNCTION	0.18	0.56	-1.08	0 01:09	0.56
J7	JUNCTION	0.22	0.61	-1.08	0 01:09	0.61
J8	JUNCTION	0.27	0.70	-1.08	0 01:10	0.70
J9	JUNCTION	0.28	0.71	-1.08	0 01:10	0.71
J10	JUNCTION	0.29	0.72	-1.08	0 01:10	0.72
J11	JUNCTION	0.18	0.57	-1.07	0 01:11	0.57
J12	JUNCTION	0.19	0.59	-1.08	0 01:11	0.59
J13	JUNCTION	0.20	0.60	-1.08	0 01:11	0.60
J14	JUNCTION	0.22	0.63	-1.08	0 01:09	0.63
J15	JUNCTION	0.21	0.62	-1.08	0 01:09	0.62
J16	JUNCTION	0.21	0.62	-1.08	0 01:09	0.62
J17	JUNCTION	0.22	0.64	-1.08	0 01:09	0.64
J18	JUNCTION	0.13	0.47	-1.08	0 01:10	0.47
J19	JUNCTION	0.14	0.48	-1.08	0 01:08	0.48
J20	JUNCTION	0.14	0.50	-1.07	0 01:06	0.50
J21	JUNCTION	0.20	0.59	-1.08	0 01:09	0.59
J22	JUNCTION	0.19	0.57	-1.08	0 01:11	0.57
J23	JUNCTION	0.18	0.56	-1.08	0 01:11	0.56
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.10	0.18	-1.64	0 01:10	0.18
SCARICO	OUTFALL	0.09	0.17	-1.65	0 01:10	0.17

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10 <sup>6</sup> ltr	Total Inflow Volume 10 <sup>6</sup> ltr	Flow Balance Error Percent
J1	JUNCTION	173.63	173.63	0 00:48	0.281	0.281	-0.016
J2	JUNCTION	0.00	172.10	0 00:48	0	0.281	0.003
J3	JUNCTION	238.63	402.63	0 00:48	0.545	0.827	0.046
J4	JUNCTION	0.00	396.96	0 00:48	0	0.826	0.029
J5	JUNCTION	322.41	713.52	0 00:48	0.539	1.61	0.046
J6	JUNCTION	10.32	10.32	0 00:48	0.0135	0.0146	-0.212
J7	JUNCTION	27.14	655.17	0 00:47	0.0361	1.51	-0.084
J8	JUNCTION	0.00	620.97	0 00:47	0	1.6	0.252
J9	JUNCTION	0.00	514.11	0 00:48	0	1.7	0.170
J10	JUNCTION	0.00	342.13	0 00:48	0	1.77	0.170

J11	JUNCTION	17.20	17.20	0	00:48	0.0236	0.0251	-0.278
J12	JUNCTION	0.00	15.26	0	00:37	0	0.029	0.239
J13	JUNCTION	27.15	66.94	0	00:48	0.0371	0.0917	-1.224
J14	JUNCTION	22.51	74.67	0	00:48	0.0283	0.0645	-1.399
J15	JUNCTION	25.09	69.52	0	00:48	0.0321	0.0662	-1.291
J16	JUNCTION	26.80	71.09	0	00:48	0.0345	0.067	-1.320
J17	JUNCTION	23.12	71.06	0	00:45	0.0291	0.0661	-1.305
J18	JUNCTION	25.58	41.14	0	00:44	0.0328	0.0476	-1.698
J19	JUNCTION	23.58	38.17	0	00:37	0.0299	0.0404	-1.854
J20	JUNCTION	25.65	48.17	0	00:41	0.033	0.0489	-1.240
J21	JUNCTION	0.00	130.17	0	00:38	0	0.334	0.277
J22	JUNCTION	0.00	93.59	0	00:38	0	0.203	0.417
J23	JUNCTION	0.00	47.43	0	00:39	0	0.0891	0.959
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	195.39	0	01:10	0	1.69	0.005
SCARICO	OUTFALL	0.00	195.40	0	01:10	0	1.69	0.000

\*\*\*\*\*  
 Node Surcharge Summary  
 \*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
 Node Flooding Summary  
 \*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	92.20	84.83	195.40	1.690
System	92.20	84.83	195.40	1.690

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	172.10	0 00:48	0.63	0.35	0.56
C2	CONDUIT	165.31	0 00:48	0.47	0.33	0.60
C3	CONDUIT	396.96	0 00:48	1.06	0.80	0.63
C4	CONDUIT	392.85	0 00:49	1.12	0.79	0.64
C5	CONDUIT	628.03	0 00:47	1.02	0.63	0.71
C6	CONDUIT	620.97	0 00:47	0.92	0.38	0.63
C7	CONDUIT	514.11	0 00:48	0.84	0.31	0.68
C8	CONDUIT	342.13	0 00:48	0.60	0.21	0.70
C10	CONDUIT	49.67	0 00:51	0.33	0.03	0.64
C11	CONDUIT	48.56	0 00:51	0.34	0.03	0.64
C12	CONDUIT	48.95	0 00:45	0.34	0.03	0.66
C13	CONDUIT	56.07	0 00:48	0.33	0.03	0.65
C14	CONDUIT	15.26	0 00:37	0.37	0.03	0.68
C15	CONDUIT	14.19	0 00:36	0.34	0.03	0.70
C16	CONDUIT	52.52	0 00:51	0.37	0.03	0.63
C17	CONDUIT	26.25	0 00:54	0.27	0.03	0.64
C18	CONDUIT	122.03	0 00:38	0.44	0.12	0.69
C19	CONDUIT	23.68	0 00:54	0.33	0.02	0.62
C20	CONDUIT	91.61	0 00:38	0.40	0.09	0.68
C21	CONDUIT	25.84	0 00:46	0.35	0.03	0.60
C22	CONDUIT	47.43	0 00:39	0.32	0.05	0.66
C23	CONDUIT	8.12	0 00:48	0.15	0.02	0.68
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	195.40	0 01:10	1.03	0.37	0.17

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C9	ORIFICE	195.39	0	01:10	1.00
R1	WEIR	0.00	0	00:00	0.00

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Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	----- Up Dry		Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.48	0.00
C2	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.50	0.00
C3	1.00	0.07	0.00	0.00	0.92	0.01	0.00	0.00	0.01	0.00
C4	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.16	0.00
C5	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.30	0.00
C7	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.04	0.00
C8	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.25	0.00
C11	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.25	0.00
C12	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.23	0.00
C13	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.24	0.00
C14	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.31	0.00
C15	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.22	0.00
C16	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.29	0.00
C17	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.41	0.00
C18	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.43	0.00
C20	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.44	0.00
C22	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.24	0.00
C23	1.00	0.07	0.00	0.00	0.93	0.00	0.00	0.00	0.18	0.00
C24	1.00	0.07	0.17	0.00	0.76	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.07	0.00	0.00	0.77	0.16	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

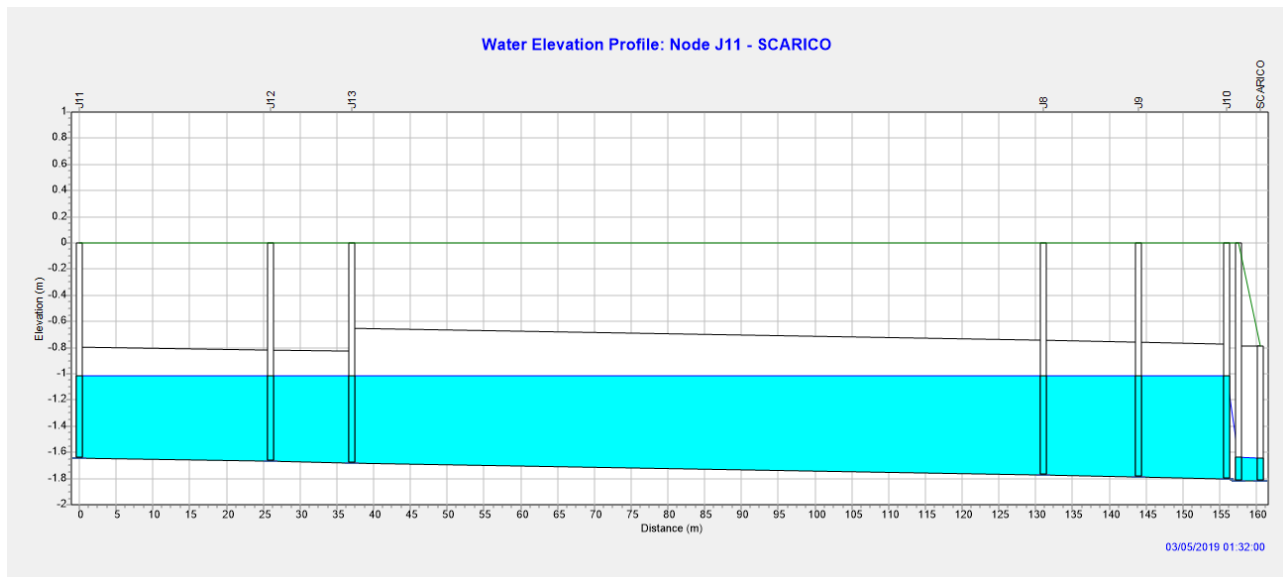
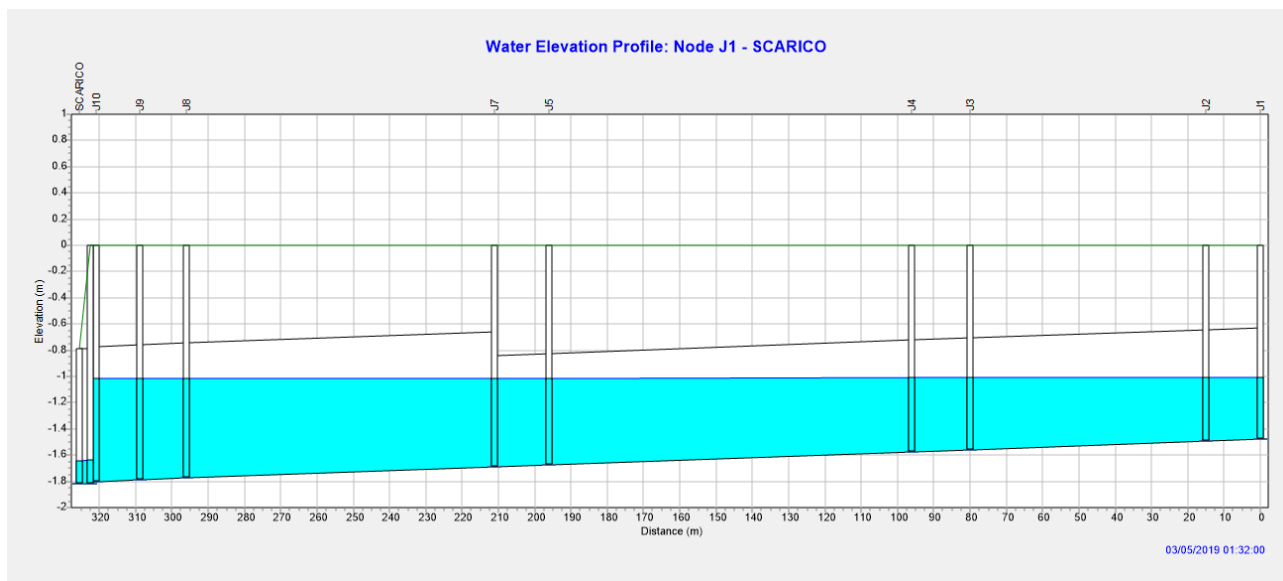
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:43:50 2019  
Analysis ended on: Thu Mar 07 18:43:51 2019  
Total elapsed time: 00:00:01

**Progetto:**  
**Elaborato:**  
**Data:**

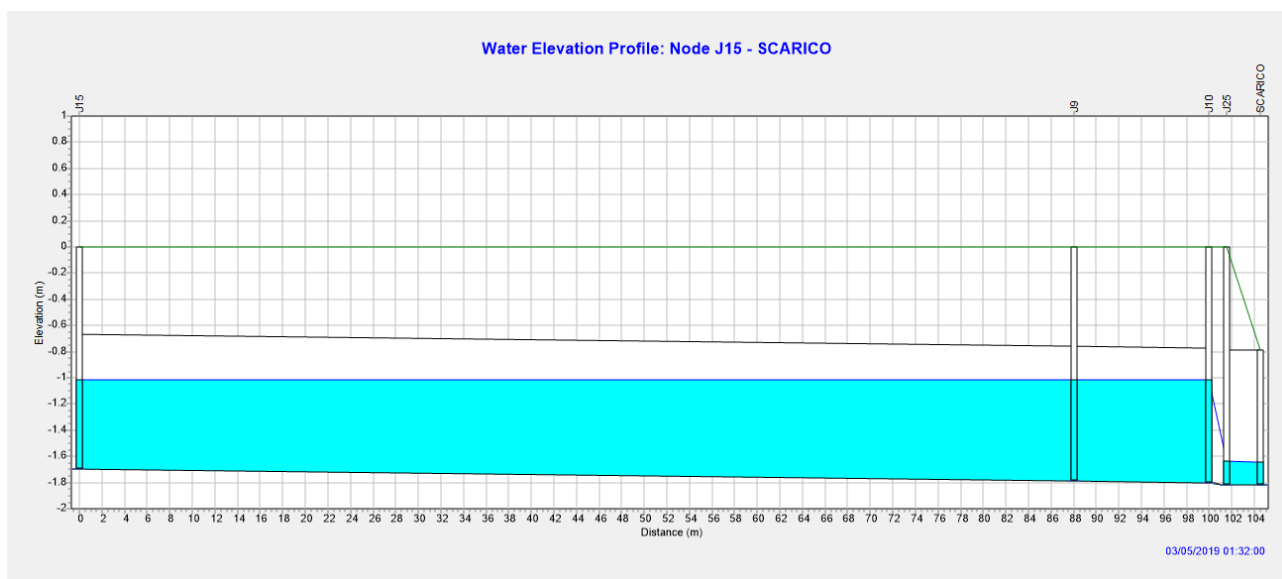
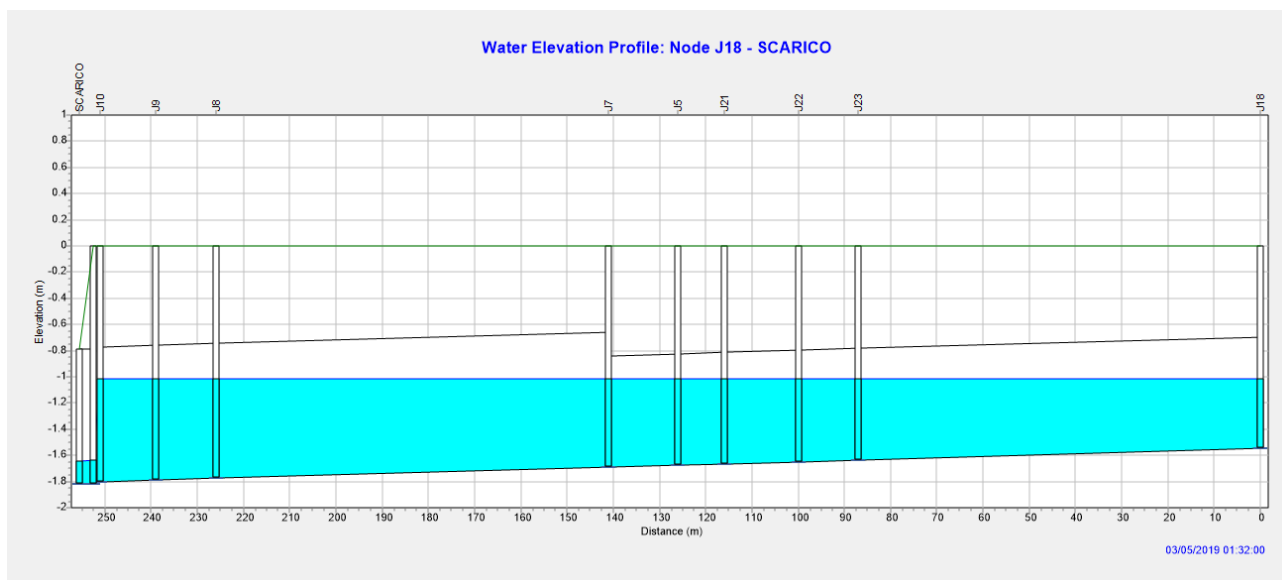
**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

**ALLEGATO 4.5. Risultati modello SWMM TR 20 anni Tp 0.6 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*

Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO  
  Snowmelt ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.253	40.890
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.049	7.863
Surface Runoff .....	0.190	30.749
Final Storage .....	0.014	2.289
Continuity Error (%) .....	-0.025	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.190	1.902
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.189	1.894
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.001	0.009
Continuity Error (%) .....	-0.073	

Highest Continuity Errors  
Node J13 (-1.07%)

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	40.89	0.00	0.00	8.47	30.33	0.32	145.37	0.742
S2	40.89	0.00	0.00	0.00	37.67	0.60	221.14	0.921
S3	40.89	0.00	0.00	10.30	28.49	0.60	273.44	0.697
S4	40.89	0.00	0.00	18.36	21.06	0.04	21.20	0.515
S5	40.89	0.00	0.00	13.37	25.91	0.03	19.04	0.634
S6	40.89	0.00	0.00	18.31	21.08	0.04	21.13	0.515
S7	40.89	0.00	0.00	4.11	34.93	0.02	7.68	0.854
S8	40.89	0.00	0.00	1.96	37.01	0.04	19.95	0.905
S9	40.89	0.00	0.00	15.33	23.98	0.04	21.82	0.586
S10	40.89	0.00	0.00	13.45	25.90	0.03	18.56	0.633
S11	40.89	0.00	0.00	0.00	38.89	0.04	19.88	0.951
S12	40.89	0.00	0.00	16.77	22.65	0.04	20.61	0.554
S13	40.89	0.00	0.00	13.56	25.76	0.03	18.09	0.630
S14	40.89	0.00	0.00	0.00	38.85	0.03	12.67	0.950

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.15	0.47	-1.00	0 01:29	0.47
J2	JUNCTION	0.15	0.49	-1.00	0 01:29	0.49
J3	JUNCTION	0.19	0.55	-1.01	0 01:29	0.55
J4	JUNCTION	0.20	0.57	-1.01	0 01:30	0.57
J5	JUNCTION	0.24	0.66	-1.01	0 01:34	0.66
J6	JUNCTION	0.21	0.63	-1.01	0 01:34	0.63
J7	JUNCTION	0.25	0.68	-1.01	0 01:34	0.68
J8	JUNCTION	0.31	0.76	-1.01	0 01:31	0.76
J9	JUNCTION	0.32	0.78	-1.01	0 01:31	0.77
J10	JUNCTION	0.32	0.79	-1.01	0 01:31	0.79
J11	JUNCTION	0.21	0.63	-1.01	0 01:32	0.63
J12	JUNCTION	0.22	0.66	-1.01	0 01:32	0.66
J13	JUNCTION	0.23	0.67	-1.01	0 01:32	0.67
J14	JUNCTION	0.25	0.70	-1.01	0 01:32	0.70
J15	JUNCTION	0.24	0.69	-1.01	0 01:34	0.69
J16	JUNCTION	0.24	0.69	-1.01	0 01:30	0.69
J17	JUNCTION	0.25	0.70	-1.01	0 01:34	0.70
J18	JUNCTION	0.16	0.54	-1.01	0 01:29	0.54
J19	JUNCTION	0.16	0.55	-1.01	0 01:33	0.55
J20	JUNCTION	0.17	0.57	-1.01	0 01:31	0.57
J21	JUNCTION	0.23	0.65	-1.01	0 01:34	0.65
J22	JUNCTION	0.22	0.64	-1.01	0 01:32	0.64
J23	JUNCTION	0.21	0.62	-1.01	0 01:32	0.62
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 01:31	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 01:31	0.17

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	145.37	145.37	0 01:12	0.315	0.315	-0.013
J2	JUNCTION	0.00	143.82	0 01:12	0	0.315	0.007
J3	JUNCTION	221.14	357.48	0 01:12	0.601	0.917	0.045
J4	JUNCTION	0.00	355.33	0 01:12	0	0.916	0.031
J5	JUNCTION	273.44	617.81	0 01:12	0.604	1.8	0.047
J6	JUNCTION	7.68	7.68	0 01:12	0.015	0.0155	-0.187
J7	JUNCTION	19.95	501.20	0 01:10	0.04	1.69	-0.060
J8	JUNCTION	0.00	473.10	0 01:07	0	1.78	0.223
J9	JUNCTION	0.00	388.60	0 01:06	0	1.89	0.164
J10	JUNCTION	0.00	290.57	0 01:11	0	1.97	0.182

J11	JUNCTION	12.67	12.67	0	01:12	0.026	0.0264	-0.236
J12	JUNCTION	0.00	11.30	0	00:52	0	0.0282	0.220
J13	JUNCTION	19.88	48.43	0	01:11	0.0408	0.0934	-1.055
J14	JUNCTION	18.09	51.87	0	01:03	0.033	0.0672	-1.159
J15	JUNCTION	20.61	50.79	0	01:06	0.0383	0.0678	-1.092
J16	JUNCTION	21.82	50.94	0	01:06	0.0408	0.0685	-1.117
J17	JUNCTION	18.56	50.49	0	01:09	0.0339	0.0678	-1.096
J18	JUNCTION	21.13	36.90	0	01:12	0.0394	0.0512	-1.384
J19	JUNCTION	19.04	34.74	0	01:10	0.035	0.046	-1.441
J20	JUNCTION	21.20	36.62	0	01:10	0.0396	0.0526	-1.039
J21	JUNCTION	0.00	123.50	0	01:11	0	0.376	0.248
J22	JUNCTION	0.00	87.84	0	01:12	0	0.227	0.337
J23	JUNCTION	0.00	48.13	0	01:12	0	0.095	0.783
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	206.86	0	01:31	0	1.89	0.007
SCARICO	OUTFALL	0.00	206.87	0	01:31	0	1.89	0.000

\*\*\*\*\*  
 Node Surcharge Summary  
 \*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
 Node Flooding Summary  
 \*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	88.66	98.92	206.87	1.894
System	88.66	98.92	206.87	1.894

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	143.82	0 01:12	0.57	0.29	0.57
C2	CONDUIT	137.63	0 01:11	0.43	0.28	0.61
C3	CONDUIT	355.33	0 01:12	0.98	0.72	0.66
C4	CONDUIT	344.24	0 01:12	1.02	0.70	0.72
C5	CONDUIT	483.41	0 01:12	0.93	0.49	0.79
C6	CONDUIT	473.10	0 01:07	0.82	0.29	0.70
C7	CONDUIT	388.60	0 01:06	0.76	0.24	0.75
C8	CONDUIT	290.57	0 01:11	0.55	0.18	0.76
C10	CONDUIT	32.06	0 01:06	0.30	0.02	0.71
C11	CONDUIT	32.50	0 01:13	0.31	0.02	0.71
C12	CONDUIT	32.65	0 01:09	0.30	0.02	0.72
C13	CONDUIT	35.89	0 01:03	0.30	0.02	0.72
C14	CONDUIT	11.30	0 00:52	0.34	0.02	0.76
C15	CONDUIT	10.56	0 00:51	0.32	0.02	0.78
C16	CONDUIT	29.53	0 01:15	0.34	0.02	0.69
C17	CONDUIT	18.99	0 01:32	0.25	0.02	0.72
C18	CONDUIT	118.89	0 01:11	0.38	0.12	0.77
C19	CONDUIT	16.10	0 01:10	0.30	0.02	0.70
C20	CONDUIT	85.05	0 01:12	0.34	0.09	0.76
C21	CONDUIT	22.34	0 01:19	0.32	0.02	0.68
C22	CONDUIT	48.13	0 01:12	0.27	0.05	0.74
C23	CONDUIT	5.48	0 00:59	0.15	0.01	0.76
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	206.87	0 01:31	1.05	0.40	0.18

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

C9	ORIFICE	206.86	0	01:31	1.00
R1	WEIR	0.00	0	00:00	0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	----- Up Dry	Down Dry	Sub Dry	Fraction of Crit	Time in Flow Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.10	0.00	0.00	0.89	0.00	0.00	0.00	0.39	0.00
C2	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.42	0.00
C3	1.00	0.10	0.00	0.00	0.89	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.16	0.00
C5	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.21	0.00
C7	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.17	0.00
C11	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.17	0.00
C12	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.15	0.00
C13	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.16	0.00
C14	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.22	0.00
C15	1.00	0.10	0.00	0.00	0.89	0.00	0.00	0.00	0.18	0.00
C16	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.20	0.00
C17	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.33	0.00
C18	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.34	0.00
C20	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.35	0.00
C22	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.19	0.00
C23	1.00	0.10	0.00	0.00	0.90	0.00	0.00	0.00	0.12	0.00
C24	1.00	0.11	0.09	0.00	0.80	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.11	0.00	0.00	0.82	0.08	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

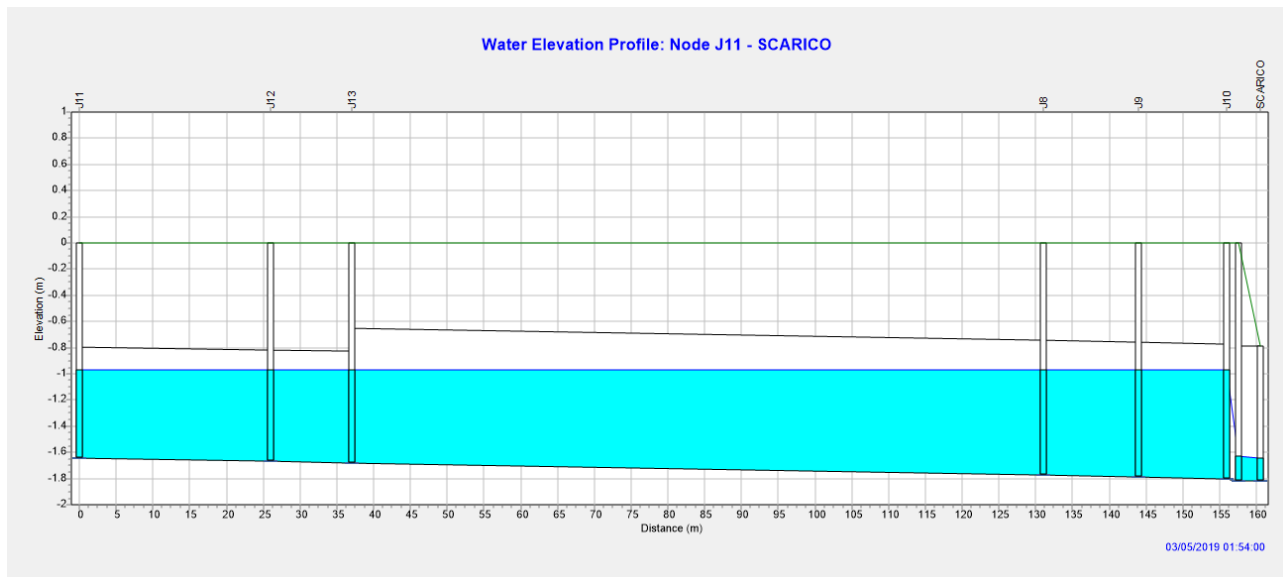
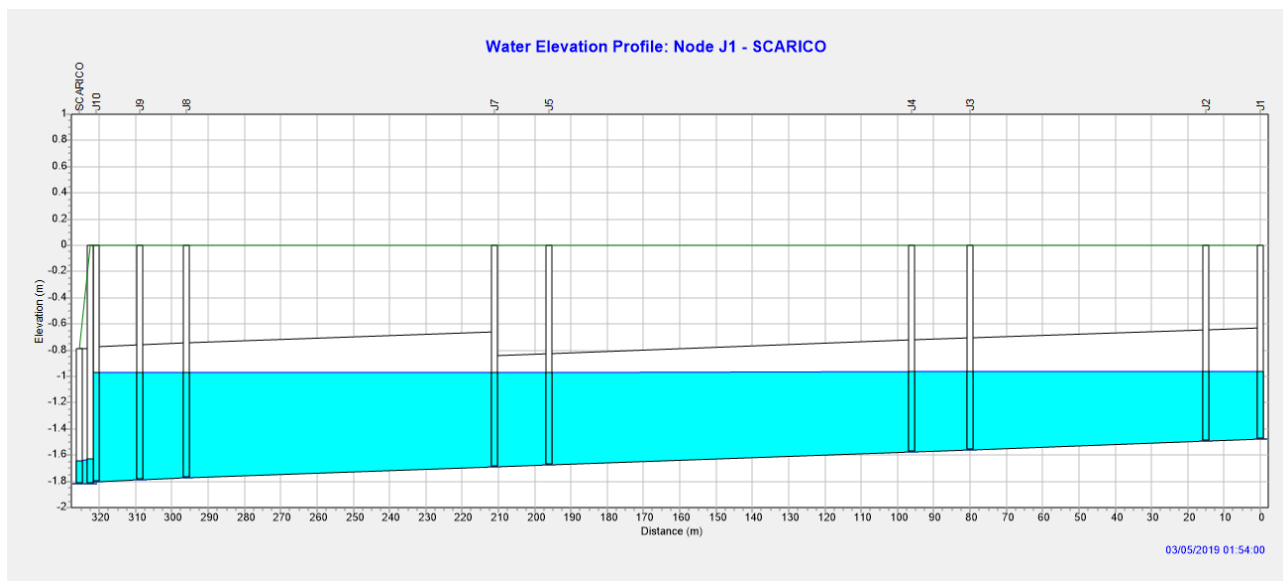
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:46:14 2019  
Analysis ended on: Thu Mar 07 18:46:15 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

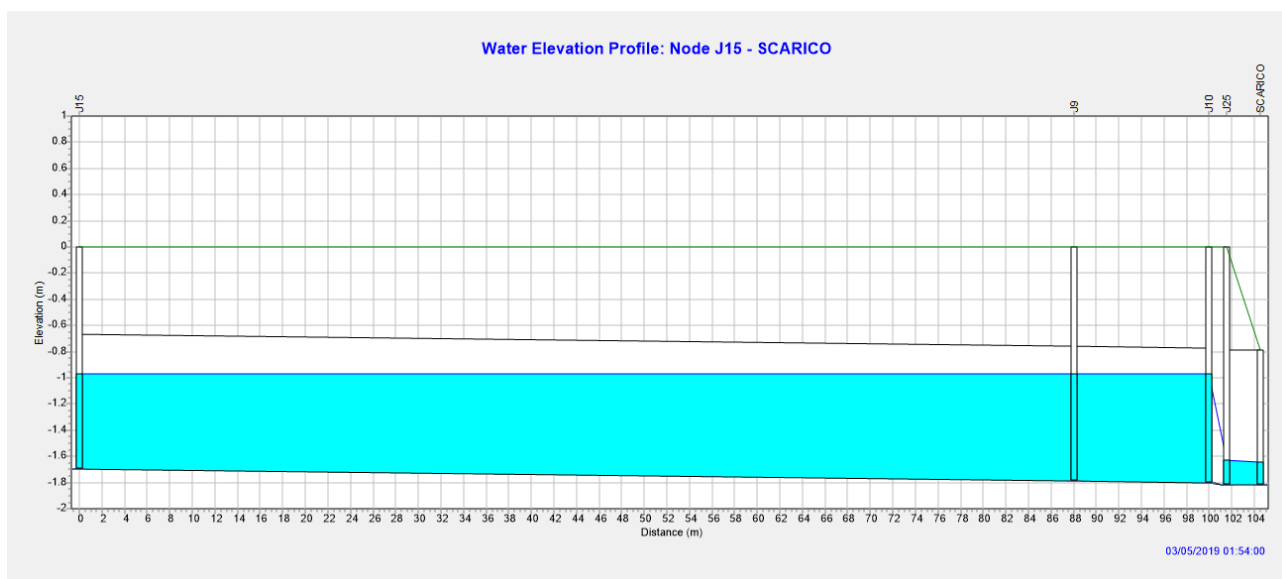
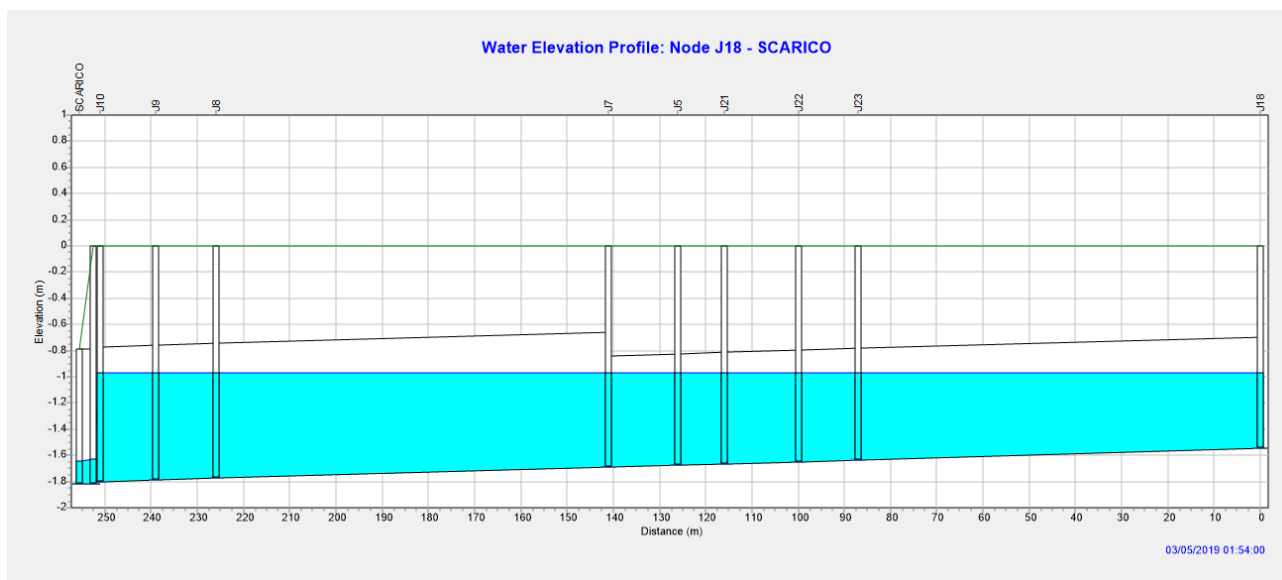
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.6. Risultati modello SWMM TR 20 anni Tp 0.8 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

**Progetto:****Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca****Elaborato:****Relazione dei calcoli idraulici fognature bianche****Data:****Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.270	43.680
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.049	7.941
Surface Runoff .....	0.207	33.405
Final Storage .....	0.014	2.343
Continuity Error (%) .....	-0.020	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.207	2.066
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.205	2.053
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.002	0.015
Continuity Error (%) .....	-0.087	

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
Subcatchment								

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

S1	43.68	0.00	0.00	8.57	32.96	0.34	124.20	0.755
S2	43.68	0.00	0.00	0.00	40.32	0.64	200.23	0.923
S3	43.68	0.00	0.00	10.57	30.99	0.66	235.31	0.709
S4	43.68	0.00	0.00	18.21	23.99	0.05	18.67	0.549
S5	43.68	0.00	0.00	13.18	28.90	0.04	16.31	0.662
S6	43.68	0.00	0.00	18.20	24.00	0.04	18.60	0.549
S7	43.68	0.00	0.00	4.12	37.68	0.02	6.21	0.863
S8	43.68	0.00	0.00	1.98	39.76	0.04	16.02	0.910
S9	43.68	0.00	0.00	15.14	26.97	0.05	18.92	0.617
S10	43.68	0.00	0.00	13.27	28.82	0.04	15.84	0.660
S11	43.68	0.00	0.00	0.00	41.67	0.04	15.93	0.954
S12	43.68	0.00	0.00	16.48	25.63	0.04	18.01	0.587
S13	43.68	0.00	0.00	13.41	28.68	0.04	15.44	0.657
S14	43.68	0.00	0.00	0.00	41.63	0.03	10.16	0.953

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.17	0.52	-0.96	0 01:52	0.52
J2	JUNCTION	0.17	0.53	-0.96	0 01:52	0.53
J3	JUNCTION	0.21	0.60	-0.96	0 01:52	0.60
J4	JUNCTION	0.22	0.61	-0.96	0 01:53	0.61
J5	JUNCTION	0.27	0.71	-0.97	0 01:55	0.71
J6	JUNCTION	0.24	0.67	-0.97	0 01:55	0.67
J7	JUNCTION	0.28	0.72	-0.97	0 01:55	0.72
J8	JUNCTION	0.33	0.81	-0.97	0 01:54	0.81
J9	JUNCTION	0.34	0.82	-0.97	0 01:54	0.82
J10	JUNCTION	0.35	0.83	-0.97	0 01:54	0.83
J11	JUNCTION	0.23	0.68	-0.97	0 01:55	0.68
J12	JUNCTION	0.25	0.70	-0.97	0 01:55	0.70
J13	JUNCTION	0.26	0.71	-0.97	0 01:55	0.71
J14	JUNCTION	0.28	0.74	-0.97	0 01:53	0.74
J15	JUNCTION	0.27	0.73	-0.97	0 01:55	0.73
J16	JUNCTION	0.27	0.73	-0.97	0 01:55	0.73
J17	JUNCTION	0.28	0.74	-0.97	0 01:57	0.74
J18	JUNCTION	0.18	0.58	-0.97	0 01:54	0.58
J19	JUNCTION	0.19	0.60	-0.96	0 01:54	0.60
J20	JUNCTION	0.19	0.61	-0.96	0 01:53	0.61
J21	JUNCTION	0.26	0.70	-0.97	0 01:55	0.70
J22	JUNCTION	0.24	0.68	-0.97	0 01:53	0.68
J23	JUNCTION	0.23	0.67	-0.97	0 01:53	0.67
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 01:54	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 01:54	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	124.20	124.20	0 01:36	0.343	0.343	-0.010
J2	JUNCTION	0.00	122.59	0 01:36	0	0.343	0.012
J3	JUNCTION	200.23	315.18	0 01:36	0.643	0.986	0.046
J4	JUNCTION	0.00	308.32	0 01:36	0	0.986	0.036
J5	JUNCTION	235.31	534.31	0 01:36	0.657	1.95	0.049
J6	JUNCTION	6.21	6.21	0 01:36	0.0162	0.0165	-0.160
J7	JUNCTION	16.02	445.03	0 01:35	0.0429	1.83	-0.043
J8	JUNCTION	0.00	417.11	0 01:35	0	1.93	0.255
J9	JUNCTION	0.00	354.99	0 01:36	0	2.04	0.229
J10	JUNCTION	0.00	281.49	0 01:36	0	2.12	0.269
J11	JUNCTION	10.16	10.16	0 01:36	0.0279	0.0279	-0.204
J12	JUNCTION	0.00	9.14	0 01:06	0	0.0287	0.200
J13	JUNCTION	15.93	37.36	0 01:34	0.0438	0.0956	-0.910
J14	JUNCTION	15.44	39.87	0 01:18	0.0367	0.0687	-0.941
J15	JUNCTION	18.01	39.23	0 01:31	0.0433	0.0687	-0.919
J16	JUNCTION	18.92	40.19	0 01:31	0.0458	0.0694	-0.943

J17	JUNCTION	15.84	40.52	0	01:36	0.0378	0.0682	-0.900
J18	JUNCTION	18.60	35.35	0	01:35	0.0449	0.0544	-1.181
J19	JUNCTION	16.31	28.65	0	01:33	0.039	0.0501	-1.206
J20	JUNCTION	18.67	28.25	0	01:37	0.0451	0.0555	-0.910
J21	JUNCTION	0.00	98.26	0	01:36	0	0.403	0.241
J22	JUNCTION	0.00	68.03	0	01:36	0	0.244	0.302
J23	JUNCTION	0.00	38.54	0	01:31	0	0.0996	0.675
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	214.23	0	01:54	0	2.05	0.013
SCARICO	OUTFALL	0.00	214.23	0	01:54	0	2.05	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	85.14	111.61	214.23	2.053
System	85.14	111.61	214.23	2.053

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	122.59	0 01:36	0.53	0.25	0.62
C2	CONDUIT	115.65	0 01:36	0.40	0.23	0.66
C3	CONDUIT	308.32	0 01:36	0.92	0.62	0.71
C4	CONDUIT	298.35	0 01:36	0.95	0.60	0.77
C5	CONDUIT	429.01	0 01:35	0.86	0.43	0.84
C6	CONDUIT	417.11	0 01:35	0.76	0.25	0.74
C7	CONDUIT	354.99	0 01:36	0.71	0.22	0.79
C8	CONDUIT	281.49	0 01:36	0.52	0.17	0.80
C10	CONDUIT	24.06	0 01:21	0.28	0.01	0.75
C11	CONDUIT	23.64	0 01:18	0.29	0.01	0.75
C12	CONDUIT	25.63	0 01:36	0.28	0.02	0.76
C13	CONDUIT	27.45	0 01:18	0.28	0.02	0.76
C14	CONDUIT	9.14	0 01:06	0.32	0.02	0.81
C15	CONDUIT	8.57	0 01:05	0.30	0.02	0.83
C16	CONDUIT	26.79	0 01:38	0.32	0.02	0.74
C17	CONDUIT	16.69	0 01:56	0.23	0.02	0.77
C18	CONDUIT	94.00	0 01:36	0.34	0.10	0.83
C19	CONDUIT	14.89	0 02:06	0.28	0.02	0.75
C20	CONDUIT	68.03	0 01:36	0.30	0.07	0.81
C21	CONDUIT	17.53	0 02:13	0.30	0.02	0.73
C22	CONDUIT	38.54	0 01:31	0.23	0.04	0.79
C23	CONDUIT	4.31	0 01:14	0.14	0.01	0.81
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	214.23	0 01:54	1.07	0.41	0.18
C9	ORIFICE	214.23	0 01:54			1.00
R1	WEIR	0.00	0 00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

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Conduit	Adjusted /Actual Length	-----		Fraction of Time in Flow Class		-----		Norm Ltd	Inlet Ctrl	
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit			Down Crit
C1	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.31	0.00
C2	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.34	0.00
C3	1.00	0.14	0.00	0.00	0.85	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.16	0.00
C5	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.13	0.00
C7	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.09	0.00
C11	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.09	0.00
C12	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.08	0.00
C13	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.08	0.00
C14	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.15	0.00
C15	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.10	0.00
C16	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.13	0.00
C17	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.25	0.00
C18	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.26	0.00
C20	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.28	0.00
C22	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.12	0.00
C23	1.00	0.14	0.00	0.00	0.86	0.00	0.00	0.00	0.06	0.00
C24	1.00	0.14	0.03	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.14	0.00	0.00	0.84	0.01	0.00	0.00	0.00	0.00

\*\*\*\*\*

Conduit Surcharge Summary

\*\*\*\*\*

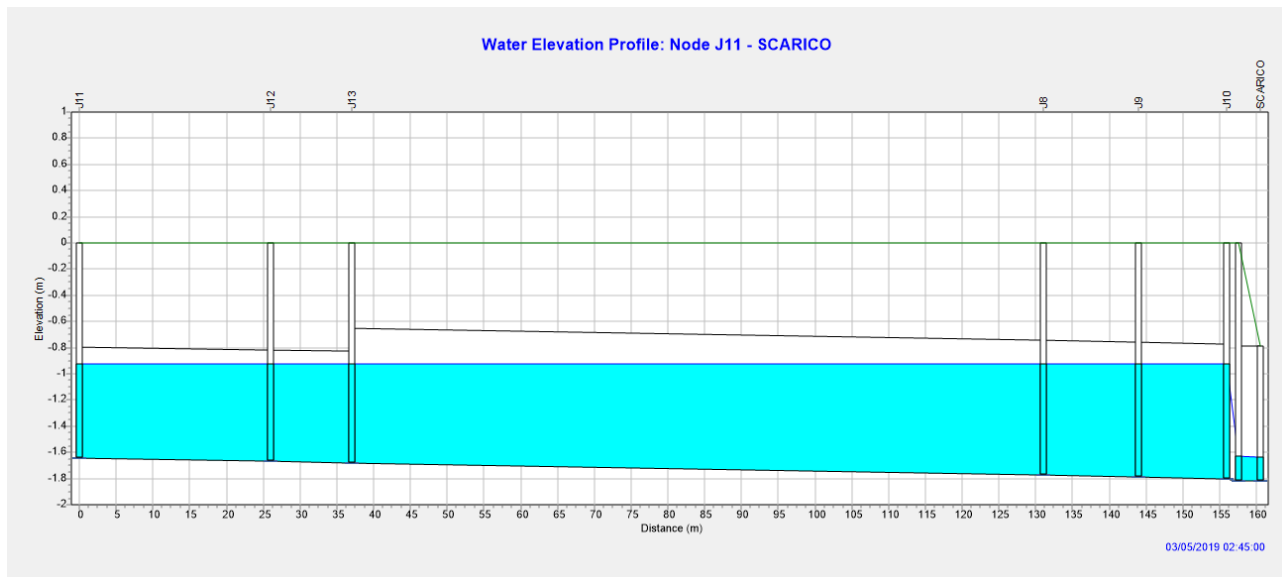
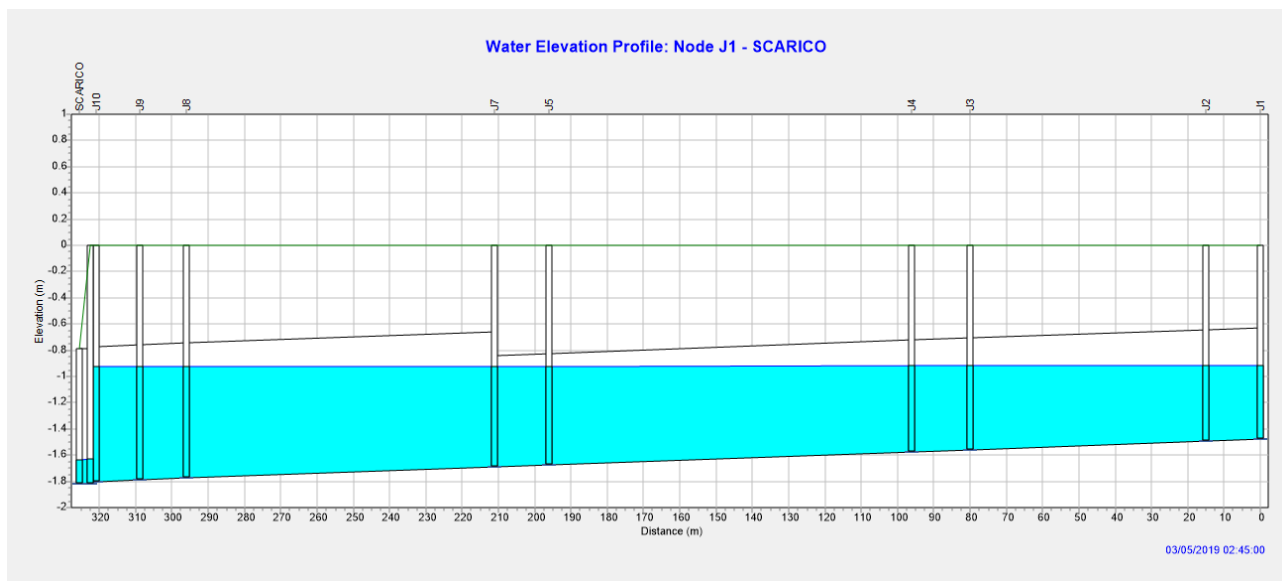
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:48:31 2019  
Analysis ended on: Thu Mar 07 18:48:32 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

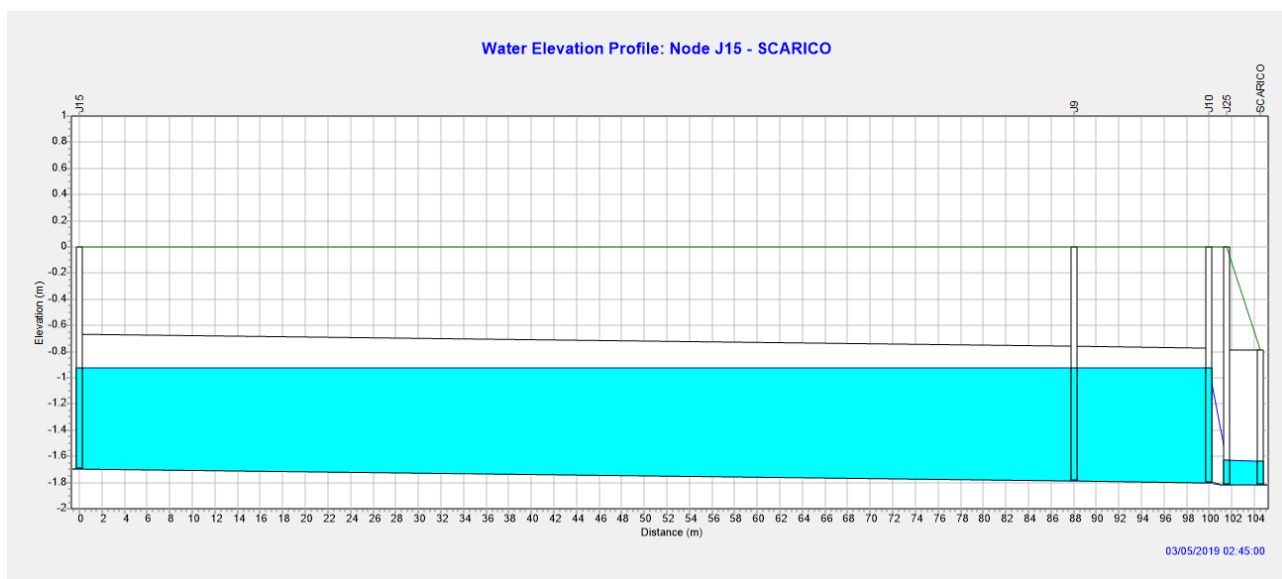
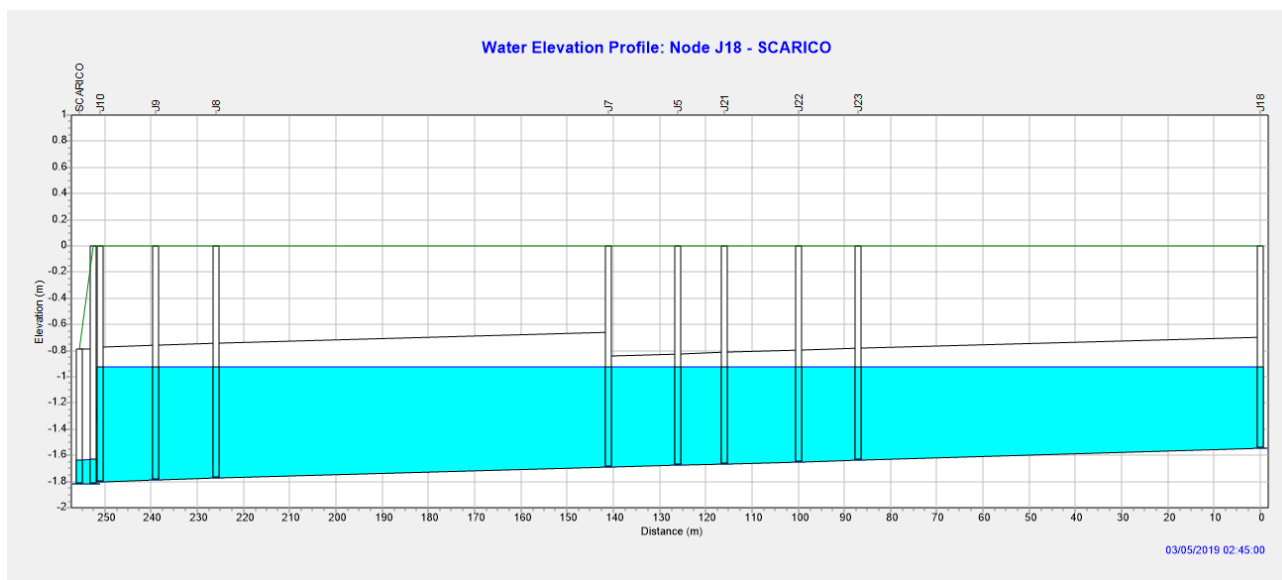
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.7. Risultati modello SWMM TR 20 anni Tp 1.2 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Progetto:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca

Elaborato:

Relazione dei calcoli idraulici fognature bianche

Data:

Marzo 2019

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.297	47.940
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.049	7.920
Surface Runoff .....	0.232	37.525
Final Storage .....	0.015	2.502
Continuity Error (%) .....	-0.014	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.232	2.321
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.226	2.260
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.006	0.063
Continuity Error (%) .....	-0.060	

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
Subcatchment								

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

S1	47.94	0.00	0.00	8.58	37.11	0.39	96.83	0.774
S2	47.94	0.00	0.00	0.00	44.23	0.71	163.75	0.923
S3	47.94	0.00	0.00	10.70	34.99	0.74	184.95	0.730
S4	47.94	0.00	0.00	17.75	28.64	0.05	15.52	0.597
S5	47.94	0.00	0.00	12.82	33.49	0.05	12.89	0.698
S6	47.94	0.00	0.00	17.78	28.64	0.05	15.45	0.597
S7	47.94	0.00	0.00	4.16	41.87	0.02	4.58	0.873
S8	47.94	0.00	0.00	2.01	43.96	0.05	11.75	0.917
S9	47.94	0.00	0.00	14.75	31.61	0.05	15.30	0.659
S10	47.94	0.00	0.00	12.96	33.32	0.04	12.46	0.695
S11	47.94	0.00	0.00	0.00	45.92	0.05	11.65	0.958
S12	47.94	0.00	0.00	16.09	30.27	0.05	14.74	0.631
S13	47.94	0.00	0.00	13.12	33.18	0.04	12.16	0.692
S14	47.94	0.00	0.00	0.00	45.86	0.03	7.44	0.957

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.19	0.57	-0.91	0 02:38	0.57
J2	JUNCTION	0.20	0.58	-0.91	0 02:38	0.58
J3	JUNCTION	0.24	0.65	-0.91	0 02:38	0.65
J4	JUNCTION	0.25	0.66	-0.91	0 02:38	0.66
J5	JUNCTION	0.30	0.76	-0.92	0 02:40	0.76
J6	JUNCTION	0.27	0.72	-0.92	0 02:40	0.72
J7	JUNCTION	0.31	0.77	-0.92	0 02:39	0.77
J8	JUNCTION	0.37	0.86	-0.92	0 02:39	0.86
J9	JUNCTION	0.37	0.87	-0.92	0 02:40	0.87
J10	JUNCTION	0.38	0.88	-0.92	0 02:40	0.88
J11	JUNCTION	0.27	0.73	-0.92	0 02:40	0.73
J12	JUNCTION	0.29	0.75	-0.92	0 02:40	0.75
J13	JUNCTION	0.30	0.76	-0.92	0 02:40	0.76
J14	JUNCTION	0.31	0.79	-0.92	0 02:40	0.79
J15	JUNCTION	0.31	0.78	-0.92	0 02:40	0.78
J16	JUNCTION	0.31	0.78	-0.92	0 02:40	0.78
J17	JUNCTION	0.32	0.79	-0.92	0 02:38	0.79
J18	JUNCTION	0.21	0.63	-0.91	0 02:39	0.63
J19	JUNCTION	0.22	0.65	-0.91	0 02:38	0.65
J20	JUNCTION	0.23	0.66	-0.92	0 02:37	0.66
J21	JUNCTION	0.29	0.75	-0.92	0 02:40	0.75
J22	JUNCTION	0.28	0.73	-0.92	0 02:38	0.73
J23	JUNCTION	0.27	0.72	-0.92	0 02:38	0.72
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 02:40	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 02:41	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	96.83	96.83	0 02:24	0.386	0.386	-0.005
J2	JUNCTION	0.00	95.31	0 02:24	0	0.386	0.022
J3	JUNCTION	163.75	252.10	0 02:23	0.706	1.09	0.052
J4	JUNCTION	0.00	245.64	0 02:24	0	1.09	0.039
J5	JUNCTION	184.95	423.33	0 02:24	0.741	2.16	0.077
J6	JUNCTION	4.58	4.58	0 02:24	0.018	0.018	0.369
J7	JUNCTION	11.75	368.18	0 02:23	0.0475	2.05	0.029
J8	JUNCTION	0.00	350.14	0 02:24	0	2.14	0.652
J9	JUNCTION	0.00	305.68	0 02:23	0	2.25	0.667
J10	JUNCTION	0.00	263.49	0 02:25	0	2.33	0.736
J11	JUNCTION	7.44	7.44	0 02:24	0.0307	0.0307	-0.087
J12	JUNCTION	0.00	6.81	0 01:34	0	0.0308	0.681
J13	JUNCTION	11.65	25.73	0 02:23	0.0482	0.0982	0.888
J14	JUNCTION	12.16	27.67	0 02:19	0.0425	0.0715	3.255
J15	JUNCTION	14.74	24.86	0 02:23	0.0512	0.0717	2.544
J16	JUNCTION	15.30	25.11	0 01:49	0.0537	0.0723	2.493

J17	JUNCTION	12.46	26.88	0	02:23	0.0437	0.0701	3.471
J18	JUNCTION	15.45	21.89	0	02:16	0.0536	0.0599	-0.921
J19	JUNCTION	12.89	24.45	0	02:21	0.0452	0.0557	-0.915
J20	JUNCTION	15.52	23.47	0	02:19	0.0538	0.0607	-0.683
J21	JUNCTION	0.00	66.56	0	02:23	0	0.426	0.382
J22	JUNCTION	0.00	48.05	0	02:23	0	0.26	0.464
J23	JUNCTION	0.00	24.01	0	02:06	0	0.106	0.776
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	222.03	0	02:40	0	2.26	0.031
SCARICO	OUTFALL	0.00	222.04	0	02:41	0	2.26	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	78.15	133.87	222.04	2.260
System	78.15	133.87	222.04	2.260

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	95.31	0 02:24	0.49	0.19	0.67
C2	CONDUIT	89.06	0 02:22	0.37	0.18	0.72
C3	CONDUIT	245.64	0 02:24	0.84	0.50	0.77
C4	CONDUIT	237.10	0 02:24	0.86	0.48	0.83
C5	CONDUIT	356.69	0 02:24	0.79	0.36	0.90
C6	CONDUIT	350.14	0 02:24	0.69	0.21	0.79
C7	CONDUIT	305.68	0 02:23	0.65	0.19	0.84
C8	CONDUIT	263.49	0 02:25	0.48	0.16	0.85
C10	CONDUIT	14.90	0 01:46	0.25	0.01	0.80
C11	CONDUIT	14.62	0 01:46	0.26	0.01	0.80
C12	CONDUIT	16.94	0 01:42	0.26	0.01	0.81
C13	CONDUIT	16.74	0 01:46	0.25	0.01	0.81
C14	CONDUIT	6.81	0 01:34	0.30	0.01	0.87
C15	CONDUIT	6.40	0 01:32	0.27	0.01	0.89
C16	CONDUIT	16.59	0 01:31	0.29	0.01	0.79
C17	CONDUIT	13.14	0 03:10	0.21	0.01	0.83
C18	CONDUIT	60.22	0 02:11	0.29	0.06	0.88
C19	CONDUIT	14.10	0 02:51	0.25	0.01	0.81
C20	CONDUIT	48.05	0 02:23	0.25	0.05	0.87
C21	CONDUIT	15.59	0 02:53	0.27	0.02	0.79
C22	CONDUIT	24.01	0 02:06	0.19	0.02	0.85
C23	CONDUIT	3.08	0 01:42	0.13	0.01	0.87
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	222.04	0 02:41	1.08	0.42	0.18
C9	ORIFICE	222.03	0 02:40			1.00
R1	WEIR	0.00	0 00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

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Conduit	Adjusted /Actual Length	-----		Fraction of		Time in Flow Class		-----		Inlet Ctrl
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	
C1	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.17	0.00
C2	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.20	0.00
C3	1.00	0.21	0.00	0.00	0.78	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.15	0.00
C5	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C11	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C12	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C13	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C14	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C15	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C16	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.02	0.00
C17	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.12	0.00
C18	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.13	0.00
C20	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.14	0.00
C22	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.01	0.00
C23	1.00	0.21	0.00	0.00	0.79	0.00	0.00	0.00	0.02	0.00
C24	1.00	0.21	0.03	0.00	0.76	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.21	0.00	0.00	0.77	0.02	0.00	0.00	0.00	0.00

\*\*\*\*\*

Conduit Surcharge Summary

\*\*\*\*\*

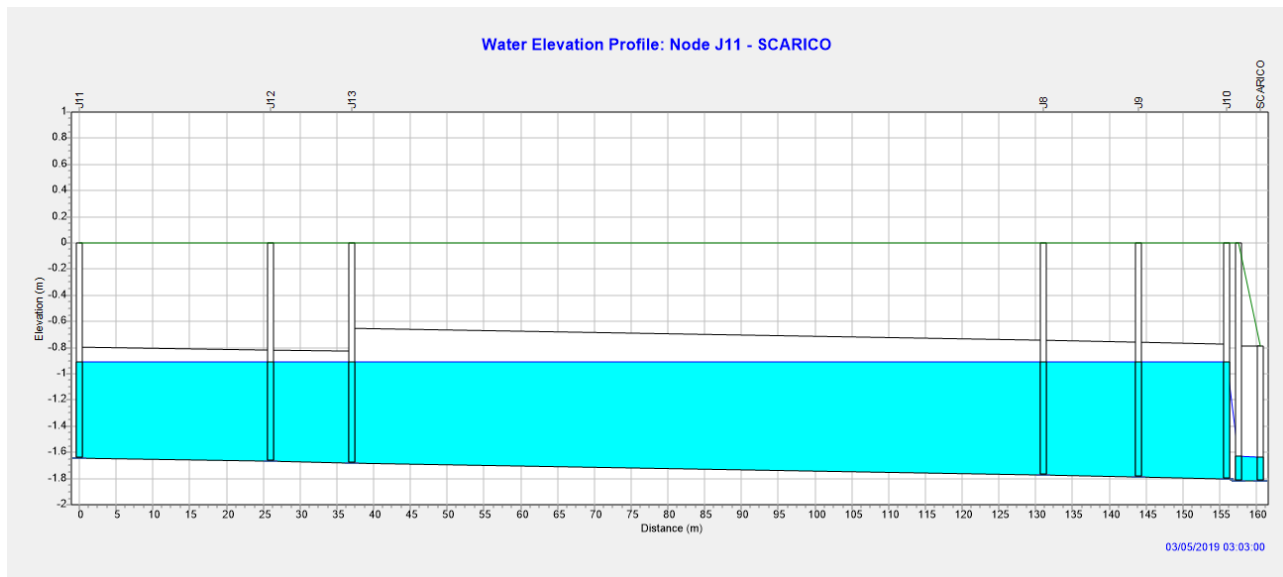
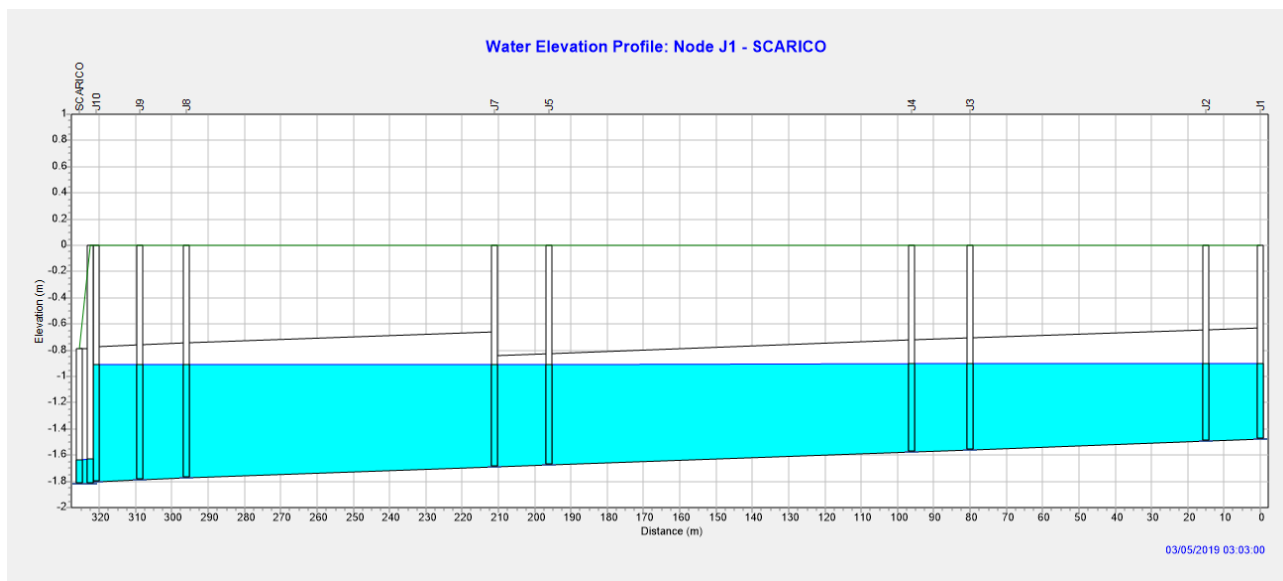
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:54:52 2019  
Analysis ended on: Thu Mar 07 18:54:53 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

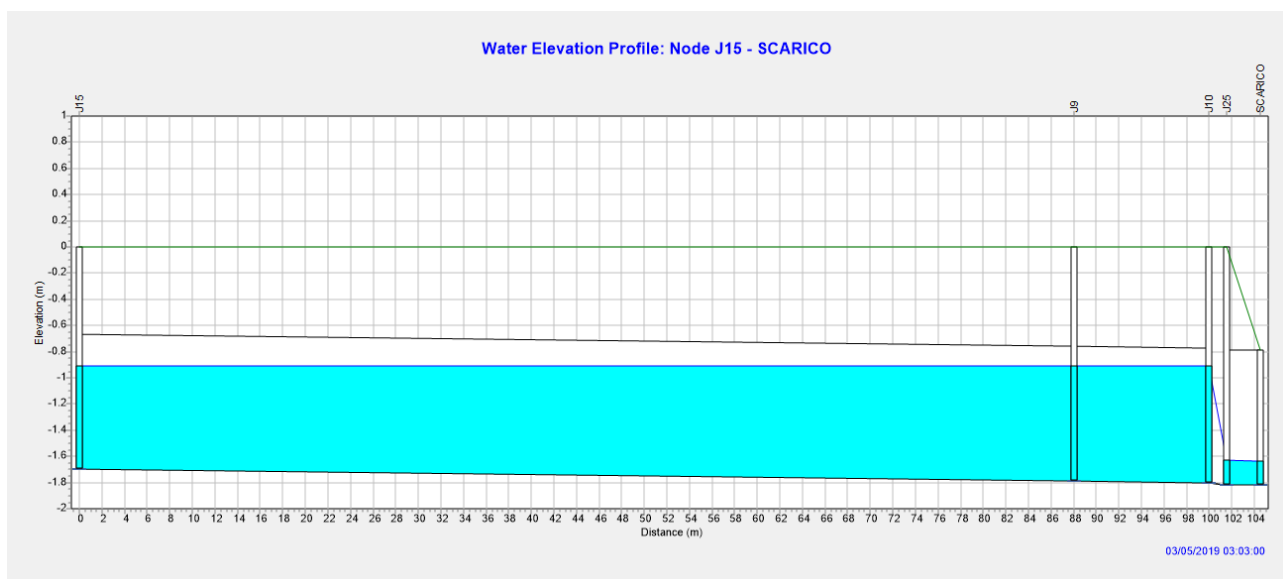
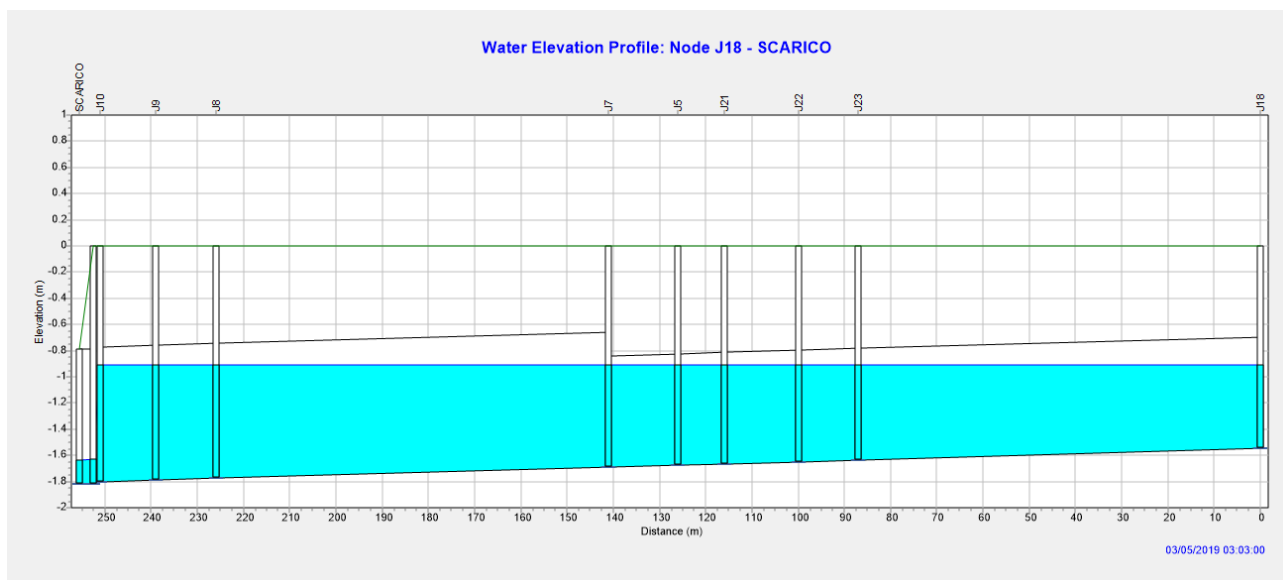
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.8. Risultati modello SWMM TR 20 anni Tp 1.4 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*

Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Snowmelt ..... NO  
Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume hectare-m	Depth mm
*****		
Runoff Quantity Continuity		
*****		
Total Precipitation .....	0.307	49.670
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.049	7.889
Surface Runoff .....	0.242	39.187
Final Storage .....	0.016	2.600
Continuity Error (%) .....	-0.013	

	Volume hectare-m	Volume 10^6 ltr
*****		
Flow Routing Continuity		
*****		
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.242	2.424
Groundwater Inflow .....	0.000	0.000
RDI Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.231	2.310
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.011	0.114
Continuity Error (%) .....	-0.035	

\*\*\*\*\*  
Highest Continuity Errors  
\*\*\*\*\*  
Node J13 (4.15%)  
Node J12 (2.16%)  
Node J23 (1.99%)  
Node J22 (1.16%)  
Node J10 (1.07%)

\*\*\*\*\*  
Time-Step Critical Elements  
\*\*\*\*\*  
None

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
All links are stable.

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	49.67	0.00	0.00	8.54	38.80	0.40	87.69	0.781
S2	49.67	0.00	0.00	0.00	45.72	0.73	149.27	0.921
S3	49.67	0.00	0.00	10.70	36.65	0.78	167.99	0.738
S4	49.67	0.00	0.00	17.60	30.55	0.06	14.38	0.615
S5	49.67	0.00	0.00	12.72	35.33	0.05	11.70	0.711
S6	49.67	0.00	0.00	17.58	30.54	0.06	14.31	0.615
S7	49.67	0.00	0.00	4.18	43.57	0.02	4.07	0.877
S8	49.67	0.00	0.00	2.04	45.66	0.05	10.45	0.919
S9	49.67	0.00	0.00	14.56	33.49	0.06	14.02	0.674
S10	49.67	0.00	0.00	12.90	35.15	0.05	11.30	0.708
S11	49.67	0.00	0.00	0.00	47.64	0.05	10.35	0.959
S12	49.67	0.00	0.00	15.93	32.16	0.05	13.56	0.648
S13	49.67	0.00	0.00	13.02	35.00	0.04	11.03	0.705
S14	49.67	0.00	0.00	0.00	47.57	0.03	6.60	0.958

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.20	0.58	-0.90	0 03:01	0.58
J2	JUNCTION	0.21	0.59	-0.90	0 03:01	0.59
J3	JUNCTION	0.25	0.66	-0.90	0 03:02	0.66
J4	JUNCTION	0.26	0.67	-0.90	0 03:02	0.67
J5	JUNCTION	0.31	0.77	-0.91	0 03:01	0.77
J6	JUNCTION	0.29	0.73	-0.91	0 03:01	0.73
J7	JUNCTION	0.32	0.78	-0.91	0 03:01	0.78
J8	JUNCTION	0.37	0.87	-0.91	0 03:02	0.87
J9	JUNCTION	0.38	0.88	-0.91	0 03:02	0.88
J10	JUNCTION	0.39	0.89	-0.91	0 03:02	0.89
J11	JUNCTION	0.28	0.74	-0.91	0 03:03	0.74
J12	JUNCTION	0.30	0.76	-0.91	0 03:03	0.76
J13	JUNCTION	0.31	0.77	-0.91	0 03:03	0.77
J14	JUNCTION	0.32	0.80	-0.91	0 03:03	0.80
J15	JUNCTION	0.32	0.79	-0.91	0 03:03	0.79
J16	JUNCTION	0.32	0.79	-0.91	0 03:03	0.79
J17	JUNCTION	0.33	0.81	-0.91	0 03:01	0.81
J18	JUNCTION	0.22	0.65	-0.90	0 03:01	0.65
J19	JUNCTION	0.23	0.66	-0.90	0 03:02	0.66
J20	JUNCTION	0.24	0.67	-0.91	0 03:02	0.67
J21	JUNCTION	0.30	0.76	-0.91	0 03:01	0.76
J22	JUNCTION	0.29	0.74	-0.91	0 03:01	0.74
J23	JUNCTION	0.28	0.73	-0.91	0 03:01	0.73
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 03:02	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 03:02	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	87.69	87.69	0 02:48	0.404	0.404	-0.002
J2	JUNCTION	0.00	86.49	0 02:48	0	0.404	0.029
J3	JUNCTION	149.27	230.16	0 02:48	0.73	1.13	0.058
J4	JUNCTION	0.00	224.42	0 02:48	0	1.13	0.049
J5	JUNCTION	167.99	385.97	0 02:48	0.776	2.24	0.161

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J6	JUNCTION	4.07	4.07	0	02:48	0.0187	0.0187	2.264
J7	JUNCTION	10.45	343.43	0	02:48	0.0493	2.13	0.179
J8	JUNCTION	0.00	328.37	0	02:48	0	2.22	0.966
J9	JUNCTION	0.00	291.39	0	02:49	0	2.31	1.001
J10	JUNCTION	0.00	257.05	0	02:49	0	2.39	1.079
J11	JUNCTION	6.60	6.60	0	02:48	0.0319	0.0319	0.879
J12	JUNCTION	0.00	6.08	0	01:48	0	0.0316	2.204
J13	JUNCTION	10.35	20.31	0	02:43	0.05	0.098	4.327
J14	JUNCTION	11.03	22.11	0	02:00	0.0448	0.072	8.462
J15	JUNCTION	13.56	20.89	0	02:00	0.0544	0.0726	7.209
J16	JUNCTION	14.02	21.27	0	02:00	0.0569	0.0732	7.124
J17	JUNCTION	11.30	22.14	0	02:47	0.046	0.0704	8.658
J18	JUNCTION	14.31	18.40	0	02:25	0.0571	0.0622	-0.725
J19	JUNCTION	11.70	21.51	0	02:46	0.0477	0.0577	-0.655
J20	JUNCTION	14.38	21.32	0	02:44	0.0574	0.0628	-0.356
J21	JUNCTION	0.00	54.69	0	02:33	0	0.425	0.880
J22	JUNCTION	0.00	38.87	0	02:40	0	0.26	1.174
J23	JUNCTION	0.00	20.11	0	02:21	0	0.107	2.028
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	223.61	0	03:02	0	2.31	0.042
SCARICO	OUTFALL	0.00	223.61	0	03:02	0	2.31	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	74.70	143.20	223.61	2.310
System	74.70	143.20	223.61	2.310

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	86.49	0 02:48	0.48	0.17	0.69
C2	CONDUIT	81.01	0 02:48	0.36	0.16	0.73
C3	CONDUIT	224.42	0 02:48	0.82	0.45	0.78
C4	CONDUIT	216.70	0 02:47	0.83	0.44	0.85
C5	CONDUIT	333.48	0 02:48	0.76	0.34	0.91
C6	CONDUIT	328.37	0 02:48	0.66	0.20	0.80
C7	CONDUIT	291.39	0 02:49	0.63	0.18	0.85
C8	CONDUIT	257.05	0 02:49	0.47	0.16	0.86
C10	CONDUIT	12.52	0 02:00	0.24	0.01	0.81
C11	CONDUIT	12.23	0 02:00	0.25	0.01	0.81
C12	CONDUIT	14.60	0 01:56	0.25	0.01	0.82
C13	CONDUIT	14.53	0 02:00	0.25	0.01	0.82
C14	CONDUIT	6.08	0 01:48	0.29	0.01	0.88
C15	CONDUIT	5.73	0 01:46	0.27	0.01	0.90
C16	CONDUIT	14.87	0 01:45	0.28	0.01	0.80
C17	CONDUIT	13.22	0 03:25	0.20	0.01	0.84
C18	CONDUIT	49.49	0 02:26	0.27	0.05	0.90
C19	CONDUIT	13.53	0 03:27	0.24	0.01	0.82
C20	CONDUIT	38.87	0 02:40	0.23	0.04	0.88

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C21	CONDUIT	15.10	0	03:09	0.26	0.02	0.81
C22	CONDUIT	20.11	0	02:21	0.17	0.02	0.86
C23	CONDUIT	2.79	0	02:05	0.13	0.01	0.88
C24	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
C25	CONDUIT	223.61	0	03:02	1.08	0.43	0.18
C9	ORIFICE	223.61	0	03:02			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Up		Down		Sub		Sup		Time in Flow Class		Inlet Ctrl
		Dry	Dry	Dry	Crit	Crit	Crit	Up	Down	Norm	Ltd	
C1	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.10	0.00	
C2	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.14	0.00	
C3	1.00	0.24	0.00	0.00	0.75	0.01	0.00	0.00	0.00	0.00	0.00	
C4	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.09	0.00	
C5	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	
C6	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	
C7	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C8	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	
C10	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.02	0.00	
C11	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.02	0.00	
C12	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C13	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C14	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C15	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C16	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.02	0.00	
C17	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.05	0.00	
C18	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	
C19	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.06	0.00	
C20	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.01	0.00	
C21	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.07	0.00	
C22	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.02	0.00	
C23	1.00	0.24	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.02	0.00	
C24	1.00	0.24	0.03	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	
C25	1.00	0.24	0.00	0.00	0.74	0.02	0.00	0.00	0.00	0.00	0.00	

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

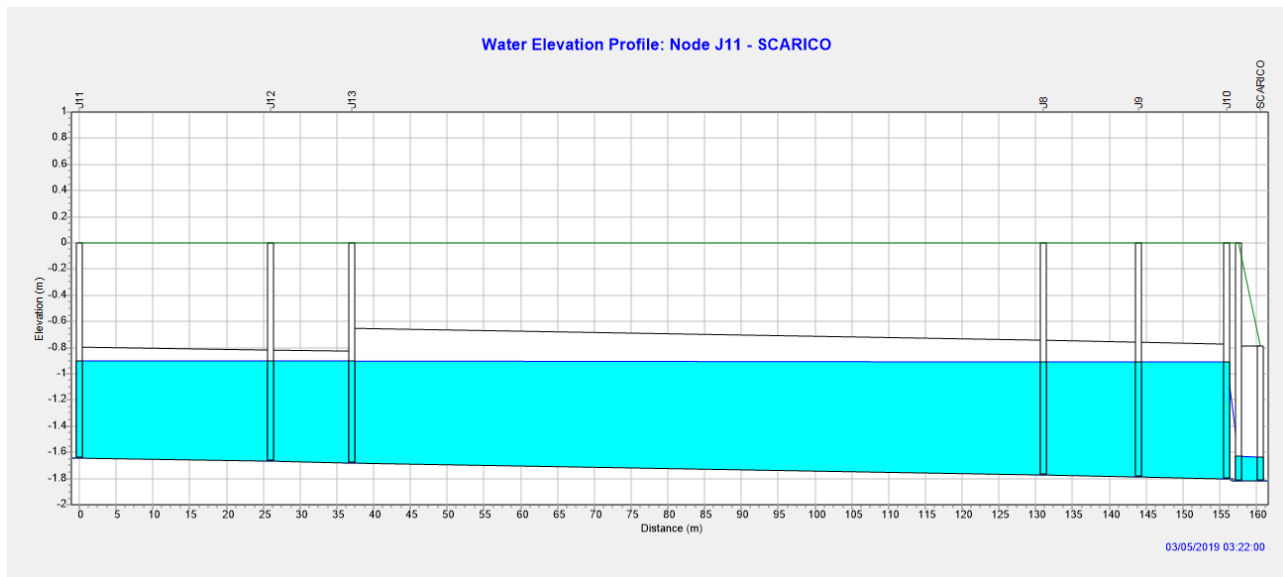
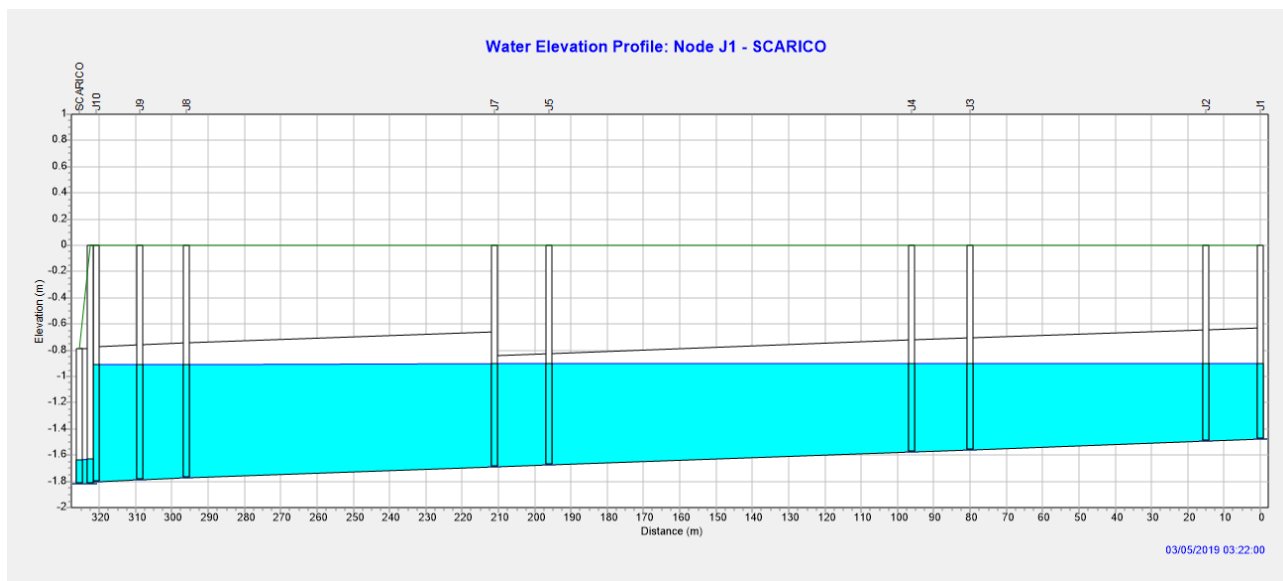
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:57:54 2019  
Analysis ended on: Thu Mar 07 18:57:55 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

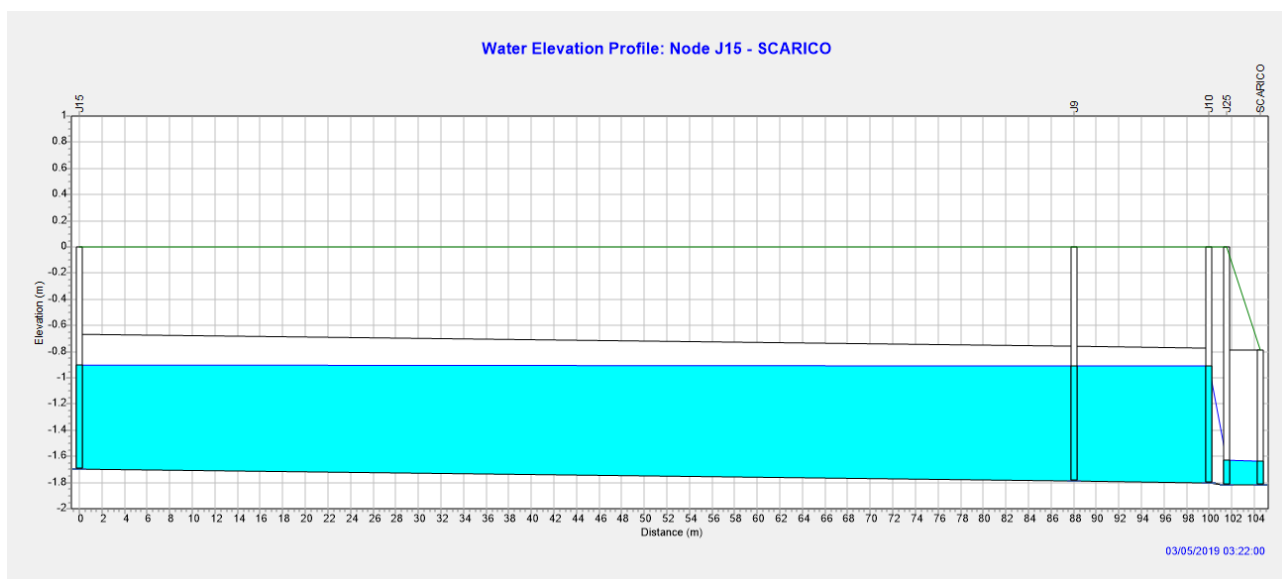
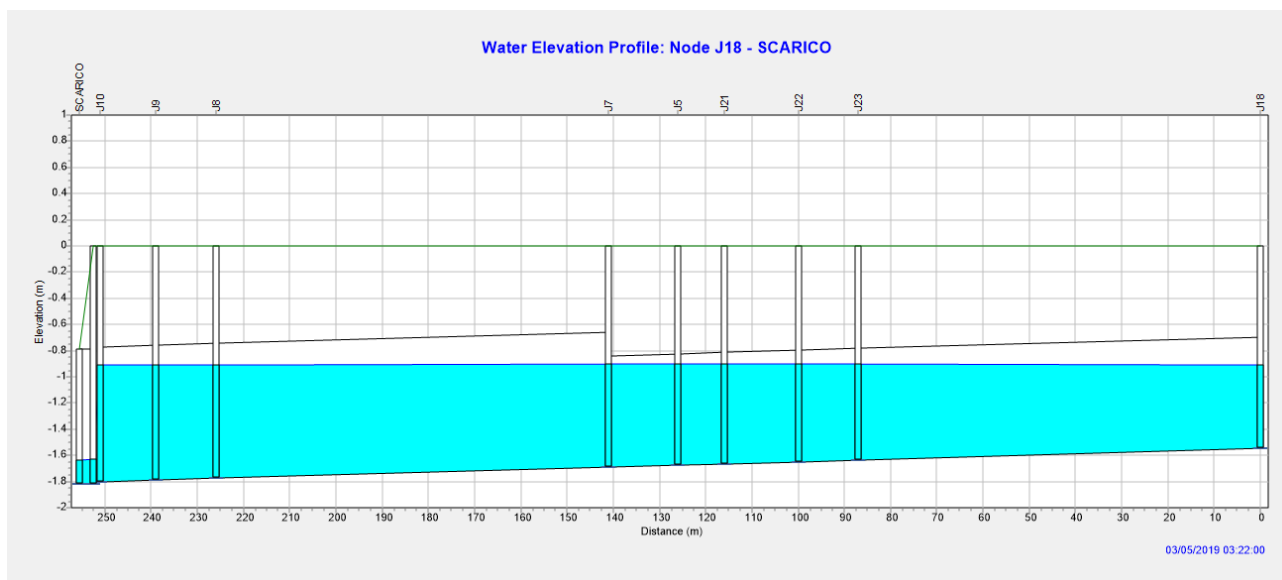
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.9. Risultati modello SWMM TR 20 anni Tp 1.6 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*

Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO  
  Snowmelt ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.317	51.210
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.049	7.840
Surface Runoff .....	0.251	40.639
Final Storage .....	0.017	2.738
Continuity Error (%) .....	-0.013	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.251	2.514
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.232	2.322
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.019	0.192
Continuity Error (%) .....	-0.001	

Highest Continuity Errors

Node J13 (8.92%)  
Node J23 (4.73%)  
Node J12 (4.41%)  
Node J22 (2.62%)  
Node J21 (1.84%)

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	51.21	0.00	0.00	8.50	40.30	0.42	80.36	0.787
S2	51.21	0.00	0.00	0.00	46.96	0.75	136.94	0.917
S3	51.21	0.00	0.00	10.65	38.11	0.81	154.36	0.744
S4	51.21	0.00	0.00	17.40	32.24	0.06	13.41	0.630
S5	51.21	0.00	0.00	12.59	36.97	0.05	10.73	0.722
S6	51.21	0.00	0.00	17.44	32.23	0.06	13.34	0.629
S7	51.21	0.00	0.00	4.22	45.08	0.02	3.68	0.880
S8	51.21	0.00	0.00	2.06	47.18	0.05	9.43	0.921
S9	51.21	0.00	0.00	14.42	35.16	0.06	12.95	0.687
S10	51.21	0.00	0.00	12.79	36.76	0.05	10.35	0.718
S11	51.21	0.00	0.00	0.00	49.17	0.05	9.34	0.960
S12	51.21	0.00	0.00	15.78	33.84	0.06	12.57	0.661
S13	51.21	0.00	0.00	12.96	36.61	0.05	10.10	0.715
S14	51.21	0.00	0.00	0.00	49.09	0.03	5.96	0.959

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.21	0.58	-0.90	0 03:25	0.58
J2	JUNCTION	0.22	0.60	-0.90	0 03:25	0.60
J3	JUNCTION	0.26	0.66	-0.90	0 03:25	0.66
J4	JUNCTION	0.27	0.68	-0.90	0 03:25	0.68
J5	JUNCTION	0.32	0.77	-0.90	0 03:25	0.77
J6	JUNCTION	0.29	0.74	-0.90	0 03:25	0.74
J7	JUNCTION	0.33	0.79	-0.90	0 03:25	0.79
J8	JUNCTION	0.37	0.87	-0.90	0 03:24	0.87
J9	JUNCTION	0.38	0.88	-0.90	0 03:24	0.88
J10	JUNCTION	0.39	0.90	-0.90	0 03:25	0.90
J11	JUNCTION	0.29	0.74	-0.90	0 03:23	0.74
J12	JUNCTION	0.30	0.77	-0.90	0 03:23	0.77
J13	JUNCTION	0.31	0.78	-0.90	0 03:23	0.78
J14	JUNCTION	0.33	0.80	-0.90	0 03:23	0.80
J15	JUNCTION	0.32	0.80	-0.90	0 03:24	0.80
J16	JUNCTION	0.32	0.80	-0.90	0 03:24	0.80
J17	JUNCTION	0.33	0.81	-0.90	0 03:25	0.81
J18	JUNCTION	0.23	0.65	-0.90	0 03:25	0.65
J19	JUNCTION	0.24	0.66	-0.90	0 03:24	0.66
J20	JUNCTION	0.25	0.67	-0.90	0 03:25	0.67
J21	JUNCTION	0.31	0.76	-0.90	0 03:25	0.76
J22	JUNCTION	0.30	0.75	-0.90	0 03:24	0.75
J23	JUNCTION	0.29	0.73	-0.90	0 03:25	0.73
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 03:25	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 03:25	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10 <sup>6</sup> ltr	Total Inflow Volume 10 <sup>6</sup> ltr	Flow Balance Error Percent
J1	JUNCTION	80.36	80.36	0 03:12	0.419	0.419	0.001
J2	JUNCTION	0.00	79.22	0 03:12	0	0.419	0.039
J3	JUNCTION	136.94	210.93	0 03:12	0.749	1.17	0.071
J4	JUNCTION	0.00	205.79	0 03:12	0	1.17	0.081
J5	JUNCTION	154.36	354.99	0 03:12	0.808	2.29	0.304
J6	JUNCTION	3.68	3.68	0 03:12	0.0194	0.0194	5.835

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J7	JUNCTION	9.43	323.37	0	03:11	0.051	2.19	0.387
J8	JUNCTION	0.00	309.81	0	03:11	0	2.26	1.388
J9	JUNCTION	0.00	279.51	0	03:12	0	2.35	1.448
J10	JUNCTION	0.00	252.08	0	03:12	0	2.41	1.533
J11	JUNCTION	5.96	5.96	0	03:12	0.0329	0.0329	2.456
J12	JUNCTION	0.00	5.51	0	02:01	0	0.0321	4.616
J13	JUNCTION	9.34	17.58	0	03:05	0.0516	0.0968	9.788
J14	JUNCTION	10.10	19.24	0	02:13	0.0469	0.0722	16.429
J15	JUNCTION	12.57	18.10	0	02:13	0.0572	0.0731	14.348
J16	JUNCTION	12.95	18.42	0	02:13	0.0598	0.0736	14.201
J17	JUNCTION	10.35	19.48	0	02:10	0.0482	0.0704	16.607
J18	JUNCTION	13.34	16.32	0	03:12	0.0603	0.0642	0.627
J19	JUNCTION	10.73	19.18	0	03:08	0.0499	0.0591	1.554
J20	JUNCTION	13.41	17.71	0	03:04	0.0606	0.0646	2.541
J21	JUNCTION	0.00	46.32	0	02:59	0	0.412	1.874
J22	JUNCTION	0.00	32.77	0	02:59	0	0.254	2.693
J23	JUNCTION	0.00	16.94	0	02:35	0	0.106	4.963
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	224.13	0	03:25	0	2.32	0.052
SCARICO	OUTFALL	0.00	224.13	0	03:25	0	2.32	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	71.22	150.91	224.13	2.322
System	71.22	150.91	224.13	2.322

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	79.22	0 03:12	0.47	0.16	0.69
C2	CONDUIT	74.27	0 03:10	0.35	0.15	0.74
C3	CONDUIT	205.79	0 03:12	0.79	0.42	0.79
C4	CONDUIT	199.55	0 03:12	0.80	0.40	0.85
C5	CONDUIT	313.94	0 03:11	0.74	0.32	0.92
C6	CONDUIT	309.81	0 03:11	0.64	0.19	0.81
C7	CONDUIT	279.51	0 03:12	0.61	0.17	0.85
C8	CONDUIT	252.08	0 03:12	0.46	0.15	0.86
C10	CONDUIT	10.66	0 02:13	0.24	0.01	0.82
C11	CONDUIT	10.39	0 02:13	0.24	0.01	0.82
C12	CONDUIT	12.80	0 02:10	0.24	0.01	0.83
C13	CONDUIT	12.50	0 02:13	0.24	0.01	0.83
C14	CONDUIT	5.51	0 02:01	0.28	0.01	0.88
C15	CONDUIT	5.20	0 01:59	0.26	0.01	0.91
C16	CONDUIT	13.52	0 01:58	0.27	0.01	0.80
C17	CONDUIT	12.30	0 03:44	0.20	0.01	0.84
C18	CONDUIT	41.75	0 04:17	0.26	0.04	0.90
C19	CONDUIT	12.82	0 03:43	0.24	0.01	0.83
C20	CONDUIT	32.77	0 02:59	0.21	0.03	0.89
C21	CONDUIT	12.40	0 03:26	0.25	0.01	0.81

C22	CONDUIT	17.96	0	04:05	0.16	0.02	0.87
C23	CONDUIT	2.41	0	02:19	0.12	0.00	0.89
C24	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
C25	CONDUIT	224.13	0	03:25	1.08	0.43	0.18
C9	ORIFICE	224.13	0	03:25			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
 Flow Classification Summary  
 \*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up		Down	Sub	Sup	Up	Down	Norm	Inlet
		Dry	Dry	Dry	Crit	Crit	Crit	Crit	Ltd	Ctrl
C1	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.04	0.00
C2	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.08	0.00
C3	1.00	0.28	0.00	0.00	0.72	0.01	0.00	0.00	0.00	0.00
C4	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C5	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C11	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C12	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.01	0.00
C13	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.01	0.00
C14	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C15	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.01	0.00
C16	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C17	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C18	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C20	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C22	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C23	1.00	0.28	0.00	0.00	0.72	0.00	0.00	0.00	0.02	0.00
C24	1.00	0.28	0.04	0.00	0.68	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.28	0.00	0.00	0.70	0.02	0.00	0.00	0.00	0.00

\*\*\*\*\*  
 Conduit Surcharge Summary  
 \*\*\*\*\*

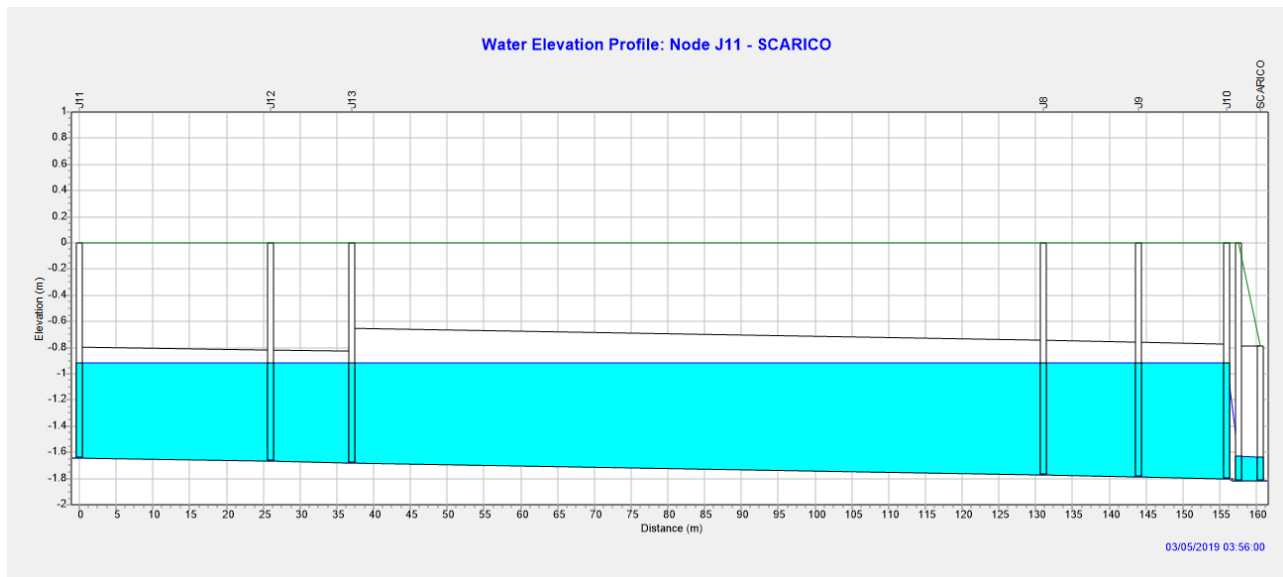
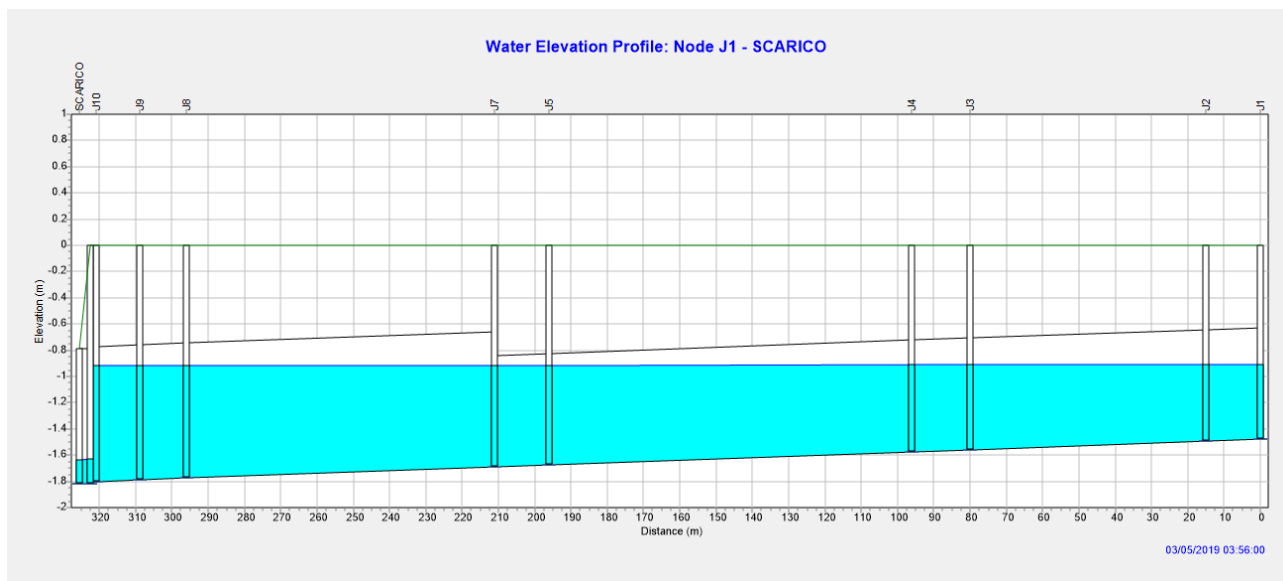
No conduits were surcharged.

Analysis begun on: Thu Mar 07 18:59:30 2019  
 Analysis ended on: Thu Mar 07 18:59:31 2019  
 Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

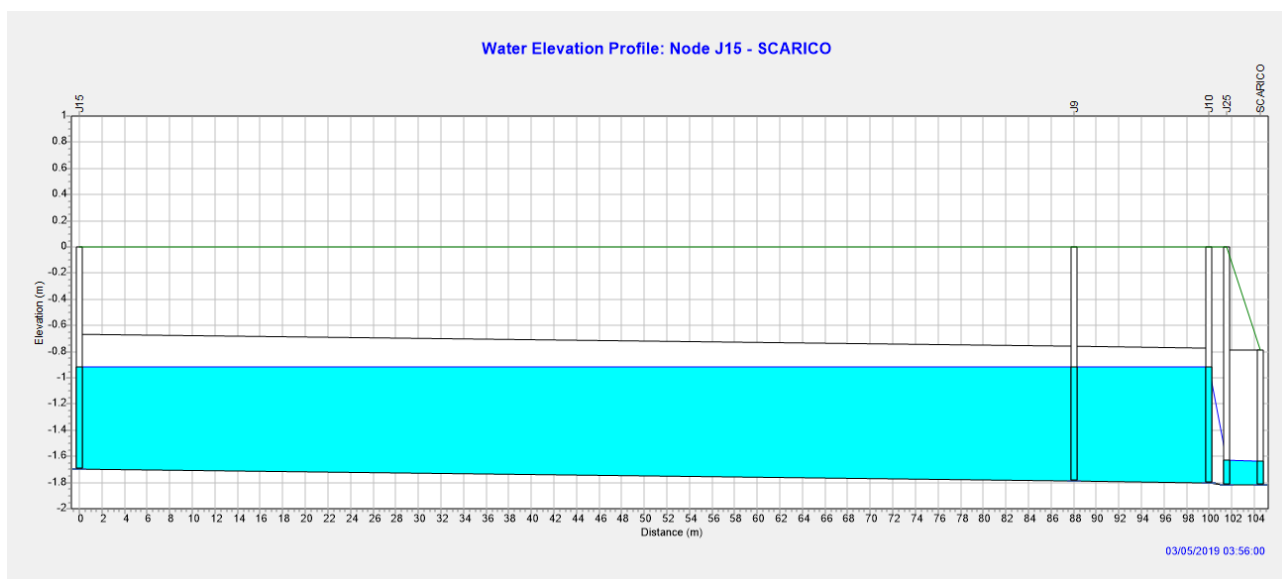
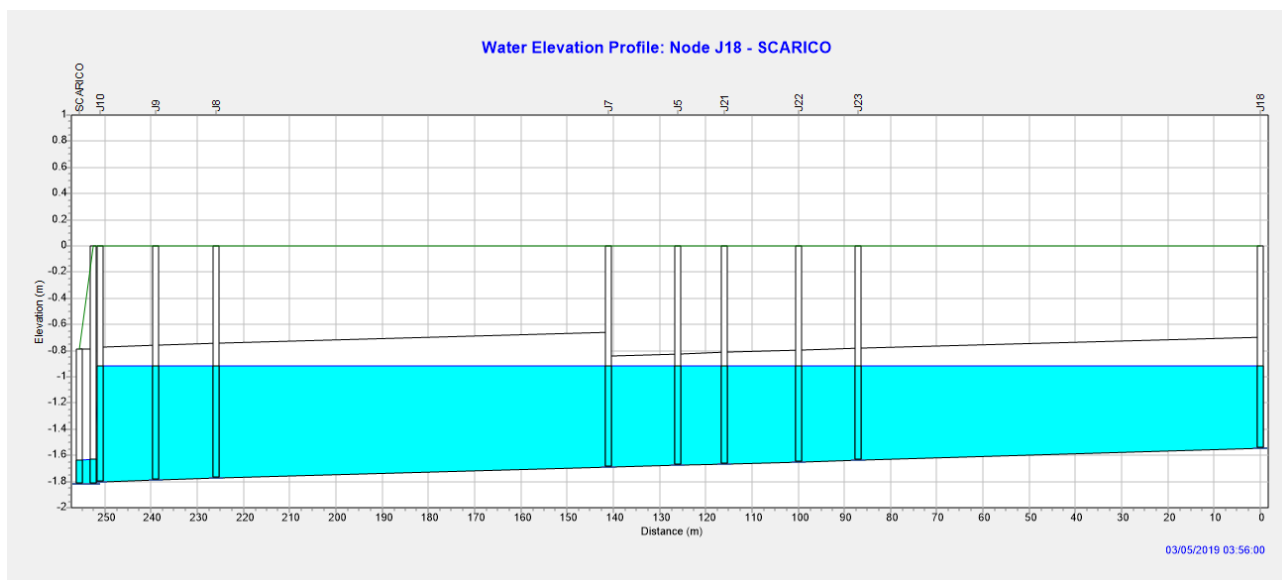
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.10. Risultati modello SWMM TR 20 anni Tp 1.8 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*  
Analysis Options  
\*\*\*\*\*  
Flow Units ..... LPS  
Process Models:  
  Rainfall/Runoff ..... YES  
  RDII ..... NO  
  Snowmelt ..... NO

**Progetto:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**

**Elaborato:**

**Relazione dei calcoli idraulici fognature bianche**

**Data:**

**Marzo 2019**

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 06:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.326	52.620
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.048	7.709
Surface Runoff .....	0.259	41.923
Final Storage .....	0.019	2.996
Continuity Error (%) .....	-0.014	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.259	2.593
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.229	2.288
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.030	0.304
Continuity Error (%) .....	0.032	

Highest Continuity Errors

Node J13 (15.58%)  
Node J23 (9.34%)  
Node J12 (7.55%)  
Node J22 (5.08%)  
Node J21 (3.43%)

Time-Step Critical Elements

None

Highest Flow Instability Indexes

All links are stable.

Routing Time Step Summary

Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	52.62	0.00	0.00	8.43	41.63	0.43	74.36	0.791
S2	52.62	0.00	0.00	0.00	47.99	0.77	126.46	0.912
S3	52.62	0.00	0.00	10.36	39.43	0.84	143.22	0.749
S4	52.62	0.00	0.00	17.26	33.78	0.06	12.57	0.642
S5	52.62	0.00	0.00	12.52	38.45	0.05	9.91	0.731
S6	52.62	0.00	0.00	17.30	33.77	0.06	12.50	0.642
S7	52.62	0.00	0.00	4.23	46.45	0.02	3.37	0.883
S8	52.62	0.00	0.00	2.07	48.56	0.05	8.62	0.923
S9	52.62	0.00	0.00	14.32	36.68	0.06	12.04	0.697
S10	52.62	0.00	0.00	12.75	38.23	0.05	9.56	0.726
S11	52.62	0.00	0.00	0.00	50.56	0.05	8.53	0.961
S12	52.62	0.00	0.00	15.68	35.37	0.06	11.73	0.672
S13	52.62	0.00	0.00	12.89	38.07	0.05	9.33	0.724
S14	52.62	0.00	0.00	0.00	50.47	0.03	5.44	0.959

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.21	0.58	-0.90	0 03:49	0.58
J2	JUNCTION	0.22	0.59	-0.90	0 03:48	0.59
J3	JUNCTION	0.26	0.66	-0.90	0 03:49	0.66
J4	JUNCTION	0.27	0.67	-0.90	0 03:49	0.67
J5	JUNCTION	0.32	0.77	-0.90	0 03:48	0.77
J6	JUNCTION	0.29	0.74	-0.90	0 03:48	0.74
J7	JUNCTION	0.32	0.79	-0.90	0 03:48	0.79
J8	JUNCTION	0.37	0.87	-0.90	0 03:47	0.87
J9	JUNCTION	0.38	0.88	-0.90	0 03:47	0.88
J10	JUNCTION	0.38	0.90	-0.90	0 03:47	0.90
J11	JUNCTION	0.29	0.74	-0.90	0 03:46	0.74
J12	JUNCTION	0.30	0.77	-0.90	0 03:46	0.77
J13	JUNCTION	0.31	0.78	-0.90	0 03:46	0.78
J14	JUNCTION	0.33	0.80	-0.90	0 03:47	0.80
J15	JUNCTION	0.32	0.80	-0.90	0 03:46	0.80
J16	JUNCTION	0.32	0.80	-0.90	0 03:46	0.80
J17	JUNCTION	0.33	0.81	-0.90	0 03:48	0.81
J18	JUNCTION	0.23	0.65	-0.90	0 03:48	0.65
J19	JUNCTION	0.24	0.66	-0.90	0 03:49	0.66
J20	JUNCTION	0.25	0.67	-0.90	0 03:47	0.67
J21	JUNCTION	0.31	0.76	-0.90	0 03:48	0.76
J22	JUNCTION	0.30	0.75	-0.90	0 03:48	0.75
J23	JUNCTION	0.29	0.73	-0.90	0 03:48	0.73
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.11	0.19	-1.63	0 03:47	0.19
SCARICO	OUTFALL	0.10	0.18	-1.64	0 03:47	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10 <sup>6</sup> ltr	Total Inflow Volume 10 <sup>6</sup> ltr	Flow Balance Error Percent
J1	JUNCTION	74.36	74.36	0 03:36	0.433	0.433	0.018
J2	JUNCTION	0.00	73.37	0 03:35	0	0.433	0.164
J3	JUNCTION	126.46	195.47	0 03:35	0.766	1.2	0.170
J4	JUNCTION	0.00	190.98	0 03:35	0	1.2	0.276
J5	JUNCTION	143.22	329.89	0 03:36	0.836	2.32	0.505
J6	JUNCTION	3.37	3.37	0 03:36	0.02	0.02	11.146

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J7	JUNCTION	8.62	305.40	0	03:35	0.0524	2.22	0.664
J8	JUNCTION	0.00	293.93	0	03:35	0	2.28	1.951
J9	JUNCTION	0.00	270.74	0	03:36	0	2.35	2.044
J10	JUNCTION	0.00	246.43	0	03:36	0	2.38	2.130
J11	JUNCTION	5.44	5.44	0	03:36	0.0338	0.0338	4.685
J12	JUNCTION	0.00	5.06	0	02:15	0	0.0323	8.169
J13	JUNCTION	8.53	15.81	0	03:34	0.0531	0.0951	18.449
J14	JUNCTION	9.33	17.02	0	02:27	0.0487	0.0727	28.583
J15	JUNCTION	11.73	15.96	0	02:27	0.0598	0.0744	24.865
J16	JUNCTION	12.04	16.25	0	02:27	0.0624	0.0751	24.553
J17	JUNCTION	9.56	17.58	0	03:28	0.0501	0.0713	28.362
J18	JUNCTION	12.50	15.52	0	03:31	0.0631	0.0662	5.916
J19	JUNCTION	9.91	16.87	0	03:33	0.0519	0.0602	8.009
J20	JUNCTION	12.57	15.32	0	03:19	0.0635	0.0663	8.936
J21	JUNCTION	0.00	39.84	0	03:07	0	0.387	3.547
J22	JUNCTION	0.00	27.61	0	03:07	0	0.24	5.348
J23	JUNCTION	0.00	14.16	0	02:50	0	0.102	10.308
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	224.05	0	03:47	0	2.29	0.062
SCARICO	OUTFALL	0.00	224.05	0	03:47	0	2.29	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	67.76	156.32	224.05	2.288
System	67.76	156.32	224.05	2.288

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	73.37	0 03:35	0.46	0.15	0.69
C2	CONDUIT	69.09	0 03:35	0.34	0.14	0.74
C3	CONDUIT	190.98	0 03:35	0.78	0.39	0.78
C4	CONDUIT	185.22	0 03:36	0.78	0.37	0.85
C5	CONDUIT	296.78	0 03:35	0.72	0.30	0.91
C6	CONDUIT	292.95	0 03:36	0.62	0.18	0.80
C7	CONDUIT	270.27	0 03:36	0.59	0.16	0.85
C8	CONDUIT	246.43	0 03:36	0.45	0.15	0.86
C10	CONDUIT	9.87	0 04:16	0.23	0.01	0.81
C11	CONDUIT	10.11	0 04:04	0.23	0.01	0.82
C12	CONDUIT	11.70	0 04:07	0.23	0.01	0.83
C13	CONDUIT	11.23	0 04:26	0.23	0.01	0.82
C14	CONDUIT	5.06	0 02:15	0.27	0.01	0.88
C15	CONDUIT	4.78	0 02:12	0.25	0.01	0.91
C16	CONDUIT	12.41	0 02:11	0.26	0.01	0.80
C17	CONDUIT	12.13	0 04:01	0.19	0.01	0.84
C18	CONDUIT	41.70	0 04:32	0.25	0.04	0.90
C19	CONDUIT	12.24	0 04:03	0.23	0.01	0.83
C20	CONDUIT	29.73	0 04:41	0.20	0.03	0.88
C21	CONDUIT	11.50	0 04:18	0.25	0.01	0.81

C22	CONDUIT	17.74	0	04:27	0.15	0.02	0.87
C23	CONDUIT	2.20	0	02:33	0.12	0.00	0.89
C24	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
C25	CONDUIT	224.05	0	03:47	1.08	0.43	0.18
C9	ORIFICE	224.05	0	03:47			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
 Flow Classification Summary  
 \*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class							
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
C2	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.03
C3	1.00	0.31	0.00	0.00	0.68	0.01	0.00	0.00	0.00
C4	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C5	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
C6	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
C7	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.01
C8	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
C10	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C11	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C12	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C13	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C14	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.03
C15	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.01
C16	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C17	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C18	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.00
C19	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C20	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.01
C21	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C22	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C23	1.00	0.31	0.00	0.00	0.69	0.00	0.00	0.00	0.02
C24	1.00	0.31	0.04	0.00	0.65	0.00	0.00	0.00	0.00
C25	1.00	0.31	0.00	0.00	0.67	0.02	0.00	0.00	0.00

\*\*\*\*\*  
 Conduit Surcharge Summary  
 \*\*\*\*\*

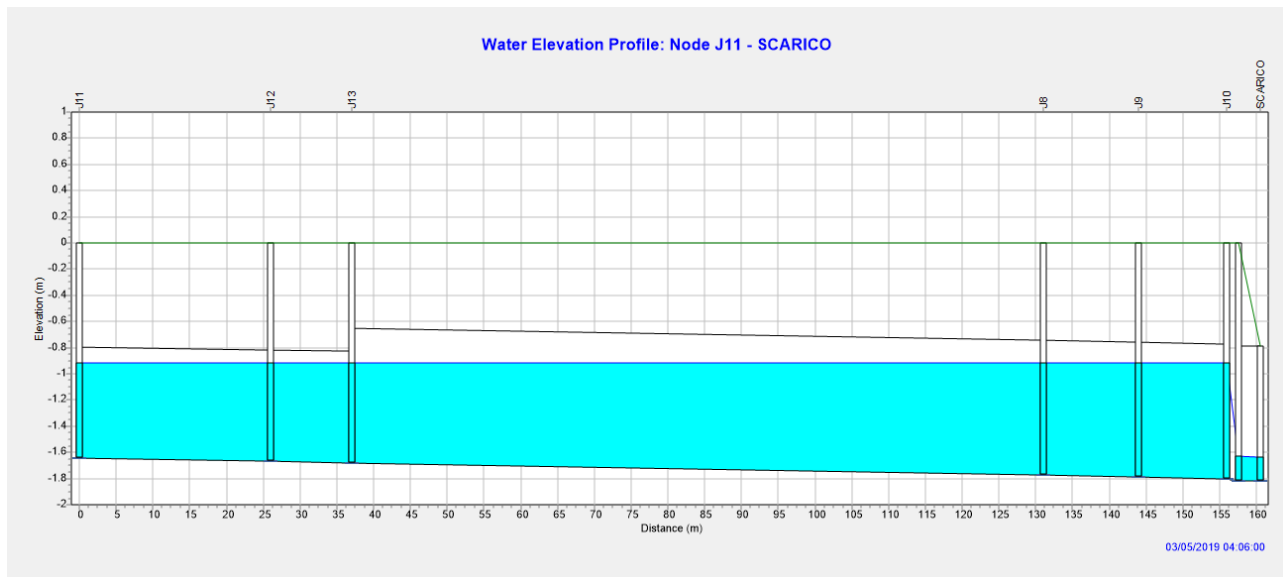
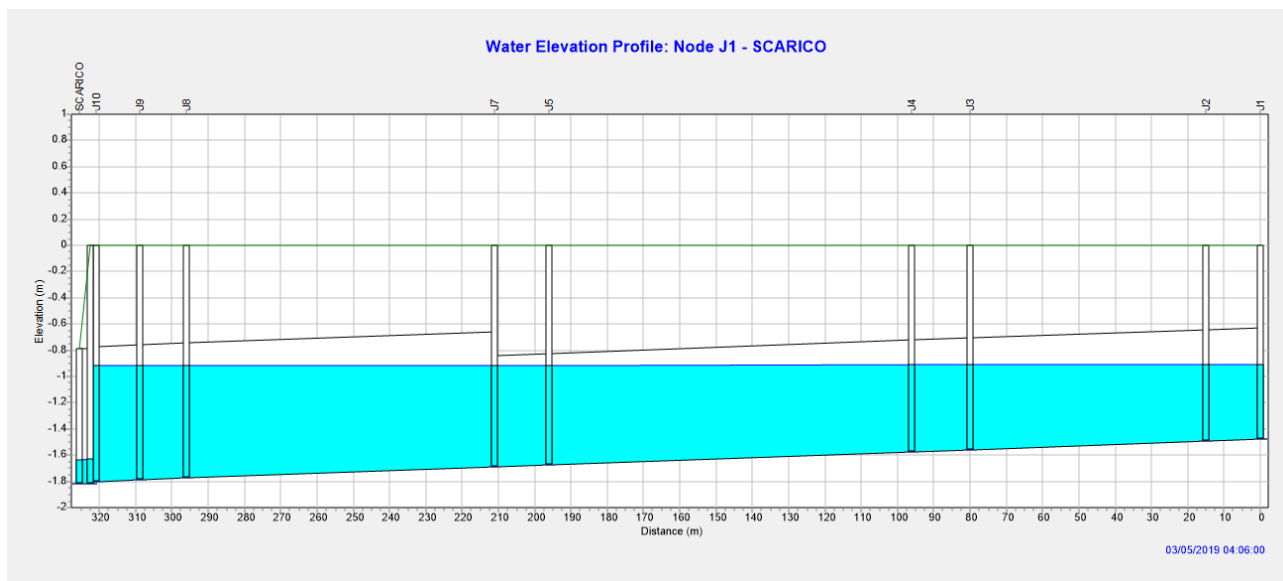
No conduits were surcharged.

Analysis begun on: Thu Mar 07 19:01:05 2019  
 Analysis ended on: Thu Mar 07 19:01:06 2019  
 Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

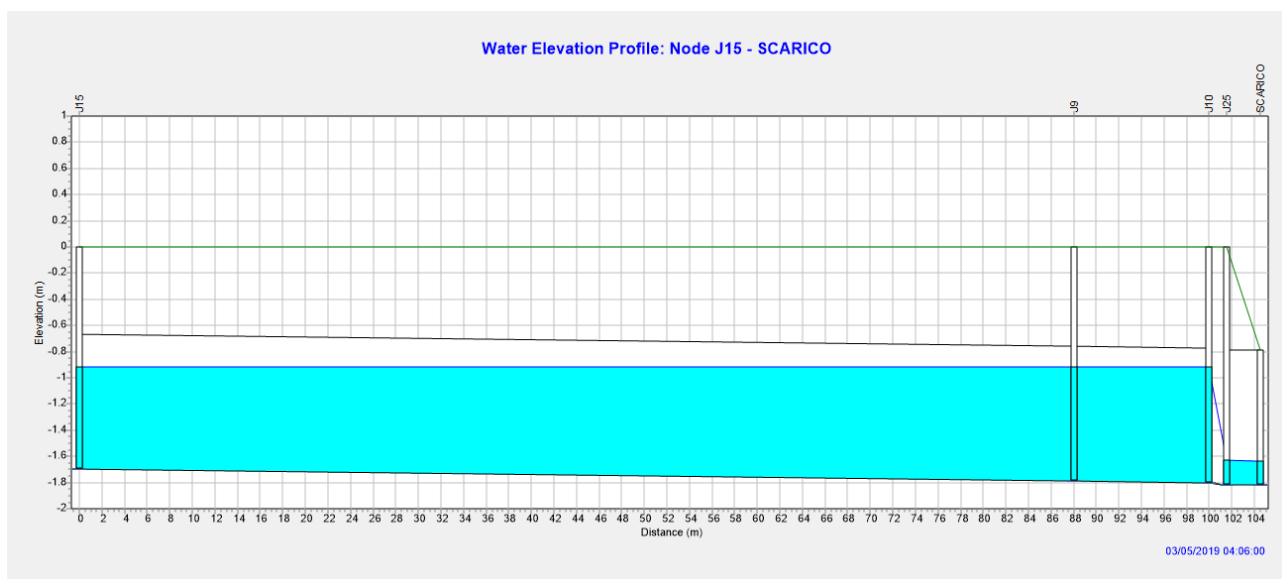
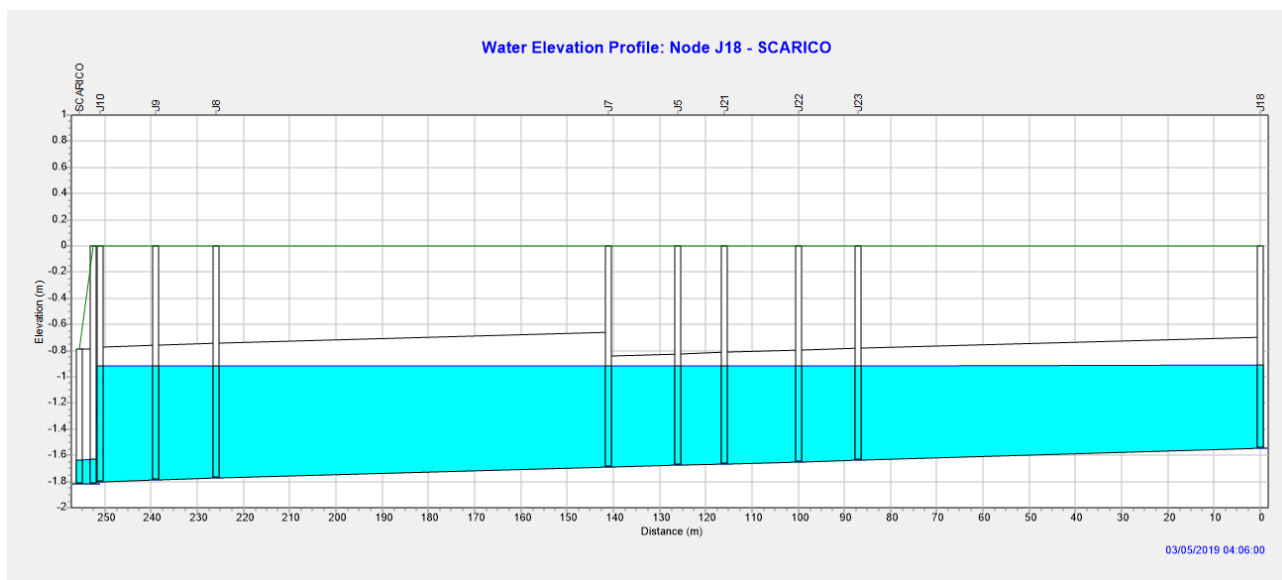
Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.11. Risultati modello SWMM TR 20 anni Tp 2.0 ore**



Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Progetto:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca

Elaborato:

Relazione dei calcoli idraulici fognature bianche

Data:

Marzo 2019

Groundwater ..... NO  
Flow Routing ..... YES  
Ponding Allowed ..... NO  
Water Quality ..... NO  
Infiltration Method ..... CURVE\_NUMBER  
Flow Routing Method ..... DYNWAVE  
Starting Date ..... 03/05/2019 00:00:00  
Ending Date ..... 03/05/2019 12:00:00  
Antecedent Dry Days ..... 0.0  
Report Time Step ..... 00:01:00  
Wet Time Step ..... 00:01:00  
Dry Time Step ..... 00:01:00  
Routing Time Step ..... 1.00 sec  
Variable Time Step ..... YES  
Maximum Trials ..... 8  
Number of Threads ..... 1  
Head Tolerance ..... 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
Total Precipitation .....	0.333	53.910
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.048	7.762
Surface Runoff .....	0.273	44.092
Final Storage .....	0.013	2.059
Continuity Error (%) .....	-0.006	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.273	2.728
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.273	2.725
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.000	0.003
Continuity Error (%) .....	-0.032	

Time-Step Critical Elements  
None

Highest Flow Instability Indexes  
All links are stable.

Routing Time Step Summary  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

Subcatchment Runoff Summary

	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
Subcatchment								

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

S1	53.91	0.00	0.00	8.39	43.55	0.45	69.32	0.808
S2	53.91	0.00	0.00	0.00	51.31	0.82	117.47	0.952
S3	53.91	0.00	0.00	10.58	41.39	0.88	133.89	0.768
S4	53.91	0.00	0.00	17.15	35.21	0.07	11.83	0.653
S5	53.91	0.00	0.00	12.45	39.83	0.05	9.22	0.739
S6	53.91	0.00	0.00	17.16	35.19	0.07	11.77	0.653
S7	53.91	0.00	0.00	4.25	47.77	0.02	3.11	0.886
S8	53.91	0.00	0.00	2.08	49.88	0.05	7.95	0.925
S9	53.91	0.00	0.00	14.22	38.08	0.06	11.26	0.706
S10	53.91	0.00	0.00	12.69	39.59	0.05	8.89	0.734
S11	53.91	0.00	0.00	0.00	51.91	0.05	7.86	0.963
S12	53.91	0.00	0.00	15.57	36.78	0.06	10.99	0.682
S13	53.91	0.00	0.00	12.84	39.43	0.05	8.68	0.731
S14	53.91	0.00	0.00	0.00	51.89	0.03	5.02	0.962

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.12	0.57	-0.90	0 04:08	0.57
J2	JUNCTION	0.12	0.59	-0.90	0 04:08	0.59
J3	JUNCTION	0.15	0.65	-0.91	0 04:08	0.65
J4	JUNCTION	0.16	0.67	-0.91	0 04:09	0.67
J5	JUNCTION	0.19	0.77	-0.91	0 04:12	0.77
J6	JUNCTION	0.16	0.73	-0.91	0 04:12	0.73
J7	JUNCTION	0.19	0.78	-0.91	0 04:10	0.78
J8	JUNCTION	0.23	0.87	-0.91	0 04:11	0.87
J9	JUNCTION	0.23	0.88	-0.91	0 04:11	0.88
J10	JUNCTION	0.24	0.89	-0.91	0 04:11	0.89
J11	JUNCTION	0.16	0.73	-0.91	0 04:10	0.73
J12	JUNCTION	0.17	0.76	-0.91	0 04:10	0.76
J13	JUNCTION	0.17	0.77	-0.91	0 04:10	0.77
J14	JUNCTION	0.19	0.80	-0.91	0 04:10	0.80
J15	JUNCTION	0.18	0.79	-0.91	0 04:10	0.79
J16	JUNCTION	0.18	0.79	-0.91	0 04:10	0.79
J17	JUNCTION	0.19	0.80	-0.91	0 04:09	0.80
J18	JUNCTION	0.12	0.64	-0.91	0 04:10	0.64
J19	JUNCTION	0.13	0.65	-0.91	0 04:11	0.65
J20	JUNCTION	0.13	0.67	-0.91	0 04:12	0.67
J21	JUNCTION	0.18	0.76	-0.91	0 04:12	0.76
J22	JUNCTION	0.17	0.74	-0.91	0 04:11	0.74
J23	JUNCTION	0.16	0.73	-0.91	0 04:11	0.73
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.08	0.19	-1.63	0 04:11	0.19
SCARICO	OUTFALL	0.07	0.18	-1.64	0 04:11	0.18

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	69.32	69.32	0 04:00	0.453	0.453	-0.009
J2	JUNCTION	0.00	68.44	0 04:00	0	0.453	-0.010
J3	JUNCTION	117.47	181.85	0 03:58	0.819	1.27	0.015
J4	JUNCTION	0.00	178.04	0 04:00	0	1.27	-0.007
J5	JUNCTION	133.89	308.43	0 04:00	0.877	2.49	0.023
J6	JUNCTION	3.11	3.11	0 04:00	0.0205	0.0205	-0.122
J7	JUNCTION	7.95	289.41	0 03:59	0.0539	2.41	-0.039
J8	JUNCTION	0.00	279.75	0 04:00	0	2.51	0.092
J9	JUNCTION	0.00	261.82	0 03:58	0	2.65	0.059
J10	JUNCTION	0.00	241.26	0 03:58	0	2.77	0.050
J11	JUNCTION	5.02	5.02	0 04:00	0.0348	0.0348	-0.125
J12	JUNCTION	0.00	4.69	0 02:28	0	0.0348	0.122
J13	JUNCTION	7.86	13.50	0 02:44	0.0545	0.0984	-0.692
J14	JUNCTION	8.68	15.20	0 02:40	0.0505	0.0721	-0.746
J15	JUNCTION	10.99	14.27	0 02:40	0.0622	0.0741	-0.682
J16	JUNCTION	11.26	14.54	0 02:40	0.0647	0.0748	-0.696

J17	JUNCTION	8.89	15.73	0	02:36	0.0519	0.0705	-0.726
J18	JUNCTION	11.77	14.19	0	03:56	0.0658	0.0678	-0.694
J19	JUNCTION	9.22	14.72	0	03:55	0.0538	0.0611	-0.732
J20	JUNCTION	11.83	12.84	0	03:35	0.0662	0.0681	-0.585
J21	JUNCTION	0.00	33.79	0	04:56	0	0.416	0.116
J22	JUNCTION	0.00	22.94	0	03:22	0	0.253	0.188
J23	JUNCTION	0.00	11.88	0	03:04	0	0.105	0.461
J24	JUNCTION	0.00	0.00	0	00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	223.26	0	04:11	0	2.73	0.001
SCARICO	OUTFALL	0.00	223.26	0	04:11	0	2.73	0.000

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 Node Surcharge Summary  
 \*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
 Node Flooding Summary  
 \*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	82.16	76.78	223.26	2.725
System	82.16	76.78	223.26	2.725

\*\*\*\*\*  
 Link Flow Summary  
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Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	68.44	0 04:00	0.45	0.14	0.68
C2	CONDUIT	64.62	0 04:00	0.33	0.13	0.73
C3	CONDUIT	178.04	0 04:00	0.76	0.36	0.78
C4	CONDUIT	173.03	0 04:00	0.76	0.35	0.84
C5	CONDUIT	281.66	0 04:00	0.70	0.28	0.91
C6	CONDUIT	279.75	0 04:00	0.60	0.17	0.80
C7	CONDUIT	258.28	0 03:59	0.58	0.16	0.85
C8	CONDUIT	241.00	0 04:01	0.44	0.15	0.86
C10	CONDUIT	8.99	0 04:50	0.22	0.01	0.81
C11	CONDUIT	9.21	0 04:44	0.23	0.01	0.81
C12	CONDUIT	10.23	0 04:46	0.23	0.01	0.82
C13	CONDUIT	9.74	0 04:42	0.22	0.01	0.82
C14	CONDUIT	4.69	0 02:28	0.27	0.01	0.88
C15	CONDUIT	4.43	0 02:26	0.25	0.01	0.90
C16	CONDUIT	11.48	0 02:25	0.25	0.01	0.79
C17	CONDUIT	11.15	0 04:21	0.19	0.01	0.84
C18	CONDUIT	41.24	0 04:56	0.23	0.04	0.89
C19	CONDUIT	11.31	0 04:20	0.23	0.01	0.82
C20	CONDUIT	29.43	0 05:07	0.19	0.03	0.88
C21	CONDUIT	11.24	0 04:43	0.24	0.01	0.80
C22	CONDUIT	17.10	0 04:46	0.14	0.02	0.86
C23	CONDUIT	2.04	0 02:37	0.12	0.00	0.88
C24	CONDUIT	0.00	0 00:00	0.00	0.00	0.09
C25	CONDUIT	223.26	0 04:11	1.08	0.43	0.18
C9	ORIFICE	223.26	0 04:11			1.00
R1	WEIR	0.00	0 00:00			0.00

\*\*\*\*\*  
 Flow Classification Summary  
 \*\*\*\*\*

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

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Conduit	Adjusted /Actual Length	-----		Fraction of		Time in Flow Class		-----		Inlet Ctrl
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	
C1	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.46	0.00
C2	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.48	0.00
C3	1.00	0.17	0.00	0.00	0.82	0.00	0.00	0.00	0.26	0.00
C4	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.09	0.00
C5	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.37	0.00
C7	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.25	0.00
C8	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.35	0.00
C11	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.35	0.00
C12	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.34	0.00
C13	1.00	0.17	0.00	0.00	0.82	0.00	0.00	0.00	0.34	0.00
C14	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.39	0.00
C15	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.11	0.00
C16	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.37	0.00
C17	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.43	0.00
C18	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.40	0.00
C20	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.22	0.00
C21	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.32	0.00
C22	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.34	0.00
C23	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.35	0.00
C24	1.00	0.17	0.31	0.00	0.51	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.17	0.00	0.00	0.52	0.31	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary

\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Thu Mar 07 19:03:02 2019  
Analysis ended on: Thu Mar 07 19:03:03 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.12. Risultati modello SWMM TR 20 anni Tp 3.0 ore**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
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Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... CURVE\_NUMBER

Flow Routing Method ..... DYNWAVE

Starting Date ..... 03/05/2019 00:00:00

Ending Date ..... 03/05/2019 12:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 00:01:00

Routing Time Step ..... 1.00 sec

Variable Time Step ..... YES

Maximum Trials ..... 8

Number of Threads ..... 1

Head Tolerance ..... 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation .....	0.366	59.160
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.047	7.602
Surface Runoff .....	0.306	49.400
Final Storage .....	0.013	2.160
Continuity Error (%) .....	-0.004	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.306	3.056
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.305	3.052
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.000	0.005
Continuity Error (%) .....	-0.034	

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Time-Step Critical Elements

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None

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Highest Flow Instability Indexes

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All links are stable.

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*

Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	59.16	0.00	0.00	8.20	48.93	0.51	52.60	0.827
S2	59.16	0.00	0.00	0.00	56.31	0.90	87.14	0.952
S3	59.16	0.00	0.00	10.36	46.78	0.99	102.86	0.791
S4	59.16	0.00	0.00	16.73	40.87	0.08	9.17	0.691
S5	59.16	0.00	0.00	12.24	45.28	0.06	6.90	0.765
S6	59.16	0.00	0.00	16.77	40.84	0.08	9.11	0.690
S7	59.16	0.00	0.00	4.33	52.93	0.02	2.28	0.895
S8	59.16	0.00	0.00	2.14	55.07	0.06	5.83	0.931
S9	59.16	0.00	0.00	13.91	43.64	0.07	8.55	0.738
S10	59.16	0.00	0.00	12.52	44.98	0.06	6.66	0.760
S11	59.16	0.00	0.00	0.00	57.15	0.06	5.75	0.966
S12	59.16	0.00	0.00	15.21	42.37	0.07	8.40	0.716
S13	59.16	0.00	0.00	12.68	44.82	0.06	6.49	0.758
S14	59.16	0.00	0.00	0.00	57.12	0.04	3.67	0.966

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.12	0.51	-0.97	0 06:06	0.51
J2	JUNCTION	0.13	0.53	-0.97	0 06:06	0.53
J3	JUNCTION	0.16	0.59	-0.97	0 06:06	0.59
J4	JUNCTION	0.17	0.61	-0.97	0 06:06	0.61
J5	JUNCTION	0.20	0.70	-0.97	0 06:07	0.70
J6	JUNCTION	0.18	0.67	-0.97	0 06:07	0.67
J7	JUNCTION	0.21	0.72	-0.97	0 06:07	0.72
J8	JUNCTION	0.25	0.80	-0.97	0 06:06	0.80
J9	JUNCTION	0.25	0.82	-0.97	0 06:06	0.82
J10	JUNCTION	0.26	0.83	-0.97	0 06:06	0.83
J11	JUNCTION	0.17	0.67	-0.97	0 06:06	0.67
J12	JUNCTION	0.19	0.70	-0.97	0 06:06	0.70
J13	JUNCTION	0.19	0.71	-0.97	0 06:06	0.71
J14	JUNCTION	0.20	0.74	-0.97	0 06:05	0.74
J15	JUNCTION	0.20	0.73	-0.97	0 06:05	0.73
J16	JUNCTION	0.20	0.73	-0.97	0 06:05	0.73
J17	JUNCTION	0.21	0.74	-0.97	0 06:06	0.74
J18	JUNCTION	0.13	0.58	-0.97	0 06:07	0.58
J19	JUNCTION	0.14	0.59	-0.97	0 06:06	0.59
J20	JUNCTION	0.14	0.61	-0.97	0 06:07	0.61
J21	JUNCTION	0.19	0.70	-0.97	0 06:07	0.69
J22	JUNCTION	0.18	0.68	-0.97	0 06:06	0.68
J23	JUNCTION	0.17	0.67	-0.97	0 06:07	0.67
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.08	0.19	-1.63	0 06:06	0.19
SCARICO	OUTFALL	0.07	0.18	-1.64	0 06:06	0.18

\*\*\*\*\*  
Node Inflow Summary

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	52.60	52.60	0 06:00	0.509	0.509	-0.005
J2	JUNCTION	0.00	52.16	0 06:00	0	0.509	-0.002
J3	JUNCTION	87.14	137.26	0 06:00	0.899	1.41	0.019
J4	JUNCTION	0.00	135.27	0 05:58	0	1.41	0.004
J5	JUNCTION	102.86	236.94	0 06:00	0.991	2.72	0.026
J6	JUNCTION	2.28	2.28	0 06:00	0.0228	0.0228	-0.103
J7	JUNCTION	5.83	236.72	0 06:00	0.0595	2.69	-0.023
J8	JUNCTION	0.00	233.66	0 06:00	0	2.8	0.085
J9	JUNCTION	0.00	229.80	0 06:00	0	2.95	0.057
J10	JUNCTION	0.00	222.85	0 05:59	0	3.08	0.050
J11	JUNCTION	3.67	3.67	0 06:00	0.0383	0.0383	-0.099
J12	JUNCTION	0.00	3.49	0 03:36	0	0.0383	0.098
J13	JUNCTION	5.75	9.40	0 03:51	0.06	0.0996	-0.599
J14	JUNCTION	6.49	10.38	0 03:31	0.0574	0.0711	-0.662
J15	JUNCTION	8.40	9.36	0 03:32	0.0716	0.0788	-0.561
J16	JUNCTION	8.55	9.55	0 03:46	0.0742	0.0801	-0.568
J17	JUNCTION	6.66	11.03	0 03:31	0.0589	0.0714	-0.628
J18	JUNCTION	9.11	9.11	0 06:00	0.0764	0.0764	-0.537
J19	JUNCTION	6.90	7.67	0 05:25	0.0611	0.0628	-0.624
J20	JUNCTION	9.17	9.17	0 06:00	0.0768	0.0772	-0.462
J21	JUNCTION	0.00	32.12	0 06:55	0	0.358	0.150
J22	JUNCTION	0.00	19.23	0 06:39	0	0.215	0.192
J23	JUNCTION	0.00	8.06	0 06:16	0	0.0958	0.435
J24	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	213.46	0 06:06	0	3.05	0.001
SCARICO	OUTFALL	0.00	213.46	0 06:06	0	3.05	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	73.54	96.07	213.46	3.052
System	73.54	96.07	213.46	3.052

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	52.16	0 06:00	0.42	0.11	0.61
C2	CONDUIT	50.17	0 06:00	0.31	0.10	0.66
C3	CONDUIT	135.27	0 05:58	0.70	0.27	0.70
C4	CONDUIT	132.66	0 06:00	0.70	0.27	0.77
C5	CONDUIT	230.90	0 06:00	0.64	0.23	0.84
C6	CONDUIT	231.34	0 06:00	0.54	0.14	0.74

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C7	CONDUIT	223.35	0	06:00	0.53	0.14	0.79
C8	CONDUIT	219.92	0	06:00	0.40	0.13	0.80
C10	CONDUIT	7.81	0	06:50	0.20	0.00	0.75
C11	CONDUIT	7.88	0	06:53	0.21	0.00	0.75
C12	CONDUIT	8.94	0	06:46	0.21	0.01	0.76
C13	CONDUIT	9.00	0	06:42	0.20	0.01	0.76
C14	CONDUIT	3.49	0	03:36	0.24	0.01	0.80
C15	CONDUIT	3.31	0	03:31	0.23	0.01	0.83
C16	CONDUIT	9.85	0	06:55	0.23	0.01	0.73
C17	CONDUIT	8.10	0	06:31	0.17	0.01	0.76
C18	CONDUIT	39.19	0	06:55	0.19	0.04	0.82
C19	CONDUIT	8.23	0	06:38	0.21	0.01	0.75
C20	CONDUIT	26.30	0	06:55	0.14	0.03	0.81
C21	CONDUIT	8.06	0	06:16	0.22	0.01	0.73
C22	CONDUIT	13.70	0	06:53	0.11	0.01	0.79
C23	CONDUIT	1.53	0	06:00	0.10	0.00	0.81
C24	CONDUIT	0.00	0	00:00	0.00	0.00	0.09
C25	CONDUIT	213.46	0	06:06	1.06	0.41	0.18
C9	ORIFICE	213.46	0	06:06			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Up		Down		Sub		Sup		Time in Flow Class		Norm Ltd	Inlet Ctrl
		Dry	Dry	Dry	Dry	Crit	Crit	Crit	Crit	Up	Down		
C1	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00
C2	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00
C3	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
C4	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
C5	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
C7	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00
C8	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
C11	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
C12	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
C13	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
C14	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
C15	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
C16	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
C17	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
C18	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00
C20	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
C21	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00
C22	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
C23	1.00	0.26	0.00	0.00	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
C24	1.00	0.26	0.16	0.00	0.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.26	0.00	0.00	0.59	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Thu Mar 07 19:04:56 2019  
Analysis ended on: Thu Mar 07 19:04:57 2019  
Total elapsed time: 00:00:01

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 4.13. Risultati modello SWMM TR 20 anni Tp 6.0 ore**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... CURVE\_NUMBER

Flow Routing Method ..... DYNWAVE

Starting Date ..... 03/05/2019 00:00:00

Ending Date ..... 03/05/2019 18:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 00:01:00

Routing Time Step ..... 1.00 sec

Variable Time Step ..... YES

Maximum Trials ..... 8

Number of Threads ..... 1

Head Tolerance ..... 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation .....	0.429	69.360
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.046	7.359
Surface Runoff .....	0.370	59.855
Final Storage .....	0.013	2.147
Continuity Error (%) .....	-0.002	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.370	3.703
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.370	3.699
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.000
Final Stored Volume .....	0.000	0.005
Continuity Error (%) .....	-0.027	

\*\*\*\*\*

Time-Step Critical Elements

\*\*\*\*\*

None

\*\*\*\*\*

Highest Flow Instability Indexes

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

\*\*\*\*\*  
All links are stable.

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*

Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 2.00  
Percent Not Converging : 0.00

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	69.36	0.00	0.00	7.90	59.43	0.62	31.98	0.857
S2	69.36	0.00	0.00	0.00	66.55	1.06	51.25	0.960
S3	69.36	0.00	0.00	9.94	57.41	1.22	63.88	0.828
S4	69.36	0.00	0.00	16.27	51.52	0.10	5.61	0.743
S5	69.36	0.00	0.00	12.07	55.65	0.08	4.13	0.802
S6	69.36	0.00	0.00	16.31	51.48	0.10	5.58	0.742
S7	69.36	0.00	0.00	4.50	62.95	0.03	1.35	0.908
S8	69.36	0.00	0.00	2.24	65.16	0.07	3.42	0.939
S9	69.36	0.00	0.00	13.59	54.16	0.09	5.16	0.781
S10	69.36	0.00	0.00	12.44	55.27	0.07	3.98	0.797
S11	69.36	0.00	0.00	0.00	67.34	0.07	3.37	0.971
S12	69.36	0.00	0.00	14.86	52.92	0.09	5.09	0.763
S13	69.36	0.00	0.00	12.60	55.10	0.07	3.89	0.794
S14	69.36	0.00	0.00	0.00	67.32	0.05	2.15	0.971

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.08	0.29	-1.18	0 12:00	0.29
J2	JUNCTION	0.09	0.31	-1.18	0 12:00	0.31
J3	JUNCTION	0.12	0.37	-1.19	0 12:00	0.37
J4	JUNCTION	0.12	0.39	-1.19	0 12:00	0.39
J5	JUNCTION	0.15	0.48	-1.20	0 12:01	0.48
J6	JUNCTION	0.13	0.44	-1.20	0 12:01	0.44
J7	JUNCTION	0.15	0.49	-1.20	0 12:01	0.49
J8	JUNCTION	0.19	0.58	-1.20	0 12:03	0.58
J9	JUNCTION	0.20	0.59	-1.20	0 12:03	0.59
J10	JUNCTION	0.20	0.60	-1.20	0 12:03	0.60
J11	JUNCTION	0.12	0.45	-1.20	0 12:02	0.44
J12	JUNCTION	0.13	0.47	-1.20	0 12:02	0.47
J13	JUNCTION	0.14	0.48	-1.20	0 12:03	0.48
J14	JUNCTION	0.15	0.51	-1.20	0 12:02	0.51
J15	JUNCTION	0.15	0.50	-1.20	0 12:02	0.50
J16	JUNCTION	0.15	0.50	-1.20	0 12:02	0.50
J17	JUNCTION	0.15	0.51	-1.20	0 12:03	0.51
J18	JUNCTION	0.09	0.35	-1.20	0 12:01	0.35
J19	JUNCTION	0.09	0.36	-1.20	0 12:01	0.36
J20	JUNCTION	0.10	0.38	-1.20	0 12:01	0.38
J21	JUNCTION	0.14	0.47	-1.20	0 12:01	0.47
J22	JUNCTION	0.13	0.45	-1.20	0 12:01	0.45
J23	JUNCTION	0.12	0.44	-1.20	0 12:01	0.44
J24	JUNCTION	0.00	0.00	-1.78	0 00:00	0.00
J25	JUNCTION	0.07	0.17	-1.65	0 12:03	0.17
SCARICO	OUTFALL	0.06	0.16	-1.66	0 12:03	0.16

\*\*\*\*\*  
Node Inflow Summary

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	31.98	31.98	0 12:00	0.618	0.618	-0.001
J2	JUNCTION	0.00	31.92	0 12:00	0	0.618	0.001
J3	JUNCTION	51.25	82.87	0 12:00	1.06	1.68	0.015
J4	JUNCTION	0.00	82.56	0 12:00	0	1.68	0.007
J5	JUNCTION	63.88	157.64	0 12:00	1.22	3.2	0.019
J6	JUNCTION	1.35	1.35	0 12:00	0.0271	0.0271	-0.078
J7	JUNCTION	3.42	160.32	0 12:00	0.0704	3.26	-0.011
J8	JUNCTION	0.00	163.64	0 12:00	0	3.38	0.057
J9	JUNCTION	0.00	170.34	0 11:59	0	3.56	0.041
J10	JUNCTION	0.00	174.33	0 12:00	0	3.71	0.035
J11	JUNCTION	2.15	2.15	0 11:20	0.0451	0.0451	-0.067
J12	JUNCTION	0.00	2.14	0 07:56	0	0.0451	0.066
J13	JUNCTION	3.37	5.36	0 06:46	0.0707	0.116	-0.416
J14	JUNCTION	3.89	6.00	0 06:43	0.0705	0.0765	-0.495
J15	JUNCTION	5.09	5.11	0 06:44	0.0894	0.0931	-0.379
J16	JUNCTION	5.16	5.21	0 07:00	0.0921	0.095	-0.382
J17	JUNCTION	3.98	6.50	0 06:43	0.0724	0.0778	-0.464
J18	JUNCTION	5.58	5.58	0 12:00	0.0963	0.0963	-0.310
J19	JUNCTION	4.13	4.13	0 12:00	0.0751	0.0751	-0.423
J20	JUNCTION	5.61	5.61	0 12:00	0.0969	0.0969	-0.295
J21	JUNCTION	0.00	24.26	0 12:41	0	0.285	0.156
J22	JUNCTION	0.00	13.81	0 12:41	0	0.179	0.184
J23	JUNCTION	0.00	5.17	0 12:20	0	0.0979	0.304
J24	JUNCTION	0.00	0.00	0 00:00	0	0	0.000 ltr
J25	JUNCTION	0.00	172.56	0 12:03	0	3.7	0.001
SCARICO	OUTFALL	0.00	172.56	0 12:03	0	3.7	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

No nodes were surcharged.

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	65.23	87.51	172.56	3.699
System	65.23	87.51	172.56	3.699

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	31.92	0 12:00	0.39	0.06	0.35
C2	CONDUIT	31.64	0 12:00	0.28	0.06	0.40
C3	CONDUIT	82.56	0 12:00	0.62	0.17	0.45
C4	CONDUIT	82.12	0 12:00	0.60	0.17	0.51
C5	CONDUIT	156.90	0 12:00	0.57	0.16	0.57
C6	CONDUIT	159.37	0 12:00	0.46	0.10	0.52

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C7	CONDUIT	161.70	0	12:00	0.44	0.10	0.57
C8	CONDUIT	168.39	0	11:59	0.36	0.10	0.58
C10	CONDUIT	5.89	0	12:35	0.17	0.00	0.53
C11	CONDUIT	5.90	0	12:38	0.17	0.00	0.53
C12	CONDUIT	5.80	0	12:40	0.17	0.00	0.54
C13	CONDUIT	5.91	0	12:46	0.17	0.00	0.54
C14	CONDUIT	2.14	0	07:56	0.21	0.00	0.54
C15	CONDUIT	2.02	0	06:46	0.20	0.00	0.56
C16	CONDUIT	7.39	0	12:49	0.19	0.00	0.51
C17	CONDUIT	5.27	0	12:21	0.15	0.01	0.50
C18	CONDUIT	29.50	0	12:41	0.13	0.03	0.56
C19	CONDUIT	4.41	0	12:42	0.18	0.00	0.48
C20	CONDUIT	19.14	0	12:41	0.08	0.02	0.54
C21	CONDUIT	5.17	0	12:20	0.19	0.01	0.46
C22	CONDUIT	9.45	0	12:41	0.09	0.01	0.52
C23	CONDUIT	1.23	0	12:00	0.09	0.00	0.54
C24	CONDUIT	0.00	0	00:00	0.00	0.00	0.08
C25	CONDUIT	172.56	0	12:03	1.00	0.33	0.16
C9	ORIFICE	172.56	0	12:03			1.00
R1	WEIR	0.00	0	00:00			0.00

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Up		Down		Sub		Sup		Time in Flow Class		Norm Ltd	Inlet Ctrl
		Dry	Dry	Dry	Crit	Crit	Crit	Crit	Crit	Up	Down		
C1	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
C2	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00
C3	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
C4	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
C5	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
C7	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
C8	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
C11	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
C12	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00
C13	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00
C14	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00
C15	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
C16	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00
C17	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
C18	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00
C20	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00
C21	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
C22	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
C23	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00
C24	1.00	0.34	0.14	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.34	0.00	0.00	0.53	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Thu Mar 07 19:06:14 2019  
Analysis ended on: Thu Mar 07 19:06:16 2019  
Total elapsed time: 00:00:02

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 5. Modello SWMM TR 20 anni durate di pioggia 0.4, 1, 3 e 6 ore sbocco rigurgitato nel Fosso Pratella**

**ALLEGATO 5.1. File di input modello SWMM con caratteristiche rete di calcolo**

[TITLE]  
;;Project Title/Notes

[OPTIONS]  
;;Option Value  
FLOW\_UNITS LPS  
INFILTRATION CURVE\_NUMBER  
FLOW\_ROUTING DYNWAVE  
LINK\_OFFSETS DEPTH  
MIN\_SLOPE 0  
ALLOW\_PONDING NO  
SKIP\_STEADY\_STATE NO

START\_DATE 03/05/2019  
START\_TIME 00:00:00  
REPORT\_START\_DATE 03/05/2019  
REPORT\_START\_TIME 00:00:00  
END\_DATE 03/05/2019  
END\_TIME 18:00:00  
SWEEP\_START 01/01  
SWEEP\_END 12/31  
DRY\_DAYS 0  
REPORT\_STEP 00:01:00  
WET\_STEP 00:01:00  
DRY\_STEP 00:01:00  
ROUTING\_STEP 0:00:01

INERTIAL\_DAMPING PARTIAL  
NORMAL\_FLOW\_LIMITED BOTH  
FORCE\_MAIN\_EQUATION H-W  
VARIABLE\_STEP 0.75  
LENGTHENING\_STEP 0  
MIN\_SURFAREA 1.14  
MAX\_TRIALS 8  
HEAD\_TOLERANCE 0.0015  
SYS\_FLOW\_TOL 5  
LAT\_FLOW\_TOL 5  
MINIMUM\_STEP 0.5  
THREADS 1

[EVAPORATION]  
;;Data Source Parameters  
;;-----  
CONSTANT 0.0  
DRY\_ONLY NO

[RAINGAGES]  
;;Name Format Interval SCF Source  
;;-----  
TR20 VOLUME 1:00 1.0 TIMESERIES icTR20TP01.00h

[SUBCATCHMENTS]  
;;Name Rain Gage Outlet Area %Imperv Width %Slope CurbLen SnowPack  
;;-----  
S1 TR20 J1 1.04 75.7 222 0.005 0  
S2 TR20 J3 1.596 100 206 0.005 0  
S3 TR20 J5 2.119 71.5 388 0.005 0  
S4 TR20 J20 0.188 40.5 180 0.005 0  
S5 TR20 J19 0.135 51.6 180 0.005 0  
S6 TR20 J18 0.187 40.7 180 0.005 0  
S7 TR20 J6 0.043 85.8 70 0.005 0  
S8 TR20 J7 0.108 92.8 200 0.005 0  
S9 TR20 J16 0.17 47.4 180 0.005 0  
S10 TR20 J17 0.131 53.4 180 0.005 0  
S11 TR20 J13 0.105 100 200 0.005 0  
S12 TR20 J15 0.169 43.9 180 0.005 0  
S13 TR20 J14 0.128 53 180 0.005 0  
S14 TR20 J11 0.067 100 72 0.005 0

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
**Marzo 2019**

[SUBAREAS]							
;;Subcatchment	N-Imperv	N-Perv	S-Imperv	S-Perv	PctZero	RouteTo	PctRouted
;;-----	-----	-----	-----	-----	-----	-----	-----
S1	0.014	0.2	2	3	0	OUTLET	
S2	0.014	0.2	2	3	0	OUTLET	
S3	0.014	0.2	2	3	0	OUTLET	
S4	0.014	0.2	2	3	0	OUTLET	
S5	0.014	0.2	2	3	0	OUTLET	
S6	0.014	0.2	2	3	0	OUTLET	
S7	0.014	0.2	2	3	0	OUTLET	
S8	0.014	0.2	2	3	0	OUTLET	
S9	0.014	0.2	2	3	0	OUTLET	
S10	0.014	0.2	2	3	0	OUTLET	
S11	0.014	0.2	2	3	0	OUTLET	
S12	0.014	0.2	2	3	0	OUTLET	
S13	0.014	0.2	2	3	0	OUTLET	
S14	0.014	0.2	2	3	0	OUTLET	
[INFILTRATION]							
;;Subcatchment	CurveNum		DryTime				
;;-----	-----	-----	-----				
S1	86.9	0	4				
S2	86.9	0	4				
S3	86.2	0	4				
S4	88.9	0	4				
S5	89.7	0	4				
S6	88.8	0	4				
S7	84	0	4				
S8	84	0	4				
S9	89.5	0	4				
S10	88.6	0	4				
S11	88.6	0	4				
S12	89.2	0	4				
S13	88.5	0	4				
S14	88.5	0	4				
[JUNCTIONS]							
;;Name	Elevation	MaxDepth	InitDepth	SurDepth	Aponded		
;;-----	-----	-----	-----	-----	-----		
J1	-1.479	1.479	0	0	0		
J2	-1.494	1.494	0	0	0		
J3	-1.559	1.559	0	0	0		
J4	-1.575	1.575	0	0	0		
J5	-1.675	1.675	0	0	0		
J6	-1.64	1.64	0	0	0		
J7	-1.69	1.69	0	0	0		
J8	-1.775	1.775	0	0	0		
J9	-1.788	1.788	0	0	0		
J10	-1.8	1.8	0	0	0		
J11	-1.644	1.644	0	0	0		
J12	-1.67	1.67	0	0	0		
J13	-1.681	1.681	0	0	0		
J14	-1.708	1.708	0	0	0		
J15	-1.7	1.7	0	0	0		
J16	-1.7	1.7	0	0	0		
J17	-1.712	1.712	0	0	0		
J18	-1.549	1.549	0	0	0		
J19	-1.561	1.561	0	0	0		
J20	-1.575	1.575	0	0	0		
J21	-1.665	1.665	0	0	0		
J22	-1.649	1.649	0	0	0		
J23	-1.636	1.636	0	0	0		
J24	-1.81	1.81	0	0	0		
J25	-1.82	1.82	0	0	0		
[OUTFALLS]							
;;Name	Elevation	Type	Stage Data	Gated	Route To		
;;-----	-----	-----	-----	-----	-----		
SCARICO	-1.82	FIXED	-0.59	YES			
[CONDUITS]							
;;Name	From Node	To Node	Length	Roughness	InOffset	OutOffset	InitFlow
MaxFlow							
;;-----	-----	-----	-----	-----	-----	-----	-----
C1	J1	J2	15	0.013	0	0	0
C2	J2	J3	65	0.013	0	0	0
C3	J3	J4	16	0.013	0	0	0

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C4	J4	J5	100	0.013	0	0	0	0
C5	J5	J7	15	0.013	0	0	0	0
C6	J7	J8	85	0.013	0	0	0	0
C7	J8	J9	13	0.013	0	0	0	0
C8	J9	J10	12	0.013	0	0	0	0
C10	J15	J9	88	0.013	0	0	0	0
C11	J16	J9	88	0.013	0	0	0	0
C12	J17	J10	88	0.013	0	0	0	0
C13	J14	J10	92	0.013	0	0	0	0
C14	J11	J12	26	0.013	0	0	0	0
C15	J12	J13	11	0.013	0	0	0	0
C16	J13	J8	94	0.013	0	0	0	0
C17	J20	J21	90	0.013	0	0	0	0
C18	J21	J5	10	0.013	0	0	0	0
C19	J19	J22	88	0.013	0	0	0	0
C20	J22	J21	16	0.013	0	0	0	0
C21	J18	J23	87	0.013	0	0	0	0
C22	J23	J22	13	0.013	0	0	0	0
C23	J6	J5	35	0.013	0	0	0	0
C24	J24	J25	3	0.013	0	0	0	0
C25	J25	SCARICO	3	0.013	0	0	0	0

[ORIFICES]							
;;Name	From Node	To Node	Type	Offset	Qcoeff	Gated	CloseTime
;;-----							
C9	J10	J25	SIDE	0	0.6401	NO	0

[WEIRS]									
;;Name	From Node		To Node		Type	CrestHt	Qcoeff	Gated	EndCon
EndCoeff	Surcharge	RoadWidth	RoadSurf						
;;-----									
R1	J10	J24		TRANSVERSE	1.03	1.67	NO	0	0
YES									

[XSECTIONS]							
;;Link	Shape	Geom1	Geom2	Geom3	Geom4	Barrels	Culvert
;;-----							
C1	CIRCULAR	0.852	0	0	0	1	
C2	CIRCULAR	0.852	0	0	0	1	
C3	CIRCULAR	0.852	0	0	0	1	
C4	CIRCULAR	0.852	0	0	0	1	
C5	CIRCULAR	0.852	0	0	0	2	
C6	CIRCULAR	1.03	0	0	0	2	
C7	CIRCULAR	1.03	0	0	0	2	
C8	CIRCULAR	1.03	0	0	0	2	
C10	CIRCULAR	1.03	0	0	0	2	
C11	CIRCULAR	1.03	0	0	0	2	
C12	CIRCULAR	1.03	0	0	0	2	
C13	CIRCULAR	1.03	0	0	0	2	
C14	CIRCULAR	0.852	0	0	0	1	
C15	CIRCULAR	0.852	0	0	0	1	
C16	CIRCULAR	1.03	0	0	0	2	
C17	CIRCULAR	0.852	0	0	0	2	
C18	CIRCULAR	0.852	0	0	0	2	
C19	CIRCULAR	0.852	0	0	0	2	
C20	CIRCULAR	0.852	0	0	0	2	
C21	CIRCULAR	0.852	0	0	0	2	
C22	CIRCULAR	0.852	0	0	0	2	
C23	CIRCULAR	0.852	0	0	0	1	
C24	CIRCULAR	1.03	0	0	0	1	
C25	CIRCULAR	1.03	0	0	0	2	
C9	CIRCULAR	0.344	0	0	0		
R1	RECT_OPEN	0.4	4	0	0		

[LOSSES]					
;;Link	Kentry	Kexit	Kavg	Flap Gate	Seepage
;;-----					
C24	0	0	0	YES	0

[TIMESERIES]			
;;Name	Date	Time	Value
;;-----			
icTR20TP00.20h		00:00	0
icTR20TP00.20h		00:12	31.78
;			
icTR20TP00.40h		00:00	0
icTR20TP00.40h		00:24	37.26
;			

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

icTR20TP00.60h	00:00	0
icTR20TP00.60h	00:36	40.89
;		
icTR20TP00.80h	00:00	0
icTR20TP00.80h	00:48	43.68
;		
icTR20TP01.00h	00:00	0
icTR20TP01.00h	01:00	45.98
;		
icTR20TP01.20h	00:00	0
icTR20TP01.20h	01:12	47.94
;		
icTR20TP01.40h	00:00	0
icTR20TP01.40h	01:24	49.67
;		
icTR20TP01.60h	00:00	0
icTR20TP01.60h	01:36	51.21
;		
icTR20TP01.80h	00:00	0
icTR20TP01.80h	01:48	52.62
;		
icTR20TP02.00h	00:00	0
icTR20TP02.00h	02:00	53.91
;		
icTR20TP03.00h	00:00	0
icTR20TP03.00h	03:00	59.16
;		
icTR20TP06.00h	00:00	0
icTR20TP06.00h	06:00	69.36

[REPORT]  
;;Reporting Options  
INPUT NO  
CONTROLS NO  
SUBCATCHMENTS ALL  
NODES ALL  
LINKS ALL

[TAGS]

[MAP]  
DIMENSIONS 113.033 435.986 11201.846 8860.439  
Units None

[COORDINATES]  
;;Node X-Coord Y-Coord  
;;-----  
J1 6856.978 8396.770  
J2 6868.512 7912.341  
J3 6880.046 6078.431  
J4 6880.046 5617.070  
J5 6868.512 2768.166  
J6 6926.182 1776.240  
J7 6430.219 2756.632  
J8 3985.006 2733.564  
J9 3985.006 2341.407  
J10 3996.540 2006.920  
J11 1147.636 1718.570  
J12 1089.965 2502.884  
J13 1355.248 2779.700  
J14 1366.782 1995.386  
J15 1516.724 2329.873  
J16 6476.355 2341.407  
J17 6487.889 1983.852  
J18 9694.348 1972.318  
J19 9659.746 2433.679  
J20 9682.814 2848.904  
J21 7156.863 2860.438  
J22 7202.999 2387.543  
J23 7214.533 1983.852  
J24 4227.220 1591.696  
J25 3788.927 1280.277  
SCARICO 3754.325 922.722

[VERTICES]  
;;Link X-Coord Y-Coord  
;;-----

[Polygons]

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

;;Subcatchment	X-Coord	Y-Coord
;;-----	-----	-----
S1	5657.439	8454.441
S1	5657.439	8016.148
S1	5126.874	8004.614
S1	5115.340	8477.509
S2	8241.061	7704.729
S2	8298.731	7289.504
S2	7768.166	7243.368
S2	7756.632	7727.797
S3	5703.576	6378.316
S3	5738.178	5870.819
S3	5253.749	5870.819
S3	5276.817	6412.918
S4	10628.604	3587.082
S4	10651.672	3125.721
S4	10132.641	3091.119
S4	10144.175	3598.616
S5	10686.275	2802.768
S5	10697.809	2283.737
S5	10224.913	2295.271
S5	10236.448	2814.302
S6	10594.002	1914.648
S6	10582.468	1407.151
S6	10132.641	1407.151
S6	10132.641	1949.250
S7	7283.737	1245.675
S7	7306.805	818.916
S7	6787.774	818.916
S7	6799.308	1257.209
S8	6245.675	3552.480
S8	6245.675	3137.255
S8	5772.780	3148.789
S8	5772.780	3633.218
S9	5899.654	1672.434
S9	5934.256	1280.277
S9	5472.895	1268.743
S9	5449.827	1683.968
S10	6637.832	1695.502
S10	6683.968	1257.209
S10	6199.539	1245.675
S10	6176.471	1683.968
S11	1539.792	3517.878
S11	1585.928	3194.925
S11	1043.829	3125.721
S11	1043.829	3575.548
S12	2797.001	1660.900
S12	2785.467	1245.675
S12	2347.174	1234.141
S12	2347.174	1741.638
S13	1943.483	1683.968
S13	1989.619	1176.471
S13	1447.520	1211.073
S13	1435.986	1672.434
S14	1136.101	1464.821
S14	1124.567	980.392
S14	640.138	968.858
S14	617.070	1522.491

[SYMBOLS]		
;;Gage	X-Coord	Y-Coord
;;-----	-----	-----
TR20	1712.803	7797.001

[PROFILES]	
;;Name	Links
;;-----	-----
"PROFILO_J1-SCARICO"	C1 C2 C3 C4 C5
"PROFILO_J1-SCARICO"	C6 C7 C8 C9 C25
"PROFILO_J11-SCARICO"	C14 C15 C16 C7 C8
"PROFILO_J11-SCARICO"	C9 C25
"PROFILO_J18-SCARICO"	C21 C22 C20 C18 C5
"PROFILO_J18-SCARICO"	C6 C7 C8 C9 C25
"PROFILO_J15-SCARICO"	C10 C8 C9 C25

**ALLEGATO 5.2. Risultati modello SWMM TR 20 anni Tp 0.4 ore**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
 NOTE: The summary statistics displayed in this report are  
 based on results found at every computational time step,  
 not just on results from each reporting time step.  
 \*\*\*\*\*

\*\*\*\*\*  
 Analysis Options  
 \*\*\*\*\*

Flow Units ..... LPS  
 Process Models:  
     Rainfall/Runoff ..... YES  
     RDII ..... NO  
     Snowmelt ..... NO  
     Groundwater ..... NO  
     Flow Routing ..... YES  
     Ponding Allowed ..... NO  
     Water Quality ..... NO  
 Infiltration Method ..... CURVE\_NUMBER  
 Flow Routing Method ..... DYNWAVE  
 Starting Date ..... 03/05/2019 00:00:00  
 Ending Date ..... 03/05/2019 18:00:00  
 Antecedent Dry Days ..... 0.0  
 Report Time Step ..... 00:01:00  
 Wet Time Step ..... 00:01:00  
 Dry Time Step ..... 00:01:00  
 Routing Time Step ..... 1.00 sec  
 Variable Time Step ..... YES  
 Maximum Trials ..... 8  
 Number of Threads ..... 1  
 Head Tolerance ..... 0.001500 m

	Volume hectare-m	Depth mm
Runoff Quantity Continuity		
*****	-----	-----
Total Precipitation .....	0.230	37.260
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.047	7.655
Surface Runoff .....	0.172	27.767
Final Storage .....	0.011	1.853
Continuity Error (%) .....	-0.040	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity		
*****	-----	-----
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.172	1.718
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.008	0.081
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.003
Final Stored Volume .....	0.146	1.460
Continuity Error (%) .....	10.424	

\*\*\*\*\*  
 Highest Continuity Errors  
 \*\*\*\*\*  
 Node J13 (63.63%)  
 Node J23 (41.40%)  
 Node J22 (35.04%)  
 Node J12 (34.86%)  
 Node J25 (24.88%)

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

\*\*\*\*\*  
Time-Step Critical Elements  
\*\*\*\*\*  
None

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link C9 (139)  
Link C24 (136)  
Link R1 (136)  
Link C12 (131)  
Link C13 (131)

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 7.41  
Percent Not Converging : 81.71

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10^6 ltr	Peak Runoff LPS	Runoff Coeff
S1	37.26	0.00	0.00	8.15	27.29	0.28	173.63	0.732
S2	37.26	0.00	0.00	0.00	35.06	0.56	238.63	0.941
S3	37.26	0.00	0.00	9.84	25.69	0.54	322.41	0.689
S4	37.26	0.00	0.00	18.19	17.54	0.03	25.65	0.471
S5	37.26	0.00	0.00	13.55	22.12	0.03	23.58	0.594
S6	37.26	0.00	0.00	18.27	17.57	0.03	25.58	0.472
S7	37.26	0.00	0.00	4.06	31.39	0.01	10.32	0.842
S8	37.26	0.00	0.00	1.92	33.46	0.04	27.14	0.898
S9	37.26	0.00	0.00	15.48	20.28	0.03	26.80	0.544
S10	37.26	0.00	0.00	13.44	22.22	0.03	23.12	0.596
S11	37.26	0.00	0.00	0.00	35.30	0.04	27.15	0.948
S12	37.26	0.00	0.00	16.74	19.01	0.03	25.09	0.510
S13	37.26	0.00	0.00	13.66	22.09	0.03	22.51	0.593
S14	37.26	0.00	0.00	0.00	35.28	0.02	17.20	0.947

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.84	0.91	-0.57	0 01:44	0.90
J2	JUNCTION	0.85	0.92	-0.57	0 01:44	0.91
J3	JUNCTION	0.91	0.98	-0.58	0 01:44	0.98
J4	JUNCTION	0.93	1.00	-0.58	0 01:44	0.99
J5	JUNCTION	1.02	1.10	-0.57	0 01:46	1.09
J6	JUNCTION	0.99	1.06	-0.58	0 01:44	1.06
J7	JUNCTION	1.04	1.11	-0.58	0 01:44	1.11
J8	JUNCTION	1.12	1.19	-0.58	0 01:46	1.19
J9	JUNCTION	1.13	1.21	-0.58	0 01:44	1.20
J10	JUNCTION	1.14	1.21	-0.59	0 01:44	1.21
J11	JUNCTION	0.99	1.10	-0.54	0 01:46	1.07
J12	JUNCTION	1.02	1.13	-0.54	0 01:46	1.10
J13	JUNCTION	1.03	1.13	-0.55	0 01:46	1.11
J14	JUNCTION	1.05	1.15	-0.56	0 01:44	1.13
J15	JUNCTION	1.05	1.16	-0.54	0 01:44	1.13
J16	JUNCTION	1.05	1.16	-0.54	0 01:44	1.13
J17	JUNCTION	1.06	1.16	-0.55	0 01:44	1.15

J18	JUNCTION	0.90	0.99	-0.56	0	01:44	0.96
J19	JUNCTION	0.91	1.01	-0.55	0	01:44	0.98
J20	JUNCTION	0.93	1.02	-0.55	0	01:43	1.00
J21	JUNCTION	1.01	1.09	-0.57	0	01:44	1.08
J22	JUNCTION	1.00	1.08	-0.57	0	01:45	1.06
J23	JUNCTION	0.98	1.07	-0.57	0	01:45	1.05
J24	JUNCTION	1.11	1.24	-0.57	0	01:59	1.23
J25	JUNCTION	1.16	1.23	-0.59	0	01:45	1.23
SCARICO	OUTFALL	1.23	1.23	-0.59	0	00:00	1.23

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	173.63	173.63	0 00:48	0.284	0.284	1.864
J2	JUNCTION	0.00	172.06	0 00:48	0	0.282	9.269
J3	JUNCTION	238.63	402.43	0 00:48	0.559	0.817	3.079
J4	JUNCTION	0.00	396.20	0 00:48	0	0.791	4.429
J5	JUNCTION	322.41	710.12	0 00:48	0.544	1.33	5.814
J6	JUNCTION	10.32	11.19	0 00:50	0.0135	0.0217	93.059
J7	JUNCTION	27.14	605.37	0 00:47	0.0361	1.02	8.037
J8	JUNCTION	0.00	554.37	0 00:47	0	0.977	20.502
J9	JUNCTION	0.00	415.50	0 00:48	0	0.795	27.561
J10	JUNCTION	0.00	221.93	0 01:44	0	4.42	17.299
J11	JUNCTION	17.20	17.20	0 00:48	0.0236	0.0303	39.416
J12	JUNCTION	0.00	15.25	0 00:37	0	0.0362	53.527
J13	JUNCTION	27.15	79.53	0 00:48	0.0371	0.13	174.961
J14	JUNCTION	22.51	87.62	0 00:48	0.0283	0.0971	411.471
J15	JUNCTION	25.09	84.32	0 00:48	0.0321	0.0999	296.474
J16	JUNCTION	26.80	85.76	0 00:48	0.0345	0.101	288.273
J17	JUNCTION	23.12	82.74	0 00:45	0.0291	0.0998	298.442
J18	JUNCTION	25.58	47.49	0 00:52	0.0329	0.0751	211.311
J19	JUNCTION	23.58	41.73	0 00:53	0.0299	0.0682	290.991
J20	JUNCTION	25.65	48.15	0 00:41	0.033	0.0749	254.204
J21	JUNCTION	0.00	180.09	0 00:53	0	0.307	23.650
J22	JUNCTION	0.00	133.46	0 00:52	0	0.245	53.932
J23	JUNCTION	0.00	80.34	0 00:52	0	0.13	70.638
J24	JUNCTION	0.00	187.37	0 01:44	0	3.6	-14.581
J25	JUNCTION	0.00	81.25	0 01:44	0	1.02	33.125
SCARICO	OUTFALL	0.00	84.52	0 01:44	0	0.0809	0.000

\*\*\*\*\*  
Node Surge Summary  
\*\*\*\*\*

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	16.28	0.057	0.570
J2	JUNCTION	16.29	0.071	0.571
J3	JUNCTION	16.36	0.129	0.578
J4	JUNCTION	16.40	0.144	0.579
J5	JUNCTION	16.65	0.249	0.574
J6	JUNCTION	16.56	0.212	0.576
J7	JUNCTION	16.29	0.083	0.577
J8	JUNCTION	16.45	0.164	0.581
J9	JUNCTION	16.49	0.180	0.578
J11	JUNCTION	16.57	0.249	0.543
J12	JUNCTION	16.64	0.275	0.543
J13	JUNCTION	16.29	0.103	0.548
J14	JUNCTION	16.32	0.116	0.562
J15	JUNCTION	16.32	0.133	0.537
J16	JUNCTION	16.32	0.132	0.538
J17	JUNCTION	16.33	0.134	0.548
J18	JUNCTION	16.35	0.141	0.556
J19	JUNCTION	16.37	0.160	0.549
J20	JUNCTION	16.40	0.170	0.553
J21	JUNCTION	16.63	0.242	0.571

J22	JUNCTION	16.58	0.225	0.572
J23	JUNCTION	16.55	0.214	0.570
J25	JUNCTION	16.57	0.204	0.586

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	7.33	17.02	84.52	0.081
System	7.33	17.02	84.52	0.081

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	172.06	0 00:48	0.63	0.35	1.00
C2	CONDUIT	164.97	0 00:48	0.47	0.33	1.00
C3	CONDUIT	396.20	0 00:48	1.06	0.80	1.00
C4	CONDUIT	390.47	0 00:48	1.11	0.79	1.00
C5	CONDUIT	578.27	0 00:47	0.98	0.58	1.00
C6	CONDUIT	554.37	0 00:47	0.86	0.34	1.00
C7	CONDUIT	415.50	0 00:48	0.79	0.25	1.00
C8	CONDUIT	214.18	0 00:48	0.57	0.13	1.00
C10	CONDUIT	60.33	0 00:48	0.33	0.04	1.00
C11	CONDUIT	60.11	0 00:48	0.34	0.04	1.00
C12	CONDUIT	60.71	0 00:45	0.34	0.04	1.00
C13	CONDUIT	66.15	0 00:48	0.33	0.04	1.00
C14	CONDUIT	15.25	0 00:37	0.37	0.03	1.00
C15	CONDUIT	14.18	0 00:36	0.34	0.03	1.00
C16	CONDUIT	66.23	0 00:50	0.37	0.04	1.00
C17	CONDUIT	35.97	0 00:54	0.27	0.04	1.00
C18	CONDUIT	180.09	0 00:53	0.44	0.18	1.00
C19	CONDUIT	35.38	0 00:53	0.33	0.04	1.00
C20	CONDUIT	133.46	0 00:52	0.40	0.13	1.00
C21	CONDUIT	37.61	0 00:52	0.35	0.04	1.00
C22	CONDUIT	80.34	0 00:52	0.32	0.08	1.00
C23	CONDUIT	7.94	0 01:23	0.15	0.02	1.00
C24	CONDUIT	67.35	0 01:44	0.08	0.04	1.00
C25	CONDUIT	84.52	0 01:44	0.05	0.16	1.00
C9	ORIFICE	23.67	0 01:43			1.00
R1	WEIR	187.37	0 01:44			0.49

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class							
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C2	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C3	1.00	0.02	0.00	0.00	0.97	0.00	0.00	0.00	0.00
C4	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C5	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C6	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00
C7	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

C8	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C17	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C18	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C23	1.00	0.02	0.00	0.00	0.98	0.00	0.00	0.00	0.00	0.00
C24	1.00	0.02	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

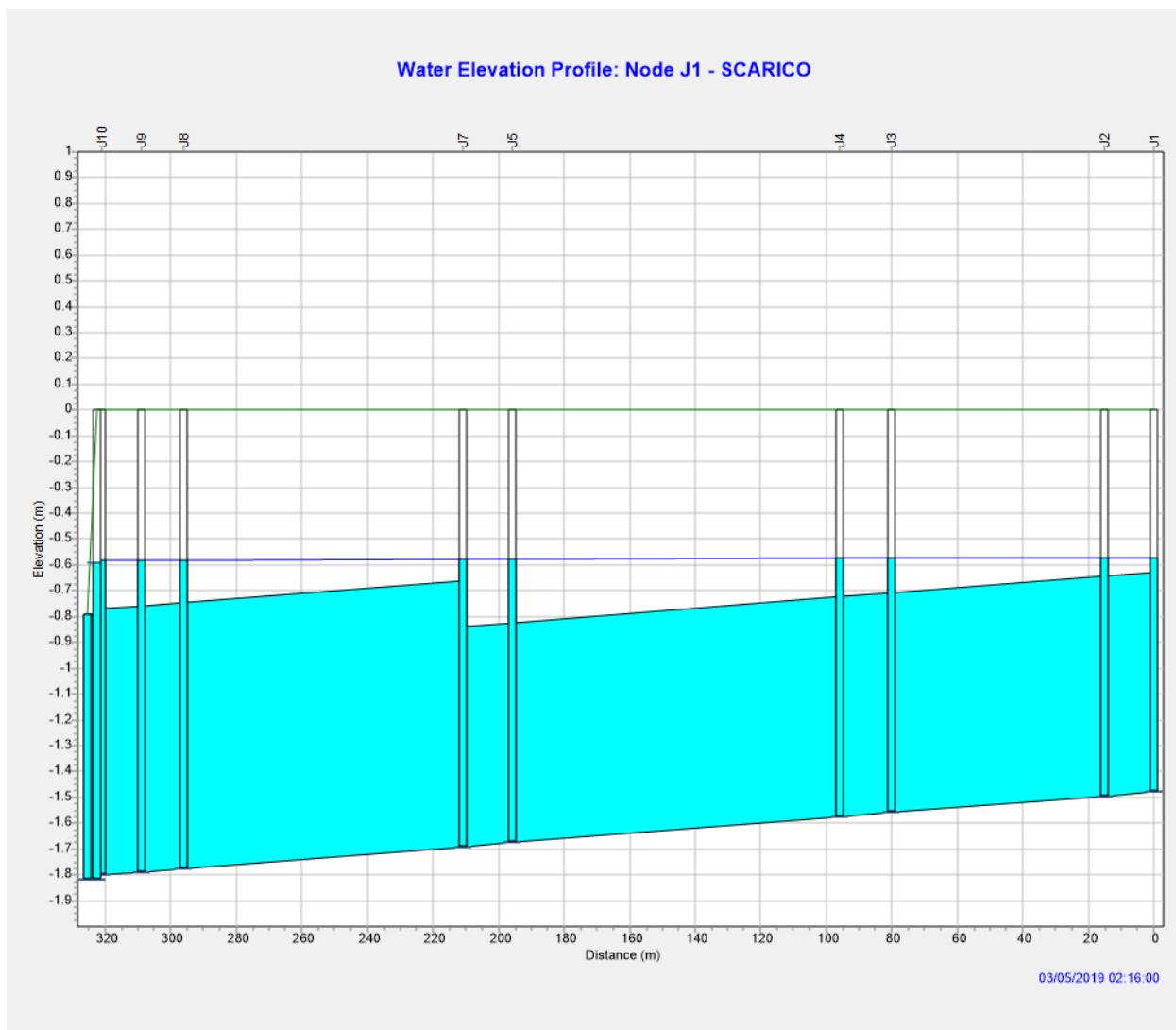
Conduit	----- Hours Full -----			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C1	16.28	16.28	16.29	0.01	0.01
C2	16.29	16.29	16.36	0.01	0.01
C3	16.36	16.36	16.40	0.01	0.01
C4	16.40	16.40	16.65	0.01	0.01
C5	16.65	16.65	16.69	0.01	0.01
C6	16.29	16.29	16.45	0.01	0.01
C7	16.45	16.45	16.49	0.01	0.01
C8	16.49	16.49	16.52	0.01	0.01
C10	16.32	16.32	16.49	0.01	0.01
C11	16.32	16.32	16.49	0.01	0.01
C12	16.33	16.33	16.52	0.01	0.01
C13	16.32	16.32	16.52	0.01	0.01
C14	16.57	16.57	16.64	0.01	0.01
C15	16.64	16.64	16.67	0.01	0.10
C16	16.29	16.29	16.45	0.01	0.01
C17	16.40	16.40	16.63	0.01	0.01
C18	16.63	16.63	16.65	0.01	2.28
C19	16.37	16.37	16.58	0.01	0.01
C20	16.58	16.58	16.63	0.01	0.60
C21	16.35	16.35	16.55	0.01	0.01
C22	16.55	16.55	16.58	0.01	0.98
C23	16.56	16.56	16.65	0.01	0.01
C24	16.45	16.45	16.56	0.01	0.04
C25	16.56	16.56	18.00	0.01	0.54

Analysis begun on: Mon Mar 18 15:39:45 2019  
Analysis ended on: Mon Mar 18 15:39:48 2019  
Total elapsed time: 00:00:03

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 5.3. Risultati modello SWMM TR 20 anni Tp 1.0 ora**



EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

```

Flow Routing ..... YES
Ponding Allowed ..... NO
Water Quality ..... NO
Infiltration Method ..... CURVE_NUMBER
Flow Routing Method ..... DYNWAVE
Starting Date ..... 03/05/2019 00:00:00
Ending Date ..... 03/05/2019 18:00:00
Antecedent Dry Days ..... 0.0
Report Time Step ..... 00:01:00
Wet Time Step ..... 00:01:00
Dry Time Step ..... 00:01:00
Routing Time Step ..... 1.00 sec
Variable Time Step ..... YES
Maximum Trials ..... 8
Number of Threads ..... 1
Head Tolerance ..... 0.001500 m

```

```

*****
Volume      Depth
Runoff Quantity Continuity  hectare-m      mm
*****
Total Precipitation ..... 0.284      45.980
Evaporation Loss ..... 0.000      0.000
Infiltration Loss ..... 0.049      7.941
Surface Runoff ..... 0.224      36.144
Final Storage ..... 0.012      1.900
Continuity Error (%) ..... -0.012

```

```

*****
Volume      Volume
Flow Routing Continuity  hectare-m      10^6 ltr
*****
Dry Weather Inflow ..... 0.000      0.000
Wet Weather Inflow ..... 0.224      2.236
Groundwater Inflow ..... 0.000      0.000
RDII Inflow ..... 0.000      0.000
External Inflow ..... 0.000      0.000
External Outflow ..... 0.060      0.601
Flooding Loss ..... 0.000      0.000
Evaporation Loss ..... 0.000      0.000
Exfiltration Loss ..... 0.000      0.000
Initial Stored Volume .... 0.000      0.003
Final Stored Volume ..... 0.146      1.460
Continuity Error (%) ..... 7.916

```

```

*****
Highest Continuity Errors
*****
Node J13 (72.53%)
Node J23 (49.07%)
Node J12 (38.35%)
Node J22 (36.42%)
Node J21 (21.06%)

```

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*****
Time-Step Critical Elements
*****
None

```

```

*****
Highest Flow Instability Indexes
*****
Link C9 (134)
Link R1 (132)
Link C24 (131)
Link C22 (124)
Link C13 (122)

```

```

*****
Routing Time Step Summary
*****
Minimum Time Step      :      0.50 sec
Average Time Step      :      1.00 sec
Maximum Time Step      :      1.00 sec
Percent in Steady State :      0.00

```

Average Iterations per Step : 7.15  
Percent Not Converging : 77.66

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	45.98	0.00	0.00	8.61	35.53	0.37	108.61	0.773
S2	45.98	0.00	0.00	0.00	43.75	0.70	180.76	0.952
S3	45.98	0.00	0.00	10.66	33.49	0.71	206.74	0.728
S4	45.98	0.00	0.00	18.00	26.50	0.05	16.90	0.576
S5	45.98	0.00	0.00	12.98	31.39	0.04	14.38	0.683
S6	45.98	0.00	0.00	17.93	26.50	0.05	16.83	0.576
S7	45.98	0.00	0.00	4.13	39.97	0.02	5.25	0.869
S8	45.98	0.00	0.00	2.00	42.06	0.05	13.51	0.915
S9	45.98	0.00	0.00	14.93	29.48	0.05	16.88	0.641
S10	45.98	0.00	0.00	13.07	31.26	0.04	13.92	0.680
S11	45.98	0.00	0.00	0.00	43.99	0.05	13.41	0.957
S12	45.98	0.00	0.00	16.27	28.14	0.05	16.17	0.612
S13	45.98	0.00	0.00	13.22	31.12	0.04	13.58	0.677
S14	45.98	0.00	0.00	0.00	43.98	0.03	8.56	0.957

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.80	1.21	-0.27	0 02:02	0.99
J2	JUNCTION	0.82	1.22	-0.28	0 02:02	1.00
J3	JUNCTION	0.88	1.20	-0.36	0 02:02	1.06
J4	JUNCTION	0.89	1.19	-0.38	0 02:02	1.08
J5	JUNCTION	0.98	1.21	-0.46	0 02:03	1.14
J6	JUNCTION	0.95	1.17	-0.47	0 02:03	1.11
J7	JUNCTION	0.99	1.21	-0.48	0 02:03	1.15
J8	JUNCTION	1.07	1.25	-0.52	0 02:03	1.23
J9	JUNCTION	1.08	1.25	-0.54	0 02:03	1.24
J10	JUNCTION	1.09	1.25	-0.55	0 02:03	1.25
J11	JUNCTION	0.95	1.38	-0.26	0 02:03	1.11
J12	JUNCTION	0.97	1.41	-0.26	0 02:03	1.14
J13	JUNCTION	0.98	1.37	-0.31	0 02:03	1.15
J14	JUNCTION	1.01	1.33	-0.37	0 02:03	1.15
J15	JUNCTION	1.00	1.18	-0.52	0 02:03	1.16
J16	JUNCTION	1.00	1.19	-0.51	0 02:03	1.16
J17	JUNCTION	1.01	1.56	-0.15	0 02:03	1.17
J18	JUNCTION	0.86	1.44	-0.10	0 02:02	1.20
J19	JUNCTION	0.87	1.22	-0.34	0 02:02	1.04
J20	JUNCTION	0.89	1.16	-0.41	0 02:02	1.03
J21	JUNCTION	0.97	1.20	-0.46	0 02:03	1.13
J22	JUNCTION	0.96	1.20	-0.45	0 02:03	1.14
J23	JUNCTION	0.94	1.18	-0.45	0 02:03	1.15
J24	JUNCTION	1.08	1.25	-0.56	0 02:03	1.23
J25	JUNCTION	1.11	1.24	-0.58	0 02:03	1.23
SCARICO	OUTFALL	1.23	1.23	-0.59	0 00:00	1.23

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10 <sup>6</sup> ltr	Total Inflow Volume 10 <sup>6</sup> ltr	Flow Balance Error Percent
J1	JUNCTION	108.61	108.61	0 02:00	0.369	0.37	1.422
J2	JUNCTION	0.00	105.18	0 01:59	0	0.367	6.954
J3	JUNCTION	180.76	271.49	0 01:59	0.698	1.04	2.396

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J4	JUNCTION	0.00	257.19	0	01:57	0	1.01	3.431
J5	JUNCTION	206.74	462.58	0	02:03	0.71	1.74	4.262
J6	JUNCTION	5.25	6.83	0	02:00	0.0172	0.0206	104.072
J7	JUNCTION	13.51	470.29	0	02:03	0.0454	1.47	5.479
J8	JUNCTION	0.00	523.72	0	02:03	0	1.42	13.238
J9	JUNCTION	0.00	576.36	0	02:03	0	1.24	16.060
J10	JUNCTION	0.00	702.04	0	02:03	0	4.62	15.241
J11	JUNCTION	8.56	8.56	0	02:00	0.0295	0.033	36.503
J12	JUNCTION	0.00	23.94	0	02:03	0	0.0315	62.194
J13	JUNCTION	13.41	95.94	0	02:02	0.0462	0.114	264.033
J14	JUNCTION	13.58	59.62	0	02:03	0.0398	0.0908	601.602
J15	JUNCTION	16.17	59.73	0	02:02	0.0476	0.0918	436.460
J16	JUNCTION	16.88	62.99	0	02:02	0.0501	0.0922	426.069
J17	JUNCTION	13.92	78.36	0	02:03	0.041	0.0877	578.328
J18	JUNCTION	16.83	42.56	0	02:02	0.0495	0.0728	232.603
J19	JUNCTION	14.38	43.44	0	02:00	0.0424	0.0661	336.260
J20	JUNCTION	16.90	40.60	0	02:01	0.0498	0.0732	270.020
J21	JUNCTION	0.00	125.66	0	01:53	0	0.292	26.679
J22	JUNCTION	0.00	93.66	0	01:58	0	0.224	57.289
J23	JUNCTION	0.00	51.25	0	02:00	0	0.114	96.332
J24	JUNCTION	0.00	428.23	0	02:03	0	3.82	-12.871
J25	JUNCTION	0.00	482.73	0	02:03	0	1.48	19.884
SCARICO	OUTFALL	0.00	484.20	0	02:03	0	0.601	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	15.95	0.359	0.268
J2	JUNCTION	15.95	0.363	0.279
J3	JUNCTION	15.97	0.350	0.357
J4	JUNCTION	15.97	0.341	0.382
J5	JUNCTION	16.00	0.362	0.461
J6	JUNCTION	15.99	0.320	0.468
J7	JUNCTION	15.95	0.184	0.476
J8	JUNCTION	15.97	0.224	0.521
J9	JUNCTION	15.98	0.222	0.536
J11	JUNCTION	15.99	0.527	0.265
J12	JUNCTION	16.00	0.561	0.257
J13	JUNCTION	15.95	0.344	0.307
J14	JUNCTION	15.95	0.305	0.373
J15	JUNCTION	15.95	0.151	0.519
J16	JUNCTION	15.95	0.162	0.508
J17	JUNCTION	15.96	0.527	0.155
J18	JUNCTION	15.96	0.592	0.105
J19	JUNCTION	15.96	0.372	0.337
J20	JUNCTION	15.97	0.311	0.412
J21	JUNCTION	16.00	0.350	0.463
J22	JUNCTION	15.99	0.344	0.453
J23	JUNCTION	15.99	0.333	0.451
J25	JUNCTION	15.99	0.210	0.580

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	11.84	78.36	484.20	0.601
System	11.84	78.36	484.20	0.601

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	105.18	0 01:59	0.51	0.21	1.00
C2	CONDUIT	99.15	0 02:03	0.38	0.20	1.00
C3	CONDUIT	257.19	0 01:57	0.86	0.52	1.00
C4	CONDUIT	259.04	0 02:02	0.87	0.52	1.00
C5	CONDUIT	463.79	0 02:03	0.78	0.47	1.00
C6	CONDUIT	468.10	0 02:03	0.67	0.29	1.00
C7	CONDUIT	533.78	0 02:03	0.62	0.33	1.00
C8	CONDUIT	577.48	0 02:03	0.45	0.35	1.00
C10	CONDUIT	49.56	0 02:02	0.27	0.03	1.00
C11	CONDUIT	52.50	0 02:02	0.27	0.03	1.00
C12	CONDUIT	70.60	0 02:03	0.27	0.04	1.00
C13	CONDUIT	52.14	0 02:03	0.26	0.03	1.00
C14	CONDUIT	8.48	0 02:03	0.31	0.02	1.00
C15	CONDUIT	23.94	0 02:03	0.28	0.05	1.00
C16	CONDUIT	85.63	0 02:02	0.30	0.05	1.00
C17	CONDUIT	27.71	0 02:01	0.22	0.03	1.00
C18	CONDUIT	125.66	0 01:53	0.31	0.13	1.00
C19	CONDUIT	30.99	0 02:00	0.26	0.03	1.00
C20	CONDUIT	93.66	0 01:58	0.27	0.09	1.00
C21	CONDUIT	35.14	0 02:02	0.28	0.04	1.00
C22	CONDUIT	51.25	0 02:00	0.21	0.05	1.00
C23	CONDUIT	3.85	0 02:02	0.14	0.01	1.00
C24	CONDUIT	427.86	0 02:03	0.51	0.29	1.00
C25	CONDUIT	484.20	0 02:03	0.29	0.93	1.00
C9	ORIFICE	55.04	0 02:03			1.00
R1	WEIR	428.23	0 02:03			0.56

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C1	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.01	0.00
C3	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.01	0.00
C5	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C12	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C13	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C14	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.01	0.00
C17	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.01	0.00
C18	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C20	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C23	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.01	0.00
C24	1.00	0.06	0.00	0.00	0.94	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surge Summary  
\*\*\*\*\*

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

Conduit	----- Hours Full -----		----- Dnstream	Hours Above Full	
	Both Ends	Upstream		Normal Flow	Capacity Limited
C1	15.95	15.95	15.95	0.01	0.01
C2	15.95	15.95	15.97	0.01	0.01
C3	15.97	15.97	15.97	0.01	0.01
C4	15.97	15.97	16.00	0.01	0.01
C5	16.00	16.00	16.01	0.01	0.01
C6	15.95	15.95	15.97	0.01	0.01
C7	15.97	15.97	15.98	0.01	0.01
C8	15.98	15.98	15.98	0.01	0.01
C10	15.95	15.95	15.98	0.01	0.01
C11	15.95	15.95	15.98	0.01	0.01
C12	15.96	15.96	15.98	0.01	0.01
C13	15.95	15.95	15.98	0.01	0.01
C14	15.99	15.99	16.00	0.01	0.01
C15	16.00	16.00	16.00	0.01	0.11
C16	15.95	15.95	15.97	0.01	0.01
C17	15.97	15.97	16.00	0.01	0.01
C18	16.00	16.00	16.00	0.01	2.12
C19	15.96	15.96	15.99	0.01	0.01
C20	15.99	15.99	16.00	0.01	0.52
C21	15.96	15.96	15.99	0.01	0.01
C22	15.99	15.99	15.99	0.01	0.93
C23	15.99	15.99	16.00	0.01	0.01
C24	15.96	15.96	15.99	0.01	0.06
C25	15.99	15.99	18.00	0.01	0.83

Analysis begun on: Mon Mar 18 15:37:14 2019  
Analysis ended on: Mon Mar 18 15:37:17 2019  
Total elapsed time: 00:00:03

Progetto:  
Elaborato:  
Data:

Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

**ALLEGATO 5.4. Risultati modello SWMM TR 20 anni Tp 3.0 ore**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
NOTE: The summary statistics displayed in this report are  
based on results found at every computational time step,  
not just on results from each reporting time step.  
\*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... CURVE\_NUMBER

Flow Routing Method ..... DYNWAVE

Starting Date ..... 03/05/2019 00:00:00

Ending Date ..... 03/05/2019 18:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 00:01:00

Routing Time Step ..... 1.00 sec

Variable Time Step ..... YES

Maximum Trials ..... 8

Number of Threads ..... 1

Head Tolerance ..... 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation .....	0.366	59.160
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.047	7.602
Surface Runoff .....	0.307	49.606
Final Storage .....	0.012	1.954
Continuity Error (%) .....	-0.003	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.307	3.069
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.144	1.442
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.003
Final Stored Volume .....	0.146	1.460
Continuity Error (%) .....	5.497	

\*\*\*\*\*

Highest Continuity Errors

\*\*\*\*\*

Node J13 (60.30%)

Node J23 (42.02%)

Node J12 (31.30%)

Node J22 (29.42%)

Node J21 (17.26%)

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

\*\*\*\*\*  
Time-Step Critical Elements  
\*\*\*\*\*  
None

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link C9 (113)  
Link R1 (106)  
Link C24 (105)  
Link C8 (94)  
Link C22 (91)

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*  
Minimum Time Step : 0.32 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 5.91  
Percent Not Converging : 58.42

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	59.16	0.00	0.00	8.20	49.07	0.51	52.60	0.829
S2	59.16	0.00	0.00	0.00	56.82	0.91	87.14	0.960
S3	59.16	0.00	0.00	10.36	46.93	0.99	102.86	0.793
S4	59.16	0.00	0.00	16.73	40.87	0.08	9.17	0.691
S5	59.16	0.00	0.00	12.24	45.29	0.06	6.90	0.765
S6	59.16	0.00	0.00	16.77	40.85	0.08	9.11	0.690
S7	59.16	0.00	0.00	4.33	52.94	0.02	2.28	0.895
S8	59.16	0.00	0.00	2.14	55.08	0.06	5.83	0.931
S9	59.16	0.00	0.00	13.91	43.65	0.07	8.55	0.738
S10	59.16	0.00	0.00	12.52	44.99	0.06	6.66	0.760
S11	59.16	0.00	0.00	0.00	57.16	0.06	5.75	0.966
S12	59.16	0.00	0.00	15.21	42.37	0.07	8.40	0.716
S13	59.16	0.00	0.00	12.68	44.83	0.06	6.49	0.758
S14	59.16	0.00	0.00	0.00	57.15	0.04	3.67	0.966

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.67	0.96	-0.52	0 05:07	0.94
J2	JUNCTION	0.68	0.97	-0.52	0 05:07	0.95
J3	JUNCTION	0.73	1.03	-0.53	0 05:07	1.02
J4	JUNCTION	0.74	1.04	-0.53	0 05:07	1.03
J5	JUNCTION	0.82	1.12	-0.55	0 05:07	1.11
J6	JUNCTION	0.79	1.09	-0.55	0 05:07	1.08
J7	JUNCTION	0.83	1.14	-0.55	0 05:07	1.13
J8	JUNCTION	0.90	1.23	-0.54	0 05:07	1.21
J9	JUNCTION	0.91	1.23	-0.55	0 05:07	1.22
J10	JUNCTION	0.92	1.23	-0.57	0 05:07	1.23
J11	JUNCTION	0.79	1.18	-0.47	0 05:07	1.12
J12	JUNCTION	0.81	1.20	-0.47	0 05:07	1.15
J13	JUNCTION	0.82	1.20	-0.48	0 05:07	1.16
J14	JUNCTION	0.84	1.18	-0.53	0 05:07	1.14
J15	JUNCTION	0.84	1.16	-0.54	0 05:07	1.15
J16	JUNCTION	0.84	1.16	-0.54	0 05:07	1.15

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J17	JUNCTION	0.85	1.18	-0.53	0	05:07	1.15
J18	JUNCTION	0.72	1.10	-0.45	0	05:07	0.98
J19	JUNCTION	0.73	1.21	-0.35	0	05:07	1.00
J20	JUNCTION	0.74	1.17	-0.41	0	05:07	1.02
J21	JUNCTION	0.81	1.12	-0.55	0	05:07	1.10
J22	JUNCTION	0.80	1.11	-0.54	0	05:07	1.08
J23	JUNCTION	0.79	1.09	-0.54	0	05:07	1.07
J24	JUNCTION	0.87	1.24	-0.57	0	05:07	1.23
J25	JUNCTION	0.93	1.24	-0.58	0	05:07	1.23
SCARICO	OUTFALL	1.23	1.23	-0.59	0	00:00	1.23

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	52.60	52.60	0 06:00	0.51	0.511	1.038
J2	JUNCTION	0.00	52.60	0 06:00	0	0.507	4.962
J3	JUNCTION	87.14	139.74	0 06:00	0.907	1.39	1.787
J4	JUNCTION	0.00	139.74	0 06:00	0	1.36	2.527
J5	JUNCTION	102.86	270.06	0 06:00	0.994	2.45	2.850
J6	JUNCTION	2.28	2.95	0 05:03	0.0228	0.0252	72.435
J7	JUNCTION	5.83	275.88	0 06:00	0.0595	2.19	3.639
J8	JUNCTION	0.00	293.82	0 05:08	0	2.16	8.244
J9	JUNCTION	0.00	334.46	0 05:08	0	2.03	9.213
J10	JUNCTION	0.00	395.76	0 05:07	0	4.48	12.284
J11	JUNCTION	3.67	3.67	0 06:00	0.0383	0.041	27.846
J12	JUNCTION	0.00	4.73	0 05:07	0	0.0378	45.556
J13	JUNCTION	5.75	50.76	0 05:07	0.06	0.138	151.872
J14	JUNCTION	6.49	33.90	0 05:06	0.0574	0.109	255.895
J15	JUNCTION	8.40	38.49	0 05:06	0.0716	0.116	183.984
J16	JUNCTION	8.55	38.54	0 05:06	0.0742	0.116	181.375
J17	JUNCTION	6.66	38.35	0 05:05	0.0589	0.106	242.398
J18	JUNCTION	9.11	25.20	0 05:06	0.0764	0.0987	107.282
J19	JUNCTION	6.90	27.61	0 05:07	0.0611	0.0869	144.667
J20	JUNCTION	9.17	23.20	0 05:07	0.0768	0.0996	115.195
J21	JUNCTION	0.00	55.22	0 04:45	0	0.37	20.855
J22	JUNCTION	0.00	38.80	0 04:53	0	0.265	41.683
J23	JUNCTION	0.00	24.66	0 05:02	0	0.136	72.473
J24	JUNCTION	0.00	300.74	0 05:07	0	3.7	-9.920
J25	JUNCTION	0.00	335.85	0 05:07	0	2.1	10.694
SCARICO	OUTFALL	0.00	336.10	0 05:07	0	1.44	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	12.88	0.108	0.519
J2	JUNCTION	12.88	0.121	0.521
J3	JUNCTION	12.90	0.177	0.530
J4	JUNCTION	12.91	0.191	0.532
J5	JUNCTION	12.99	0.272	0.551
J6	JUNCTION	12.95	0.239	0.549
J7	JUNCTION	12.89	0.110	0.550
J8	JUNCTION	12.92	0.201	0.544
J9	JUNCTION	12.93	0.204	0.554
J11	JUNCTION	12.96	0.326	0.466
J12	JUNCTION	12.98	0.347	0.471
J13	JUNCTION	12.88	0.172	0.479
J14	JUNCTION	12.89	0.147	0.531
J15	JUNCTION	12.89	0.133	0.537
J16	JUNCTION	12.89	0.132	0.538
J17	JUNCTION	12.89	0.148	0.534
J18	JUNCTION	12.90	0.245	0.452
J19	JUNCTION	12.90	0.359	0.350
J20	JUNCTION	12.91	0.316	0.407

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
Relazione dei calcoli idraulici fognature bianche  
Marzo 2019

J21	JUNCTION	12.98	0.264	0.549
J22	JUNCTION	12.96	0.255	0.542
J23	JUNCTION	12.95	0.243	0.541
J25	JUNCTION	12.96	0.207	0.583

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	16.68	133.44	336.10	1.442
System	16.68	133.44	336.10	1.442

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	52.60	0 06:00	0.42	0.11	1.00
C2	CONDUIT	54.25	0 05:08	0.31	0.11	1.00
C3	CONDUIT	139.74	0 06:00	0.68	0.28	1.00
C4	CONDUIT	140.65	0 05:08	0.67	0.28	1.00
C5	CONDUIT	270.06	0 06:00	0.61	0.27	1.00
C6	CONDUIT	275.89	0 06:00	0.51	0.17	1.00
C7	CONDUIT	296.01	0 05:08	0.46	0.18	1.00
C8	CONDUIT	335.52	0 05:08	0.34	0.20	1.00
C10	CONDUIT	30.93	0 05:06	0.20	0.02	1.00
C11	CONDUIT	30.74	0 05:06	0.21	0.02	1.00
C12	CONDUIT	32.12	0 05:05	0.20	0.02	1.00
C13	CONDUIT	27.82	0 05:06	0.20	0.02	1.00
C14	CONDUIT	4.73	0 05:07	0.24	0.01	1.00
C15	CONDUIT	6.68	0 05:07	0.23	0.01	1.00
C16	CONDUIT	41.51	0 05:07	0.23	0.03	1.00
C17	CONDUIT	15.15	0 05:07	0.17	0.02	1.00
C18	CONDUIT	55.22	0 04:45	0.19	0.06	1.00
C19	CONDUIT	21.13	0 05:07	0.21	0.02	1.00
C20	CONDUIT	38.80	0 04:53	0.14	0.04	1.00
C21	CONDUIT	23.46	0 05:07	0.22	0.02	1.00
C22	CONDUIT	24.66	0 05:02	0.11	0.02	1.00
C23	CONDUIT	3.92	0 05:06	0.10	0.01	1.00
C24	CONDUIT	297.11	0 05:07	0.36	0.20	1.00
C25	CONDUIT	336.10	0 05:07	0.20	0.64	1.00
C9	ORIFICE	39.04	0 05:07			1.00
R1	WEIR	300.74	0 05:07			0.51

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Up Dry	Down Dry	Fraction of Time Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C2	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.02	0.00
C3	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C4	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C5	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C6	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00

Progetto:  
Elaborato:  
Data:

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
*Relazione dei calcoli idraulici fognature bianche*  
Marzo 2019

C7	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C8	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C11	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C12	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C13	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C14	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C15	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C17	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C18	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C20	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C22	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C23	1.00	0.17	0.00	0.00	0.83	0.00	0.00	0.00	0.01	0.00
C24	1.00	0.17	0.01	0.00	0.82	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

\*\*\*\*\*  
Conduit Surcharge Summary  
\*\*\*\*\*

Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	12.88	12.88	12.88	0.01	0.01
C2	12.88	12.88	12.90	0.01	0.01
C3	12.90	12.90	12.91	0.01	0.01
C4	12.91	12.91	12.99	0.01	0.01
C5	12.99	12.99	13.00	0.01	0.01
C6	12.89	12.89	12.92	0.01	0.01
C7	12.92	12.92	12.93	0.01	0.01
C8	12.93	12.93	12.94	0.01	0.01
C10	12.89	12.89	12.93	0.01	0.01
C11	12.89	12.89	12.93	0.01	0.01
C12	12.89	12.89	12.94	0.01	0.01
C13	12.89	12.89	12.94	0.01	0.01
C14	12.96	12.96	12.98	0.01	0.01
C15	12.98	12.98	12.99	0.01	0.09
C16	12.88	12.88	12.92	0.01	0.01
C17	12.91	12.91	12.98	0.01	0.01
C18	12.98	12.98	12.99	0.01	1.62
C19	12.90	12.90	12.96	0.01	0.01
C20	12.96	12.96	12.98	0.01	0.42
C21	12.90	12.90	12.95	0.01	0.01
C22	12.95	12.95	12.96	0.01	0.64
C23	12.95	12.95	12.99	0.01	0.01
C24	12.91	12.91	12.95	0.01	0.08
C25	12.95	12.95	18.00	0.01	1.23

Analysis begun on: Mon Mar 18 15:40:16 2019  
Analysis ended on: Mon Mar 18 15:40:18 2019  
Total elapsed time: 00:00:02

**ALLEGATO 5.5. Risultati modello SWMM TR 20 anni Tp 6 ore**

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)

WARNING 04: minimum elevation drop used for Conduit C25

\*\*\*\*\*  
 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.  
 \*\*\*\*\*

\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... LPS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... CURVE\_NUMBER

Flow Routing Method ..... DYNWAVE

Starting Date ..... 03/05/2019 00:00:00

Ending Date ..... 03/05/2019 18:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:01:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 00:01:00

Routing Time Step ..... 1.00 sec

Variable Time Step ..... YES

Maximum Trials ..... 8

Number of Threads ..... 1

Head Tolerance ..... 0.001500 m

	Volume	Depth
	hectare-m	mm
Runoff Quantity Continuity		
-----	-----	-----
Total Precipitation .....	0.429	69.360
Evaporation Loss .....	0.000	0.000
Infiltration Loss .....	0.046	7.359
Surface Runoff .....	0.370	59.855
Final Storage .....	0.013	2.147
Continuity Error (%) .....	-0.002	

	Volume	Volume
	hectare-m	10^6 ltr
Flow Routing Continuity		
-----	-----	-----
Dry Weather Inflow .....	0.000	0.000
Wet Weather Inflow .....	0.370	3.703
Groundwater Inflow .....	0.000	0.000
RDII Inflow .....	0.000	0.000
External Inflow .....	0.000	0.000
External Outflow .....	0.209	2.088
Flooding Loss .....	0.000	0.000
Evaporation Loss .....	0.000	0.000
Exfiltration Loss .....	0.000	0.000
Initial Stored Volume ....	0.000	0.003
Final Stored Volume .....	0.146	1.460
Continuity Error (%) .....	4.252	

\*\*\*\*\*

Highest Continuity Errors

\*\*\*\*\*

Node J13 (54.34%)

Node J23 (40.81%)

Node J12 (29.37%)

Node J22 (24.79%)

Node J21 (16.54%)

\*\*\*\*\*  
Time-Step Critical Elements  
\*\*\*\*\*  
None

\*\*\*\*\*  
Highest Flow Instability Indexes  
\*\*\*\*\*  
Link C9 (81)  
Link R1 (68)  
Link C24 (66)  
Link C8 (46)  
Link C22 (43)

\*\*\*\*\*  
Routing Time Step Summary  
\*\*\*\*\*  
Minimum Time Step : 0.50 sec  
Average Time Step : 1.00 sec  
Maximum Time Step : 1.00 sec  
Percent in Steady State : 0.00  
Average Iterations per Step : 4.00  
Percent Not Converging : 27.84

\*\*\*\*\*  
Subcatchment Runoff Summary  
\*\*\*\*\*

Subcatchment	Total Precip mm	Total Runon mm	Total Evap mm	Total Infil mm	Total Runoff mm	Total Runoff 10 <sup>6</sup> ltr	Peak Runoff LPS	Runoff Coeff
S1	69.36	0.00	0.00	7.90	59.43	0.62	31.98	0.857
S2	69.36	0.00	0.00	0.00	66.55	1.06	51.25	0.960
S3	69.36	0.00	0.00	9.94	57.41	1.22	63.88	0.828
S4	69.36	0.00	0.00	16.27	51.52	0.10	5.61	0.743
S5	69.36	0.00	0.00	12.07	55.65	0.08	4.13	0.802
S6	69.36	0.00	0.00	16.31	51.48	0.10	5.58	0.742
S7	69.36	0.00	0.00	4.50	62.95	0.03	1.35	0.908
S8	69.36	0.00	0.00	2.24	65.16	0.07	3.42	0.939
S9	69.36	0.00	0.00	13.59	54.16	0.09	5.16	0.781
S10	69.36	0.00	0.00	12.44	55.27	0.07	3.98	0.797
S11	69.36	0.00	0.00	0.00	67.34	0.07	3.37	0.971
S12	69.36	0.00	0.00	14.86	52.92	0.09	5.09	0.763
S13	69.36	0.00	0.00	12.60	55.10	0.07	3.89	0.794
S14	69.36	0.00	0.00	0.00	67.32	0.05	2.15	0.971

\*\*\*\*\*  
Node Depth Summary  
\*\*\*\*\*

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.48	1.05	-0.42	0 09:22	0.94
J2	JUNCTION	0.48	1.06	-0.44	0 09:22	0.95
J3	JUNCTION	0.52	1.10	-0.46	0 09:22	1.01
J4	JUNCTION	0.53	1.11	-0.47	0 09:22	1.02
J5	JUNCTION	0.59	1.12	-0.56	0 09:23	1.11
J6	JUNCTION	0.57	1.08	-0.56	0 09:22	1.08
J7	JUNCTION	0.60	1.13	-0.56	0 09:23	1.13
J8	JUNCTION	0.65	1.20	-0.57	0 09:23	1.20
J9	JUNCTION	0.66	1.22	-0.57	0 09:23	1.21
J10	JUNCTION	0.67	1.22	-0.58	0 09:23	1.22
J11	JUNCTION	0.57	1.11	-0.53	0 09:23	1.08
J12	JUNCTION	0.59	1.13	-0.54	0 09:23	1.10
J13	JUNCTION	0.59	1.14	-0.54	0 09:23	1.11
J14	JUNCTION	0.61	1.15	-0.56	0 09:24	1.14
J15	JUNCTION	0.60	1.15	-0.55	0 09:23	1.15
J16	JUNCTION	0.60	1.15	-0.55	0 09:23	1.15

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J17	JUNCTION	0.61	1.17	-0.54	0	09:23	1.15
J18	JUNCTION	0.51	1.04	-0.51	0	09:23	1.01
J19	JUNCTION	0.52	1.03	-0.53	0	09:22	1.02
J20	JUNCTION	0.53	1.05	-0.52	0	09:22	1.01
J21	JUNCTION	0.58	1.11	-0.55	0	09:23	1.11
J22	JUNCTION	0.57	1.11	-0.54	0	09:23	1.09
J23	JUNCTION	0.57	1.10	-0.54	0	09:23	1.09
J24	JUNCTION	0.59	1.24	-0.57	0	09:22	1.23
J25	JUNCTION	0.68	1.24	-0.58	0	12:11	1.23
SCARICO	OUTFALL	1.23	1.23	-0.59	0	00:00	1.23

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	31.98	31.98	0 12:00	0.618	0.618	0.859
J2	JUNCTION	0.00	34.00	0 09:22	0	0.613	4.059
J3	JUNCTION	51.25	92.51	0 09:22	1.06	1.65	1.499
J4	JUNCTION	0.00	94.77	0 09:22	0	1.63	2.131
J5	JUNCTION	63.88	164.64	0 09:24	1.22	2.99	1.943
J6	JUNCTION	1.35	1.82	0 09:15	0.0271	0.0287	63.616
J7	JUNCTION	3.42	168.37	0 09:24	0.0704	2.75	3.014
J8	JUNCTION	0.00	200.21	0 09:23	0	2.74	6.394
J9	JUNCTION	0.00	203.73	0 09:24	0	2.63	6.964
J10	JUNCTION	0.00	272.87	0 09:22	0	3.69	9.125
J11	JUNCTION	2.15	2.15	0 11:20	0.0451	0.0463	23.212
J12	JUNCTION	0.00	3.07	0 09:22	0	0.0414	41.578
J13	JUNCTION	3.37	38.78	0 09:22	0.0707	0.153	119.004
J14	JUNCTION	3.89	25.63	0 09:21	0.0705	0.123	179.729
J15	JUNCTION	5.09	25.30	0 09:21	0.0894	0.133	130.386
J16	JUNCTION	5.16	25.58	0 09:21	0.0921	0.133	128.936
J17	JUNCTION	3.98	23.32	0 09:22	0.0724	0.12	168.323
J18	JUNCTION	5.58	25.78	0 09:22	0.0963	0.117	77.252
J19	JUNCTION	4.13	13.51	0 09:20	0.0751	0.101	106.704
J20	JUNCTION	5.61	14.43	0 09:22	0.0969	0.118	81.049
J21	JUNCTION	0.00	33.04	0 08:45	0	0.421	19.816
J22	JUNCTION	0.00	31.02	0 09:22	0	0.283	32.964
J23	JUNCTION	0.00	25.01	0 09:22	0	0.148	68.959
J24	JUNCTION	0.00	242.32	0 12:10	0	3.03	-5.356
J25	JUNCTION	0.00	245.69	0 09:23	0	2.41	6.220
SCARICO	OUTFALL	0.00	245.39	0 09:23	0	2.09	0.000

\*\*\*\*\*  
Node Surcharge Summary  
\*\*\*\*\*

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J1	JUNCTION	8.62	0.203	0.424
J2	JUNCTION	8.62	0.206	0.436
J3	JUNCTION	8.66	0.251	0.456
J4	JUNCTION	8.67	0.255	0.468
J5	JUNCTION	8.80	0.267	0.556
J6	JUNCTION	8.75	0.229	0.559
J7	JUNCTION	8.63	0.098	0.562
J8	JUNCTION	8.69	0.172	0.573
J9	JUNCTION	8.71	0.186	0.572
J11	JUNCTION	8.75	0.257	0.535
J12	JUNCTION	8.79	0.280	0.538
J13	JUNCTION	8.63	0.111	0.540
J14	JUNCTION	8.64	0.115	0.563
J15	JUNCTION	8.64	0.122	0.548
J16	JUNCTION	8.64	0.119	0.551
J17	JUNCTION	8.64	0.139	0.543
J18	JUNCTION	8.65	0.184	0.513
J19	JUNCTION	8.66	0.175	0.534
J20	JUNCTION	8.67	0.200	0.523

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

J21	JUNCTION	8.79	0.259	0.554
J22	JUNCTION	8.76	0.255	0.542
J23	JUNCTION	8.74	0.244	0.540
J25	JUNCTION	8.75	0.206	0.584

\*\*\*\*\*  
Node Flooding Summary  
\*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
Outfall Loading Summary  
\*\*\*\*\*

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
SCARICO	26.41	122.00	245.39	2.088
System	26.41	122.00	245.39	2.088

\*\*\*\*\*  
Link Flow Summary  
\*\*\*\*\*

Link	Type	Maximum  Flow  LPS	Time of Max Occurrence days hr:min	Maximum  Veloc  m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	34.00	0 09:22	0.39	0.07	1.00
C2	CONDUIT	41.60	0 09:22	0.28	0.08	1.00
C3	CONDUIT	94.77	0 09:22	0.59	0.19	1.00
C4	CONDUIT	96.82	0 09:22	0.57	0.20	1.00
C5	CONDUIT	164.98	0 09:24	0.53	0.17	1.00
C6	CONDUIT	177.91	0 09:24	0.42	0.11	1.00
C7	CONDUIT	202.87	0 09:23	0.38	0.12	1.00
C8	CONDUIT	204.64	0 09:24	0.28	0.12	1.00
C10	CONDUIT	21.07	0 09:24	0.17	0.01	1.00
C11	CONDUIT	20.90	0 09:21	0.17	0.01	1.00
C12	CONDUIT	19.62	0 09:22	0.17	0.01	1.00
C13	CONDUIT	22.03	0 09:21	0.17	0.01	1.00
C14	CONDUIT	3.07	0 09:22	0.21	0.01	1.00
C15	CONDUIT	4.02	0 09:23	0.19	0.01	1.00
C16	CONDUIT	33.88	0 09:22	0.19	0.02	1.00
C17	CONDUIT	13.73	0 09:22	0.15	0.01	1.00
C18	CONDUIT	33.04	0 08:45	0.13	0.03	1.00
C19	CONDUIT	10.90	0 09:21	0.18	0.01	1.00
C20	CONDUIT	31.02	0 09:22	0.08	0.03	1.00
C21	CONDUIT	20.91	0 09:22	0.19	0.02	1.00
C22	CONDUIT	25.01	0 09:22	0.09	0.03	1.00
C23	CONDUIT	2.06	0 09:22	0.09	0.00	1.00
C24	CONDUIT	217.38	0 09:23	0.26	0.15	1.00
C25	CONDUIT	245.39	0 09:23	0.15	0.47	1.00
C9	ORIFICE	31.23	0 09:23			1.00
R1	WEIR	242.32	0 12:10			0.49

\*\*\*\*\*  
Flow Classification Summary  
\*\*\*\*\*

Conduit	Adjusted /Actual Length	Up Dry	Down Dry	Fraction of Time Down Sub Dry Crit	Up Sup Crit	Up Down Crit	Down Norm Ltd	Inlet Ctrl
C1	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00
C2	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.03
C3	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00
C4	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.02
C5	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00
C6	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.01

**Progetto:**  
**Elaborato:**  
**Data:**

**Secondo Regolamento Urbanistico – Progetto Unitario Convenzionato Scheda 14.4 – Sistema di fognatura bianca**  
**Relazione dei calcoli idraulici fognature bianche**  
**Marzo 2019**

C7	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C8	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00
C10	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C11	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C12	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C13	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C14	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C15	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C16	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.02	0.00
C17	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.02	0.00
C18	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00
C19	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.02	0.00
C20	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C21	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.03	0.00
C22	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C23	1.00	0.34	0.00	0.00	0.66	0.00	0.00	0.00	0.01	0.00
C24	1.00	0.34	0.01	0.00	0.65	0.00	0.00	0.00	0.00	0.00
C25	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

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Conduit Surcharge Summary  
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Conduit	----- Both Ends	Hours Full Upstream	----- Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	8.62	8.62	8.62	0.01	0.01
C2	8.62	8.62	8.66	0.01	0.01
C3	8.66	8.66	8.67	0.01	0.01
C4	8.67	8.67	8.80	0.01	0.01
C5	8.80	8.80	8.83	0.01	0.01
C6	8.63	8.63	8.69	0.01	0.01
C7	8.69	8.69	8.71	0.01	0.01
C8	8.71	8.71	8.72	0.01	0.01
C10	8.64	8.64	8.71	0.01	0.01
C11	8.64	8.64	8.71	0.01	0.01
C12	8.64	8.64	8.72	0.01	0.01
C13	8.64	8.64	8.72	0.01	0.01
C14	8.75	8.75	8.79	0.01	0.01
C15	8.79	8.79	8.81	0.01	0.05
C16	8.63	8.63	8.69	0.01	0.01
C17	8.67	8.67	8.79	0.01	0.01
C18	8.79	8.79	8.80	0.01	0.71
C19	8.66	8.66	8.76	0.01	0.01
C20	8.76	8.76	8.79	0.01	0.13
C21	8.65	8.65	8.74	0.01	0.01
C22	8.74	8.74	8.76	0.01	0.35
C23	8.75	8.75	8.80	0.01	0.01
C24	8.68	8.68	8.75	0.01	0.09
C25	8.75	8.75	18.00	0.01	0.95

Analysis begun on: Mon Mar 18 15:40:38 2019  
Analysis ended on: Mon Mar 18 15:40:40 2019  
Total elapsed time: 00:00:02