

Optimised Decision Making

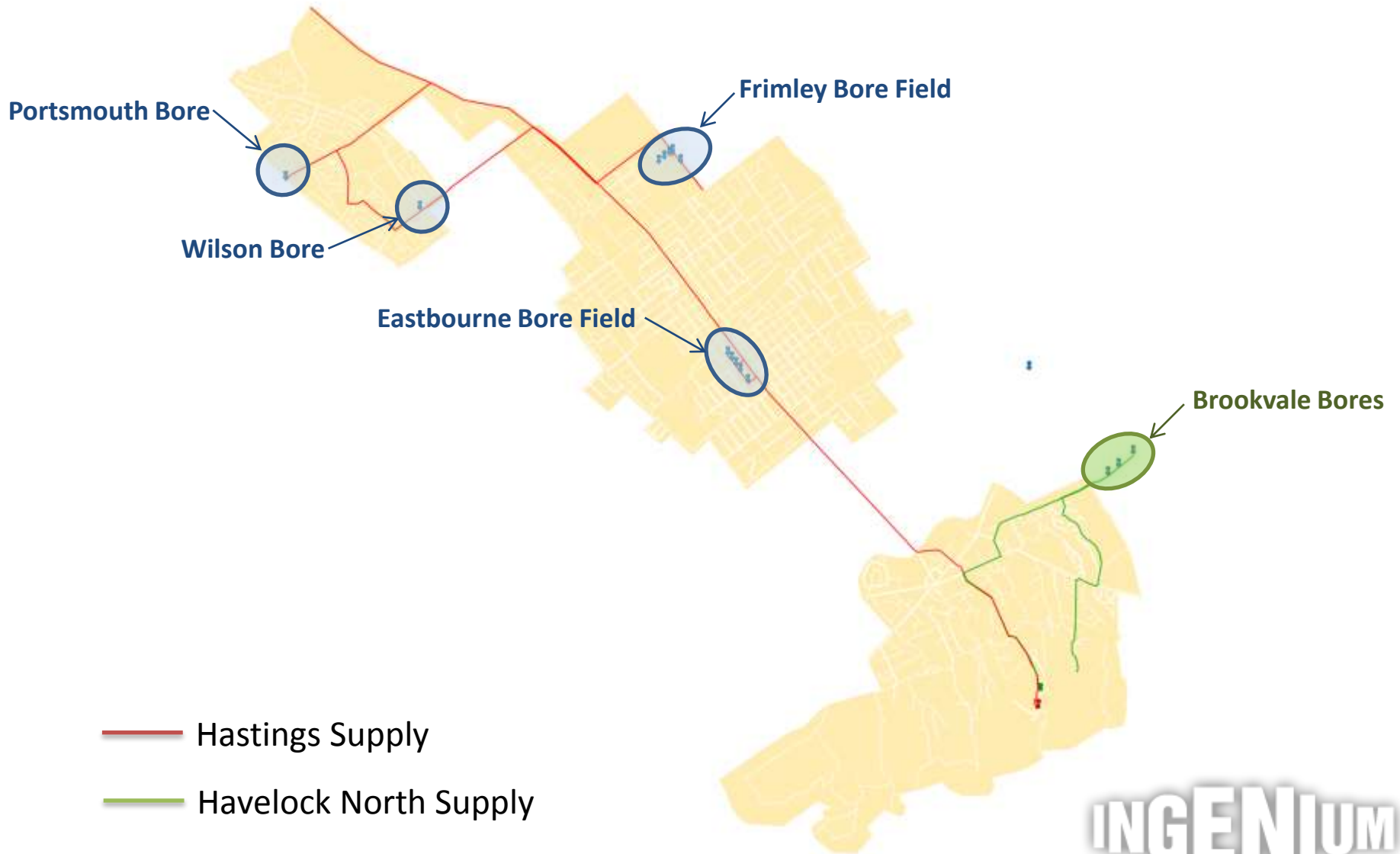
The cost of getting it wrong



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Hastings & Havelock North Supplies

(Trunk Mains & Sources)



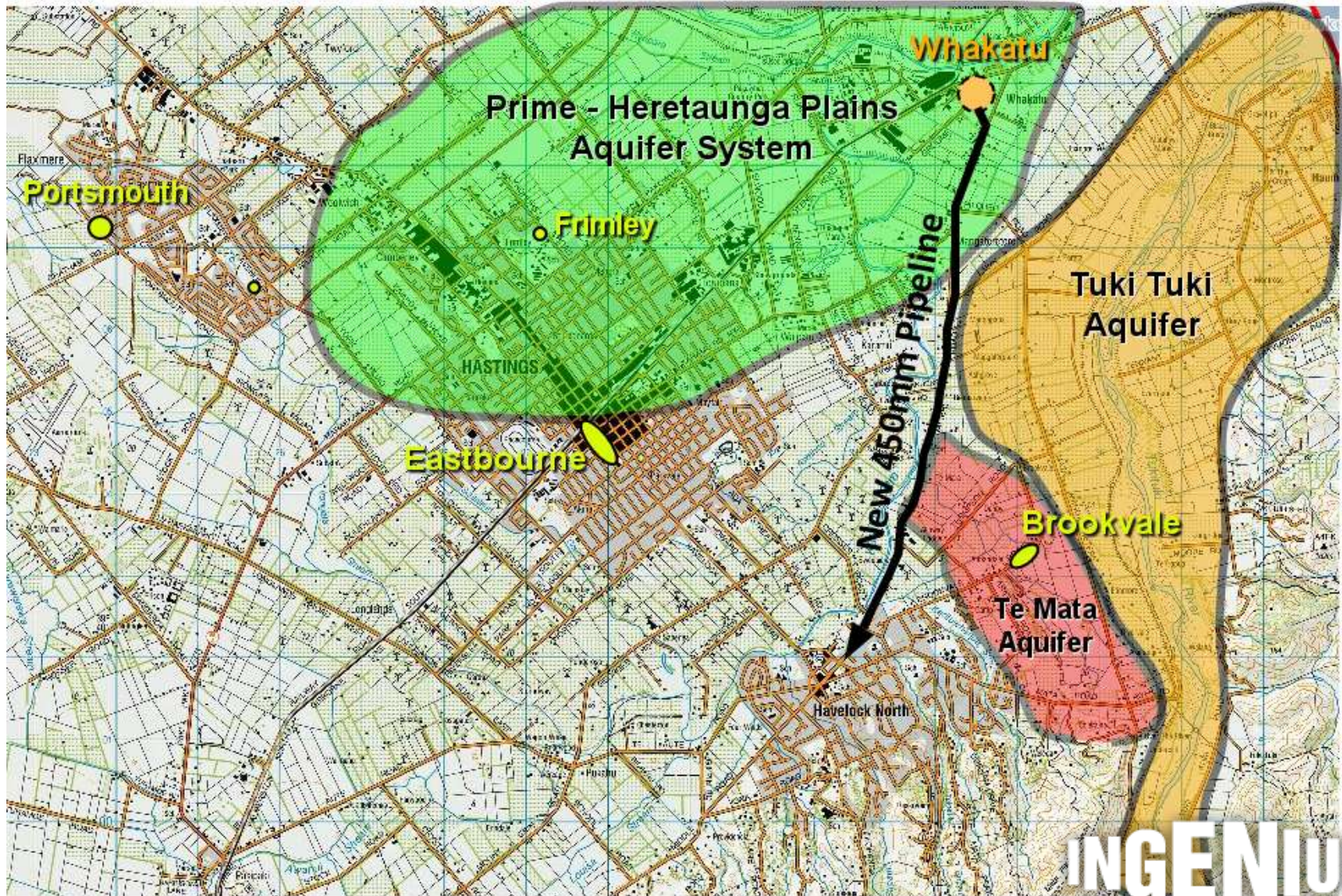
History – A Left Field Decision

- During the late 1990's Havelock North experienced rapid growth in the Arataki Area. The need for additional water was essential.
- In 1998 the HDC sought to increase its existing Brookvale Bores consent from **200Ltr/sec** to 250Ltr/sec to met committed growth needs. At the time the HDC had already constructed a large diameter main leading up to a future reservoir site.
- After applying for what it thought was a simply formality to increase from 200Ltr/sec to 250Ltr/sec, the process turned into a nightmare! The response from the HBRC was that we could only have **90Ltr/sec!** Starting a 10 year consenting process. Unfortunately a local stream had now been identified as being influenced by HDCs' pumping, and it was considered that there could be a potential adverse affect.
- In 2008 the HDC received consent to maintain 200Ltr/sec for a 10 year period.
- The HDC had now committed itself to withdrawing from the Brookvale Bores as a primary source, and the hunt for a new source was on!

Initial Concept and Budget Decision

7.5km - 450mm Pipeline from Whakatu

\$4.5M



Start of the Journey

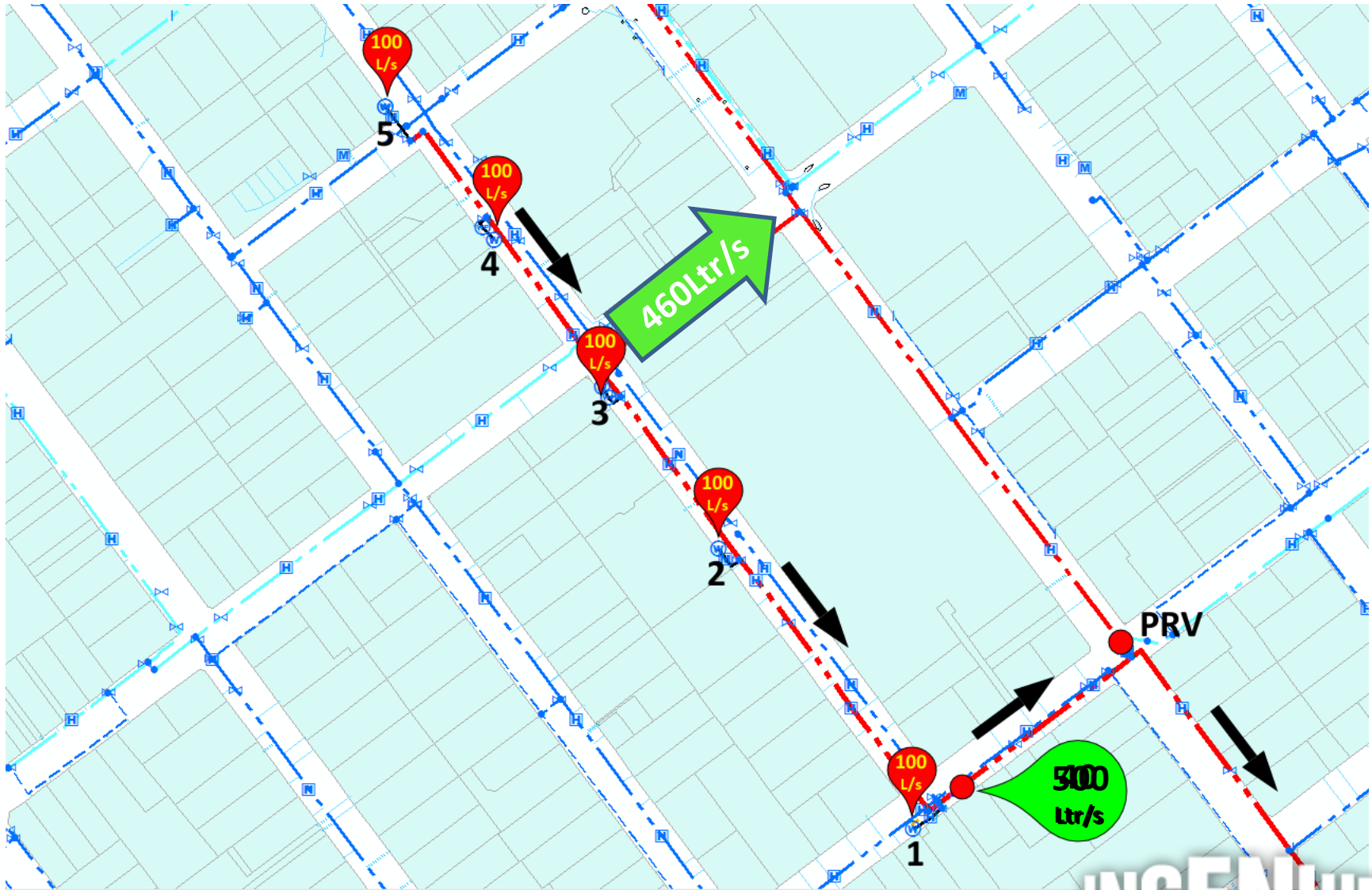
- Initial planning focused on simply replacing the existing Brookvale Road bores.
- The Whakatu area is in a high yielding part of the aquifer with very high water quality. This source would easily provide the additional water required to replace the Brookvale Bores, but would also give an alternative lifelines link for the main Hastings supply located at Eastbourne St.
- Initial Budget was set at \$4.5M
- The next step was to integrate growth needs, level of service desires and constraints, planned renewal and capital works, risk, environmental effects, and cost.
- Another major influence in the HDC's thinking process was the need to replace its main Hastings water supply resource consent which is due for renewal.
- As the HDC embarked on this evaluation process, a new software provider from Australia (Optimatics) presented their new network optimisation software which would ultimately prove a valuable tool.

Network Modelling

- One of the key factors in optimised decision making is quality data.
- The HDC is fortunate that it inherited very high quality infrastructure data.
- High quality data enabled the development of a hydraulic network model in the 1990's. Telemetry data over the last 20 years has gradually calibrated the model. This model formed the basis of the optimisation model
- Key inputs for an optimised network model are known constraints, critical network points, high cost items. E.g. Railway line, high volume roads, newly constructed CBD and areas in the network that you don't want affected. E.g. maintaining a minimum level of service.

• Be wary of historical assumptions! If the data's good, you can trust the model.

Example of Historical assumptions



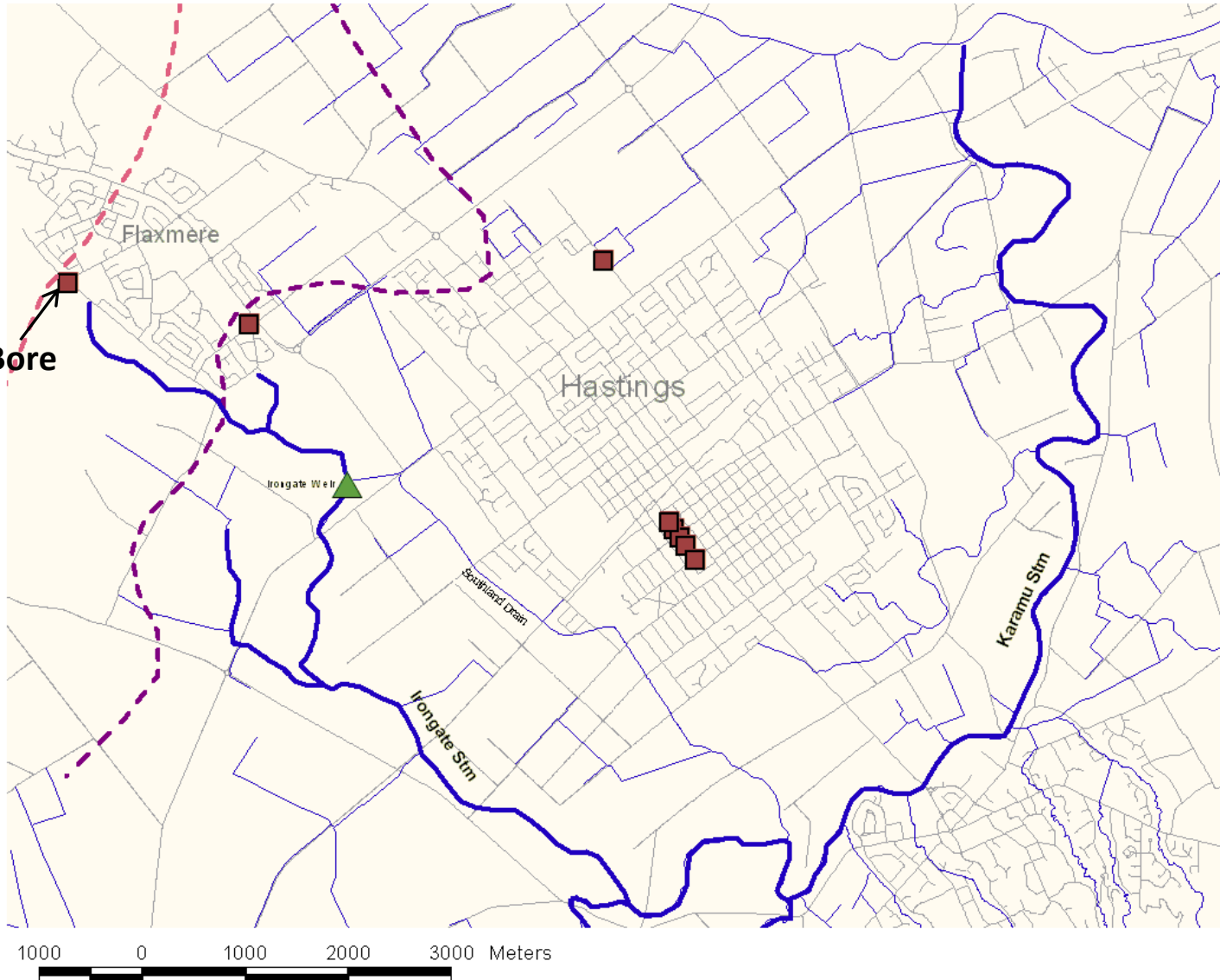
Future Growth Areas



Figure 2-2: Future development areas within Hastings

Aquifer Testing

Principle surface water bodies.

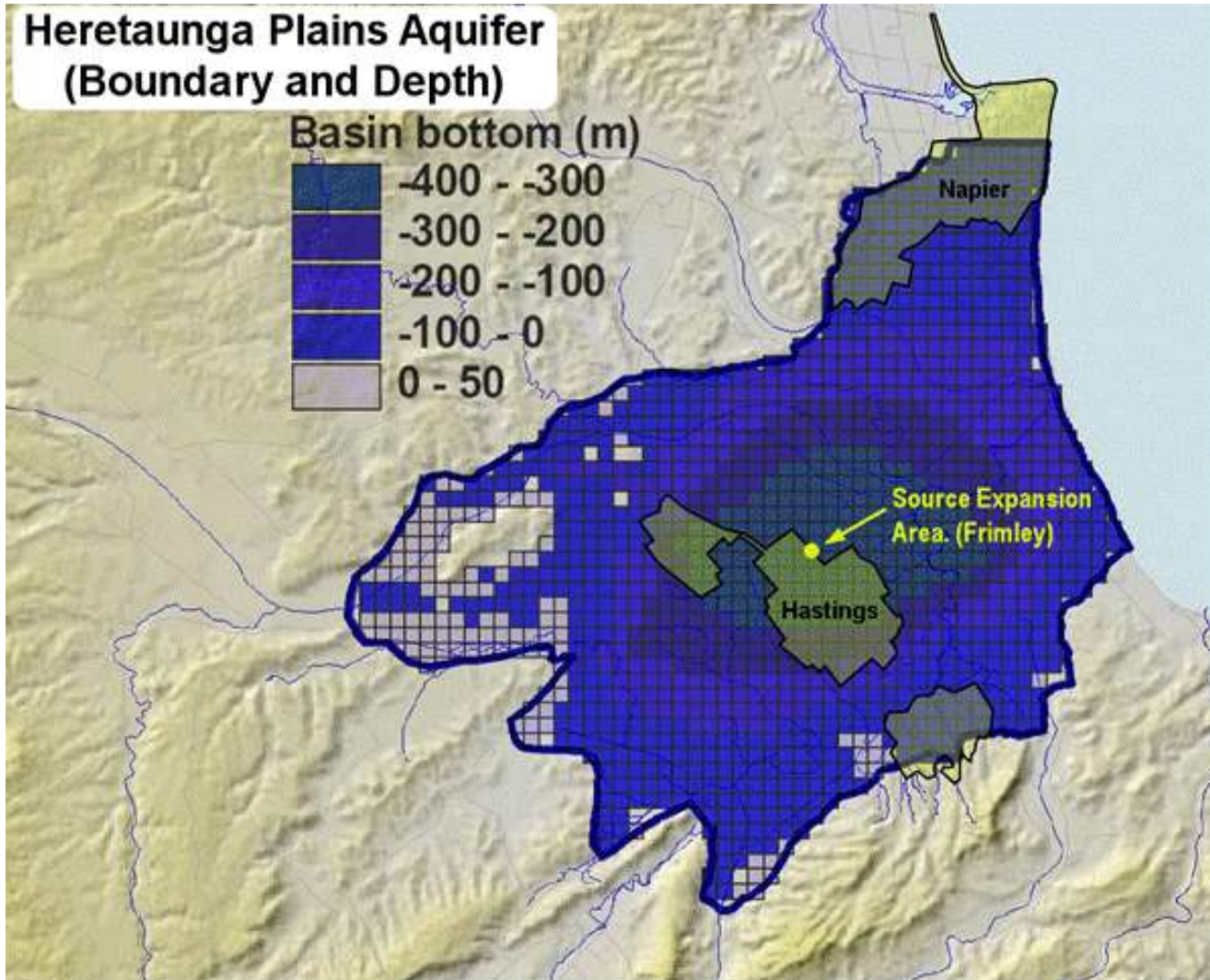


Aquifer Testing Results

- Test results provided some interesting insights into the aquifer system.
- The two Flaxmere bores showed the potential to influence the nearby Irongate Stream.
- The existing Frimley and Eastbourne bore field proved to be extremely valuable, and able to be expanded.
- Results of this testings process was also fed into the optimisation model.

Frimley Bore Field

The optimisation model was setup to allow as many new bores it needed at the Frimley site



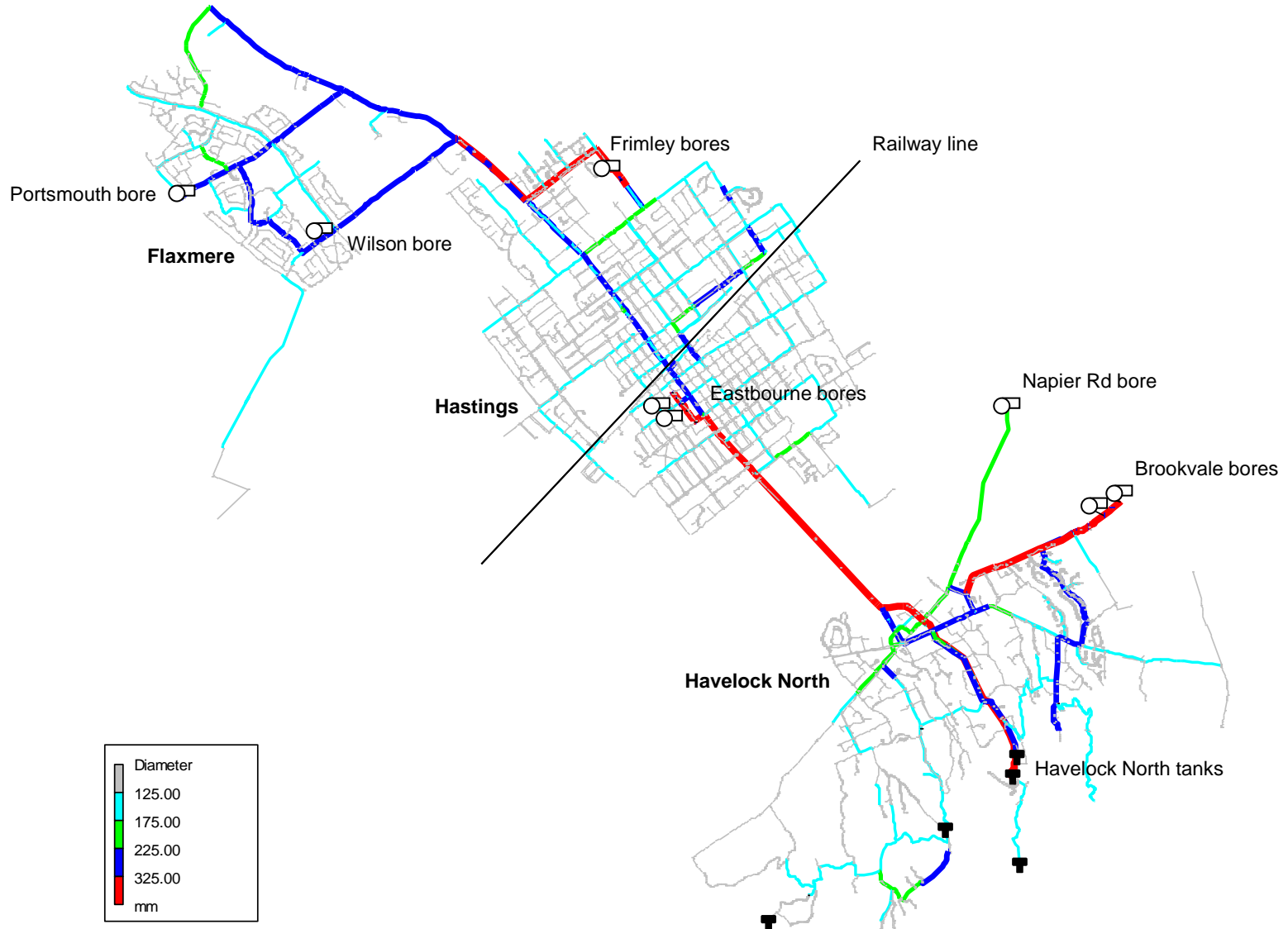


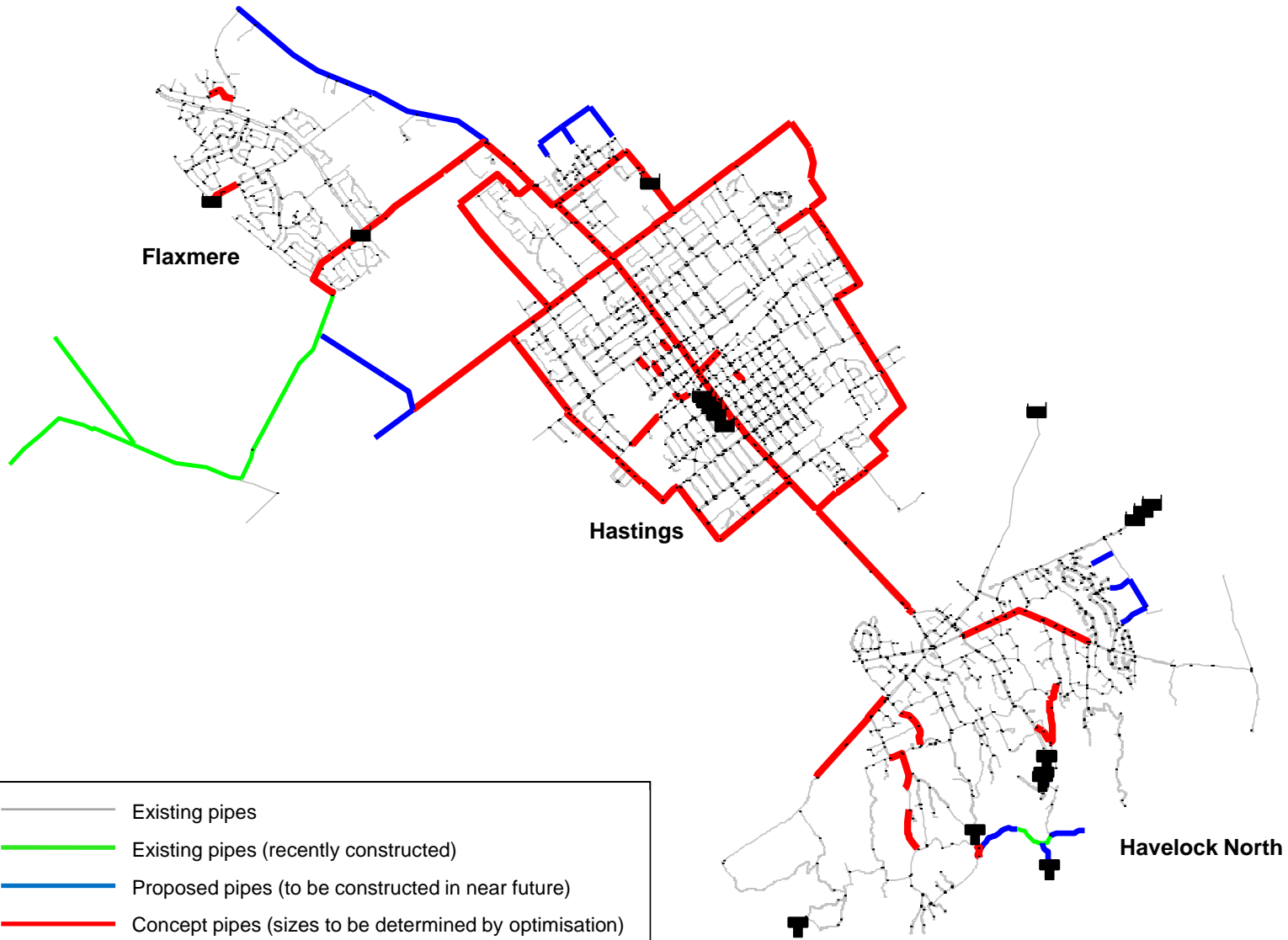
Optimatics

optimizing water systems

Optimisation of the Hastings Water Supply System

Existing Hastings Water Model Imported from Infoworks/Innovyse





New pipe costs

- The optimisation considered the following possible pipe sizes for potential new pipes as well as a “zero” pipe size for non-essential new pipe

Diameter (mm)	Water main in road (\$/m)		
	Supply	Laying in Road	Water Main in Road Valuation
100	22.1	89.3	111.4
125	30.8	103.2	134.0
150	41.0	117.1	158.1
200	65.6	144.8	210.4
225	80.0	158.7	238.7
250	95.8	172.6	268.4
300	131.7	200.4	332.1
330	156.0	217.0	373.0
375	196.2	242.0	438.2
450	273.4	283.6	557.0
500	331.9	311.4	643.3
525	363.3	325.3	688.6
600	465.9	366.9	832.8

Note. HDC provided unit pipe cost data in June 2005 dollars. These unit costs were converted to December 2010 dollars by considering the increase in the Capital Goods Price Index for pipelines (CEPQ S2CB) between June 2005 and December 2010. Adjustment factors (such as environmental performance factors and oncosts) are yet to be taken into account.

Problem formulation in Optimizer

The screenshot displays the Optimizer software interface. The main window shows a network map with a legend indicating 'Proposed pipe' (green) and 'Proposed pipe essential' (red). The interface includes a Properties Editor, a Main Browser, and a table of pipe decisions.

Properties Editor - Pipe Decisions

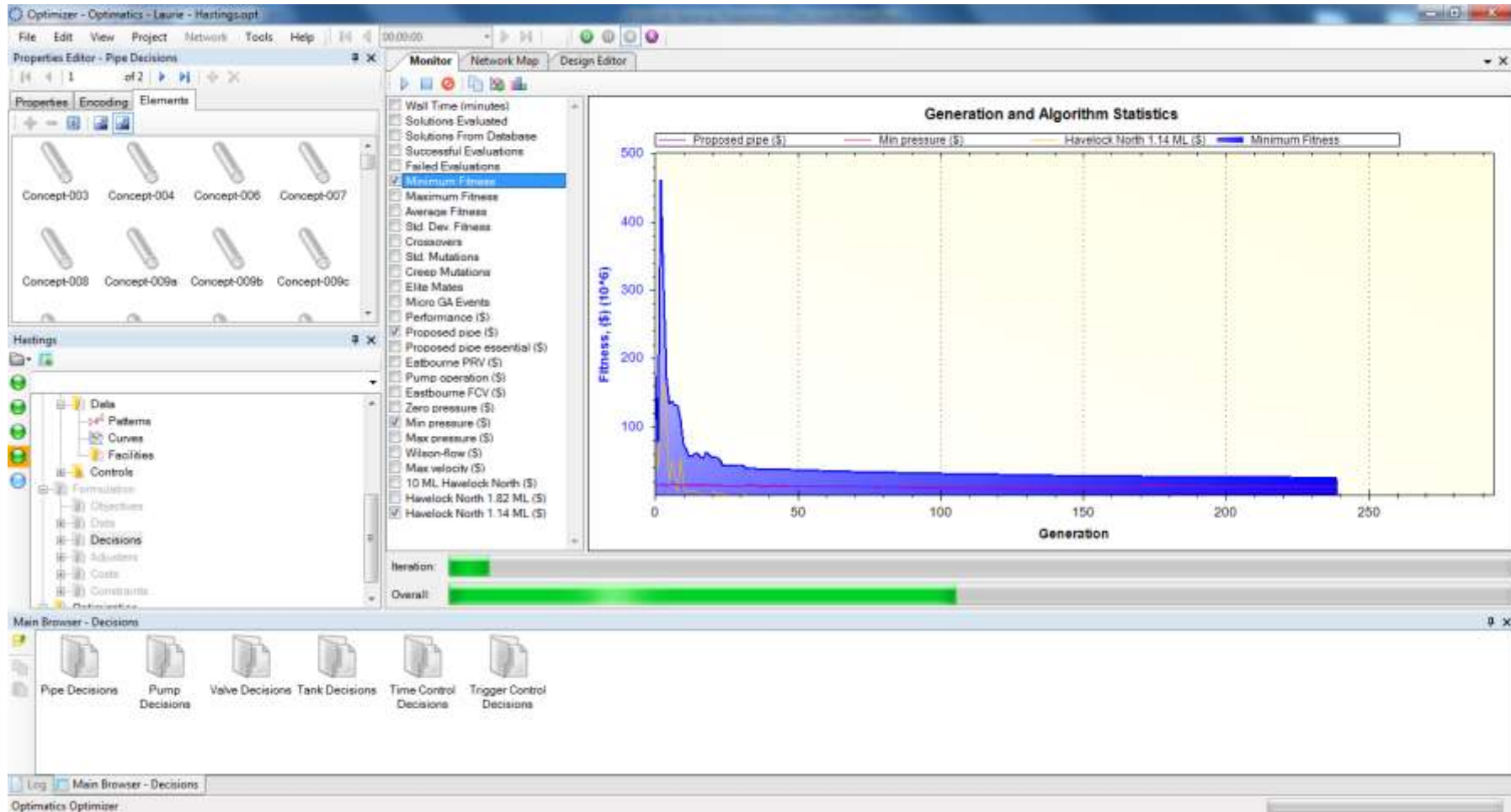
Concept-005a Concept-005b Concept-005c Concept-005d
 Concept-005e Concept-010b Concept-023a Concept-023b

Main Browser - Pipe Decisions

RC	ID	Objective	Material Table	Relining Table	Optional?	Apply Closing Cost?	Closing Cost Equation	Can Leave Unchanged?	Apply Opening Cost?	Opening Cost Equation	Close in Random?	Remove Closed?	Is Group?	Is Exclusive?
75	Proposed pipe	Performance	Base		<input checked="" type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
76	Proposed pipe essential	Performance	Base		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

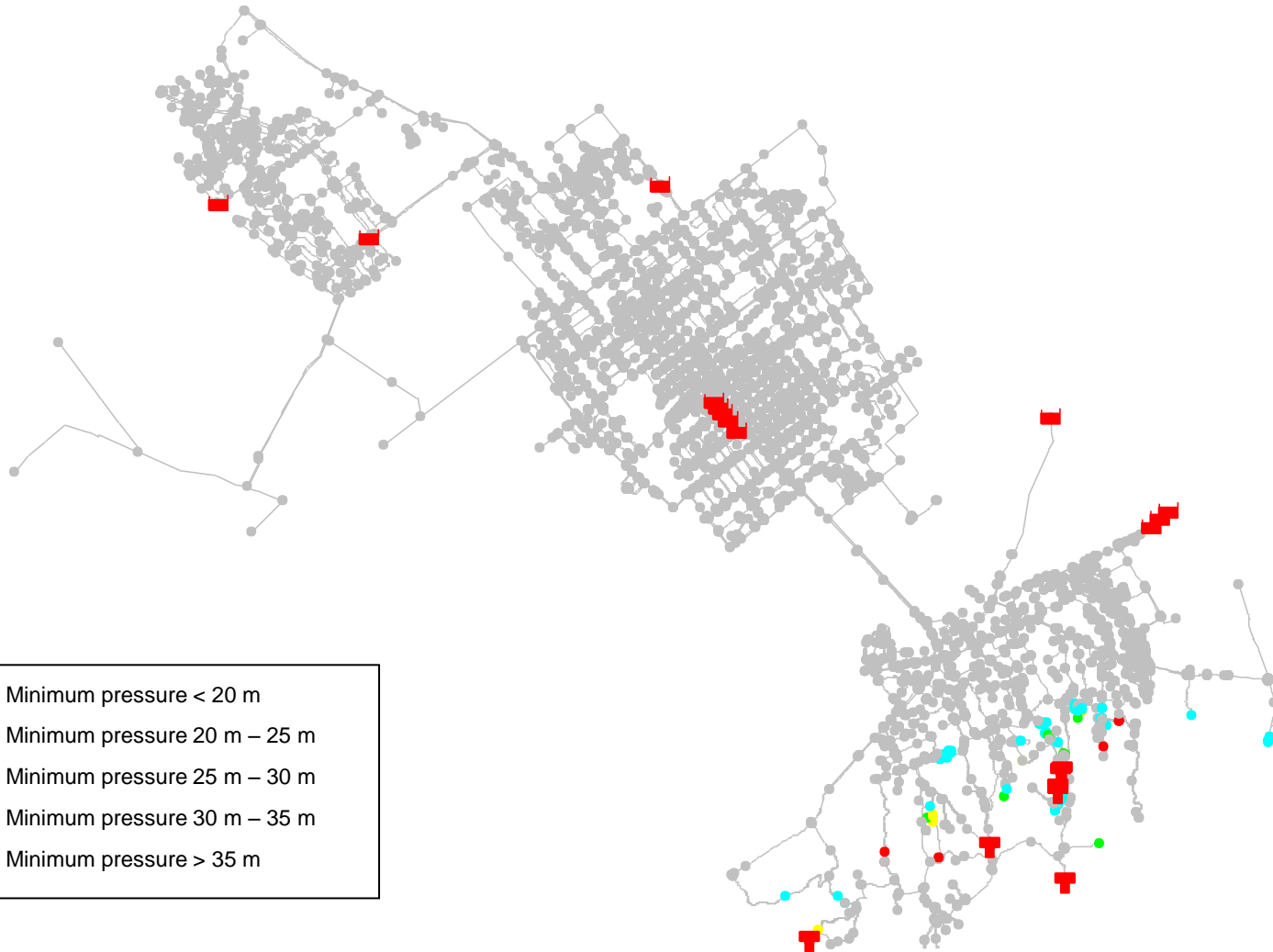
LEGEND
 Pipe Decisions
 Proposed pipe
 Proposed pipe essential

Optimizer run in progress



Optimisation results – low pressures observed

Scenario 6 (< 100 L/s Brookvale; < 80 L/s Wilson; no Portsmouth)

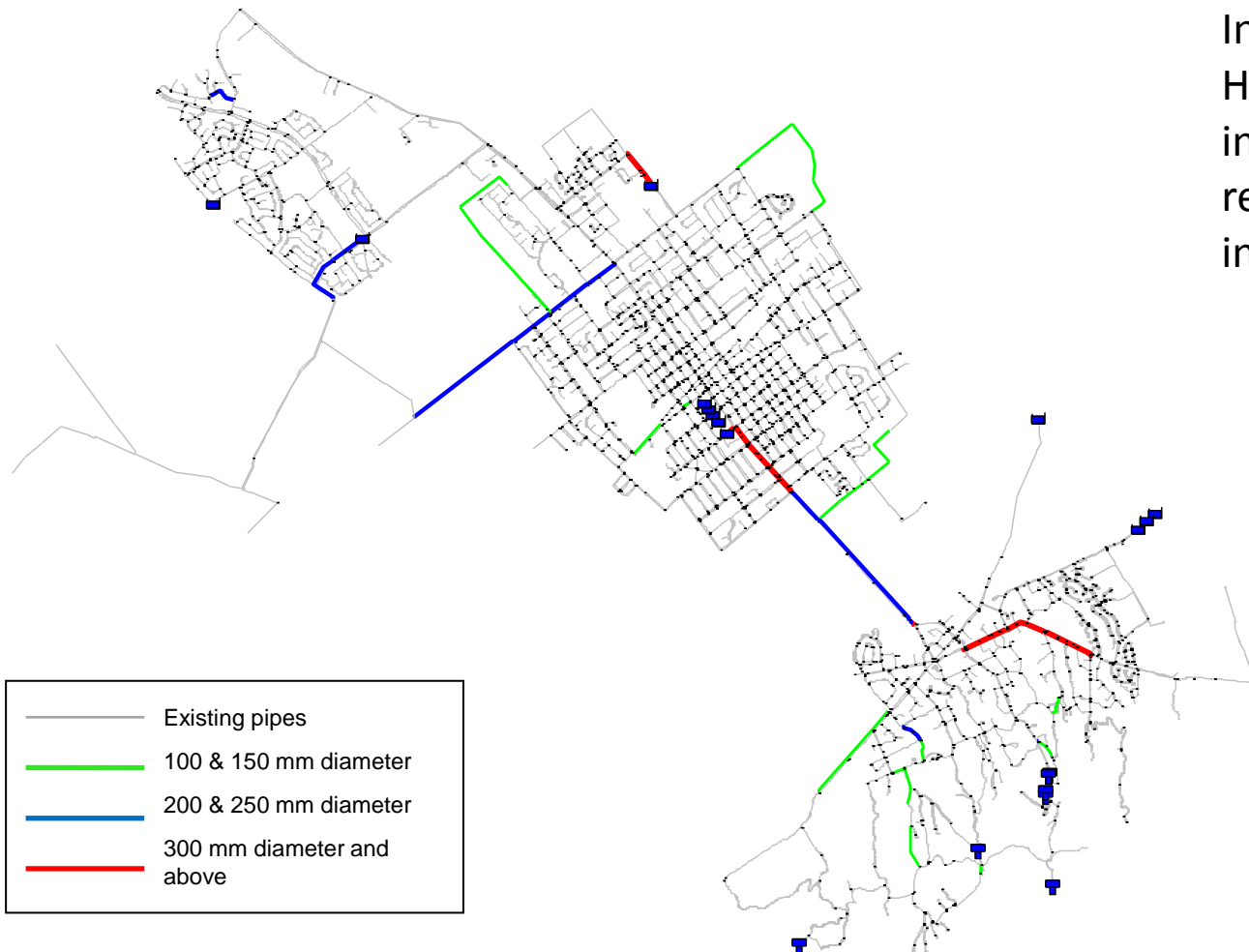


Scenario 3 supply rates (no supply from Brookvale or Flaxmere bores)

Borefield	Average take (L/s)	Maximum instantaneous take (L/s)	Total take (m ³)	Max no. of bore pumps operating
Eastbourne St	440.5	559.0	38,062	5
Frimley	276.1	437.8	23,859	7
Wilson	-	-	-	-
Portsmouth	-	-	-	-
Brookvale	-	-	-	-
TOTAL	716.7		61,920	

Proposed new pipes

Scenario 5 (no Brookvale; < 80 L/s Wilson; no Portsmouth)



In the 10 year projection
HDC will save over **\$1.5M**
in capital expenditure on
renewals and new works
investments.

Good processes
+
good decision making
=
Good Outcomes

Conclusions

- HDC's initial planning had been overly conservative.
- Wish lists are not always cost effective.
- Pet projects may need to give.
- Don't make un-validated assumptions.
- Optimisation modelling is difficult for elected members to dispute.
- Robust and effective planning method.