Memo

To: All Relevant Stakeholders

From: Jewel Zhu – Fire Engineer

Date: 23 June 2022

Action: 19 Derrimore Heights Residential House Fire

INTRODUCTION

In the early morning of 07 April 2022, Fire and Emergency was alerted to a structure fire in a residential house development located at 19 Derrimore Heights, Clover Park, Auckland. Due to the size of the fire, the incident was escalated to a third-alarm, resulting in the attendance of 9 fire appliances and numerous personnel.

Fire crews managed to extinguish the fire but not without substantial damage to neighbouring properties. As a result, four new builds have been damaged by this fire. The extent of damage included one building completed destroyed by fire and three buildings severely damaged. All four properties of concern were under construction and were empty at the time, so no injuries were reported.

This report documents the findings of the review against the following aspects:

- Explore the availability and access to fire-fighting water and its compliance with SNZ PAS 4509 - firefighting water supplies code of practice
- Assess external fire spread and discuss possible limitations in current compliance requirements (C/AS1)
- Identify factors that should communicated as lessons learned from this incident

DESCRIPTION OF INCIDENT

[Information on the incident was gathered from logs from SMS[1], on site observation by Fire Engineer Jewel Zhu, recorded radio communication[2] and statement from officer in charge (OIC).]

Fire and Emergency New Zealand Communications Centre received a 111-telephone call advising of a house fire in the vicinity of Derrimore Heights, Clover Park at 5:10 a.m. on 07 April 2022.

The first fire appliance (PAPA344) from the Papatoetoe fire station was dispatched at 5:11:33 a.m. and arrived the scene at 5:17:30 a.m. Meanwhile, multiple phone calls were received by 111 and stated that “possible 2 houses were on fire, houses are close together”, then more fire appliances from Otara fire station were dispatched.

[1] Station Management System, Internal logging system for FENZ
[2] Time stamps from radio recordings were offset and had to be adjusted to the times provided in SMS log.

The first arriving appliance transmitted a K99: [PROPERTY FIRE WELL INVOLVED] arrival coded message, advising of multiple houses under construction on fire and the OIC escalated the response to a 2nd alarm at 05:24:38 a.m.

The crew attacked the fire from the house at the rear seat with two low pressure deliveries (LPD) but found out that water supplies on site were extremely limited, the OIC confirmed that the second house was also well involved in fire, with multiple exposures. The incident was further escalated to a 3rd alarm at 05:27:02 a.m. Additional deliveries were established but it became clear that water supplies were insufficient to support those. Following a request from the OIC, The communication center contacted Watercare to request boosting the water pressure at 05:41 a.m. Meanwhile, further deliveries were established from Redoubt Road. At the peak of the incident, six LPD were in use.

A specialist fire investigator attended the incident to determine the cause and origin of the fire. The cause of this fire is believed to be deliberately lit (Incendiary) by person(s). For more information on the origin, probable cause and the fuel loads within the building at the time of the fire, refer to the Fire and Emergency fire investigation report for the incident(F3436740) written by the attending Specialist Fire Investigator.

DESCRIPTION OF THE BUILDING

Following the incident, a review of the building history was carried out, based on information held by Auckland Council.

The site of 19 Derrimore Heights, Clover Park is legally described as Lot 244 DP79742. It is rectangular in shape with a pan-handle shaped driveway strip serving the site from the public road (Derrimore Heights). It has a land area of 933 m^2. It is understood that a building has been located on this site since the 1970s, consisting of a detached residential dwelling. The dwelling was single storey with a floor area of 155m^2 and was recently sold in Jan 2020. The new owner proposed a subdivision development which includes three residential Lots with the existing dwelling on the site to be removed. Auckland Council had granted consent for "three new standalone two-story dwellings" to be built the same address in late 2020.

Refer to Figure 1 for the visual representation of the proposed subdivision development. For ease of reference, the dwellings located at Lot 1, 2 and 3 will be referred to as dwelling 1, 2 and 3 respectively in this report. The entire subdivision development of concern will be referred to as Derrimore development in this report.

At the time of the incident, the three two-storey dwellings were under construction and were considered weathertight, however, it is noted that the internal wall framing was not lined yet and no electrical services were installed.

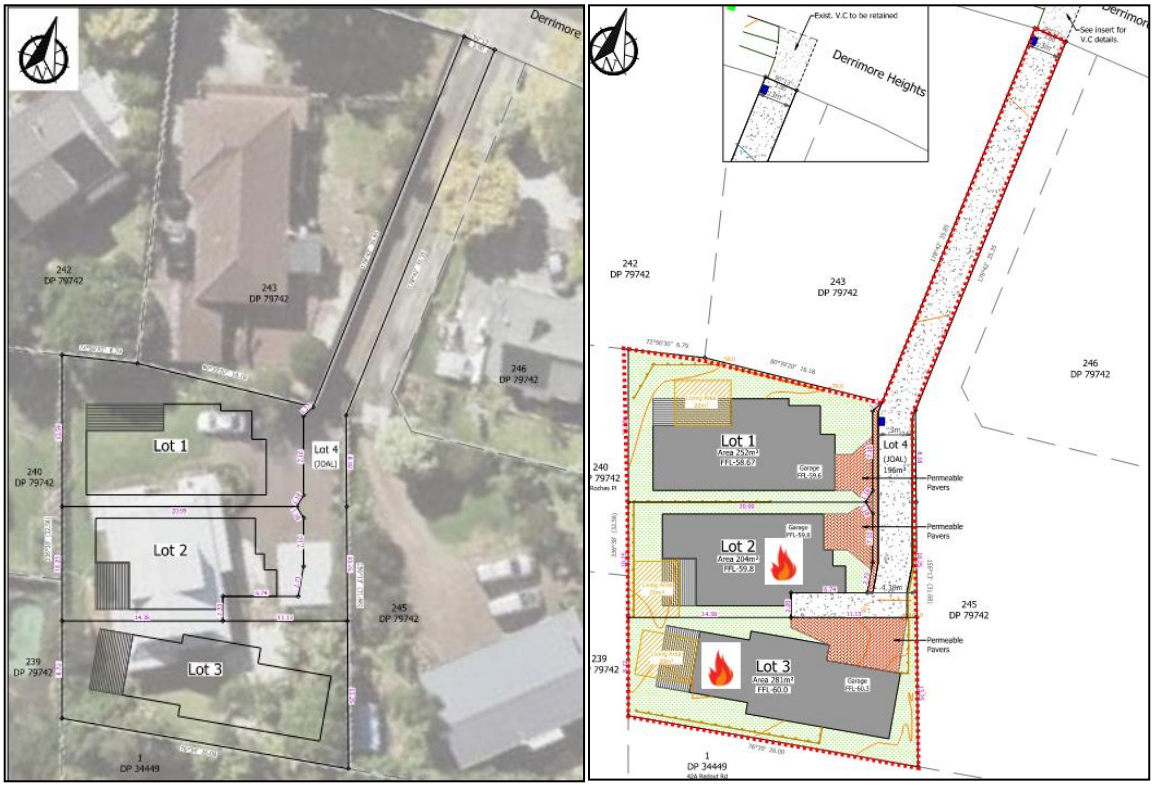


Figure 1: Left - Proposed development overlaid with existing building layout
Right - Proposed subdivision development with 3 residential Lot – Extracted from Engineering Plan

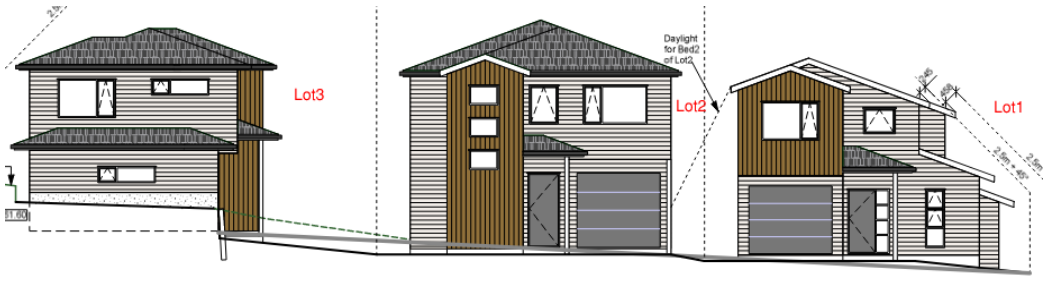


Figure 2: Proposed three new standalone two storey dwellings at the same site – elevation view from the east

FIREFIGHTING ACCESS

Access to the building is straight from Derrimore Heights (i.e. public road to the north), via an approximately 40m long pan-handle shaped private driveway. As the driveway was covered in gravel and only provides 2.9m effective width, it is not suitable for a fire appliance. Consequently, fire appliances had to park on Derrimore Heights. The hose run distance from Derrimore Heights to the furthest point of each building is within 75m, however, this is noted to be marginal.

It is noted that during the firefighting operations, additional firefighting accesses were established from Rochas Place to the west and Redoubt Road to the south, in order to control the fire spread to the neighbouring properties (mainly the 42 Redoubt Road properties). However, this was limited to firefighters on foot establishing hose lines through other properties but did not offer alternative access for appliances.

Refer to Figure 3 below for the firefighting access to site during the firefighting operations.

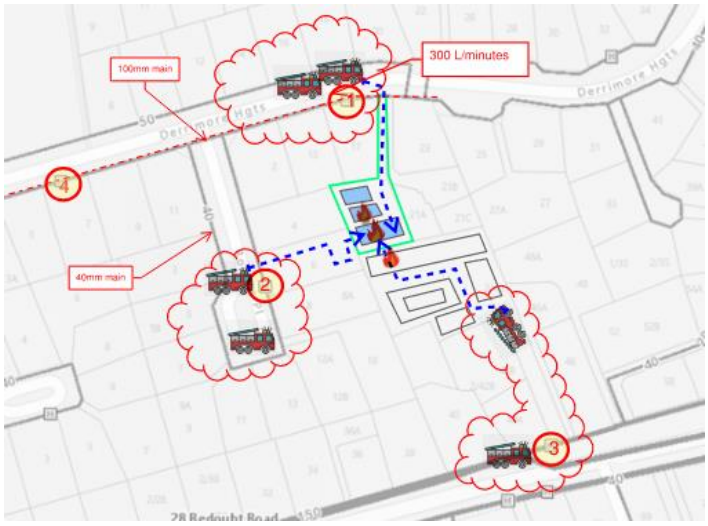


Figure 3: Firefighting access; Reticulated line and locations of the street hydrant - from Smart Map

FIREFIGHTING WATER SUPPLIES

During the firefighting operations, it is noted that the water supply was insufficient to support the number of deliveries that had been established. this posed a detrimental impact on the ability for firefighters to fight the fire.

The Derrimore development is provided with a reticulated water system including in-ground fire hydrants. There are street hydrants within 135 m of the site on Derrimore Heights to the north and Rochas Place to the west. The closest street hydrant on Redoubt Road to the south is approximately 160m away of the site, when measured in a straight-line. However, as access through neighbouring properties cannot be guaranteed, the actual distance far exceeded 270m. Refer to Figure 3 for approximate locations of the street hydrants.

Although street hydrants are available at regular intervals on the south, west and north side of the building, the OIC reported "brigade had extremely limited water" when two LPD were established from the street hydrants (denoted as H1 and H4 as shown in Figure 3) from Derrimore Heights. Responding crews were not able to secure sufficient water supply available to carry out firefighting operations.

NECESSARY WATER SUPPLY

In New Zealand, the Councils will normally consider water supply provisions in the subdivision section of their District Plans, this will also include the water supply for firefighting purpose. As a general rule, water supply systems should be designed and installed not only to provide sufficient water for domestic, commercial, and industrial demands but also to provide the water that may be needed to fight fires. The flow, storage and volume requirements of firefighting water is determined by Code of Practice (CoP) issued by Fire and Emergency New Zealand (Currently, SNZ PAS 4509: 2008 – New Zealand Fire Service firefighting water supplies code of practice).

Auckland Council has adopted SNZ PAS 4509 for its subdivision development, this is evidenced in a few Council documentations such as *"Auckland Unitary Plan - Standard Conditions Manual",*

"Subdivision -Urban - AUP E38", and "*The Auckland Code of Practice for Land Development and Subdivision (Chapter 6 by Watercare)".*

In accordance with SNZ PAS 4509, the Derrimore development has a FW2 risk classification, therefore the firefighting water required is 1500L/min in total, this is expected to be achieved by no more than two hydrants with a combined flow rate of 750L/min located within a distance of 135m and a further two hydrants with the same combined flow rate within 270m.

	Reticulated water supply			Non-reticulated water supply	
Fire water classification	Required water flow within a distance of 135 m	Additional water flow within a distance of 270 m	Maximum number of fire hydrants to provide flow	Minimum water storage within a distance of 90 m (see Note 8)	
				Time (firefighting) (min)	Volume (m^3)
FW1	450 L/min (7.5 L/s) (See Note 3)	–	1	15	7
FW2	750 L/min (12.5 L/s)	750 L/min (12.5 L/s)	2	30	45
FW3	1500 L/min (25 L/s)	1500 L/min (25 L/s)	3	60	180
FW4	3000 L/min (50 L/s)	3000 L/min (50 L/s)	4	90	540
FW5	4500 L/min (75 L/s)	4500 L/min (75 L/s)	6	120	1080
FW6	6000 L/min (100 L/s)	6000 L/min (100 L/s)	8	180	2160

Figure 4: Method for determining firefighting water supply - from SNZ PAS 4509

AVAILABLE WATER

As part of this investigation, a flow test to the street main was conducted by Fire and Emergency on 10 April 2022. Due to resource constrains, only the hydrant located outside the 17 Derrimore Heights was tested and a flow rate of 300L/minute was reported, it is expected that this will give us some indication on the flowrate that was potentially available at the time of incident.

The flow test conducted by Fire and Emergency indicates that the hydrant located outside the 17 Derrimore Heights (denoted as H1 shown in Figure 3) has a flow rate of 300L/minute. As the two hydrants outside the 7 Derrimore Heights (denoted as H4) and 6 Rochas Place (denoted as H2) are served by the same water main as H1, the three hydrants (i.e. H1, H2 and H4) combined would provide a flow rate of 900L/min in a best-case scenario. It is noted that in reality, the combined flow rate is likely to be much less as the flow and pressure would reduce significantly as additional hydrants are opened. Therefore, when comparing the water flow available with the requirement of SNZ PAS 4509, the shortfall is noted to be 600L/min at least.

WATER USED DURING THE INCIDENT

It was understood from the OIC that during the entire firefighting operations, three deliveries were established from Derrimore Heights, two deliveries were established from Rochas Place and one delivery was established from Redoubt Road.

In accordance with *F1 GD Fire Suppression Guide*, the typical flow ranges for LPD (i.e. with 45mm diameter delivery hose) is from 200L/min to 450L/min, refer to Figure 5 for details. Noting that the flow rate used in the calculation below is taken as 400L/min, for conservatism.

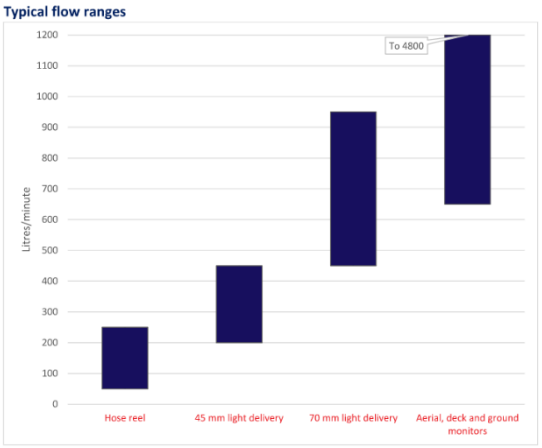


Figure 5: Typical flow ranges – Extracted from F1 GD Fire Suppression Guide

The estimated flow rate required by the operational needs, the flow rate available from the street hydrants and the flow rate required by COP SNZ PAS 4509 were compared and listed in Table 1 below.

Table 1: Water supply flow rate comparison

	No. of Deliveries	**Flow required (L/min)**	**Flow available (L/min)**	**COP requirement (L/min)**
Derrimore Hgt.	3	400x3 =1200	< 900 (300x3) at most	750x2 = 1500
Rochas Pl.	2	400x2=800		
Redoubt Rd.	1	400	*Sufficient	N/A

**sufficient flow is provided given the size of the water main being 150mm.*

DISCUSSION

The maximum water flow required by the actual firefighting activities served by the Derrimore Heights main during the incident was 2000L/min (based on five LPD operating from that side, but excluding those supplied from Redoubt Road), which even exceeds the value derived from SNZ PAS 4509. This is largely due to the firefighting tactics to deal with the fire with multiple exposure and fire spread over multiple buildings.

Some discrepancies relating to water supply provision have been noticed in Resource Consent documentation. Although it is clearly stated that the *"granting of this application does not does not constitute a guarantee from Watercare Services Limited to provide a firefighting capability in accordance with Fire and Emergency New Zealand Code of Practice"* in the Council Engineering plan approval letter (ref: ENG60360984), the Watercare peer review letter (ref: RC-28477) indicates that Auckland Council was satisfied the proposed water connection via 100m water main along Derrimore Heights will achieve FW2. It appears that the application did not include evidence to support that conclusion. As evidenced by the flow test conducted by FENZ, the water flow provided at the site is clearly inadequate to cater for the firefighting water required by SNZ PAS 4509, with a significant shortfall experienced.

Like Derrimore development, in many cases the domestic demand is not critical and the firefighting requirement will generally dominate the overall water supply requirement. It is suggested that

when planning the land use (i.e. at Resource Consent stage), the amount of water available for firefighting purpose should be considered with the current network capacity (pipe size provided). This could be implemented by requesting flow test to validate the proposed provision and some necessary consultation with FENZ.

FIRE DEVELOPMENT AND SPREAD

The three dwellings on site are generally comprised of timber framing, timber subfloor and cladded with weatherboard type of façade. In Dwelling 3, the roof, subfloor, and majority supporting structure collapsed, combustible internal partitions and external facade were entirely consumed. The top floor of dwelling 2 was also extensively damaged by fire, including majority section of the roof and upper floor façade burnt through.

The extent of damage to dwelling 2 and 3 (as shown in the figures below) was generally in line with expectation given the type of structure and the severity of the fire. Refer to Appendix A for more details.

Figure 6: The extent of damage to Dwelling 3 – Overlook from South

Figure 7: The extent of damage to Dwelling 3 – View from North (entry access way)

Figure 8: The extent of damage to Dwelling 2 – Overlook from South

Figure 9: Partial northern external wall of Dwelling 2 – View from Dwelling 3

The fire in the dwelling 3 spread throughout the building envelope and then into the neighbouring Redoubt Rd properties that backs on the Derrimore Heights site. The neighbouring subdivisions which are also under construction, sustained some fairly severe damage to its boundary fencing, cladding and external glazing. Attending crews indicated that the wind direction was north to south (i.e. from Derrimore site to Redoubt Rd site) on the day of the incident, compounded with other factors such as short separation distance (i.e. 3m) in between, the fire was therefore driven towards the rear neighbouring subdivision, the intense heat and direct flame impingement would have been sufficient to cause fence collapse, glazing fracture and ignition of the external wall. Refer to Figure 10 for details.

Figure 10: Extent of damage neighbouring Redoubt Rd subdivisions at the rear

It is also noted that the building to the east of the Derrimore site had very minor damage around the wrapping material around the building envelope, which had partially melted. As part of the that building located approximately 4m away from dwelling 3, the extent of damage was limited by a combination of separation distance, wind direction (driving the fire in the opposite direction) and the action of firefighting crews.

Figure 11: Extent of damage neighbouring properties under construction from the east

FIRE ASSESSMENT ON FILE

There is no dedicated fire report accompanied with the consent documentation for the Derrimore development, possibly due to its simple nature. In the *Residential Processing Checklist* held by Auckland council (ref: AC1124), there are some brief statements noted under *C1 Fire protection* section, indicating that the proposed development has been assessed as single family unit dwelling (i.e. risk group SH), among other things it is concluded that the design complies with relevant boundary requirements in accordance with C/AS1, that is, 1.0m between the building and the relevant boundary or 2.0m between any two buildings on site.

Under the Auckland Unitary plan, the site of 19 Derrimore Heights is categorised as Zone 18 Residential - Mixed Housing Suburban Zone, which allows three dwellings per site. Each dwelling

is required to be set back from the Lot boundaries at certain distance, this is generally regulated by sunlight, natural ventilation and fire safety requirements, of which the fire safety requirements appears to be the most stringent and generally dominates all other requirements.

COMPLIANCE METHODOLOGY

Acceptable solutions provide a prescriptive option to demonstrate that the fire safety objectives of the Building Code have been met and typically apply to simple buildings. In the case of stand-alone dwellings, Acceptable Solution C/AS1 applies. Therefore, adopting C/AS1 is appropriate as the proposed Derrimore development falls under this category.

C/AS1 PART 5 - HORIZONTAL SPREAD OF FIRE

Horizontal fire spread will occur as a result of radiation from non-fire rated areas of a wall. These could be either natural openings (e.g. windows) or from the collapse of part of the structure of a wall. C/AS1 part 5 sets out the requirements to control of external fire spread, to protect other property or sleeping spaces in any adjacent building that may be present. This can be achieved by either:

- Ensuring that the wall is at least 1m away from the boundary; or
- designing the wall to achieve a fire resistance rating

This is illustrated in Building A, B C in Figure 12 below.

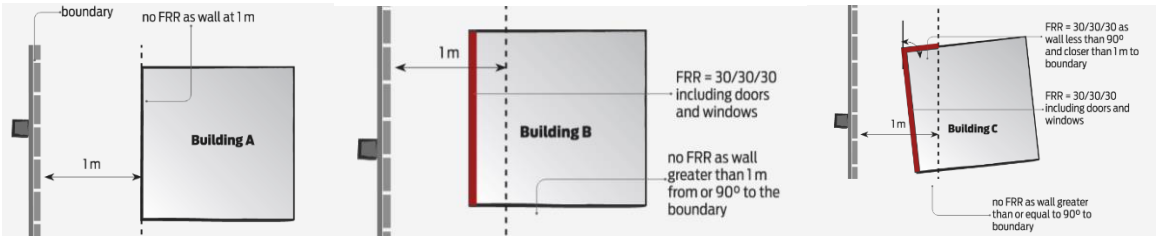


Figure 12: External fire resistance rating requirement for single household

If the buildings considered includes sleeping use, those requirements also apply to buildings on the same section under one title or same ownership. Under this circumstance, a notional boundary should be used between the two buildings instead of relevant boundary; for instance, between the main house and sleepout.

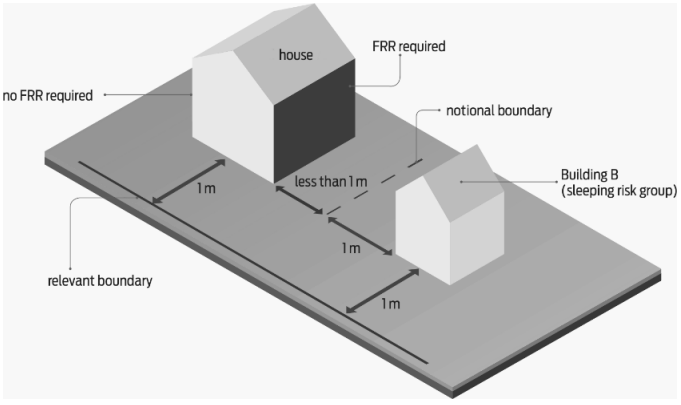


Figure 13: Fire resistance ratings for various sleeping risk group buildings under the same title

Based on above, this subdivision development is considered to be fully compliant with C/AS1 part 5. However, from the site observation outlined in the previous section, it is evident that the separation distance was not sufficient to prevent fire spread and substantial damage to the neighbouring buildings.

COMPLIANCE WITH THE BUILDING CODE

Although compliance with C/AS1 is a deemed to satisfy approach which is considered to achieve compliance with the performance requirement of the Building Code, it is worth considering the actual requirement. Of particular relevance is Clause C3.6, establishing the following performance requirement:

> *"Buildings must be designed and constructed so that in the event of fire in the building the received radiation at the relevant boundary of the property does not exceed 30 kW/m^2 and at a distance of 1 m beyond the relevant boundary of the property does not exceed 16 kW/m^2."*

To explore the compliance status with NZBC clause C3.6, with the proposed site arrangement, a quantitative analysis has been carried out using the Thermal Radiation Analysis (TRA) software, to determine the radiation received at the boundaries, 1m beyond the relevant boundary and at the closest façade line to neighbouring building.

TRA simulates incident heat flux on a receiver from an emitter. For residential settings including stand-alone houses, an emissive flux of 84kW/m^2 is usually assumed. It is in line with the parameters used for "all spaces where occupants sleep" as described in C/VM2 *Verification Method: Framework for Fire Safety Design*. It is noted that the dwelling of concern was not occupied at the time of the fire, with no furniture or personal belongings, so the live fuel loads would be reduced. On the other hand, as the internal wall framing was not lined (with plasterboard typically), all the exposed combustible structure members and insulation material could increase the severity and provide considerable amount of fuel to sustain the fire once it became established. Though the accelerant used might have contributed during the early stages of fire development, its impact at later (e.g. post flashover) stage can be neglected.

Therefore, it is considered appropriate to use the standard emissive flux in this case. In the TRA simulation, emitter temperature was set to 1110K (corresponding temperature based on emissive flux of 84kW/m^2) whilst receiver temperature was set to 293K (ambient temperature).

In this analysis, a few other assumptions have been made for simplification as follows:

- The emitter panel is limited to dwelling 3 only, the radiation from dwelling 2 is neglected due to significant separation distance.
- Simulation was based on the entire south elevation of dwelling 3 as unprotected area, the distances used in the simulation is taken from the actual location of the south elevation to the planes of concern (relevant boundary, 1m beyond the relevant boundary, and closest façade line of neighbouring buildings)
- Wind effect is not included in the assessment, this relates to the wind direction (from north to south) driving the fire spread towards the neighbouring properties, and increasing the severity of the damage imposed.

- Each emitter/ receiver was divided into 50/100 sub panels respectively. The resolution adopted is appropriately fined to provide a relative divisional objectivity.

The detailed geometry of the entire dwelling 3 south elevation and receiver panels used in TRA simulation is illustrated Figure 14 below. Refer to Appendix A for three-dimensional coordinates included in the simulation.

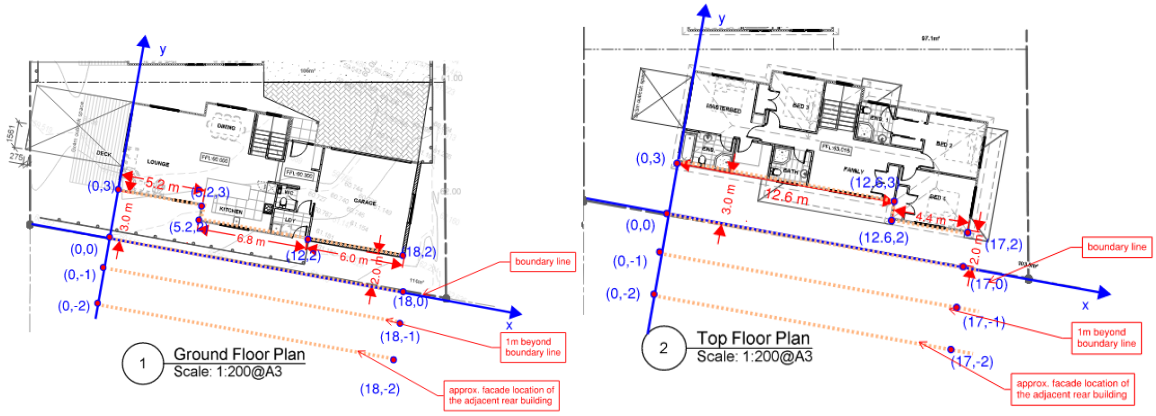


Figure 14: TRA input emitter and receiver panels in plan view – x, y coordinates

The output files of the TRA simulation are shown in the figure below.

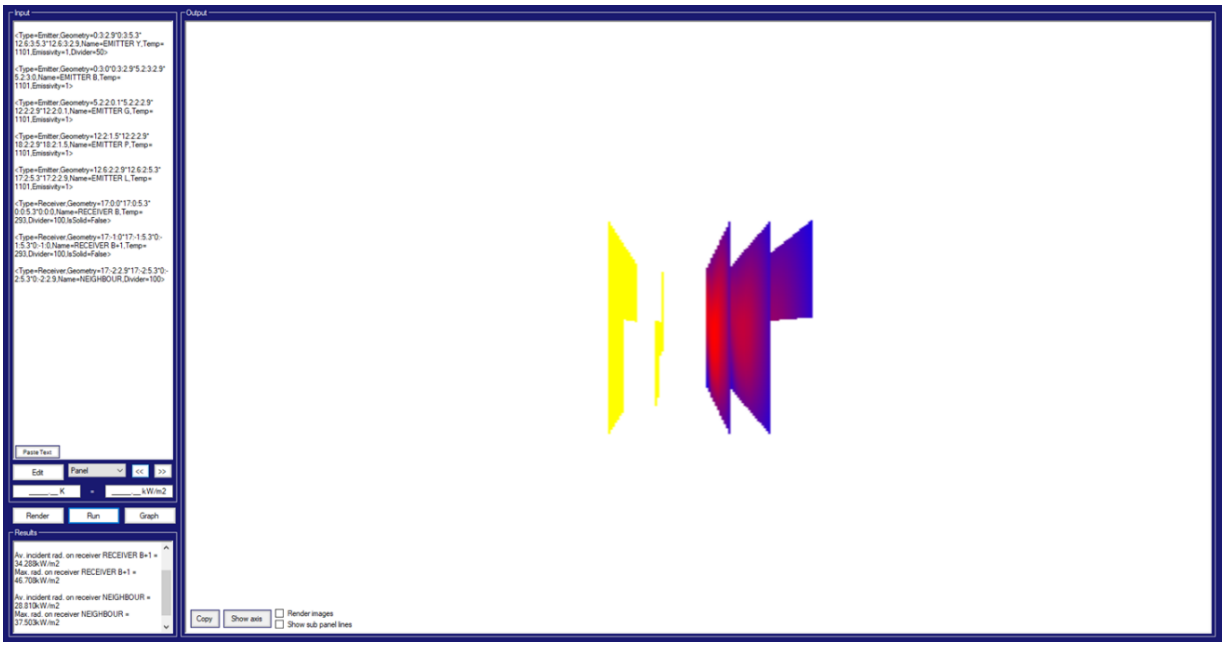


Figure 15: TRA output – snapshot from TRA software

In Figure 15 above, areas shown in red/purple are identified as receivers, whilst areas shown in yellow are emitters. The incident flux at the boundary, 1m beyond the boundary and at the closest façade line of neighbouring building are tabulated in Table 2 below:

Table 2: TRA output

	At relevant boundary	1m beyond	Façade line of neighbor
Max. Incident Radiation	57.858 kW/m^2	46.708 kW/m^2	37.503 kW/m^2
Max. Permitted by C3.6	30 kW/m^2	16 kW/m^2	-

It can be concluded that, although the Derrimore development was designed and constructed in compliance with C/AS1, a more thorough assessment of the boundary conditions would not have demonstrated compliance with the Building Code, Clause C3.6.

DISCUSSION

It is understood that C/AS1 is mostly intended for typical urban housing arrangement consisting of a single stand-alone house on a relatively sizeable section. Although it is not specifically stated in the Acceptable Solution, this assumption underpins a number of the standard requirements and aligns with what, historically, would have been the preferred type of construction in New Zealand. According to Auckland Regional Growth Strategy (2005): "*Historically, New Zealand's urban housing market has been dominated by owner-occupied, detached dwellings built on relatively large sites, until the 1960's the norm was the 'quarter acre section'. Since then sites have decreased in size, particularly in the major cities, such as Auckland".* Adopting C/AS1 to assess the external fire spread seems to be appropriate, if the proposed buildings feature backyard, front yard, or garden spaces with fairly large distance offset from the boundaries. In those situations, it would not be uncommon for a house to be relatively close to a neighbouring site on one or even two sides but rarely in every direction. Further, other factors such as a short distance from the street and direct, easy access serve to mitigate situations where the close proximity may present a risk of fire spread. This is particularly relevant in enabling effective firefighting operations, thus implicitly relying on the response and action of fire crews to prevent fire spread. While the standard 1m separation required by C/AS1 would never have been considered sufficient to prevent fire spread, it was deemed adequate to balance the risk against the constraints on sites and buildings, in the overall context. This is in line with many other requirements of the Acceptable Solutions which, if subjected to technical scrutiny in isolation may not fully achieve compliance with the Building Code, but represent a "societally acceptable risk".

The Derrimore development is considered to be a good representation of the urban intensification trend within New Zealand over the last few decades. Many councils have seen urban intensification as the preferred approach to achieving the right balance between housing supply and affordability, environmental protection and living standards. As a result, Auckland council has taken action to encourage or require this approach in majority larger urban areas. Urban intensification constitutes development at higher densities than currently prevail within an existing urban area, it will be referred to as Medium density housing (MDH) hereinafter.

It becomes obvious that MDH poses additional challenges for fire safety. Smaller separation distances between buildings increases the risk of fire spreading to a neighbouring property, while complicating access for firefighters. Further, subdividing existing sections results in some of the new dwellings being relatively far from the street. This leads to question whether the standard 1m

separation distance continues to be appropriate. It is suggested that the requirements in Acceptable Solution C/AS1 should be reviewed in light of the current trends and updated to address the increased risk. In the meantime, extra precautions should be given to fire safety aspects when designing MDH, which may include but not limited to the following:

a. Additional separation distance – When determining the distance to the boundaries during the planning stage, it is recommended to use more sophisticated method (e.g. Calculation or Tabulated values as outlined in C/VM2 4.5 or C/AS2 part 5), to satisfy NZBC C3.6.
b. Additional fire rated construction – If the distance to the boundary cannot be increased, additional fire rated construction to the external façade could be used to reduce the risk.
c. Residential sprinkler system, designed to NZS 4517 *Fire sprinkler systems for houses*. Sprinklers have an excellent track record for reducing fire risk as they can react quickly to reduce the heat and flames from a fire.
d. Further to c above, sprinkler systems in residential buildings up to four-storey and a floor area up to 2,000 m² can be designed to NZS 4515 Fire sprinkler systems for life safety in sleeping occupancies (up to 2000 square meters), or to NZS 4541 Automatic fire sprinkler systems.

Furthermore, increased residential density brings additional challenges for firefighting operations as noted in the previous sections. Typically, access can become an issue and the time required to investigate the location of a fire and set up fire-fighting equipment increases as distance from the street and site complexity increase.

It is noted that standalone dwellings are exempt from having to comply with firefighting requirements in Clauses C5.3 to C5.8 of the Building Code. This is reflected in the Acceptable Solution C/AS1. While Fire and Emergency can recommend that developers consider providing driveways suitable for fire appliance access, it must be acknowledged that the requirements for Type 3 pumping appliance are very onerous for private residential driveways. Loadbearing capacity and minimum width in particular are problematic, especially for rear sections served by a "panhandle" driveway which is often limited in width. As an alternative, smaller appliances could be another option to be explored by Fire and Emergency.

Effective firefighting also relies on sufficient water supply provided around the site, this also ties back with the water supply aspect discussed early, during the planning stage. It is further noted that the fire water (FW) classification identified in SNZ PAS 4509 is based on the assumption that a single dwelling is on fire, this is also in line with the typical urban housing arrangement (i.e. a single stand-alone house on a relatively sizeable section) where multiple exposure/fire spread between multiple building is not likely and the access to site is relatively easy and straightforward. That's clearly not the case for MDH, it is suggested to review and amend SNZ PAS 4509 to reflect the additional risks posed by the urban intensification. Meanwhile, extra caution should be taken by the industry (e.g. fire engineer and planner) to ensure the infrastructure (i.e. water supply provision) within neighbourhoods has the capacity to support the intensification.

CONCLUSIONS

After reviewing all the information gathered on site and the information provided by Auckland Council, the following can be concluded in relation to the fire incident on 7 April 2022:

- It appears that Auckland Council has granted the application for water supplies without supporting evidence (e.g. flow test report) during resource consent stage, however, the water supply provision for the proposed subdivision was not adequate for firefighting in accordance with SNZ PAS 4509.
- The water supply provision necessary to comply with SNZ PAS 4509, would have been short of the amount of water that was actually required to deal with this fire, due to the multiple exposure and fire spread resulting in more multiple dwellings involvement.
- It is acknowledged that the fire design complies with C/AS1 in relation to the external fire spread, substantial damage to the rear neighbouring properties (located at 42 Redoubt Road) were observed on site. This suggests that the requirements outlined in Compliance Documentation, i.e. C/AS1 part 5, consisting of a minimum 1m separation distance may not be sufficient to address the control of external fire spread, particularly in situations where firefighters may not be able to readily protect neighbouring properties.
- Recent urban intensification trends have posed additional challenges for fire safety. Although not currently prescribed in the Acceptable Solution, extra consideration should be given in a fire design relating to dwellings in close proximity.. This includes but may not be limited to the aspects such as additional separation distance or fire rated construction and provision of sprinkler system.
- With regard to the incident response for a site remote from street access, this incident highlights challenges for Fire and Emergency heavy appliances to gain access to congested sites with tight driveways.

RECOMMENDATIONS

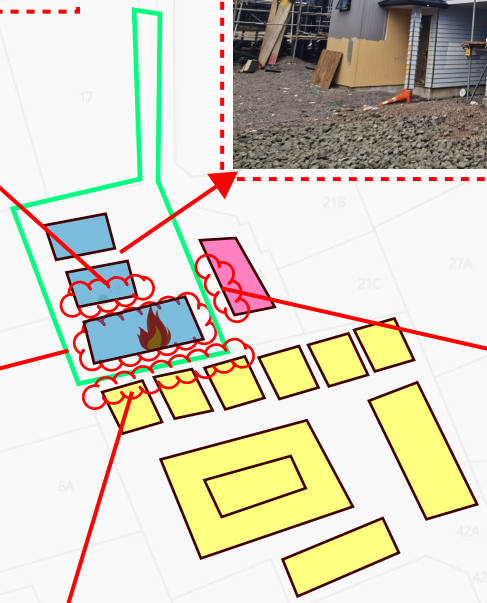
Based on the findings of the Post Incident Analysis, it is recommended that:

- Councils should adopt a pro-active approach and require additional evidence such as flow test when reviewing water supply applications as part of the resource consent process.
- As part of regular revisions to the Acceptable Solutions, MBIE considers the evolution of housing construction and whether the current requirements remain fit for purpose in the next revision of Acceptable Solutions.
- The current New Zealand Fire Service firefighting water supplies code of practice SNZ PAS 4509 should be reviewed and amended to reflect the additional challenges posed by the urban intensification.
- Fire and Emergency should initiate a review of its equipment and tactics and consider whether changes to those may be required to ensure that it can effectively respond in the evolving urban landscape.
- Educating the construction industry, such as fire engineers or planner to be aware of the additional risk raised by the urban intensification, encourage them to take a step further to explore the possible options that could benefit the client and the community.
- The contents and conclusions of this report should be passed on to the relevant stakeholders, including (but not limited to) Auckland Council, MBIE and other practice fire engineers.

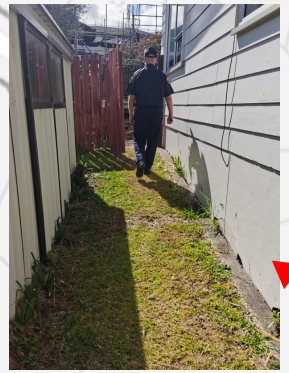
APPENDIX A – SUPPORTING DRAWINGS

Drawing Title:	PIA site view	**Drawing Ref:**	FS01
Date:	11/04/2022	**Project:**	F3436740
Revision:	-	**Drawn by:**	JZ

NORTH



access via other residential property



Back of the neighboring residential property (obstruction)

view from property

view from street

access via other development (under construction) from Redoubt Rd

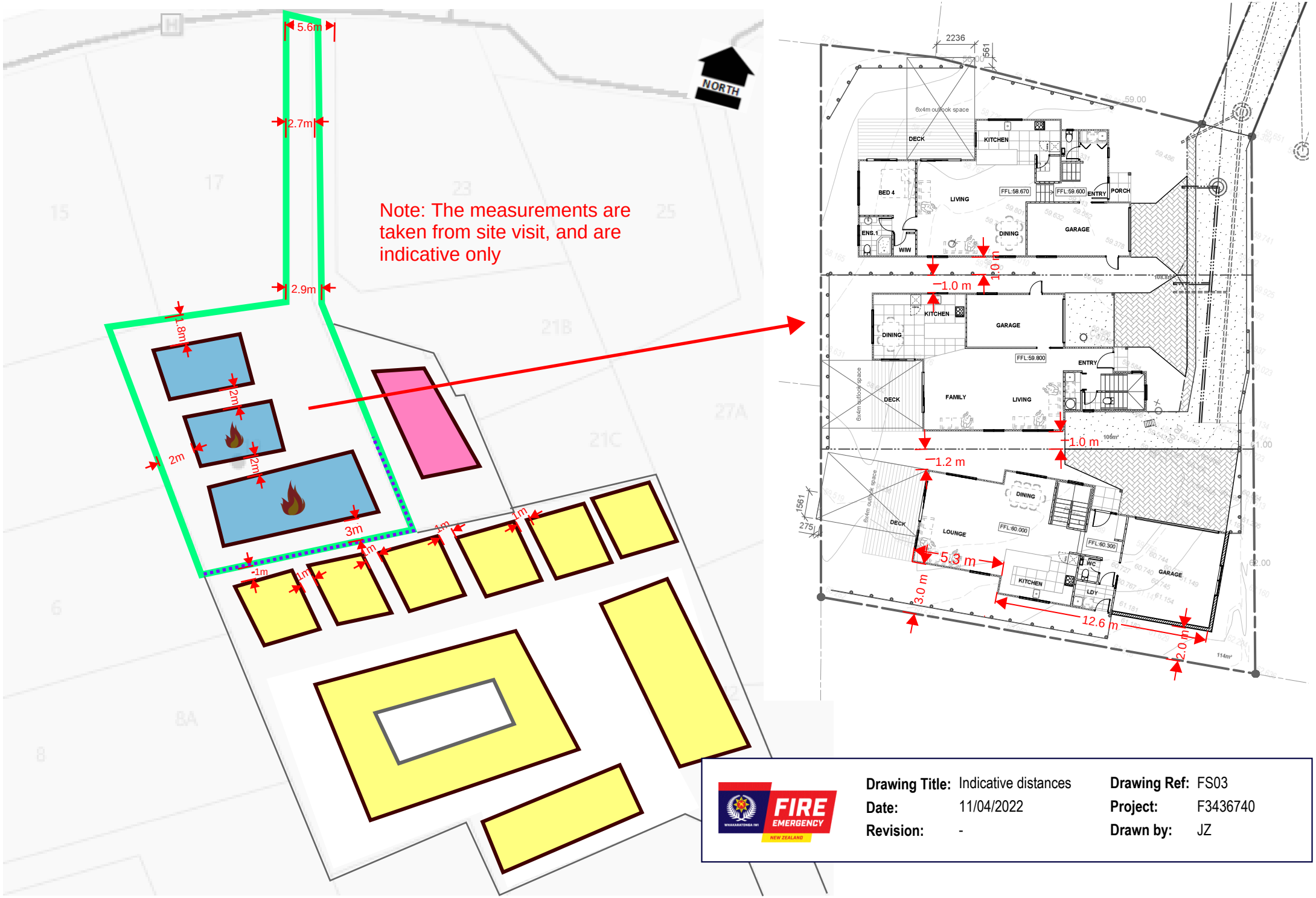
300 L/minutes

100mm main

40mm main

Note: Hydrant 1, 2, 4 are within the same main

Drawing Title:	Firefitghting access	**Drawing Ref:**	FS02
Date:	11/04/2022	**Project:**	F3436740
Revision:	-	**Drawn by:**	JZ



Drawing Title:	Indicative distances	**Drawing Ref:**	FS03
Date:	11/04/2022	**Project:**	F3436740
Revision:	-	**Drawn by:**	JZ

Receiver coordinate

(0,0,5.3) receiver Boundary (17,0,5.3)

(0,0,0) (17,0,0)

(0,-1,5.3) receiver 1m above (17,-1,5.3)

(0,-1,0) (17,-1,0)

(0,-2,5.3) receiver neighbour (17,-2,5.3)

(0,-2,2.9) (17,-2,2.9)

south elevation

Z

20°

2.5m + 45°

z=5.3

Top floor RL:63.015

z=2.9

Ground floor RL:60.000

z=0

2420 2000 295 2300

5.3 m

2.9 m

5.2 m

0.1 m

6.8 m

z=0.1

6.0 m

1.4 m

z=1.5

(0,3,5.3) (12.6,3,5.3)

(0,3,2.9) (12.6,3,2.9)

(12.6,2,5.3) (17,2,5.3)

(12.6,2,2.9) (17,2,2.9)

(0,3,2.9) (5.2,3,2.9)

(0,3,0) (5.2,3,0)

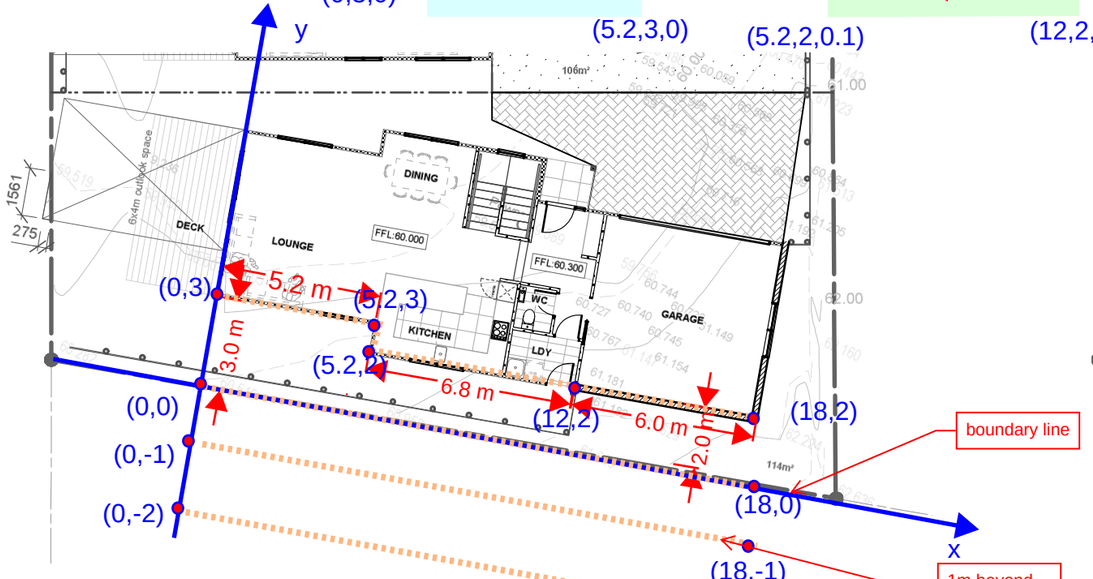
(5.2,2,2.9) (12,2,2.9)

(5.2,2,0.1) (12,2,0.1)

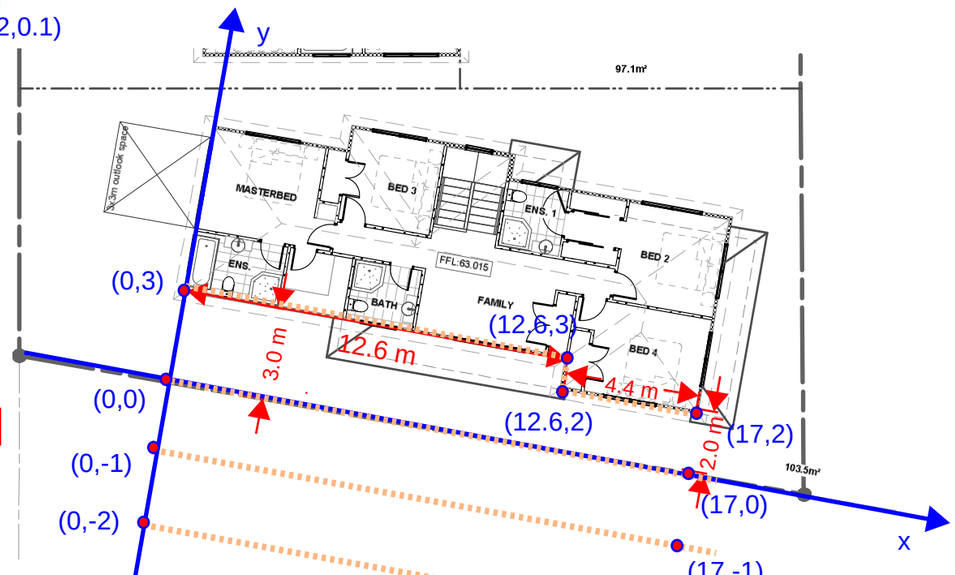
(12,2,2.9) (18,2,2.9)

(12,2,1.5) (18,2,1.5)

Emitter coordinate



1 Ground Floor Plan
Scale: 1:200@A3



2 Top Floor Plan
Scale: 1:200@A3

REV	DATE	COMMENTS
A	06.05.2020	Resource Consent

JOB TITLE

Proposed Subdivition
at 19 Derrimore Heights
Clover Park, Auckland

Z & Z Consult Ltd
Po Box 27-133
Mt. Roskill
Mobile: 021-2664253
Email: homedesign.nz@gmail.com

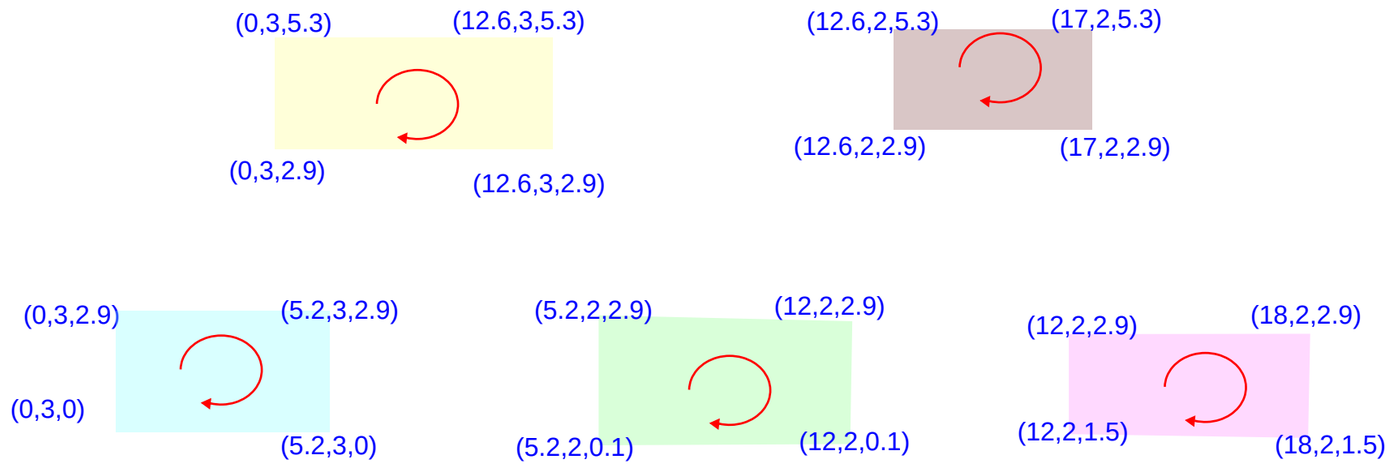
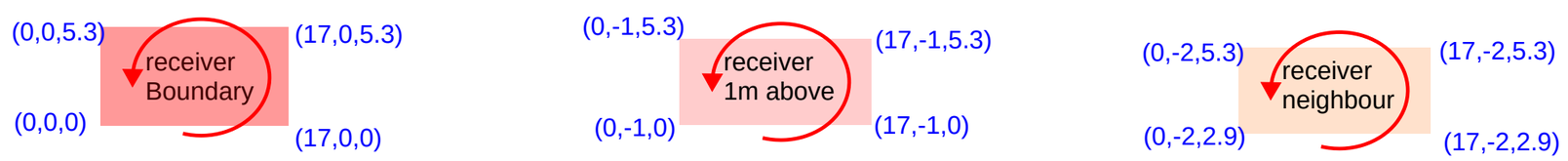
SHEET TITLE

Floor Plans

FIRE EMERGENCY NEW ZEALAND

Drawing Title: TRA Input markup
Date: 11/04/2022
Revision: -

Drawing Ref: FS04
Project: F3436740
Drawn by: JZ

Emitter panels 5 pcs in total	
Receiver panels 2 pcs in total	

Drawing Title:	TRA Input coordinates	**Drawing Ref:**	FS05
Date:	11/04/2022	**Project:**	F3436740
Revision:	-	**Drawn by:**	JZ