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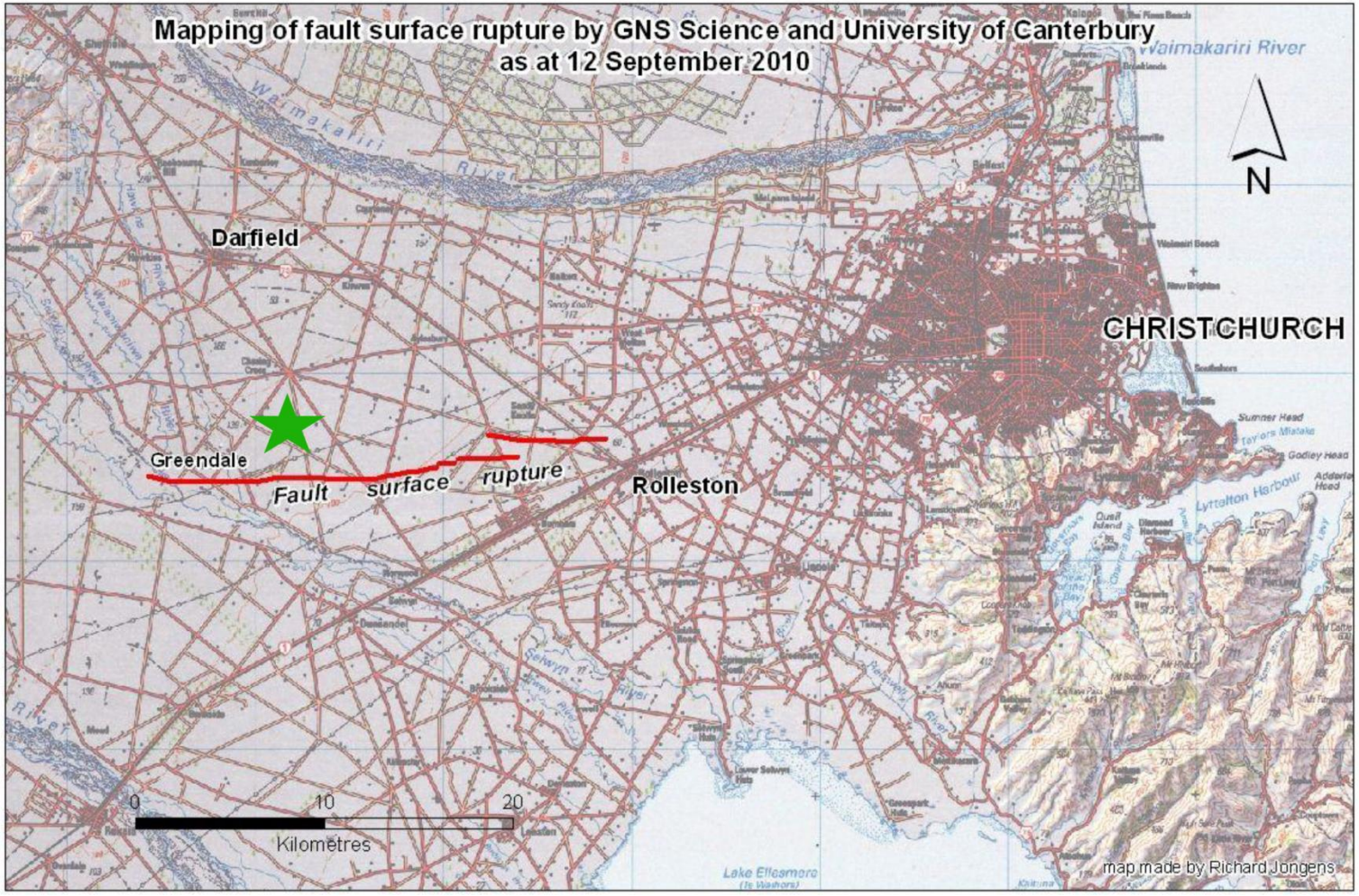
Rebuilding Infrastructure

KEEPING A CITY MOVING

THE TRANSPORT PLANNING, TRAFFIC MANAGEMENT & COMMUNICATIONS DURING THE CHRISTCHURCH REBUILD

ANGUS BARGH, TRESCA FORRESTER, KERSTIN RUPP, KEVIN WESTENENG

Darfield earthquake: 4 Sept 2010, 7.1 magnitude



Sept 4 2010,40km W of Christchurch, Mw 7.1, Depth 10km

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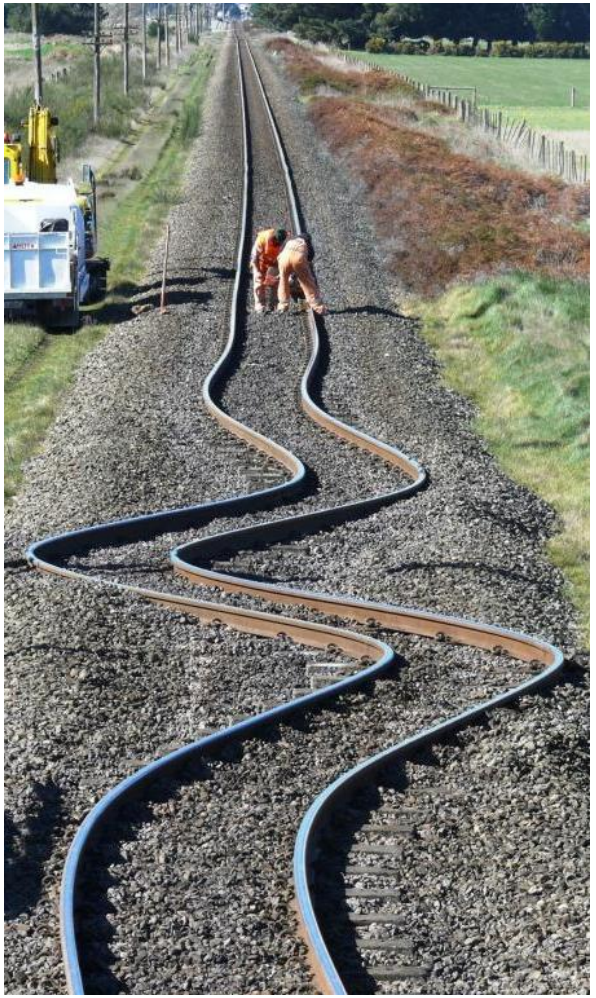
Darfield earthquake: 4 Sept 2010, 7.1 magnitude



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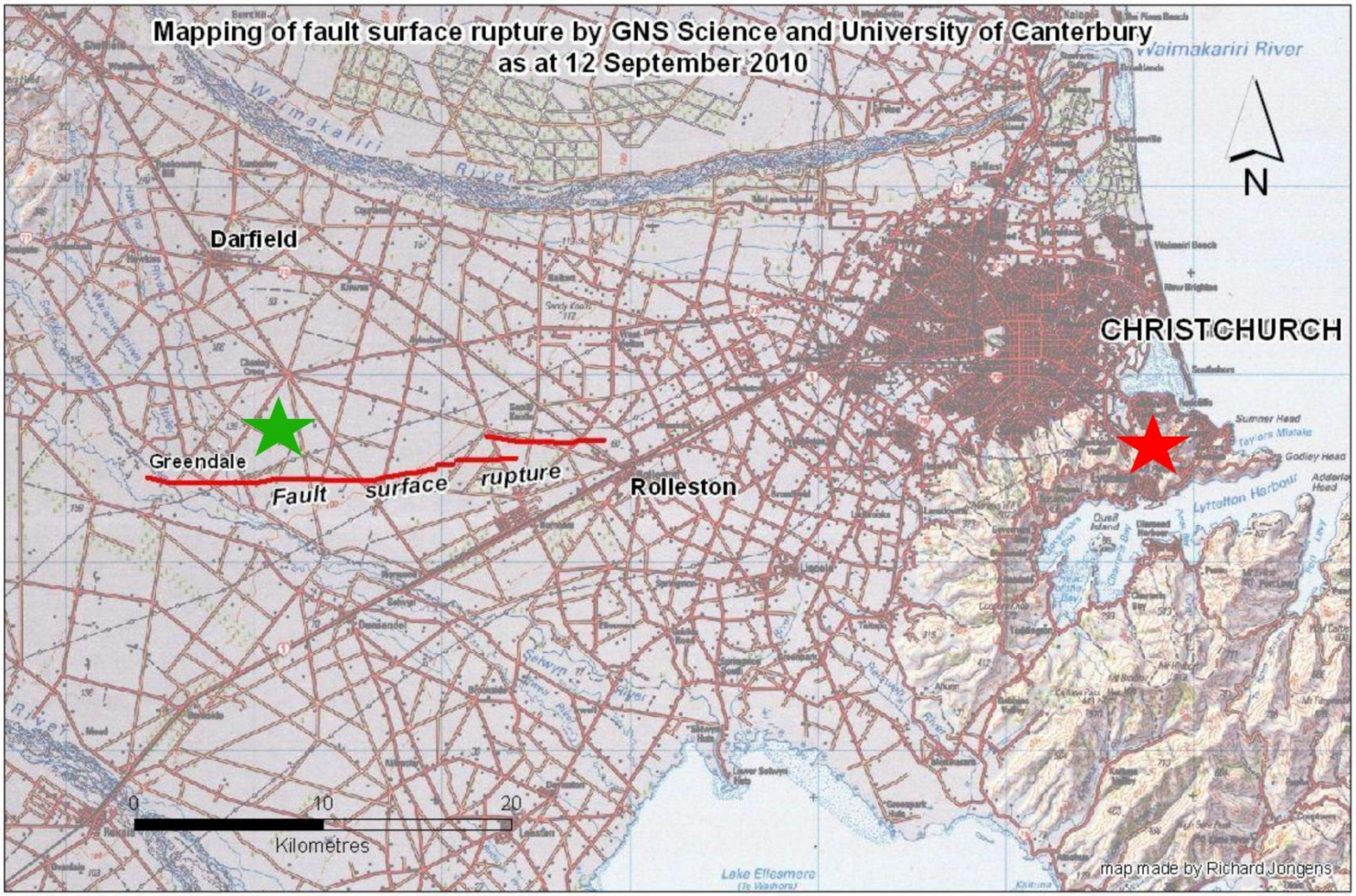
Christchurch earthquake: 22 Feb 2011, 6.3 magnitude



Feb 22 2011, 7 km SE of Christchurch, Mw 6.3, Depth 5 km

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Christchurch earthquake: 22 Feb 2011, 6.3 magnitude

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Christchurch earthquake: destruction

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Christchurch earthquake: destruction

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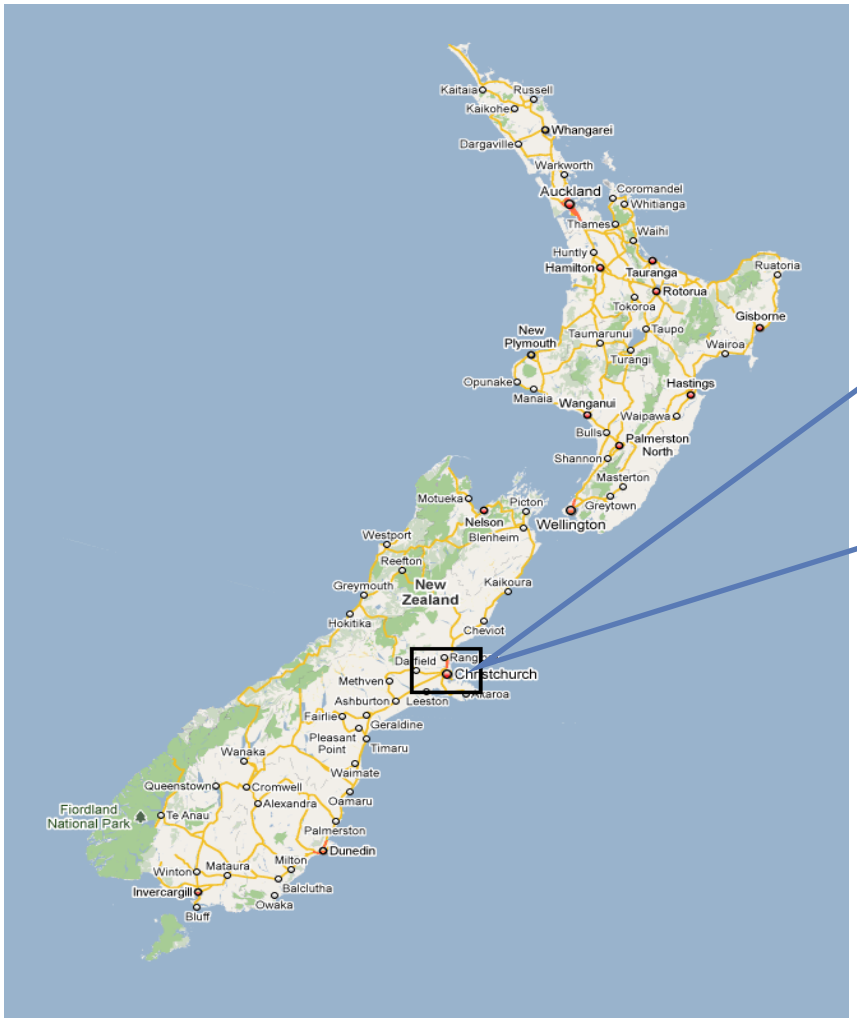
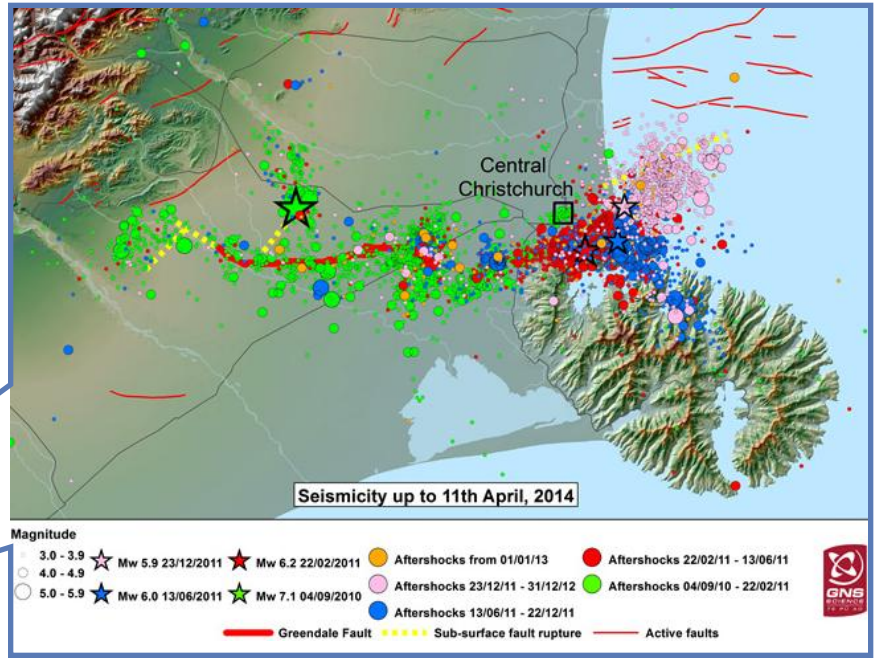
Quake and aftershock maps





Christchurch

- Population: ~350,000
- Total Area: ~1,425 km^2
- Since Sep 2010: >13,000 quakes

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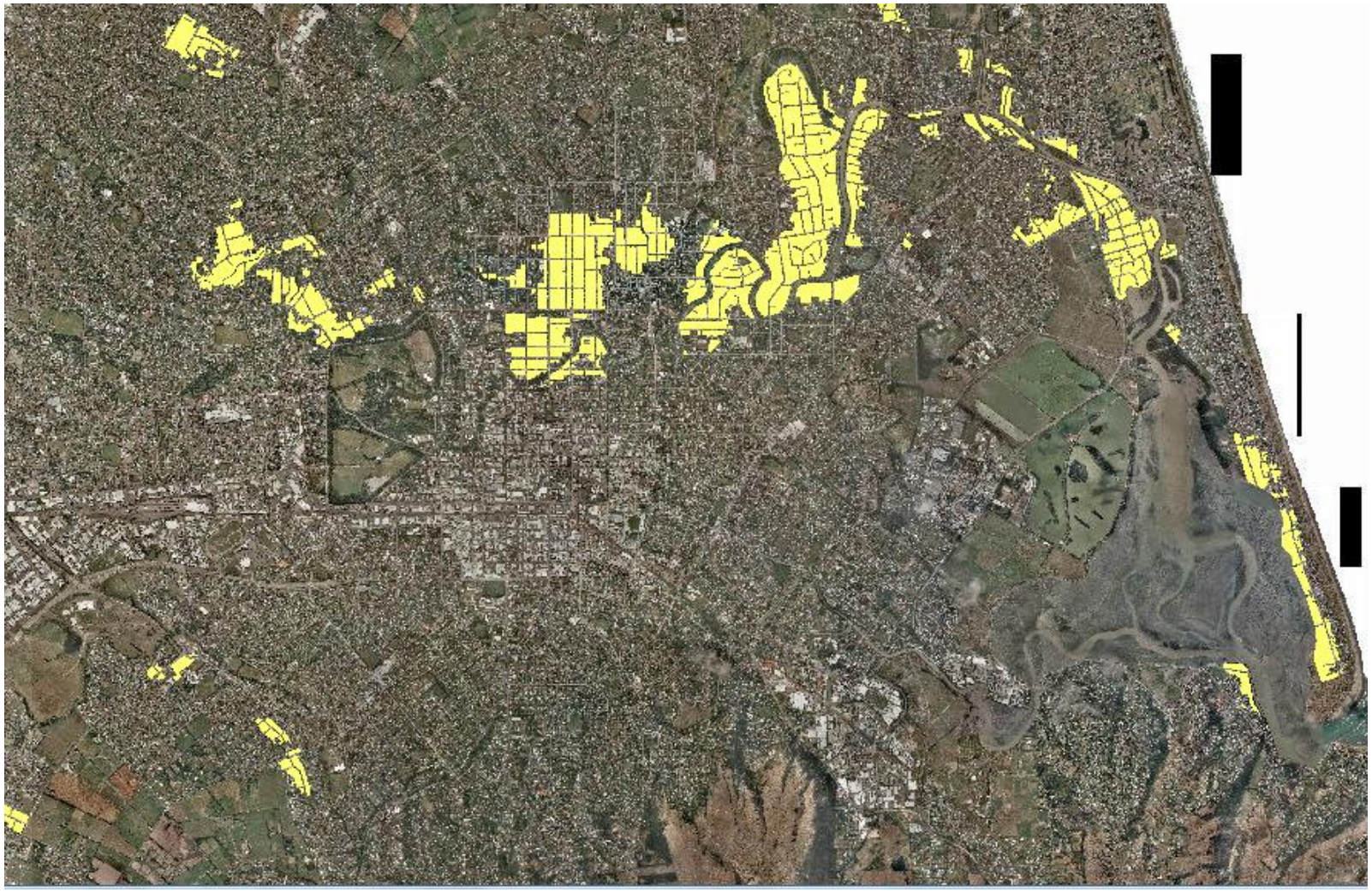
Christchurch earthquake: liquefaction (Sept 2010)



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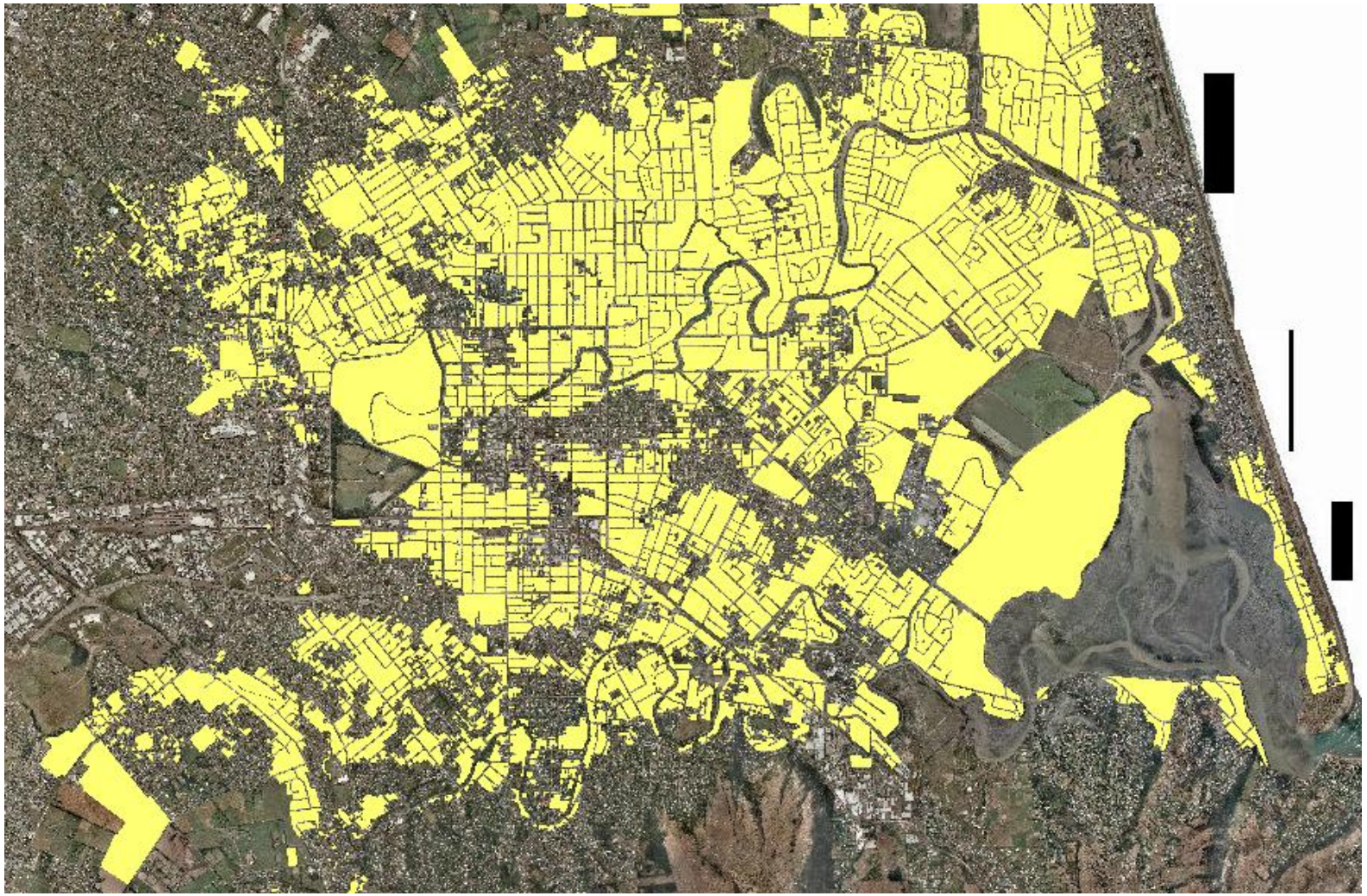
Christchurch earthquake: liquefaction (Feb 2011)



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Christchurch earthquake: liquefaction (Feb 2011)

322,000 tonnes…

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Bridges

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Roads

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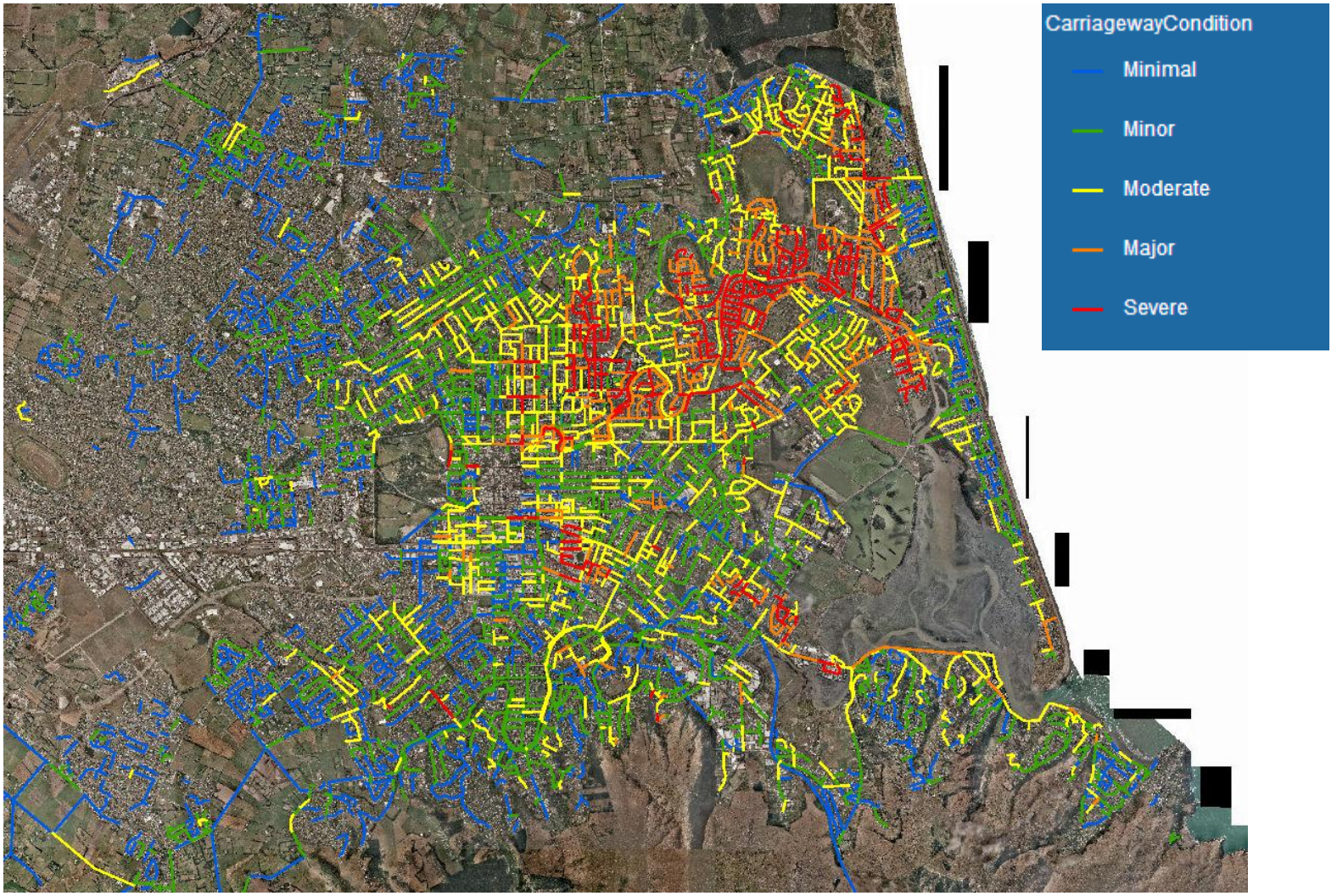
Magnitude of pavement damage



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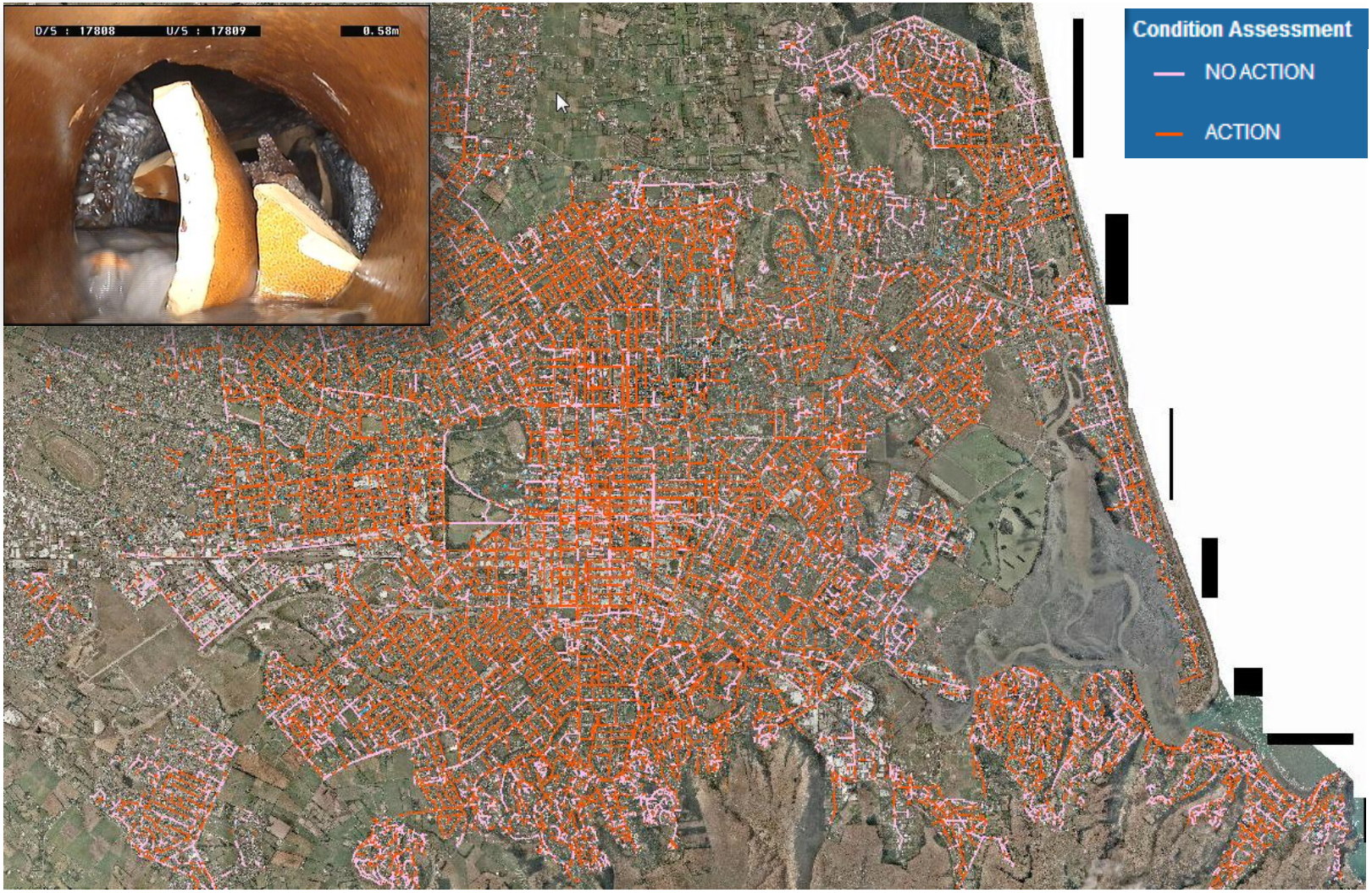
Wastewater & stormwater damage



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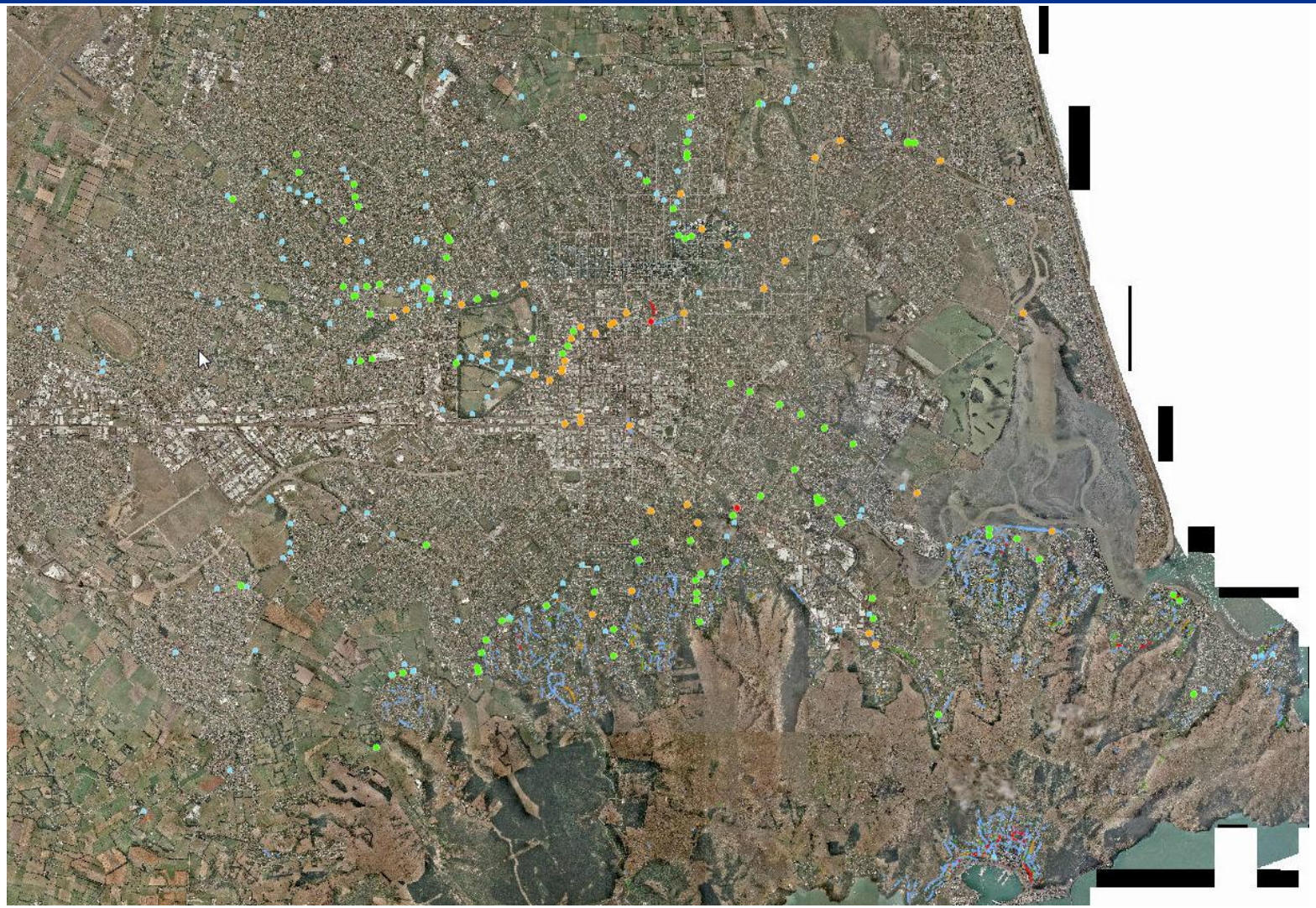
Structures damage



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Work to be done

Asset Type	Length/No (approx)	Damage (approx)
WW Reticulation	1,600km	40%
WW Pump Stations - repair	165	35%
Pump Stations – new / decom.	30 / 10	
WW Lift Stations – new	65	
WS Reticulation	2,850km	2%
WS Pump Stations & Reservoirs	220	35%
SW Reticulation	330km	10%
SW Pump Stations - repair	38	20%
Pump Stations - new	3	
RD Carriageway	11,672,000m^2	10%
RD Bridges/Culverts	225	65%
RD Retaining Walls	490	45%

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Work to be done - CBD

Asset Type	Length/No (approx)	Damage (approx)
Wastewater	65km	75%-90% >TL
Storm Water	55km	30%-50% >TL
Water Supply	75km Mains, 50km Submains	10% >TL
Roading	65km	35% Severe/Major 45% Moderate 20% Minor/None

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SCIRT – The Infrastructure Delivery Model

Post Sept 2010:

IRMO – 4 Contractor Led Design-Build consortia each assigned a geographical area to rebuild all infrastructure.

Post Feb 2010:

SCIRT established by an Alliance Agreement between 3 Owners and 5 Contractors and took over from IRMO Sept 2011.

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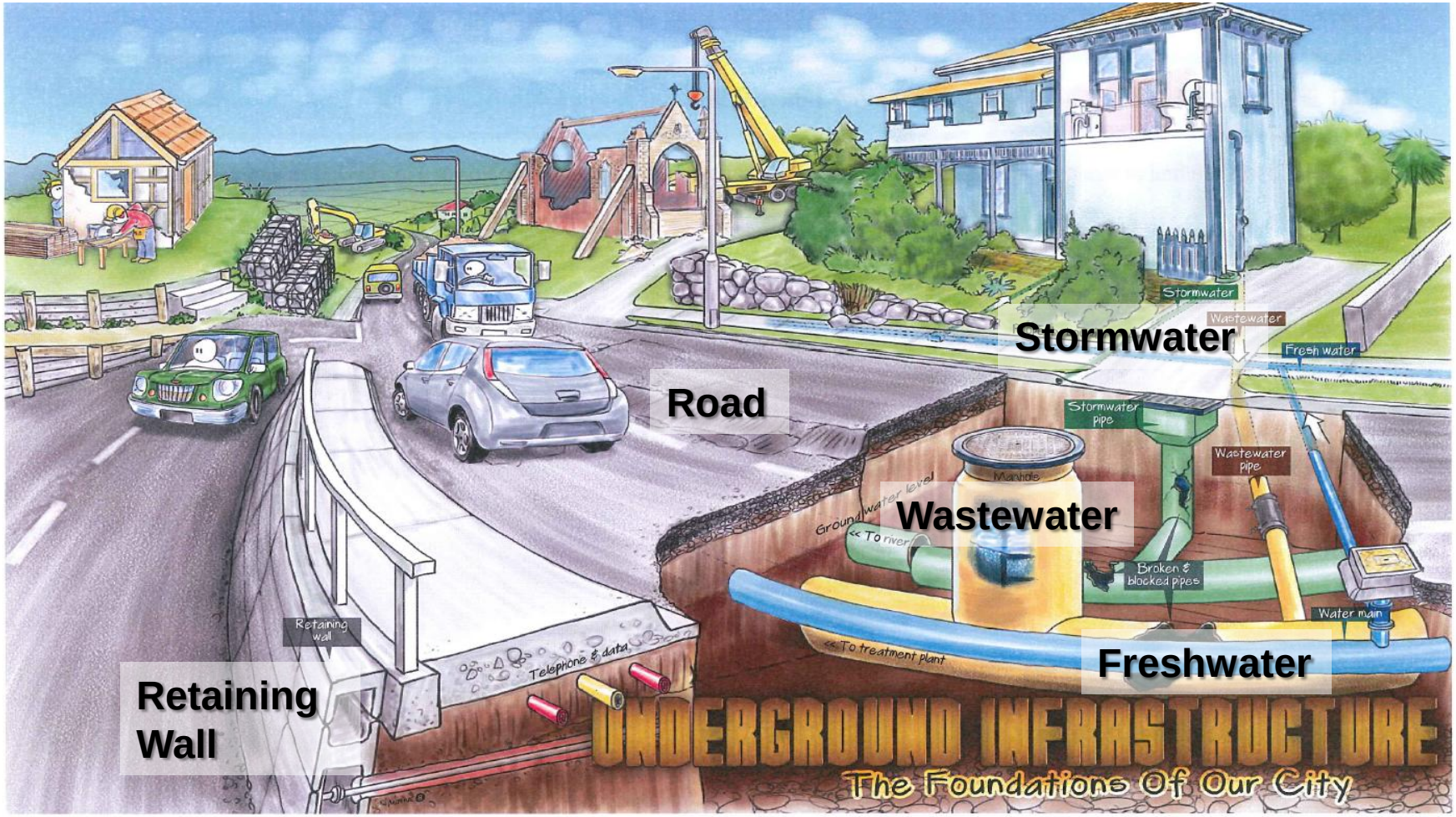
SCIRT is rebuilding the city's horizontal infrastructure



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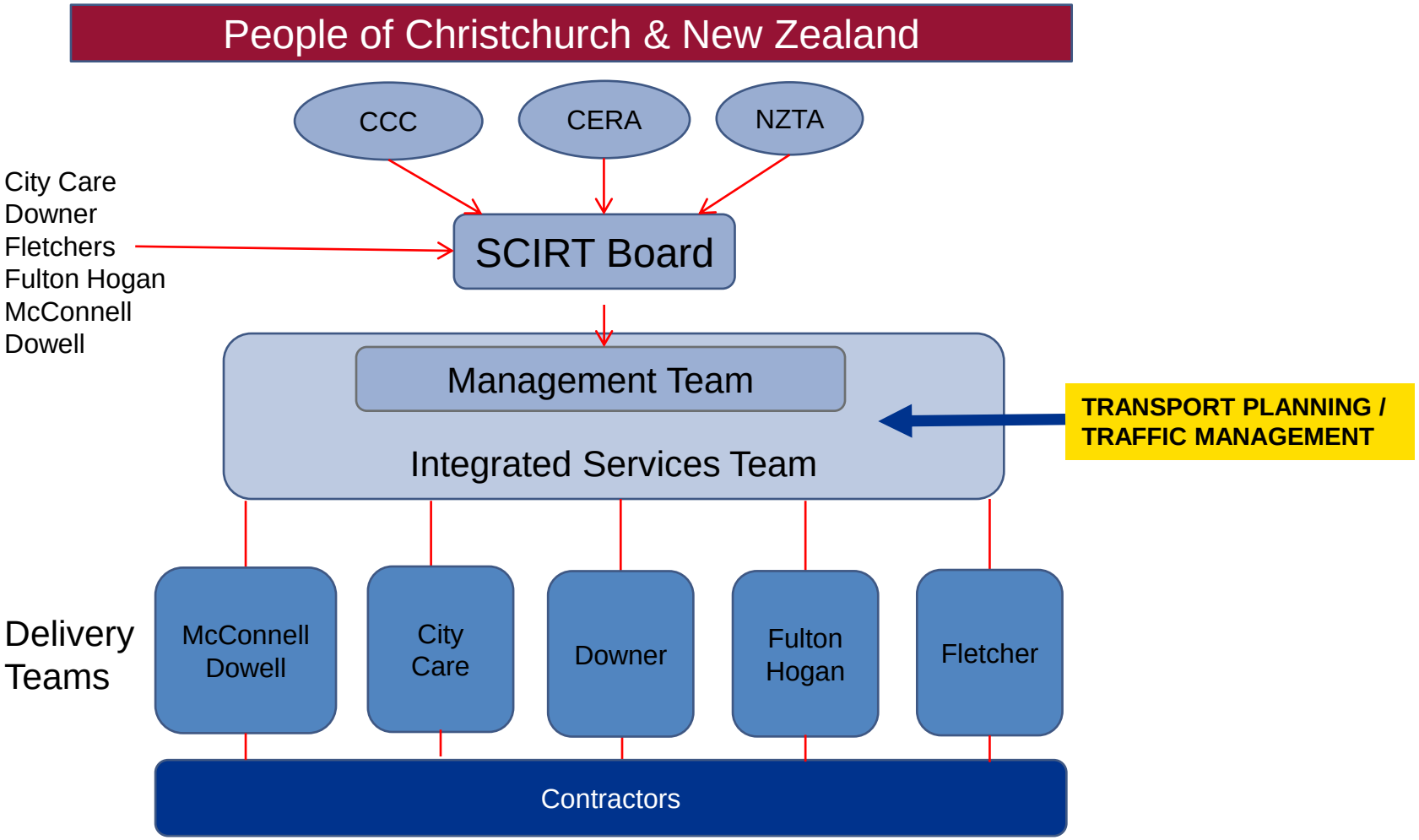
SCIRT team structure



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SCIRT transport team

Transport planners:

- Scheduling
- Impact assessment
- Economic assessment
- Communication strategies
- Traffic management strategies

Traffic managers:

- TMP approvals
- Site compliance
- Cycle, VMS strategies
- Speed management
- Traffic management strategies

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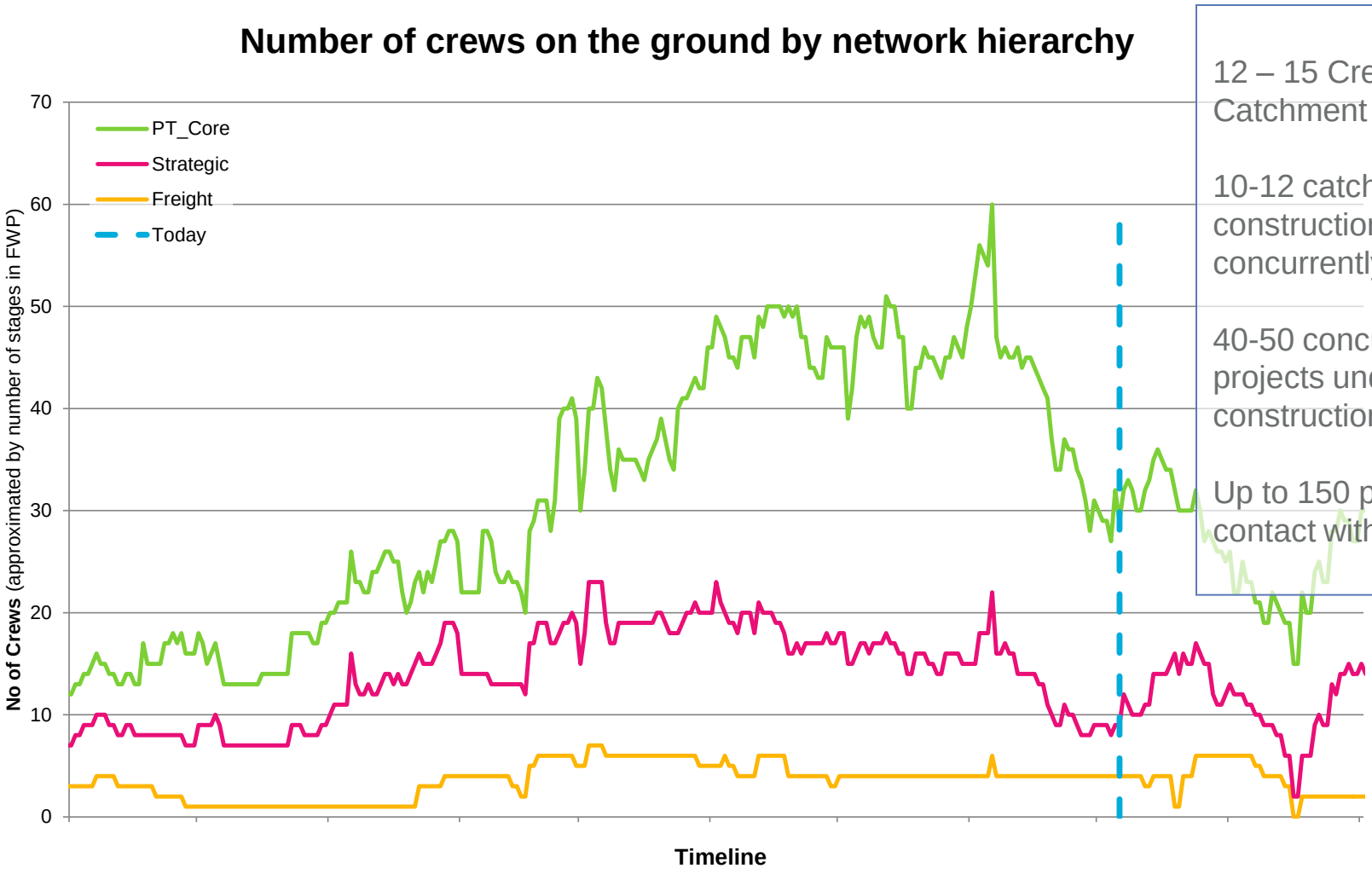
Why is transport planning so important?



12 – 15 Crews per Catchment

10-12 catchments in construction concurrently

40-50 concurrent projects under construction

Up to 150 points of contact with network

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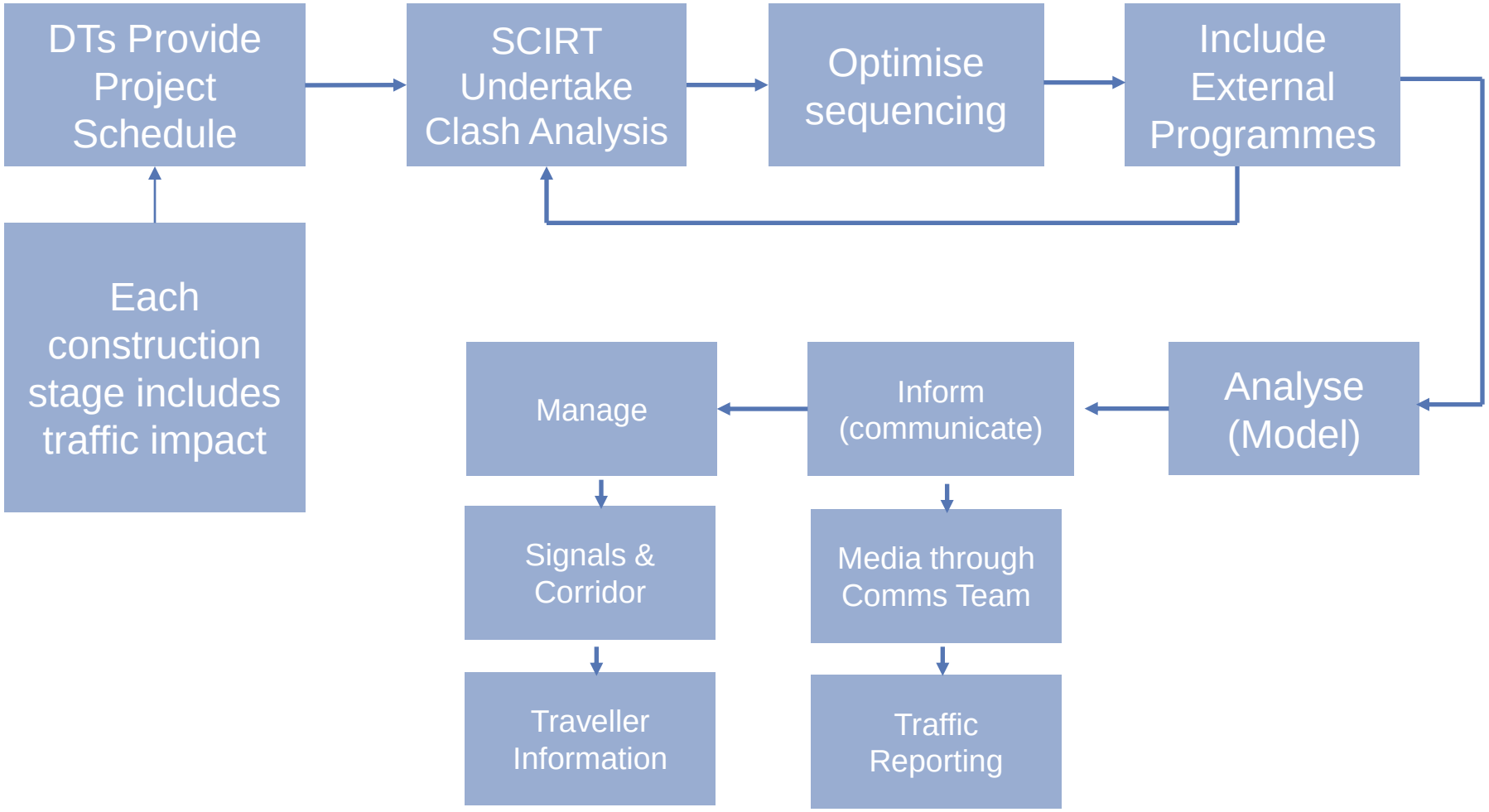
Making it Happen



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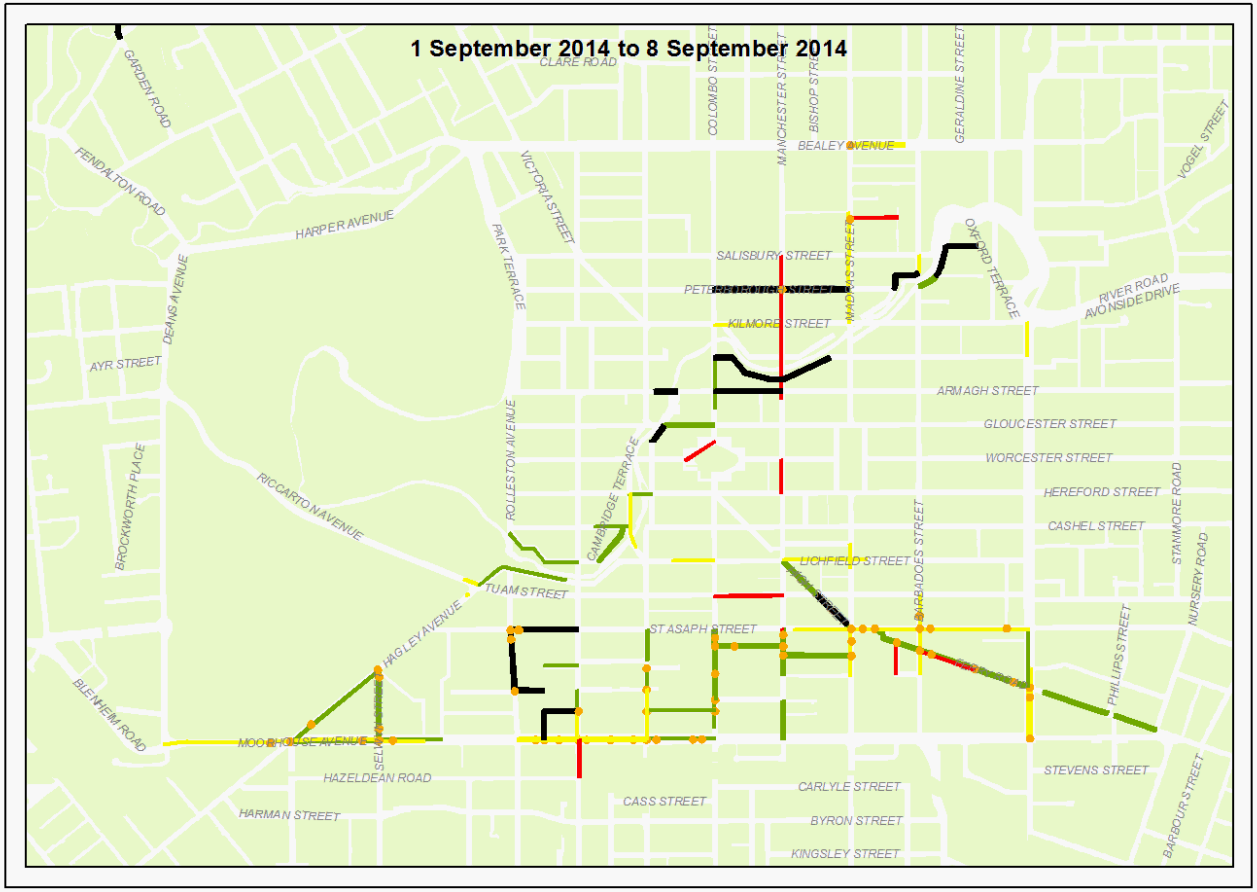
Snapshot of central city works – GIS viewer



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Transport planning tools

- Christchurch Assignment and Simulation Traffic (CAST) SATURN model and economics assessment tool
- Traffic Impact Management (TIM) model
- Long term traffic impact dashboard
- Project approvals and scheduling Gantt chart
- Impedance tool

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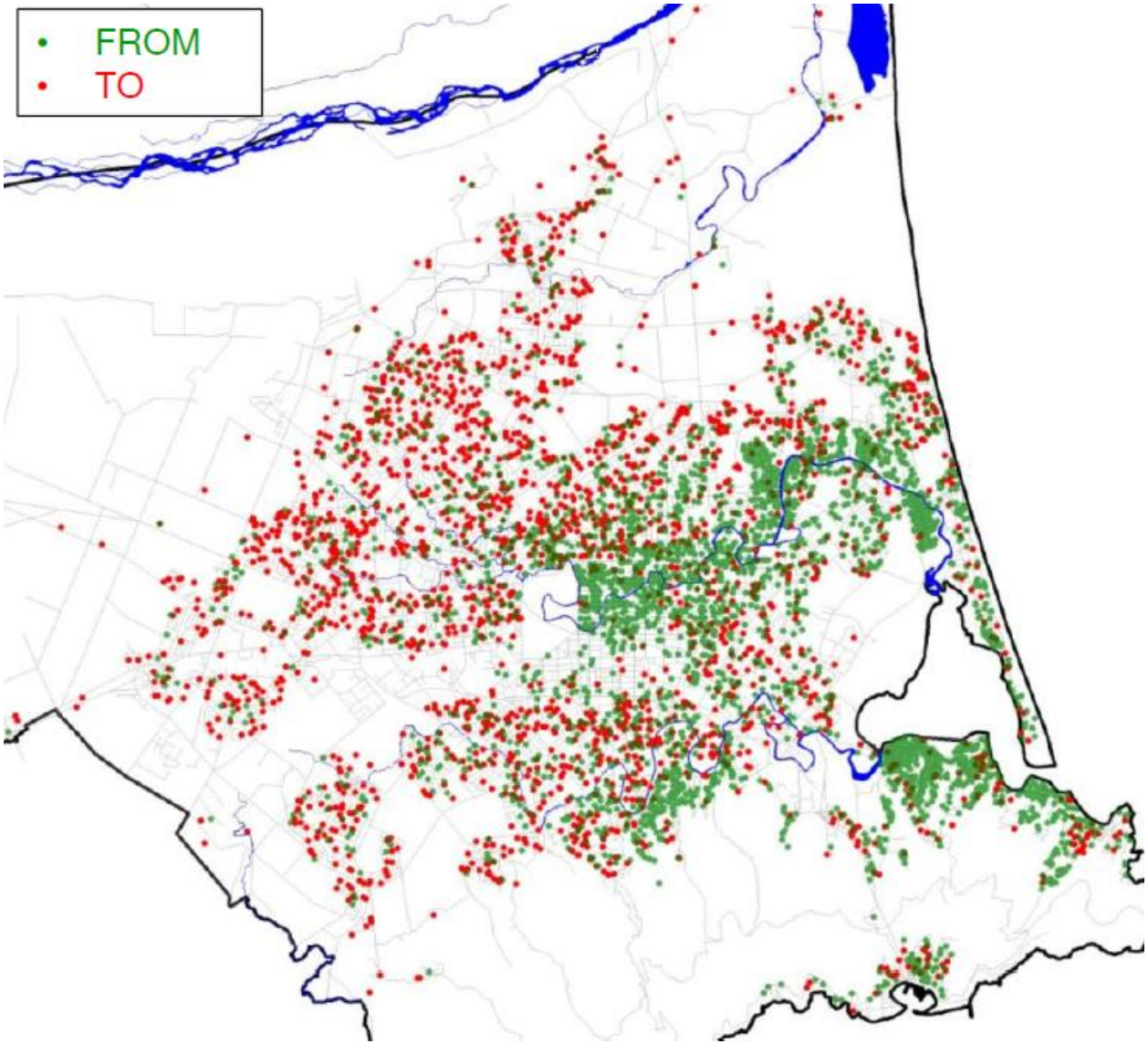
CAST (post-earthquake)



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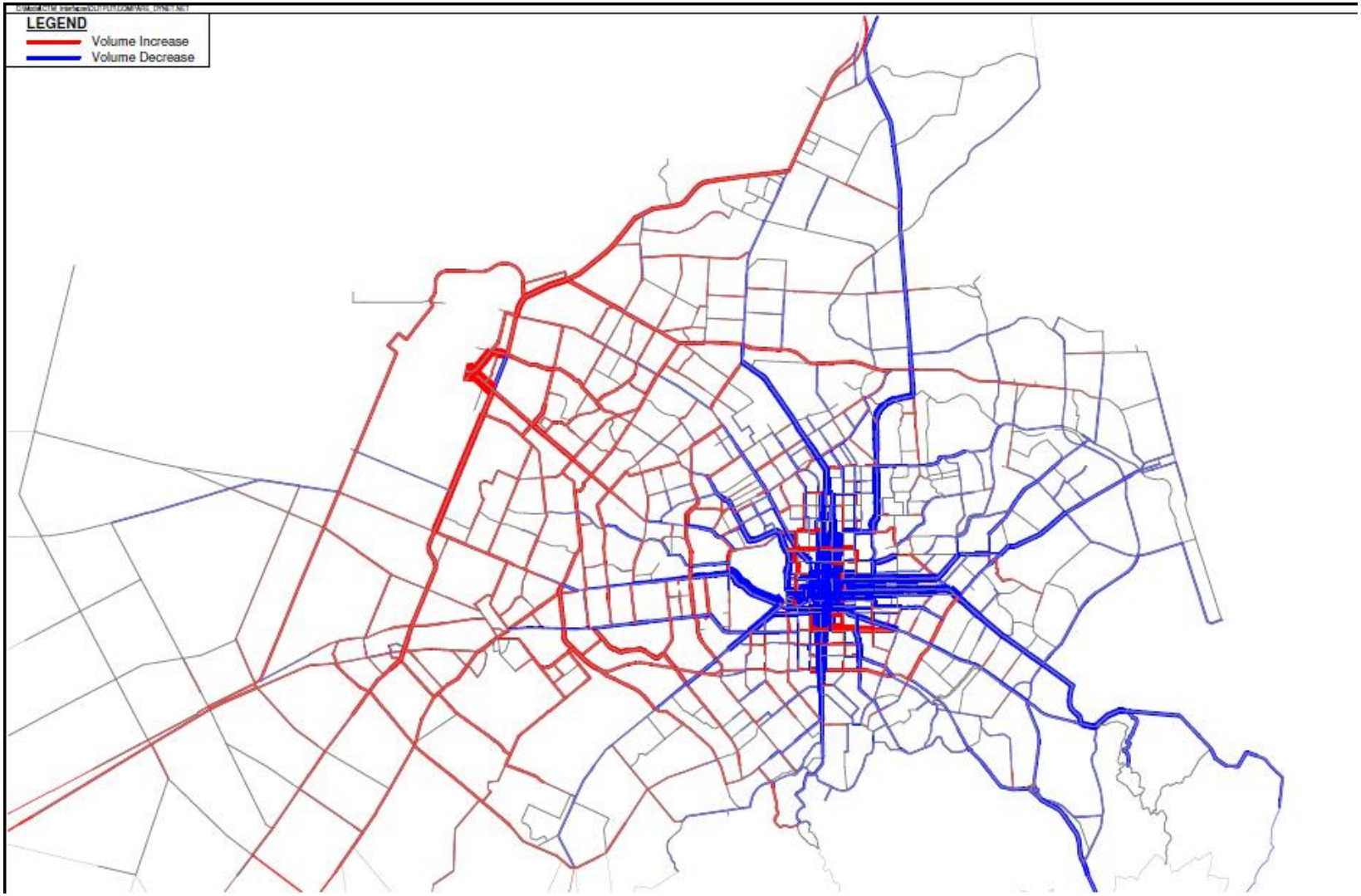

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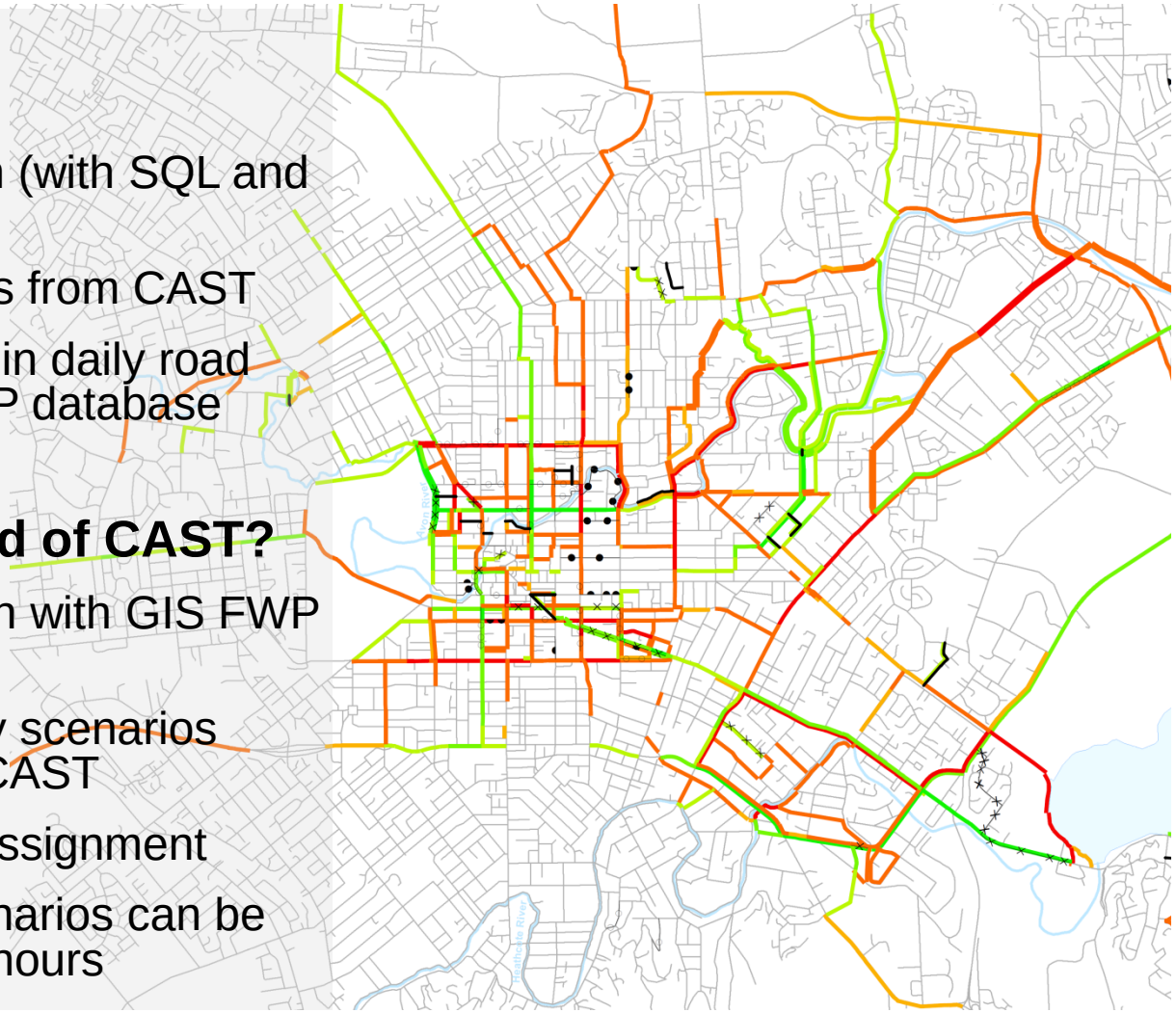
TIM model

How does it work?

- SQL Server platform (with SQL and Python scripting)
- Uses assigned paths from CAST
- Automatically reads in daily road works from GIS FWP database

Why use this instead of CAST?

- Seamless integration with GIS FWP database
- Ability to model daily scenarios much quicker than CAST
- Not an equilibrium assignment
- Weeks worth of scenarios can be carried out in a few hours



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Long term traffic impact dashboard

SCIRT Confidential

Last Updated 20/03/2015 11:45:27 a.m.

Traffic Impact: For the Week Beginning 23/03/2015

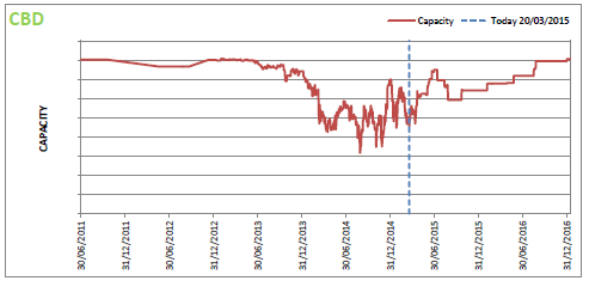
Forward Works Program Summary	Fletcher Construction	MacDow	City Care	Downer	Fulton Hogan	Total
Number of Projects in Asta (in construction)	12	16	21	27	24	100
Number of Projects in SDI	7	6	15	14	13	55
% of Projects in FWP	58%	38%	71%	52%	54%	55%
Number of Stages in FWP	172	118	70	114	68	542
Number of Significant Stages in FWP	332	63	142	258	90	885
Full closure on roads with more than 5,000vpd (two-way)	4	0	2	4	0	10
One-way closure on roads with more than 10,000vpd (two-way)	7	24	12	16	1	60
Lane closure on roads with more than 12,500vpd (one-way)	0	0	0	0	0	0
Any work on strategic route	321	39	128	238	89	815
Number of Bus Routes Affected	12	12	8	23	7	62
Bus Routes With Full Closure or One-way Closure	12	12	8	23	7	62
Bus Routes With Any Road Works						0

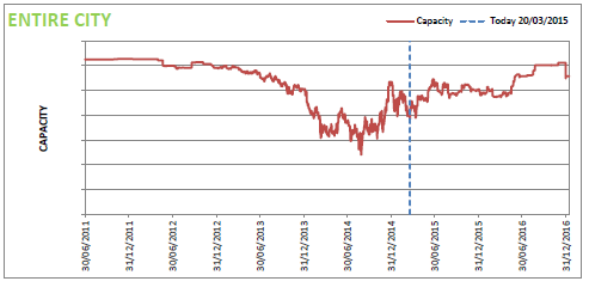
LEGEND

Strategic route?	Strategic routes are defined as routes that have significant impact on the network and full closures are not recommended
Nett Lane Impact	Impact to number of lanes on route compared number of through lanes
Max % Dem/ Cap	Maximum volume to capacity ratio by segments along route
Through lanes	Minimum number of lanes available on route from start to end

Impact on demand	Impact of road works to vehicles (analysed by individual route segments)
	no impact
LOW	less than 35% of max demand impacted by works
MEDIUM	35 - 75% of max demand impacted by works
HIGH	more than 75% of max demand impacted by works

Capacity and Value of Time: From Mid 2011 to End of 2016





North/South Routes

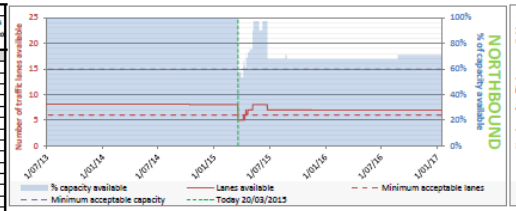
	NORTHBOUND								SOUTHBOUND							
	Strategic route?	No works			Wk Beginning 23/03/2015 - (next week)			Wk Beginning 30/03/2015 - (2 weeks from now)								
		Through lanes	Route Capacity	Max Veh Demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand	Strategic route?	Through lanes	Route Capacity	Max Veh Demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand
Montreal St (Bealey Ave to Moorhouse Ave)	YES	2	2800	1792	-1	89%		-1	89%											
Durham St/Cambridge Tce (Bealey Ave to Moorhouse Ave)											YES	2	2800	1838	-1	128%		-1	128%	
Colombo St (Bealey Ave to Moorhouse Ave - exclude Cathedral Sqr)		1	800	573	0	48%		0	48%			1	800	415	0	R.Closure		0	35%	
Manchester St (Bealey Ave to Moorhouse Ave)		1	1200	564	-1	R.Closure		-1	R.Closure			1	1200	622	0	63%		0	63%	
Madras St (Bealey Ave to Moorhouse Ave)	YES	2	3400	1724	-1	121%		-1	121%											
Barbadoes St (Bealey Ave to Moorhouse Ave)											YES	2	3400	1639	0	48%		0	48%	
Fitzgerald Ave (Bealey Ave to Moorhouse Ave)	YES	2	3400	1635	0	44%		0	44%		YES	2	3400	1987	0	42%		0	42%	
Total		8	11600	6248								8	11600	6501						

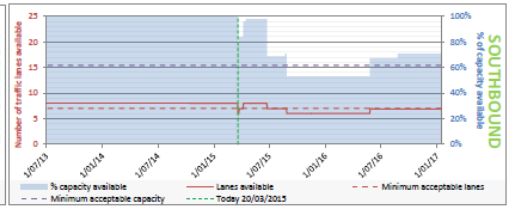
East/West Routes

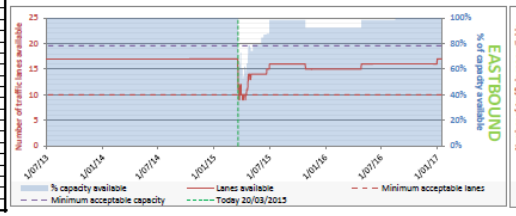
	EASTBOUND								WESTBOUND							
	Strategic route?	No works			Wk Beginning 23/03/2015 - (next week)			Wk Beginning 30/03/2015 - (2 weeks from now)								
		Through lanes	Route Capacity	Max Veh Demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand	Nett Lane Impact	Max % Dem/Cap	Impact on demand	Strategic route?	Through lanes	Route Capacity	Max Veh Demand	Nett Lane Impact	Max % Dem/Cap	Impact on demand	Nett Lane Impact	Max % Dem/ Cap	Impact on demand
Hagley Ave (Moorhouse Ave to Oxford Tce)		1	1400	1409	-1	R.Closure		-1	R.Closure			1	1400	829	-1	R.Closure		-1	R.Closure	
Bealey Ave (Park Tce to Fitzgerald Ave)	YES	3	3400	2413	0	104%		-1	123%		YES	2	3400	1565	0	63%		0	58%	
Salisbury St (Park Tce to Barbadoes St)	YES	2	2800	748	0	27%		0	27%											
Kilmore St (Park Tce to Fitzgerald Ave)											YES	1	1400	1787	0	64%		-1	R.Closure	
Hereford St (Rolleston Ave to Fitzgerald Ave)		1	1200	1717	-1	R.Closure		-1	R.Closure			1	1200	362	-1	R.Closure		-1	R.Closure	
Oxford Tce/Lichfield St (Riccarton Ave to Fitzgerald Ave)		2	1400	1409	-1	R.Closure		-1	R.Closure											
Tuam St (Riccarton Ave to Fitzgerald Ave)		1	1200	1024	-1	R.Closure		-1	R.Closure			1	1200	1120	-1	R.Closure		-1	R.Closure	
St Asaph St (Hagley Ave to Fitzgerald Ave)											YES	1	1400	1327	0	47%		0	47%	
Moorhouse Ave (Deans Ave to Fitzgerald Ave)	YES	3	3400	1821	-1	57%		-2	143%		YES	3	3400	2245	0	96%		-1	96%	
Total		13	14800	10542								10	13406	9234						

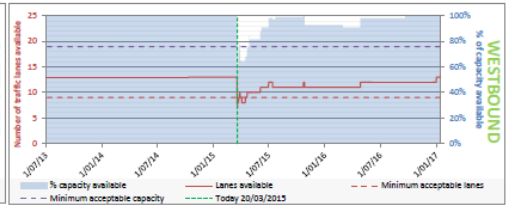
Critical Routes Weekly Summary (for 31 weeks, starting from current week)

Week	Starting Day	Number of Traffic Lanes - with FWP						% Drop in Number of Traffic Lanes					
		CBD (NB)	CBD (SB)	CBD (EB)	CBD (WB)	Bridges (Avon)	Bridges (Heathcote)	CBD (NB)	CBD (SB)	CBD (EB)	CBD (WB)	Bridges (Avon)	Bridges (Heathcote)
	Without FWP	8	8	17	13	53	20						
0	18/03/2015	5	6	9	7	49	20	-38%	-25%	-47%	-46%	-8%	0%
1	25/03/2015	5	7	10	9	45	20	-38%	-13%	-41%	-31%	-15%	0%
2	1/04/2015	5	7	9	8	45	20	-38%	-13%	-47%	-38%	-15%	0%
3	8/04/2015	5	8	9	8	46	20	-38%	0%	-47%	-38%	-13%	0%
4	15/04/2015	6	8	10	8	47	20	-25%	0%	-41%	-38%	-11%	0%
5	22/04/2015	7	8	13	10	50	20	-13%	0%	-24%	-23%	-6%	0%
6	29/04/2015	7	8	13	10	50	20	-13%	0%	-24%	-23%	-6%	0%
7	6/05/2015	7	8	14	10	50	20	-13%	0%	-18%	-23%	-6%	0%
8	13/05/2015	8	8	14	10	51	20	0%	0%	-18%	-23%	-4%	0%
9	20/05/2015	8	8	14	10	51	20	0%	0%	-18%	-23%	-4%	0%
10	27/05/2015	8	8	14	10	49	20	0%	0%	-18%	-23%	-8%	0%
11	3/06/2015	8	8	14	10	49	20	0%	0%	-18%	-23%	-8%	0%
12	10/06/2015	8	8	14	11	49	20	0%	0%	-18%	-15%	-8%	0%
13	17/06/2015	8	8	14	11	49	20	0%	0%	-18%	-15%	-8%	0%
14	24/06/2015	7	7	15	11	50	20	-13%	-13%	-12%	-15%	-6%	0%
15	1/07/2015	7	7	16	12	50	20	-13%	-13%	-6%	-8%	-6%	0%
16	8/07/2015	7	7	16	11	50	20	-13%	-13%	-6%	-15%	-6%	0%
17	15/07/2015	7	7	16	11	50	20	-13%	-13%	-6%	-15%	-6%	0%
18	22/07/2015	7	7	16	11	50	20	-13%	-13%	-6%	-15%	-6%	0%
19	29/07/2015	7	7	16	11	50	20	-13%	-13%	-6%	-15%	-6%	0%
20	5/08/2015	7	7	16	11	52	20	-13%	-13%	-6%	-15%	-2%	0%
21	12/08/2015	7	7	16	11	52	20	-13%	-13%	-6%	-15%	-2%	0%
22	19/08/2015	7	7	16	11	52	20	-13%	-13%	-6%	-15%	-2%	0%
23	26/08/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
24	2/09/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
25	9/09/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
26	16/09/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
27	23/09/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
28	30/09/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
29	7/10/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
30	14/10/2015	7	6	16	11	51	20	-13%	-25%	-6%	-15%	-4%	0%
31	21/10/2015	7	6	15	11	50	20	-13%	-25%	-12%	-15%	-6%	0%









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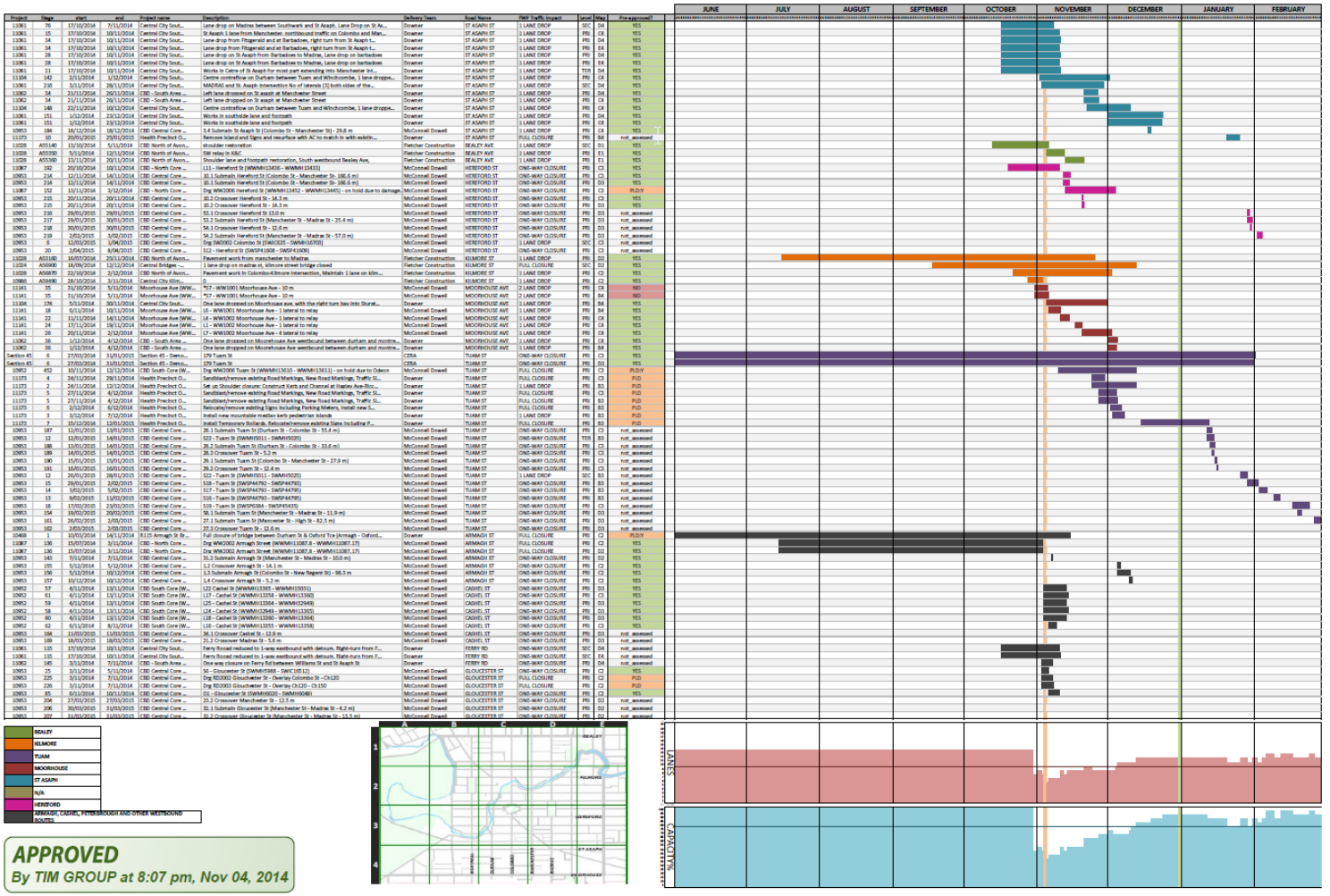
Gantt chart



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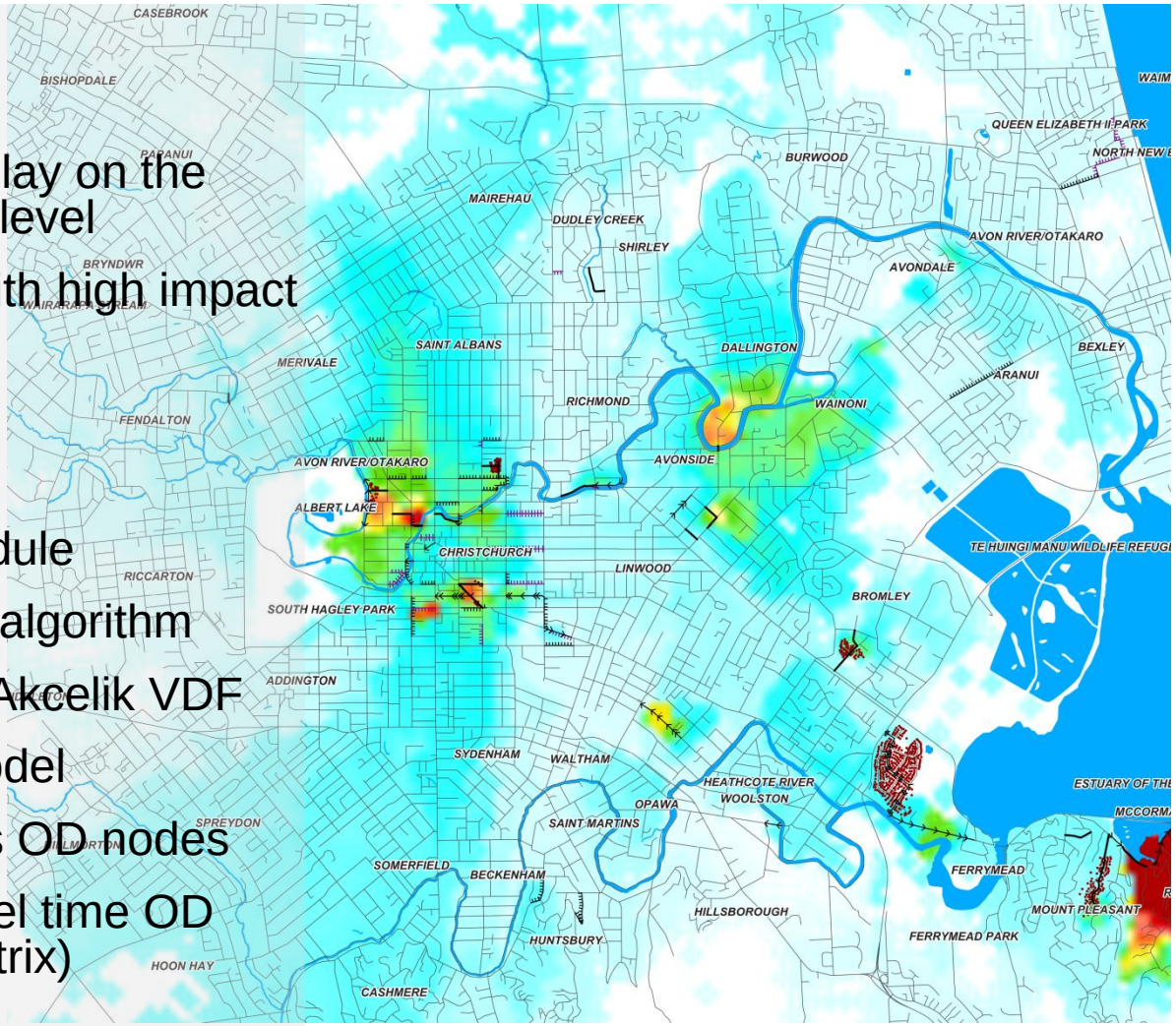
Impedance tool

Purpose

- To assess average delay on the network at a property level
- To determine areas with high impact due to road works

How does it work?

- NetworkX Python module
- Dijkstra shortest path algorithm
- Link and intersection Akcelik VDF
- Volumes from TIM model
- Uses property data as OD nodes
- Develop average travel time OD matrix (~170,000^2 matrix)



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TRAFFIC MANAGEMENT

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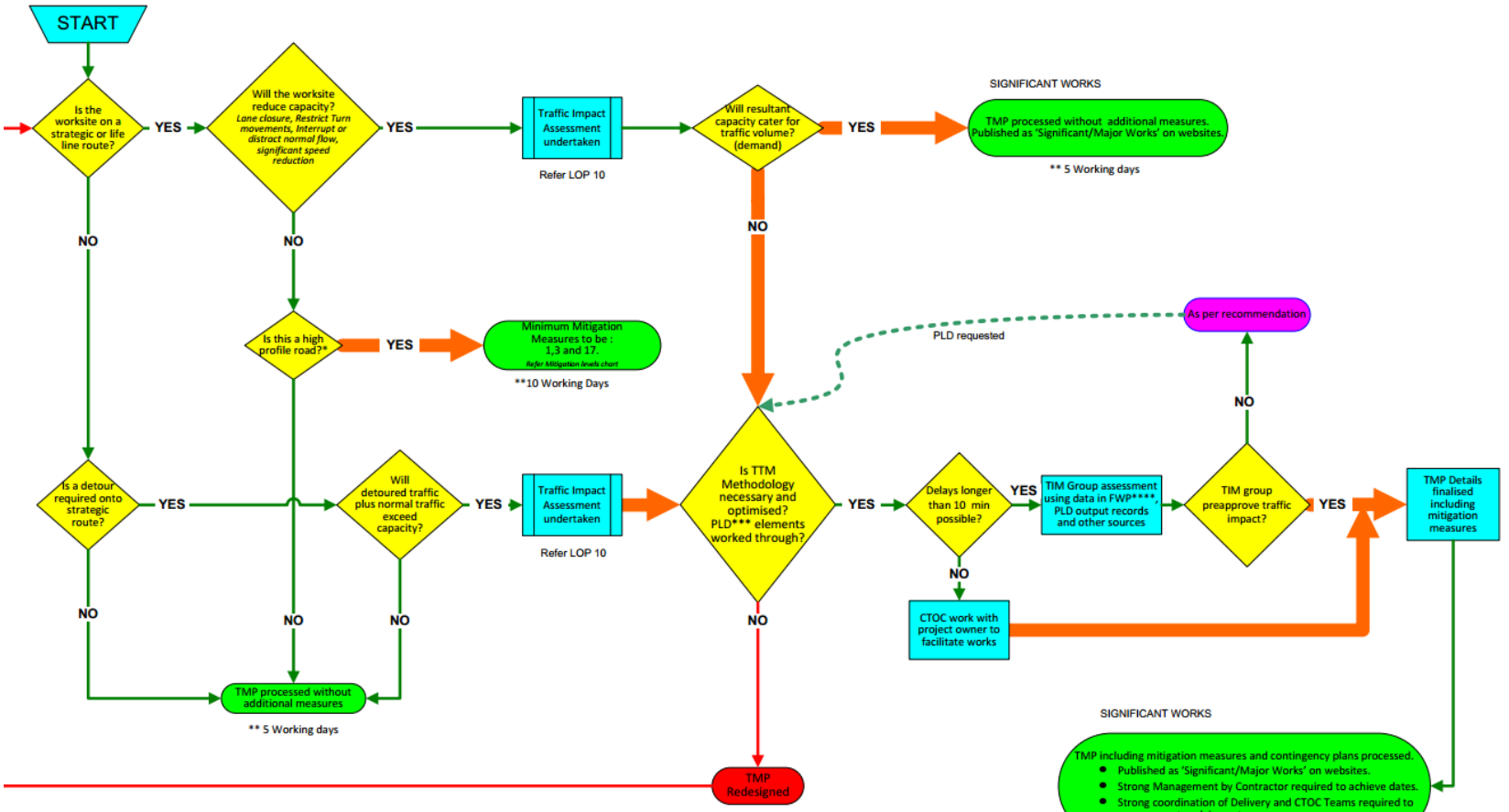
CTOC - Significant Works Identification (SWIF)



* *Roads highly visible by influential stakeholders and general public e.g. Arterial roads beside Government agency offices, Main Road to Sumner.*

** *Working days indicated are minimum timeframes required for CTOC processing of TMPs*

*** *Project Level Discussion*

**** *Forward Works Programme administered by Land Information New Zealand*

→ *Involve CTOC representitive in concept / detailed TTM development*

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Traffic management statistics

- ~250 traffic management personnel and associated people
- ~150 work sites
- 24/7 operation
- > 3,050 TMPs submitted and processed
- > 6,750 revisions
- Approx processing times for TMPs:
  - 1.5 days SCIRT
  - 5 days CTOC

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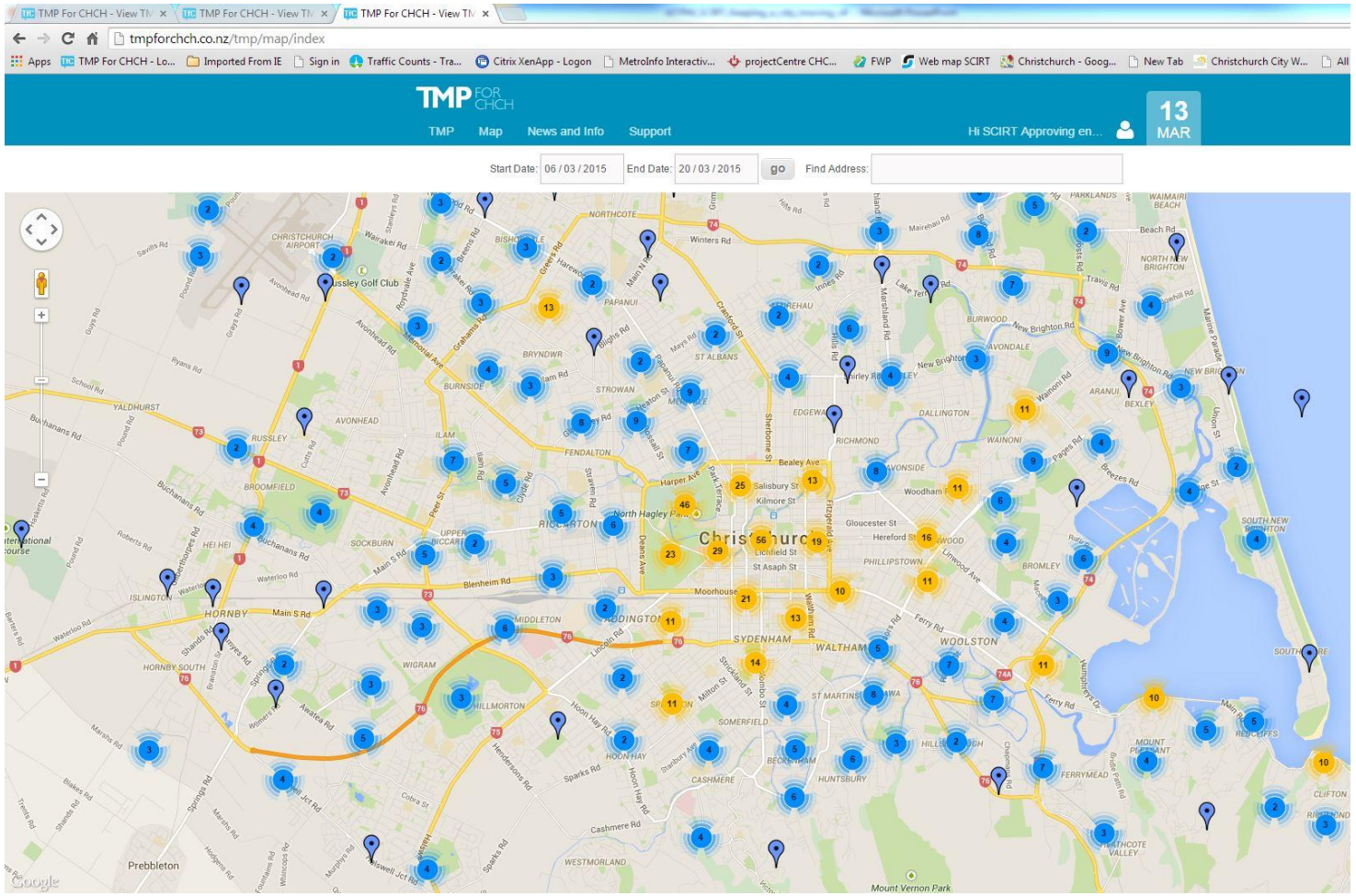
Current activity ‘on-the-ground’



- 20% of all plans sent into CCC are SCIRT’s
- SCIRT work affects approx 80% of the network

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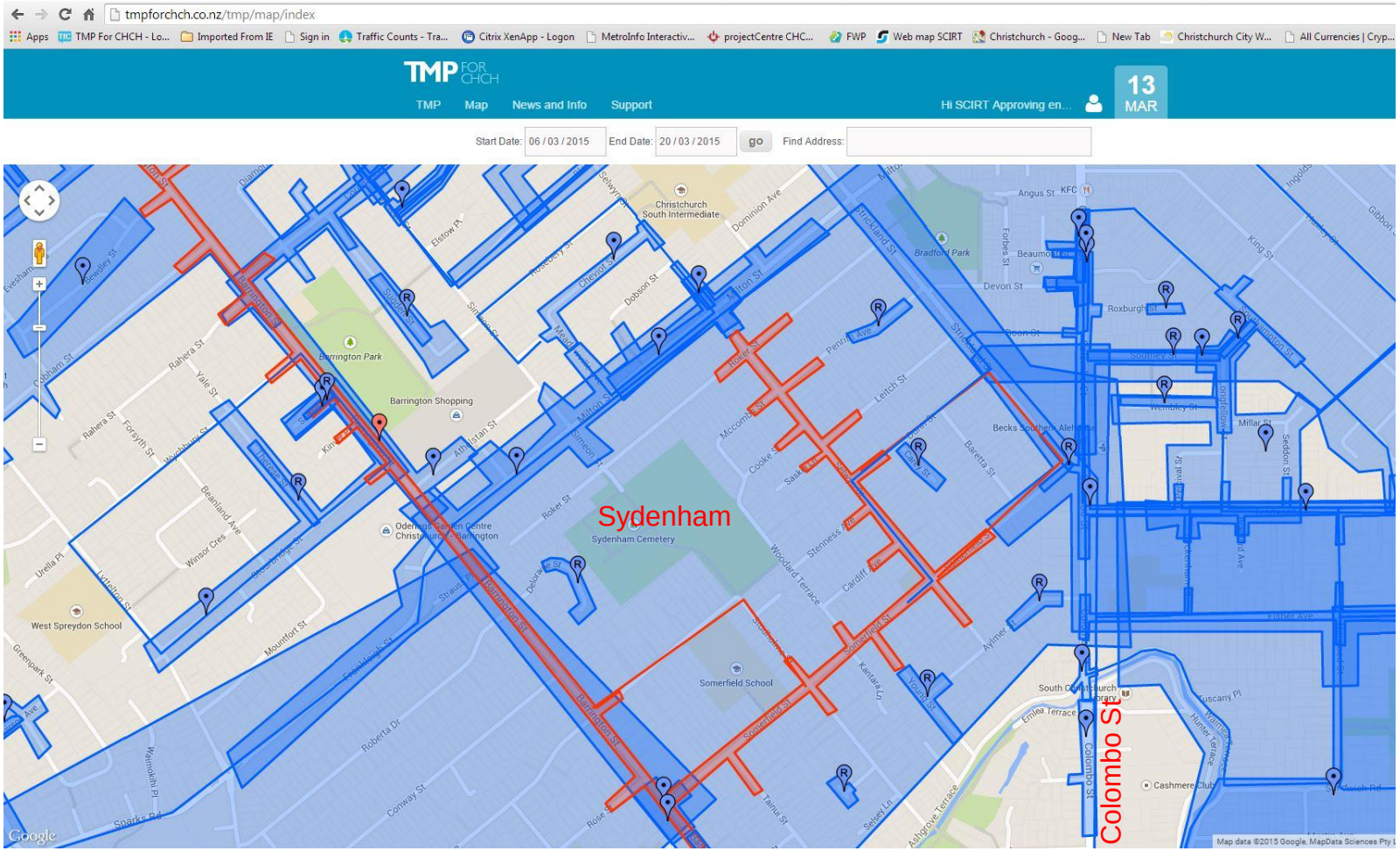
Current activity ‘on-the-ground’



Creation of polygon to show the extent of the Traffic Management Plan

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Traffic management plans

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Site photos

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Rewarding Our People

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COMMUNICATIONS

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Communications – Where, What, How and So What?

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Rebuilding earthquake damaged roads, water, wastewater and storm water pipes.

Project #11128

9 March 2015

Works Notice – Somerfield Street, Strickland Street, Colombo Street, Somerfield— Wastewater repair

What	Wastewater repair
Where	Somerfield Street, Strickland Street, Colombo Street and Tennyson Street, Beckenham
When	Starting Monday 16 March 2015 for about three weeks

What we are doing:

- As you may know, Downer is repairing the PS20 sewer main. As part of this work we will be lining four sections of the sewer main around the Somerfield Street, Strickland Street and Colombo Street intersection and at the Colombo Street and Tennyson Street intersection.
- The work will start on Monday 16 March 2015 and will take about three weeks.
- The work will be done in two stages.

Stage One

What: We will be working on Somerfield Street and within the Somerfield Street, Strickland Street and Colombo Street intersection.

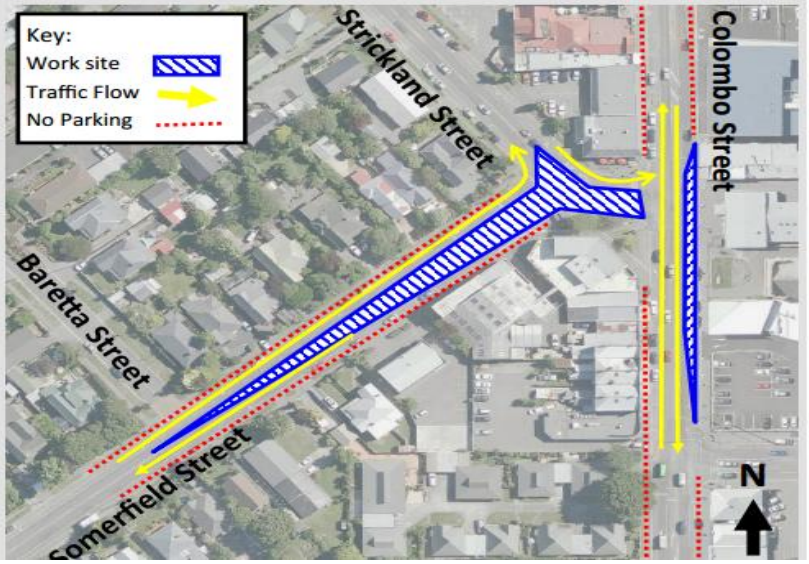
There will also be a work site on Colombo Street.

When: 16 March 2015 for about two weeks, subject to weather and onsite conditions.

Traffic:

- Two way traffic will be maintained on Somerfield and Colombo Streets.

⇒ There will be no entry to Strickland Street from Colombo Street.



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SCIRT – Keeping Stakeholders and Communities informed

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The Christchurch Transport Operations Centre (CTOC)

- Christchurch City Council (CCC), New Zealand Transport Agency (NZTA), Environment Canterbury (E-can) Alliance
- All CTOC Partners seeking to make best use of existing network and enable the rebuild
- One Network
- One of three TOCs – Auckland (ATOC) & Wellington (WTOC)

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CTOC Traveller Information

What is Traveller information?

- Relevant, reliable and timely information so road users can make smarter choices.
- Allows better decisions on when, where, how and even if people travel.

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What makes Christchurch (CTOC) special?

- One Network Approach
- Road works – orange is the new black
- Collaborative working relationship with SCIRT
- Central City Rebuild
- An Accessible City – changing the central city roading network
- Congestion – spatial patterns have changed

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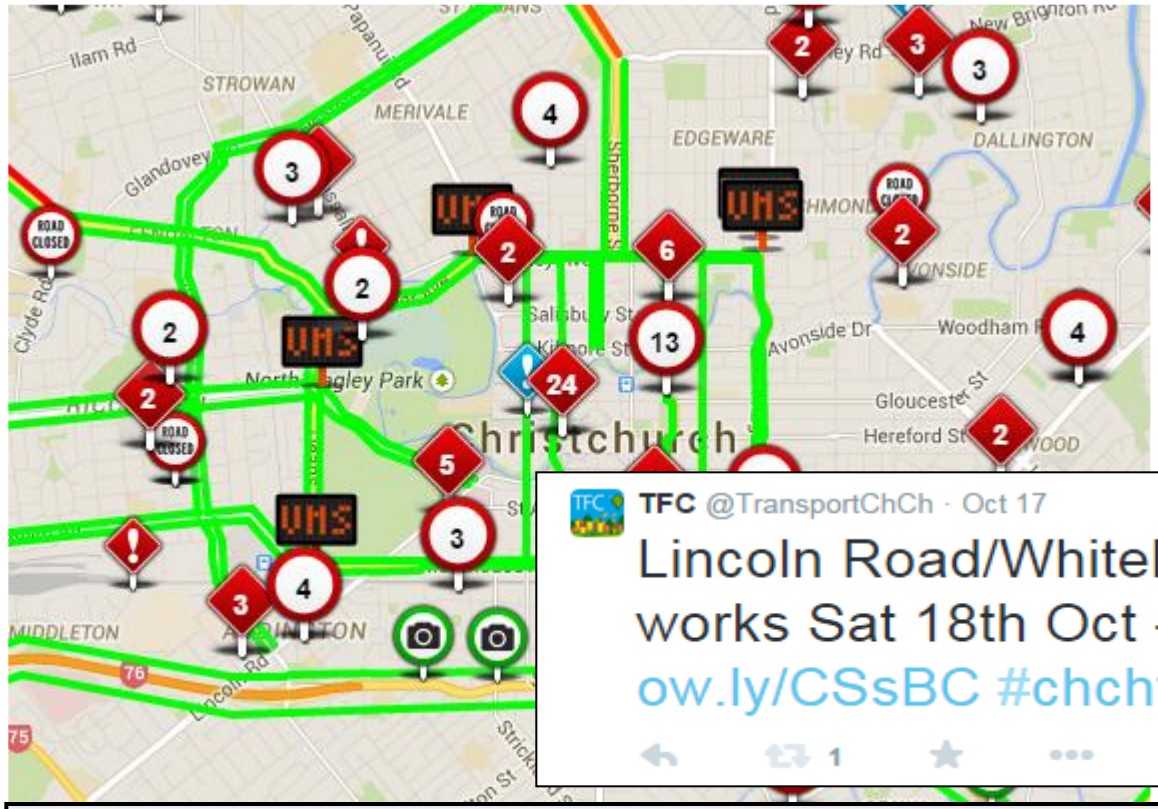
How did we do it?



TFC @TransportChCh · Oct 17

Lincoln Road/Whiteleigh Ave - MAJOR works Sat 18th Oct - expect delays more - ow.ly/CSsBC #chchtraffic ^TF

SCIRT @SCIRT_info · Mar 13

Ferry Rd detour Sun night, Park Tce 1 way Mon nite and more #chchtraffic @rebuildchch bit.ly/1DddYnZ @ChristchurchCC @TransportChCh

Details

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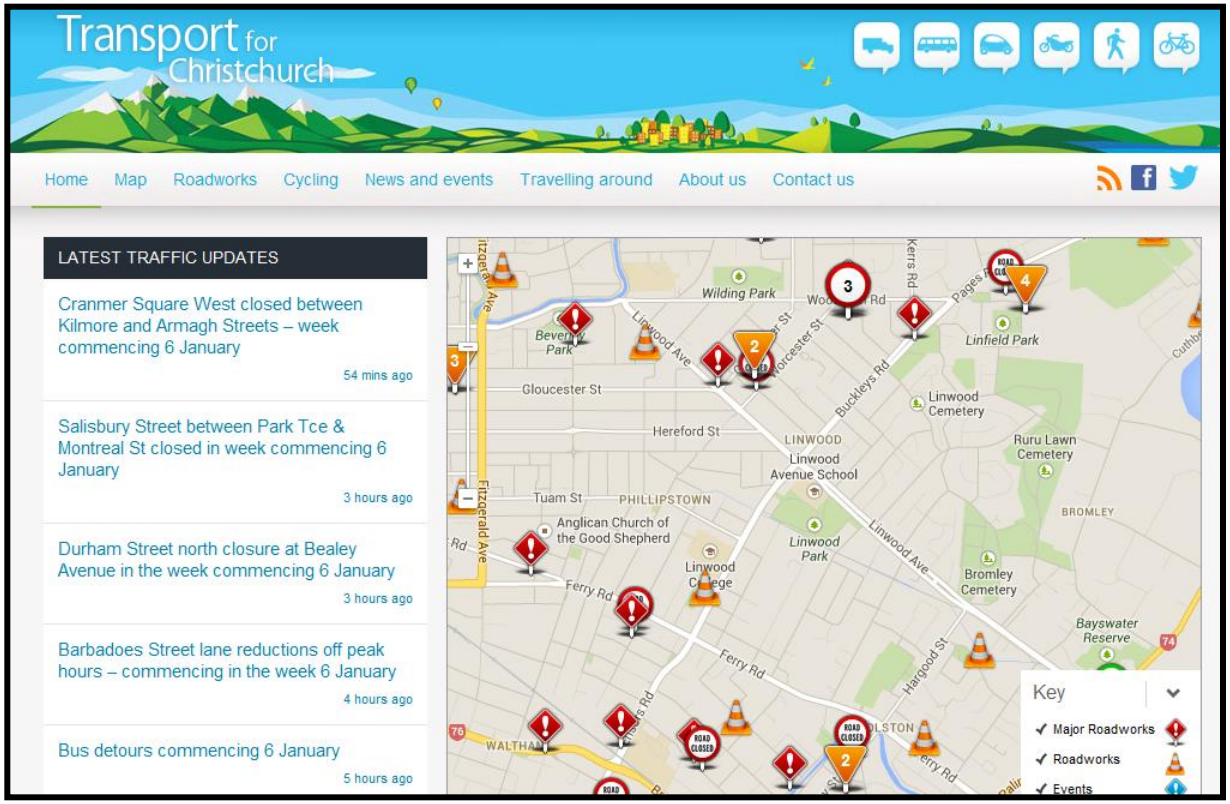
Transport for Christchurch – a website born

www.tfc.govt.nz



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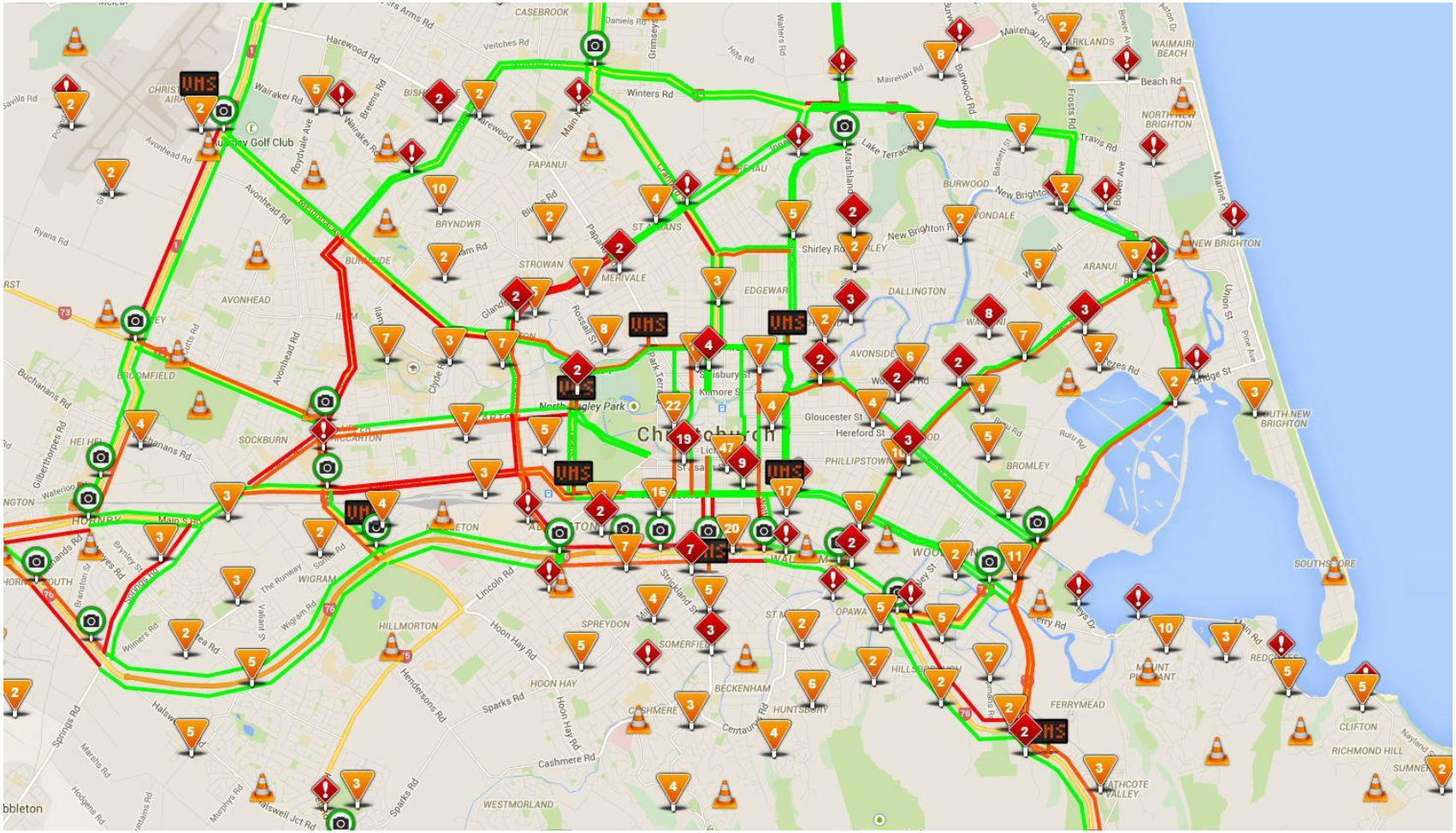
The Challenge – how do you communicate this?



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Thinking outside the box

VMS – Network strategies

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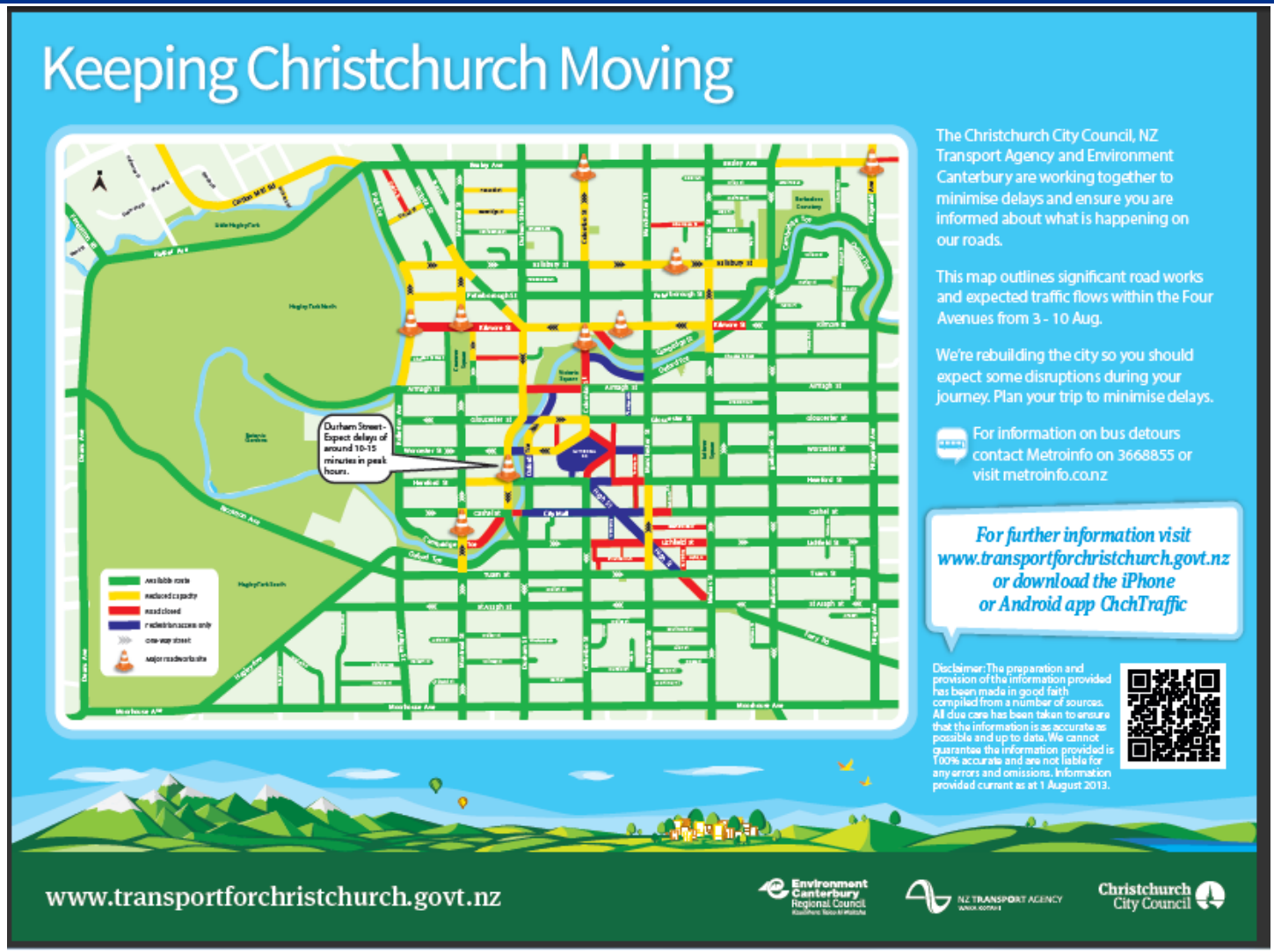
Printed Press – CBD Maps weekly



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Advertorials

Keeping Christchurch Moving

Gayhurst Road bridge closing this week

Road users who use the Gayhurst Road bridge as part of their daily journey will need to allow extra time from next week when the bridge closes for demolition work to begin.

Scheduled for the week of Monday 26th May, the closure will go in once the temporary footbridge, which is currently under construction, is open.

Some roads leading to the bridge will also have restrictions, including closures during the anticipated year long closure.

ROAD CLOSED AHEAD

The restrictions in place starting next week are:

LOCKSLEY AVENUE – CLOSED from Gayhurst to approximately 15 Locksley Avenue

GAYHURST ROAD – CLOSED from Rupert Place to Gayhurst Bridge

DALLINGTON TERRACE – CLOSED at the Gayhurst Rd intersection

AVONSIDE DRIVE – CLOSED west of Gloucester Street intersection

AVONSIDE DRIVE – EASTBOUND only from Gloucester Street to Ngarimu Street.

DETOUR AHEAD FOLLOW

DETOUR ROUTES:

Southbound detour:
McBratneys Rd – River Rd – North Avon Rd – Stanmore Rd – Swanns Rd – Avonside Dr – Woodham Rd – Gloucester Street.

Northbound detour:
Ngarimu St – Woodham Rd – Avonside Dr – Swanns Rd – Stanmore Rd – North Avon Rd – River Rd – McBratneys Road.

A two-metre wide temporary footbridge for pedestrians and cyclists will connect Locksley Ave with Avonside Drive.

Access to the footbridge will be via Rupert Place on the northern side of the river and between Gloucester and Ngarimu on the southern side.

We suggest allowing extra travel time for journeys due to the detours required as part of the bridge closure.

metro BUS INFORMATION

MetroBus users who use Route 510 should check www.metroinfo.co.nz for updates on detours for this route.

FURTHER TRANSPORT INFORMATION:
For up to date traffic information please visit
www.transportforchristchurch.govt.nz

www.transportforchristchurch.govt.nz

Environment Canterbury Regional Council Kaunihera Taiao ki Waitaha

NZ TRANSPORT AGENCY WAKA KOTAHI

Christchurch City Council

In partnership with SCIRT Rebuilding Infrastructure

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Social Media – instant communication

SCIRT @SCIRT_info · 54m

Wainoni Road - Aranui - vacuum wastewater system installation *Update* strongerchristchurch.govt.nz/work/activity/… #chch

1

TFC @TransportChCh · 2h

Park Terrace-southbound closure implemented after morning peak hrs today- Bealey Ave to Kilmore St-ow.ly/KmkmQ ^KG

1 2

SCIRT @SCIRT_info · Mar 11

Main Road - Redcliffs - storm water repairs strongerchristchurch.govt.nz/work/activity/… #chch

Transport for Christchurch

Posted by Hootsuite [?] · 9 March at 07:12 ·

Bealey/Madras Street - reduced lanes on both Bealey and Madras Street, delays in peak times - use Montreal St. ^TF

Boost Post

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Did it work? March 7 2014

Black Monday – 7th March

- 25,000 hits
- 335 comments
  - "we are in a rebuild, this is expected"
  - "manage the work programme better"
  - "more cycle, PT etc trips"
  - "poor historic planning therefore insufficient capacity"

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Collaborative Media

Christchurch traffic jam today, jam tomorrow

SARAH-JANE O'CONNOR AND SHELLEY ROBINSON

Christchurch traffic woes to ramp up this winter

SHELLEY ROBINSON

CTV
It's Canterbury

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Radio

The Breeze – weekly live traffic updates with James Daniels

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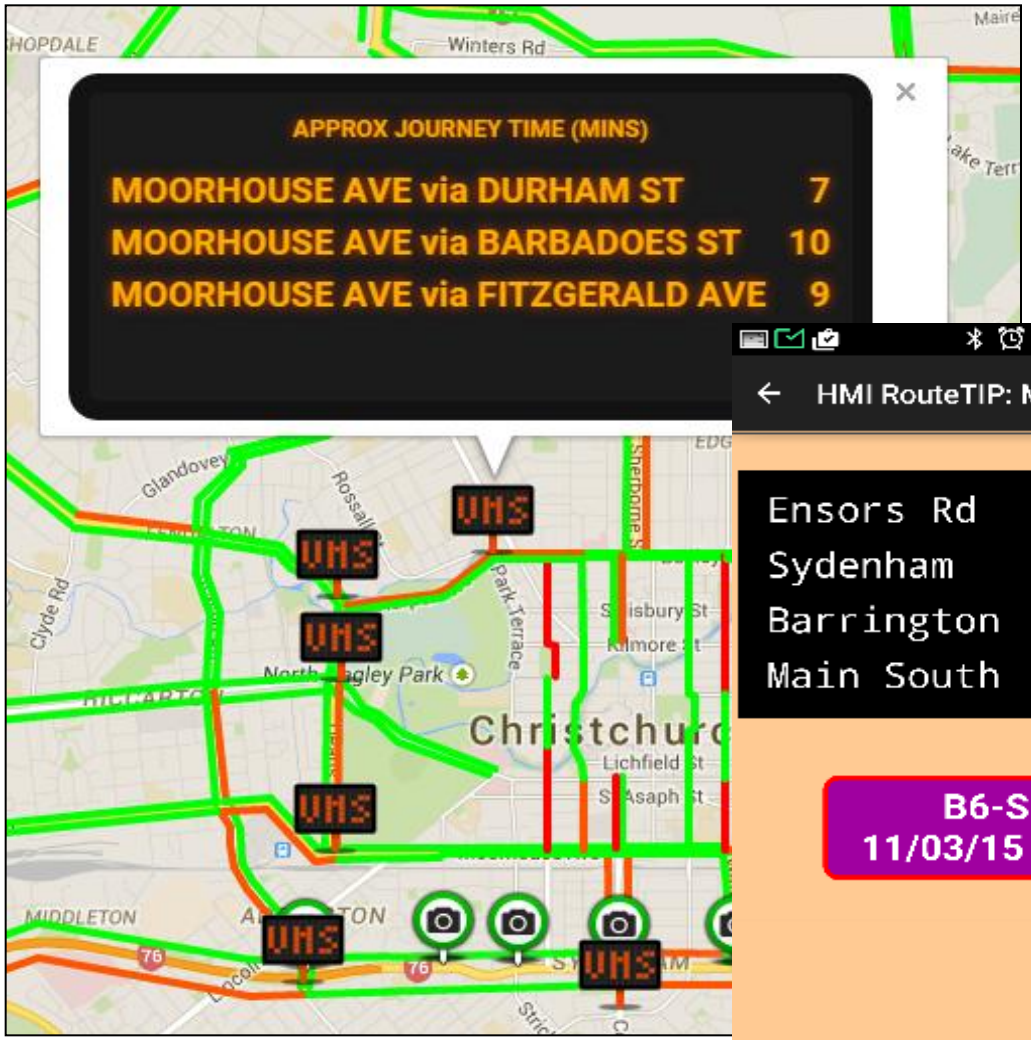
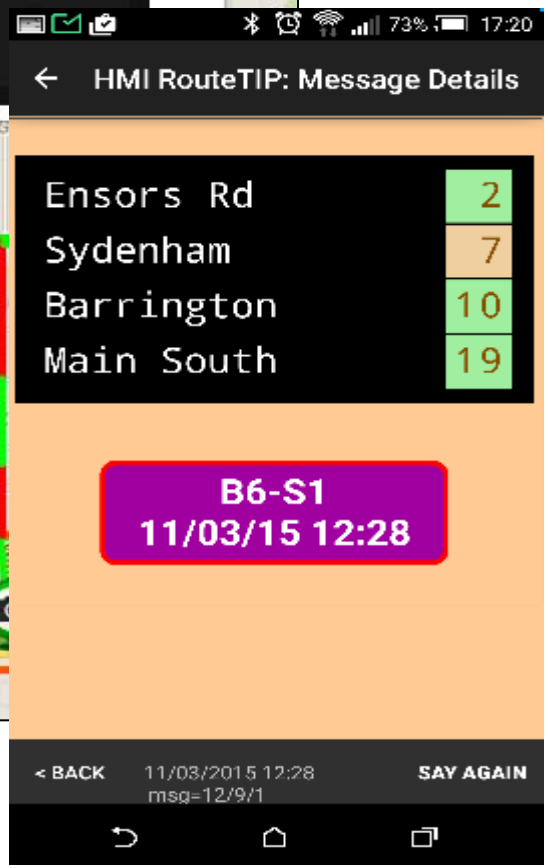
What has it led to?





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What next for Traveller information?

- **How do we learn from this?**
- **Resilient Transport Network**
- **Customer Research**
- **Enhancing Technology – limitless possibilities**
- **Travel Demand Management**

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Legacy

SCIRT objectives

- Best for communities
- Open to new ways and perspectives
- Developing our people

Many tools and processes developed set a precedent to the way it will be done in the future…

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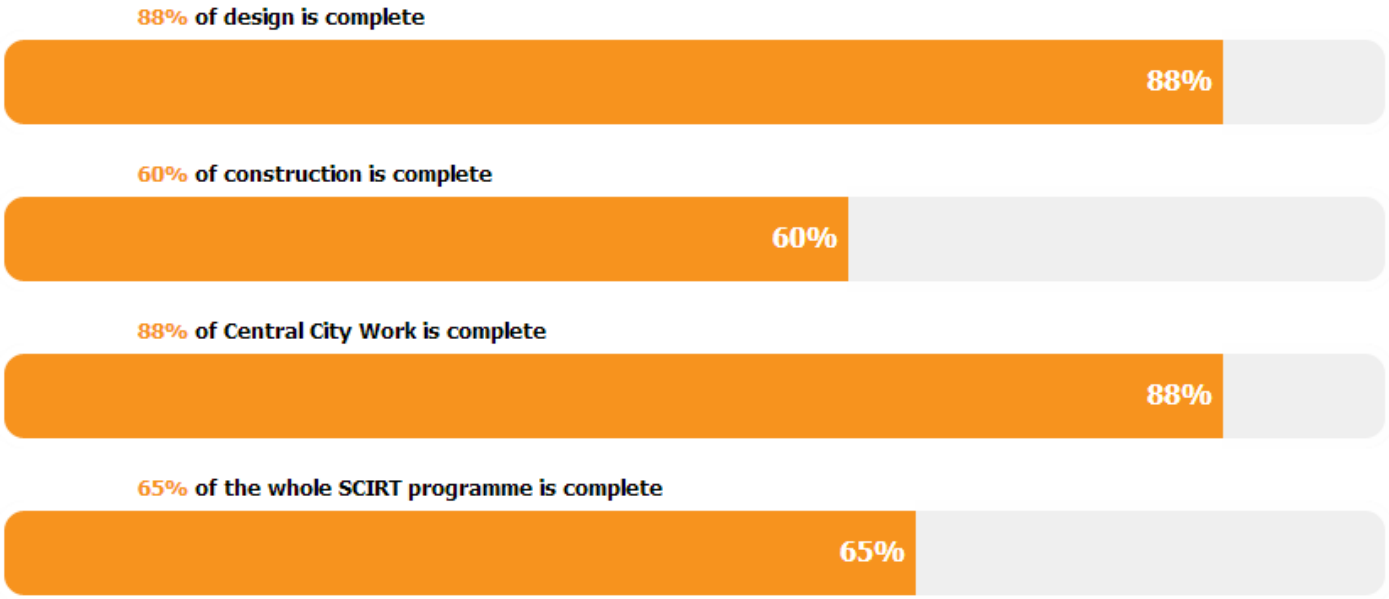
SCIRT progress so far

WASTEWATER	353 km pipe (54%) repaired/replaced
	60 pump stations (59%) repaired/replaced
STORM WATER	14 km of pipe (52%) repaired/replaced
	4 pump stations (33%) repaired/replaced
FRESH WATER	51 km of pipe (74%) repaired/replaced
	64 pump stations and reservoirs (88%) repaired/replaced
ROADING	483, 776 sq m of road (37%) repaired/replaced
	102 bridges/culverts (68%) repaired/replaced
	75 retaining walls (35%) repaired/replaced



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KEEPING A CITY MOVING

THANK YOU

ANY QUESTIONS?

ANGUS BARGH, TRESCA FORRESTER, KERSTIN RUPP, KEVIN WESTENENG