RAPT CONSULTING

Construction Noise Assessment – Penrith Lakes Subdivision

Prepared for
Great River NSW Pty Ltd

March 2023

Relationships Attention Professional Trust

Document Details

Construction Noise Assessment – Penrith Lakes Subdivision

Prepared For:

Great River NSW Pty Ltd

Prepared By:

RAPT Consulting

18&19 / 10 Kenrick Street

The Junction, NSW 2291

ABN: 30330220290

www.raptconsulting.com.au

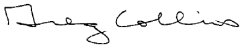
Document ID	Rev No.	Date	Author	
2222396	0	25 May 2022	Gregory Collins - MAAS	
2222396_1	1	07 December 2022	Gregory Collins - MAAS	
2222396_2	2	31 January 2022	Gregory Collins - MAAS	
2222396_3	4	16 March 2023	Gregory Collins - MAAS	

Table of Contents

1. INTRODUCTION 7

1.1 Background 7

1.2 Assessment Objectives 10

1.3 Scope 10

1.4 Relevant Guidelines 10

1.5 Limitations 11

2. EXISTING ENVIRONMENT 12

2.1 Receptors 12

2.2 Background and Ambient Noise 13

3. NOISE OBJECTIVES 17

3.1 Construction Noise 17

3.2 Construction Sleep Disturbance 18

3.3 Construction Road Traffic Noise 19

4. CONSTRUCTION NOISE ASSESSMENT 20

4.1 Construction 20

4.2 Construction Assessment 21

4.3 Construction Noise Management Plan 29

4.3.1 Planning and design of construction works 29

5. CONCLUSION 31

APPENDIX A: GLOSSARY OF ACOUSTIC TERMS 32

APPENDIX B NOISE MODELLING RESULTS dB(A) LEQ(15MIN) 34

Table Index

Table 2-1 Receptors Assessed 12

Table 2-2 Summary of Measured Results dB(A) 16

Table 3-1 ICNG Recommended Construction Hours 17

Table 3-2 ICNG Noise Guidelines at Receivers 17

Table 3-3 ICNG NML's for residential receivers Leq(15min) dB(A) 18

Table 3-4 Construction Noise Sleep Disturbance Assessment Levels 19

Table 4-1 Plant and Equipment Noise Levels 21

Table 4-2 Noise Enhancing Meteorological Conditions 22

Table 4-3 Excavation / Earthworks Predicted Construction Noise Levels dB(A) LAeq(15min) 26

Table 4-4 Building Works Predicted Construction Noise Levels dB(A) LAeq,15min 28

Figure Index

Figure 1-1 Site Location 8

Figure 1-2 Draft Site Layout 9

Figure 2-1 Receptors Assessed Surrounding the Proposal Site 13

Figure 2-2 Monitoring Location. 14

Figure 2-3 Noise Monitoring Location 15

Figure 4-1 Example of Differing Work Areas 23

Figure 4-2 Site Staging 25

Figure 4-3 Assessed Locations 26

Figure 0-1 Stage 1 Excavation 34

Figure 0-2 Stage 2 Excavation 35

Figure 0-3 Stage 4 Excavation 36

Figure 0-4 Stage 7 Excavation 37

Figure 0-5 Stage 9 Excavation 38

Figure 0-6 Stage 10A Excavation 39

Figure 0-7 Stage 10B Excavation 40

Figure 0-8 Stage 11 Excavation 41

Figure 0-9 Stage 3 Excavation 42

Figure 0-10 Stage 5 Excavation 43

Figure 0-11 Stage 6 Excavation 44

Figure 0-12 Stage 12 Excavation 45

Figure 0-13 Stage 13 Excavation 46

Figure 0-14 Stage 1 Building 47

Figure 0-15 Stage 2 Building 48

Figure 0-16 Stage 4 Building 49

Figure 0-17 Stage 7 Building 50

Figure 0-18 Stage 9 Building 51

Figure 0-19 Stage 10A Building 52

Figure 0-20 Stage 10B Building 53

Figure 0-21 Stage 11 Building 54

Figure 0-22 Stage 3 Building 55

Figure 0-23 Stage 5 Building 56

Figure 0-24 Stage 6 Building 57

Figure 0-25 Stage 8 Building 58

Figure 0-26 Stage 12 Building 59

Figure 0-27 Stage 13 Building 60

1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake a construction noise assessment (CNA) for Great River NSW Pty Ltd to inform its modification application to DA9876 Employment Lands Subdivision and Works. The modification pertains to conditions D4 – D7 shown below:

Construction Hours

D4. Construction, including all works under this consent and the delivery of materials to and from

the site, may only be carried out between the following hours:

(a) between 7am and 6pm, Mondays to Fridays inclusive; and

(b) between 8am and 1pm, Saturdays.

No work may be carried out on Sundays or public holidays.

D5. Construction activities may be undertaken outside of the hours in condition D4 if required:

(a) by the Police or a public authority for the delivery of vehicles, plant or materials; or

(b) in an emergency to avoid the loss of life, damage to property or to prevent environmental harm.

D6. Notification of such construction activities as referenced in condition D5 must be given to affected residents before undertaking the activities or as soon as is practical afterwards.

D7. Rock breaking, rock hammering, sheet piling, pile driving and similar activities may only be carried out between the following hours:

(a) 9am to 12pm, Monday to Friday;

(b) 2pm to 5pm Monday to Friday; and

(c) 9am to 12pm, Saturday.

The purpose of the application is to allow for out of hours (24hr) construction operations.

It is understood that with consideration to condition D7, that no rock breaking, rock hammering, sheet piling, pile driving or other similar activities are planned as part of this construction activity.

The site is located at 14-270 Old Castlereagh Road, Penrith NSW and shown in Figure 1-1.

Figure 1-1 Site Location

The proposed development includes the Torrens title land subdivision of 3 lots into 93 (with 4 residual lots). The lots range in size from 2,006.4m2 to 20,238.2m2 with the following break-down:

- 56 lots less than 3,000m2
- 8 lots between 3,000m2 and 5,000m2
- 25 lots between 5,000m2 and 10,000m2
- 4 lots more than 10,000m2.

Figure 1-2 shows a draft site layout.

Figure 1-2 Draft Site Layout

1.2 Assessment Objectives

The purpose is to assess potential noise from the project and to recommend mitigation measures where required.

1.3 Scope

The acoustic assessment scope of work included:

- Initial desk top review to identify noise sensitive receptors from aerial photography
- Undertake noise measurements to determine ambient and background noise levels
- Establish project noise goals for the construction of the proposal
- Identify the likely principal noise sources during construction and their associated noise levels
- assessment of potential noise and sleep disturbance impacts associated with construction aspects of the project
- provide recommendations for feasible and reasonable noise mitigation and management measures, where noise objectives may be exceeded.

1.4 Relevant Guidelines

The relevant policies and guidelines for noise assessments in NSW that have been considered during the preparation of this assessment include:

- Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change, 2009
- NSW Road Noise Policy (RNP), Department of Environment, Climate Change and Water (DECCW), 2011
- Noise Policy for Industry (NPfI), Environment Protection Authority (EPA), 2017.

1.5 Limitations

The purpose of the report is to provide an independent acoustic assessment for the proposal.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the acoustic assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for acoustics, noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

2.1 Receptors

The area surrounding the site is commercial and industrial to the east and south, two residences to the north of the site and other commercial uses to the north and north-west of the site.

Closest residential receptors to the proposal assessed in this assessment are identified as R1 and R2 and other commercial / industrial receptors are identified as R3 – R6 in Table 2-1 and Figure 2-2.

Table 2-1 Receptors Assessed

Receiver ID	Address	Receptor Type	Easting	Northing
R1	39 Old Castlereagh Road	Residential	285970	6265485
R2	47-65 Old Castlereagh Road	Residential	285833	6265503
R3	Armory group	Industrial	286062	6265317
R4	ARM Penrith	Industrial	286037	6265192
R5	Die-Namic Tool Making	Industrial	286012	6265072
R6	Berton Furniture	Commercial	285848	6264806

Figure 2-1 Receptors Assessed Surrounding the Proposal Site

2.2 Background and Ambient Noise

To establish background and ambient noise levels, noise monitoring was undertaken by RAPT Consulting from 20 May to 27 May 2019. The monitoring was undertaken at the northern end of the site direction across Old Castlereagh Road from the nearest residential receptors. Site observations noted this location was considered indicative of the local ambient noise environment and the site also presented as secure location whereby minimising the risk of theft or vandalism to the monitoring equipment. Additionally, it is considered as an acceptable location for determination of the background noise with consideration to the NSW Environment Protection Authority's (EPA's) – Noise Policy for Industry (NPfI). During site visits it was noted that road traffic, and natural wildlife, primarily described the ambient noise environment and is indicative of a sub-urban noise environment.

The monitoring location is shown in Figure 2-3 – 2-4.

Figure 2-2 Monitoring Location.

Figure 2-3 Noise Monitoring Location

Monitoring was undertaken using an Acoustic Research Laboratories EL-315 noise logger with Type 2 Precision. These loggers are capable of measuring continuous sound pressure levels and are able to record L_{Amin}, L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors. The instrument was programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period.

The noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, "Acoustics – Description and Measurement of Environmental Noise" and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

The L_{A90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 percent of the time over a relevant period of measurement. In line with the procedures described in the EPA's NPfI, the assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is

based on the median of individual ABL's determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level, or simply the background level.

The L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

The RBL and ambient LAeq levels are provided in Table 2-2 below.

Table 2-2 Summary of Measured Results dB(A)

Descriptor	Noise Level dB(A)	Time Interval
$L_{A90(Day)}$	37	7:00am - 6:00pm
$L_{A90(evening)}$	37	6:00pm - 10:00pm
$L_{A90(night)}$	32	10:00pm - 7:00am
$L_{Aeq(15hr)}$	56	7:00am - 10:00pm
$L_{Aeq(9hr)}$	49	10:00pm – 7:00am
$L_{Aeq(24hr)}$	54	6:00am – 6:00am
$L_{Aeq(1hr)}$ Day	57	7:00am - 10:00pm
$L_{Aeq(1hr)}$ Night	50	10:00pm – 7:00am

3. Noise Objectives

3.1 Construction Noise

Construction noise is assessed with consideration to DECCW Interim Construction Noise Guidelines (ICNG) (July 2009). The ICNG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 3-1.

Table 3-1 ICNG Recommended Construction Hours

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 3-2.

Table 3-2 ICNG Noise Guidelines at Receivers

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used, Outdoor Noise Level 55 dB(A) assumes 10 dB(A) loss through an open window)
Active recreation areas (characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion)	65 dB(A)
Offices, retail outlets (external)	70 dB(A)
industrial premises (external)	75 dB(A)

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences).
- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Based on the above and the RBL's determined from site monitoring, construction noise management levels (NML's) have been derived as shown in Table 3-3.

Table 3-3 ICNG NML's for residential receivers Leq(15min) dB(A)

Receiver	Within Recommended Standard Hours	Outside Recommended Standard Hours	
		Evening (6pm-10pm)	Night (10pm-7am)
Residential (external)	47	42	37
Offices, retail outlets (external)	70	70	70
Industrial premises (external)	75	75	75

3.2 Construction Sleep Disturbance

The ICNG requires a sleep disturbance assessment to be undertaken where construction works are planned to extend over more than two consecutive nights. The ICNG makes reference to the EPA's NSW Environment Criteria for Road Traffic Noise (ECRTN), now superseded by the NSW Road Noise Policy (RNP), for the assessment of sleep disturbance. The RNP references the recommendations in the ECRTN as providing the most appropriate assessment guidance.

The guidance provided in the RNP for assessing the potential for sleep disturbance recommends that to minimise the risk of sleep disturbance during the night-time period (10pm to 7am), the $L_{A1(1\ min)}$ noise level outside a bedroom window should not exceed the $L_{A90(15\ min)}$ background noise level by more than 15 dB(A). The EPA considers it appropriate to use this

metric as a screening criterion to assess the likelihood of sleep disturbance. If this screening criterion is found to be exceeded, then a more detailed analysis should be undertaken that should include the extent that the maximum noise level exceeds the background noise level and the number of times this is likely to happen during the night-time period.

The RNP contains a review of research into sleep disturbance which represents NSW EPA advice on the subject of sleep disturbance due to noise events. It concludes that having considered the results of research to date that, 'Maximum internal noise levels below 50-55 dB(A) are unlikely to cause awakening reactions. Therefore, given that an open window provides around 10 dB(A) in noise attenuation from outside to inside, external noise levels of 60-65 dB(A) are unlikely to result in awakening reactions.

construction sleep disturbance assessment levels are presented in Table 3-4.

Table 3-4 Construction Noise Sleep Disturbance Assessment Levels

Night-time rating background level, dB(A)	Sleep disturbance screening $L_{A1(1min)}$ criteria, dB(A)	Sleep disturbance awakening reaction $L_{A1(1min)}$ criteria, dB(A)
32	47	65

3.3 Construction Road Traffic Noise

Noise from construction traffic on public roads is not covered by the ICNG. However, the ICNG does refer to the ECRTN, which is now superseded by the RNP, for the assessment of noise relating to construction traffic on public roads.

To assess noise impacts from construction traffic, an initial screening test is undertaken by evaluating whether existing road traffic noise levels would increase by more than 2 dB(A). Where the predicted noise increase is 2 dB(A) or less, then no further assessment is required. However, where the predicted noise level increase is greater than 2 dB(A), and the predicted road traffic noise level exceeds the road category specific criterion then noise mitigation should be considered for those receivers affected. The RNP does not require assessment of noise impact to commercial or industrial receivers. In order to increase noise levels by 2 dB(A) an increase in traffic volume of 60% would be required, which based on the nature of works associated with the project is not expected to occur and therefore compliance is expected.

4. Construction Noise Assessment

4.1 Construction

Location and timing of construction activities can exacerbate noise levels and their effects on sensitive land uses such as residences. Construction noise by its nature is temporary, may not be amenable to purpose-built noise control measures applied to industrial processes, and may move as construction progresses. With these constraints in mind, the ICNG was developed to focus on applying a range of work practices most suited to minimise construction noise impacts, rather than focusing only on achieving numeric noise levels. While some noise from construction sites is inevitable, the aim of the Guideline is to increase protection of residences and other sensitive land uses from noise pollution most of the time.

While it is unknown at this stage what specific machinery will be at the subdivision, generally the typical construction activity on the proposed sub-division is civil works and landscaping. Therefore, an assumed construction sequence would be:

- Excavation/Site preparation.
- Building

Table 4-1 provides general plant and machinery data that has been used to predict noise levels at the neighbouring properties. The noisiest data has been chosen for each piece of plant/machinery to present a reasonable worst-case scenario.

Table 4-1 Plant and Equipment Noise Levels

Plant Item	Activity Noise Level L_{Aeq} @ 10m	DEFRA Construction Noise Database	Anticipated Usage %
Excavation			
Dozer	80	Table 2 Ref 10	50
Tracked Excavator	79	Table 2 Ref 14	50
Articulated Dump Truck	74	Table 2 Ref 32	50
Roller	73	Table 2 Ref 38	50
Building			
Concrete Pump & Cement Mixer	67	Table 4 Ref 24	50
Poker Vibrator	69	Table 4 Ref 34	50
Mobile Telescopic Crane	67	Table 4 Ref 36	50
Diesel Generator	61	Table 4 Ref 75	90

Note 1. Estimated time use per 15 minutes is provided based previous experience of construction noise characteristics

The approval already allows for standard construction hours, this proposal is to allow for additional operation of out of hours (OOH) therefore OOH construction is assessed.

4.2 Construction Assessment

Acoustic modelling was undertaken using SoftNoise's "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Enhancing Weather Conditions

Fact Sheet D of the NPfI provides guidance for accounting for noise-enhancing weather conditions. Two options are available to consider meteorological effects:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night. Or

2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

As a detailed analysis of the significance of noise enhancing conditions has not been undertaken, option 1 has been utilised. Table D1 from the NPfI is reproduced in Table 4-2 and shows the noise enhancing meteorological conditions that have been adopted for this assessment

Table 4-2 Noise Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Noise-enhancing meteorological conditions	Daytime/evening: stability category D with light winds (up to 3 m/s at 10 m AGL). Night-time: stability category F with winds up to 2 m/s at 10 m AGL.

Note 2 m/s = metres per second; m = metres; AGL = above ground level; where a range of conditions is nominated, the meteorological condition delivering the highest-predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise-enhancing conditions as relevant. All wind speeds are referenced to 10 m AGL. Stability categories are based on the Pasquill–Gifford stability classification scheme.

Other Key assumptions in the model include:

- topographical information was obtained from NSW Government Spatial Services
- all cleared areas were modelled considering a conservative ground factor of 0.8 to account for grassed areas
- all receivers were modelled at 1.5 metres above the ground surface

Construction noise levels have been predicted based on the potential construction noise levels provided in Table 4-1. These noise levels represent different equipment noise levels and give an idea how noise levels may change across the proposal area with different activities being undertaken.

The magnitude of off-site noise impact associated with construction would be dependent upon several factors:

- The intensity of construction activities;
- The location of construction activities;
- The type of equipment used;
- Intervening terrain; and
- The prevailing weather conditions.

The calculated noise levels would inevitably depend on the number and type of plant items and equipment operating at any one time and their precise location relative to the receiver of interest. In practice, the noise levels would vary due to the fact that plant and equipment would move about the worksites and would not all be operating concurrently. In some cases, reductions in noise levels would occur when plant are located behind obstacles or even other items of equipment. Predicted noise levels have been assessed from each of the work scenarios outlined above in a number of work locations. As work moves away from receivers, noise levels decrease as can be seen in Figure 4-1.

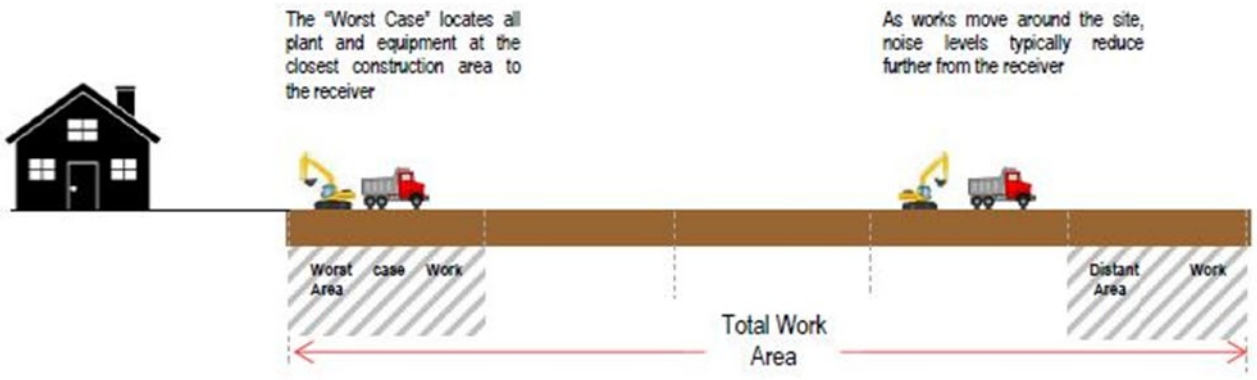


Figure 4-1 Example of Differing Work Areas

The noise levels are representative of the worst-case impact, for a given receiver type and are intended to give an indication of the possible noise levels from construction work when work is at their closest. For most construction activities, it is expected that construction noise levels would frequently be lower than predicted at the most exposed receiver. A general description of NML exceedance groups are provided below. The impact of these potential exceedances depends on the period in which they were to occur (generally night-time is more sensitive than daytime or evening for most people).

- Noise levels 1 – 10 dB(A) above NML – Impact generally marginal to minor
- Noise Levels 11 – 20 dB(A) above NML – Impact generally moderate
- Noise Levels > 20 dB(A) above NML – Impact generally high

During any given period, the machinery items to be used in the study area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Finally, certain types of construction machinery would be present in the development footprint for only brief periods during construction. Therefore, the modelled construction noise results are considered to represent a reasonable worst-case scenario.

The development is proposed to be staged in its delivery, illustrated in Figure 4-2, and described below:

- Stage 1 – construction of 6 lots, formation of the eastern site entrance at Lugard Street, and roads within the stage boundary as indicated on the staging plan
- Stage 2 – construction of 4 lots, and roads within the stage boundary as indicated on the staging plan

- Stage 3 – construction of 10 lots
- Stage 4 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 5 – construction of 8 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 6 – construction of 6 lots, formation of main entrance to/from Old Castlereagh Road, and roads within the stage boundary as indicated on the layout plan
- Stage 7 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 8 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 9 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 10 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 11 – construction of 8 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 12 – construction of 9 lots, and roads within the stage boundary as indicated on the staging plan
- Stage 13 – construction of 7 lots, and roads within the stage boundary as indicated on the staging plan

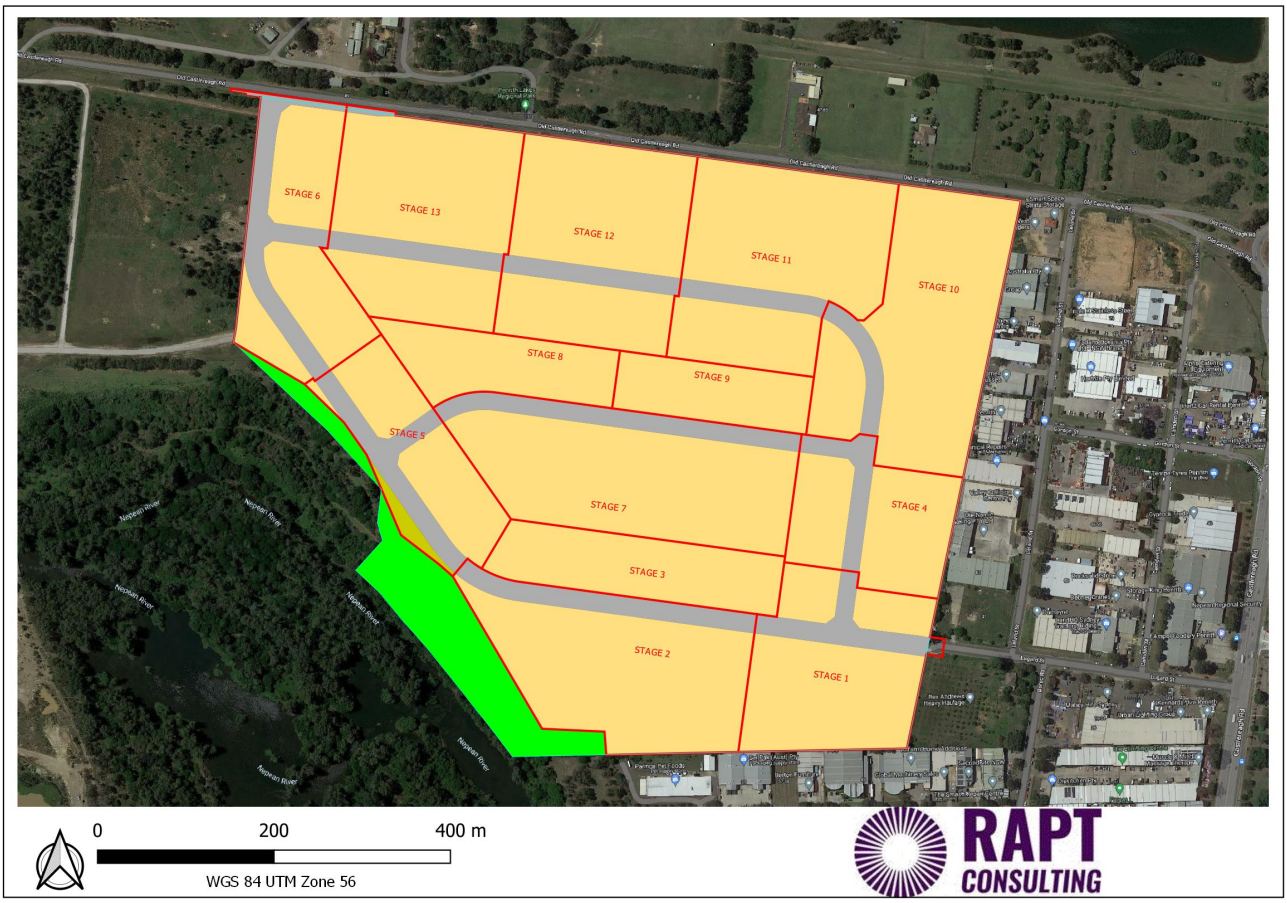


Figure 4-2 Site Staging

Locations representative of the different stage areas were modelled as shown in Figure 4-2. The locations were assessed and modelled as area noise sources. These scenarios also demonstrate how received noise levels can change due to location of construction activity. Modelled scenarios include excavation and building as outlined in Table 4-1.

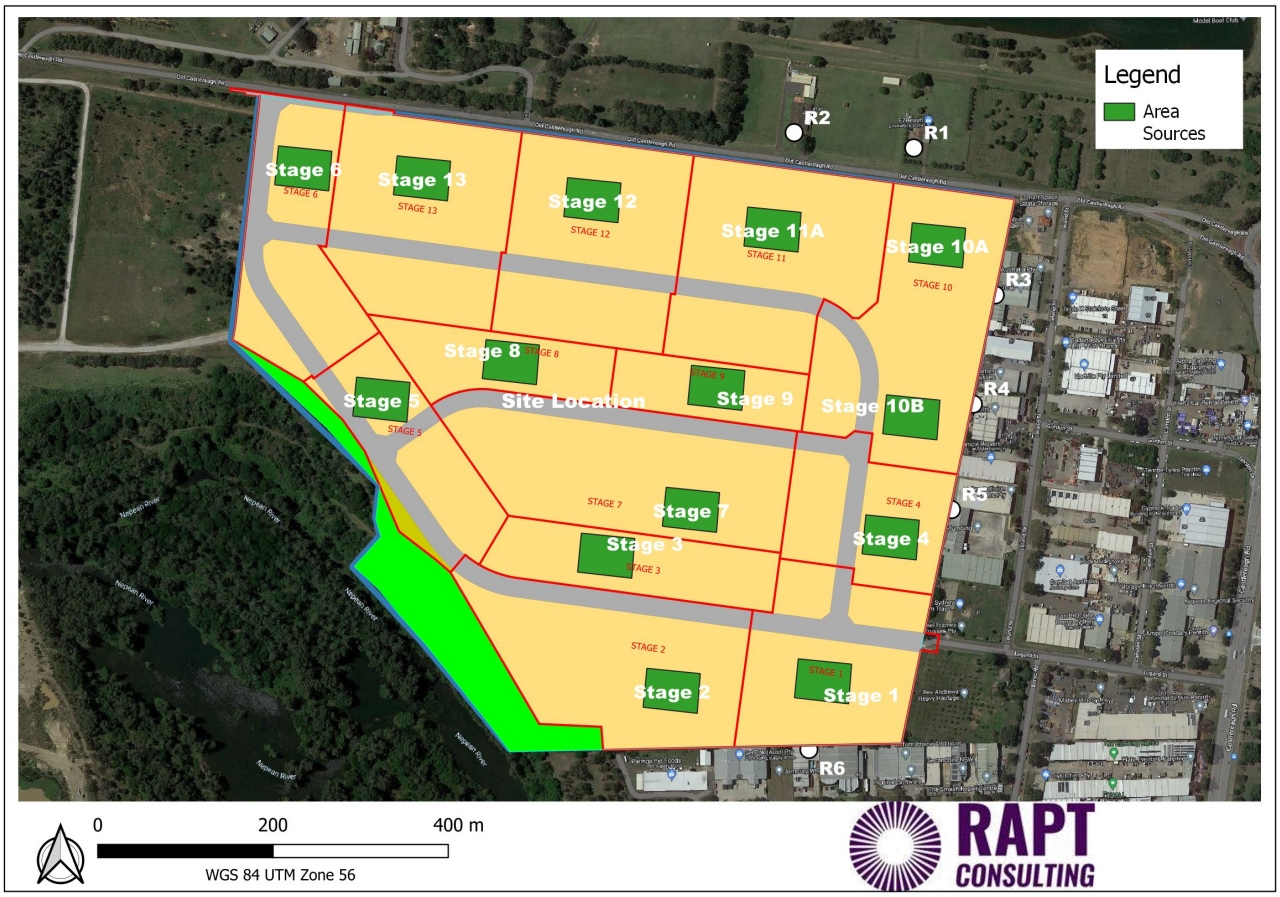


Figure 4-3 Assessed Locations

Construction noise assessment results

Noise levels were predicted to each assessed receptor assuming receiver heights of 1.5m above ground level for typical construction activities. Table 4-3 - 4-4 summarises the maximum predicted noise level from each of the construction scenarios at identified assessed receptors for noise enhancing climatic conditions. Predicted exceedances of NML's are highlighted in RED. Noise modelling contours are provided in Appendix B.

Table 4-3 Excavation / Earthworks Predicted Construction Noise Levels dB(A) LAeq(15min)

Excavation / Earthworks																			
Receiver	Stage 1	Stage 10A	Stage 10B	Stage 11	Stage 2	Stage 4	Stage 7	Stage 9	Stage 3	Stage 5	Stage 6	Stage 8	Stage 12	Stage 13	OOH Daytime NML	OOH Evening NML	OOH Night NML	Sleep Disturbance Screening Criteria $L_{A1(1min)}$	Sleep Disturbance Screening Criteria $L_{A1(1min)}$
R1	33	45	40	51	33	37	37	41	35	35	35	38	43	38	42	42	37	47	65
R2	34	51	41	46	32	37	36	40	34	33	32	36	39	35	42	42	37	47	65
R3	38	56	49	45	37	43	40	43	38	34	33	37	38	35	75	75	75	-	-
R4	41	49	59	44	40	49	43	45	40	36	33	38	39	36	75	75	75	-	-
R5	47	44	54	42	42	59	44	44	41	35	32	38	37	34	75	75	75	-	-
R6	56	36	40	36	49	45	43	40	43	35	31	37	34	32	70	70	70	-	-

The results of the assessment indicate OOH work NML's can be achieved at all commercial and industrial receptors.

The results of the assessment indicate OOH work NML's can be achieved at R1 with the exception of:

- Stage 10A (+3dB(A) Day and Evening, +8dB(A) Night)
- Stage 10B (+3dB(A) Night)
- Stage 11 (+9dB(A) Day and Evening, +14dB(A) Night, Sleep Disturbance Criteria +4dB(A))
- Stage 9 (+4dB(A) Night)
- Stage 8 (+1 dB(A) Night)
- Stage 12 (+1 dB(A) Day and Evening, +6 dB(A) Night)
- Stage 13 (+1 dB(A) Night)

The results of the assessment indicate OOH work NML's can be achieved at R2 with the exception of:

- Stage 10A (+9dB(A) Day and Evening, +14dB(A) Night, Sleep Disturbance Criteria +4dB(A))
- Stage 10B (+4dB(A) Night)
- Stage 11 (+4dB(A) Day and Evening, +9dB(A) Night)
- Stage 9 (+3dB(A) Night)
- Stage 12 (+2 dB(A) Night)

It is important to note, these are modelled exterior noise levels. Based on the ICNG reference to the EPA's Environmental Criteria for Road Traffic Noise (ECRTN,1999), maximum internal noise levels below 55 dBA are unlikely to result in an awakening reaction. This is consistent with guidance contained in the EPA's NSW Road Noise Policy (RNP, 2011) which concludes that 'Maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep'. It is generally accepted that internal noise levels in a dwelling with the windows open are 10 dB lower than external noise levels. Therefore, based on a minimum attenuation of 10 dB, with windows open, it is predicted that this internal noise level of 55 dBA will be complied with.

Table 4-4 Building Works Predicted Construction Noise Levels dB(A) LAeq,15min

Building Works																			
Receiver	Stage 1	Stage 10A	Stage 10B	Stage 11	Stage 2	Stage 4	Stage 7	Stage 9	Stage 3	Stage 5	Stage 6	Stage 8	Stage 12	Stage 13	OOH Daytime NML	OOH Evening NML	OOH Night NML	Sleep Disturbance Screening Criteria $L_{A1(1min)}$	Sleep Disturbance Screening Criteria $L_{A1(1min)}$
R1	19	31	26	37	19	23	23	27	21	21	21	24	30	24	42	42	37	47	65
R2	20	37	27	32	18	23	22	26	20	19	18	22	25	21	42	42	37	47	65
R3	24	43	35	31	23	29	26	29	24	20	19	23	25	21	75	75	75	-	-
R4	27	35	45	30	26	35	29	31	26	22	19	24	25	22	75	75	75	-	-
R5	33	30	40	28	28	45	30	30	27	21	19	24	24	20	75	75	75	-	-
R6	42	22	26	22	35	31	29	26	29	21	18	23	20	18	70	70	70	-	-

The results of the building works assessment indicated OOH work NML's can be achieved in all situations assessed.

While in many instances the construction NML's are anticipated to be complied with, the results of the construction assessment indicate exceedances of external NML's may occur depending on work location, work activity and proximity to receivers, particularly during excavation works. Certain types of construction machinery would be present in the study area for only brief periods during construction. Therefore, noise predictions are considered conservative.

Based on the results of the assessment, it is generally recommended that:

- Stages 1 – 7 excavation and building works may take place during OOH day, evening and night time
- Stage 8 excavation works be restricted to OOH day and evening works, No night time OOH works
- Stage 8 building works may take place during OOH day, evening and night time
- Stage 9 excavation works be restricted to OOH day and evening works, No night time OOH works
- Stage 9 building works may take place during OOH day, evening and night time
- Stage 10A excavation works be restricted standard hours only, No OOH Work
- Stage 10A building works may take place during OOH day, evening and night
- Stage 10B excavation works be restricted to OOH day and evening works, No night time OOH works
- Stage 10B building works may take place during OOH day, evening and night
- Stage 11 excavation works be restricted to standard hours, No OOH Work
- Stage 11 building works may take place during OOH day, evening and night
- Stage 12 excavation works be restricted to standard hours, No OOH Work

- Stage 12 building works may take place during OOH day, evening and night
- Stage 13 excavation works be restricted to OOH day and evening works, No night time OOH works
- Stage 13 building works building works may take place during OOH day, evening and night

Once construction programmes are known and commenced, noise monitoring could be undertaken to ascertain compliance with the abovementioned situations to allow for OOH excavation works.

4.3 Construction Noise Management Plan

A Construction Noise Management Plan (CNMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The CNMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.3.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures are could be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least one week prior to the commencement of works.
- Consultation and communication between the site(s) and neighbours to the site(s) would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.
- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.

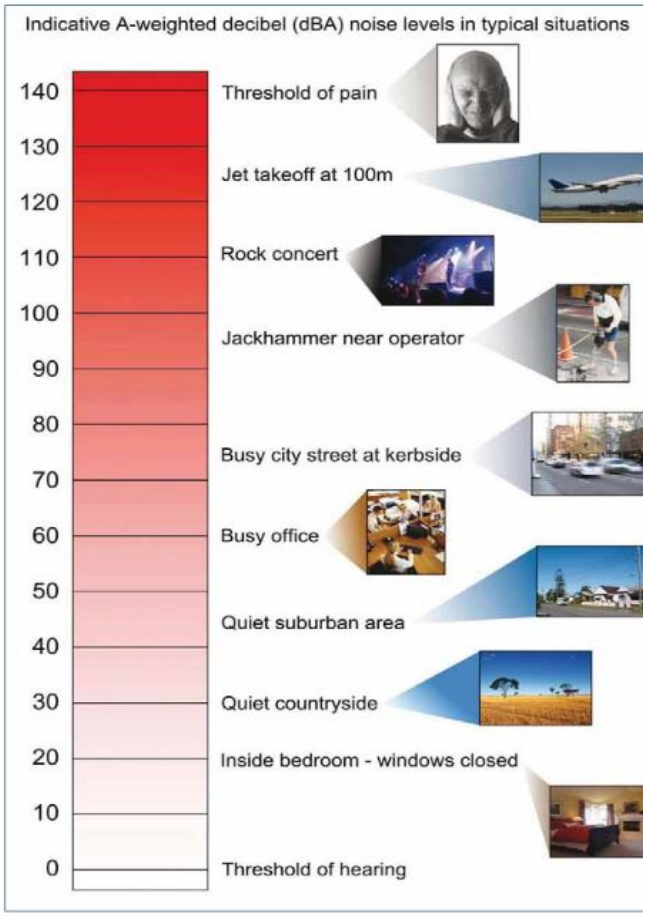
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.
- Equipment which is used intermittently should be shut down when not in use.
- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- Material dumps should be located as far as possible from the nearest receptors.
- Wherever possible, loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

5. Conclusion

This Construction Noise Impact Assessment has been undertaken by RAPT Consulting for Great River NSW Pty Ltd to inform its modification application to DA9876 Employment Lands Subdivision and Works to allow for out of hours construction works.

The assessment outlined in this report indicates that external construction noise management levels will be complied with in most situations. However, internal sleep disturbance noise criteria are expected to be complied with. A set of standard mitigation measures for construction noise have been provided based on anticipated requirements of the proposal. Therefore based on the results of the assessment it is considered allowing for Condition D4 of the approval to allow 24 hour operation is acceptable from an acoustics perspective.

Appendix A: Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources. 
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.
Noise sensitive receiver	An area or place potentially affected by noise which includes:

	A residential dwelling. An educational institution, library, childcare centre or kindergarten. A hospital, surgery or other medical institution. An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. Commercial or industrial premises. A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: Noise impacts Noise mitigation benefits Cost effectiveness of noise mitigation Community views.
Sound power level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).

Appendix B Noise Modelling Results dB(A) Leq(15min)

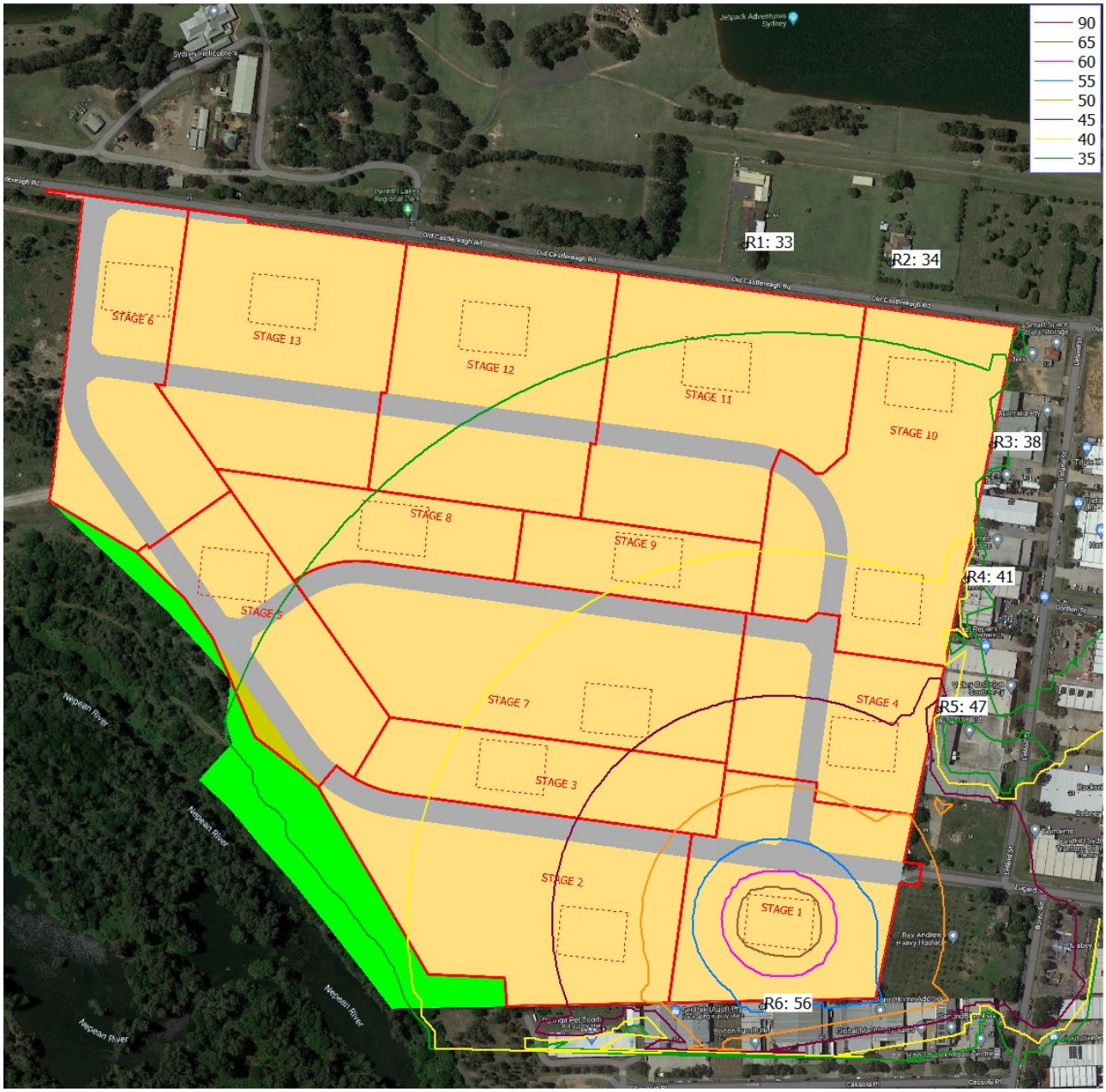


Figure 0-1 Stage 1 Excavation

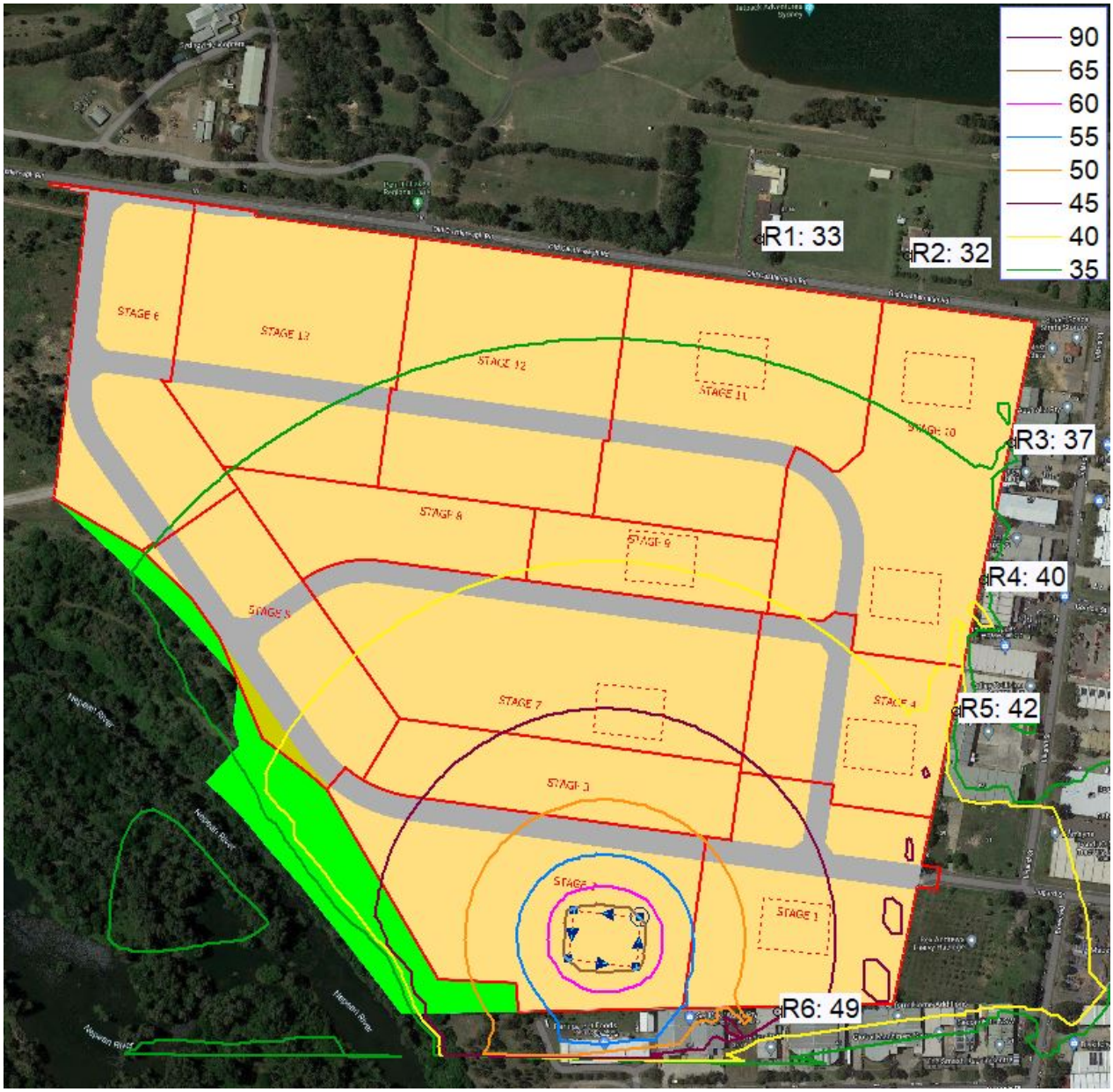


Figure 0-2 Stage 2 Excavation

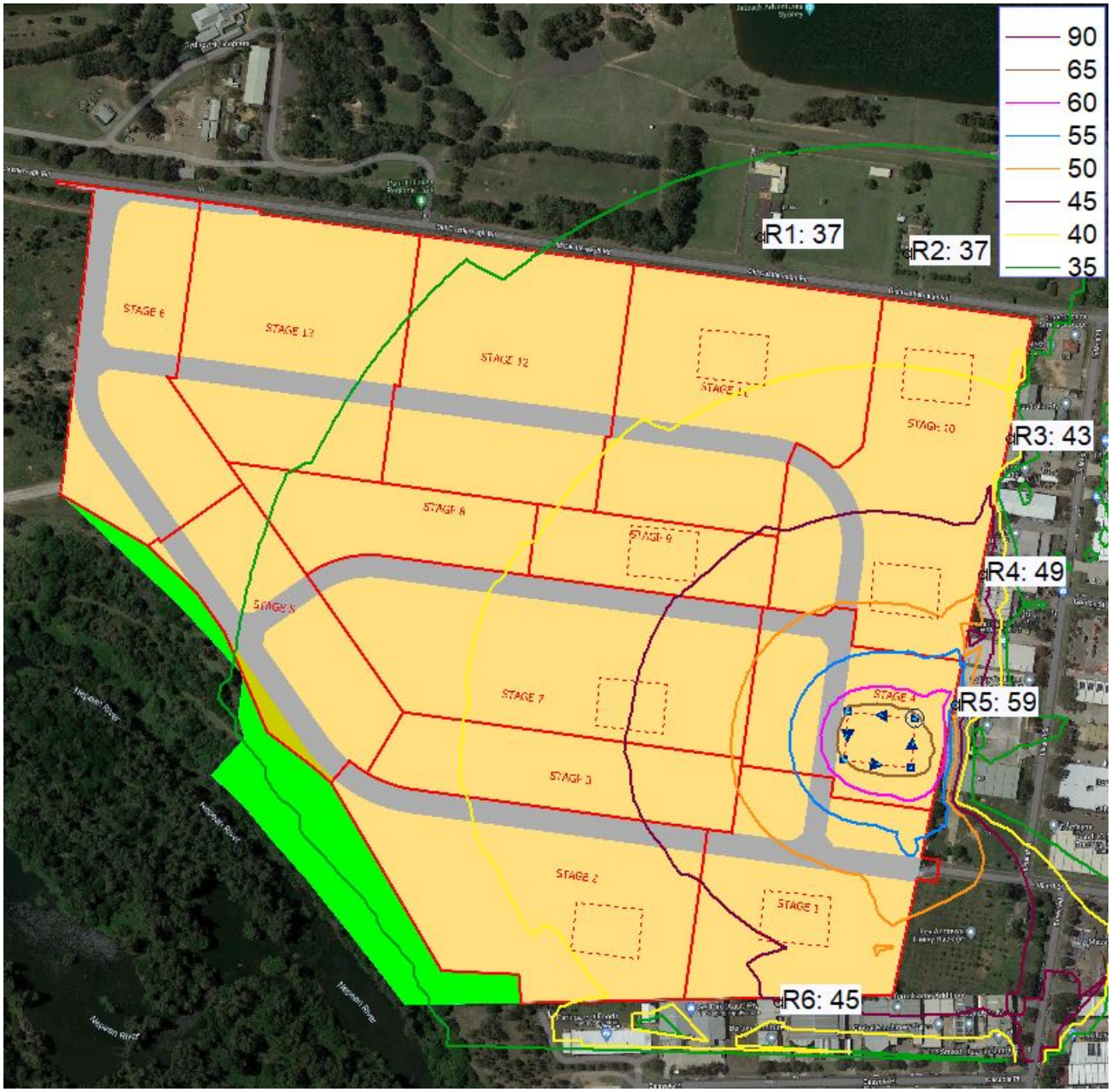


Figure 0-3 Stage 4 Excavation

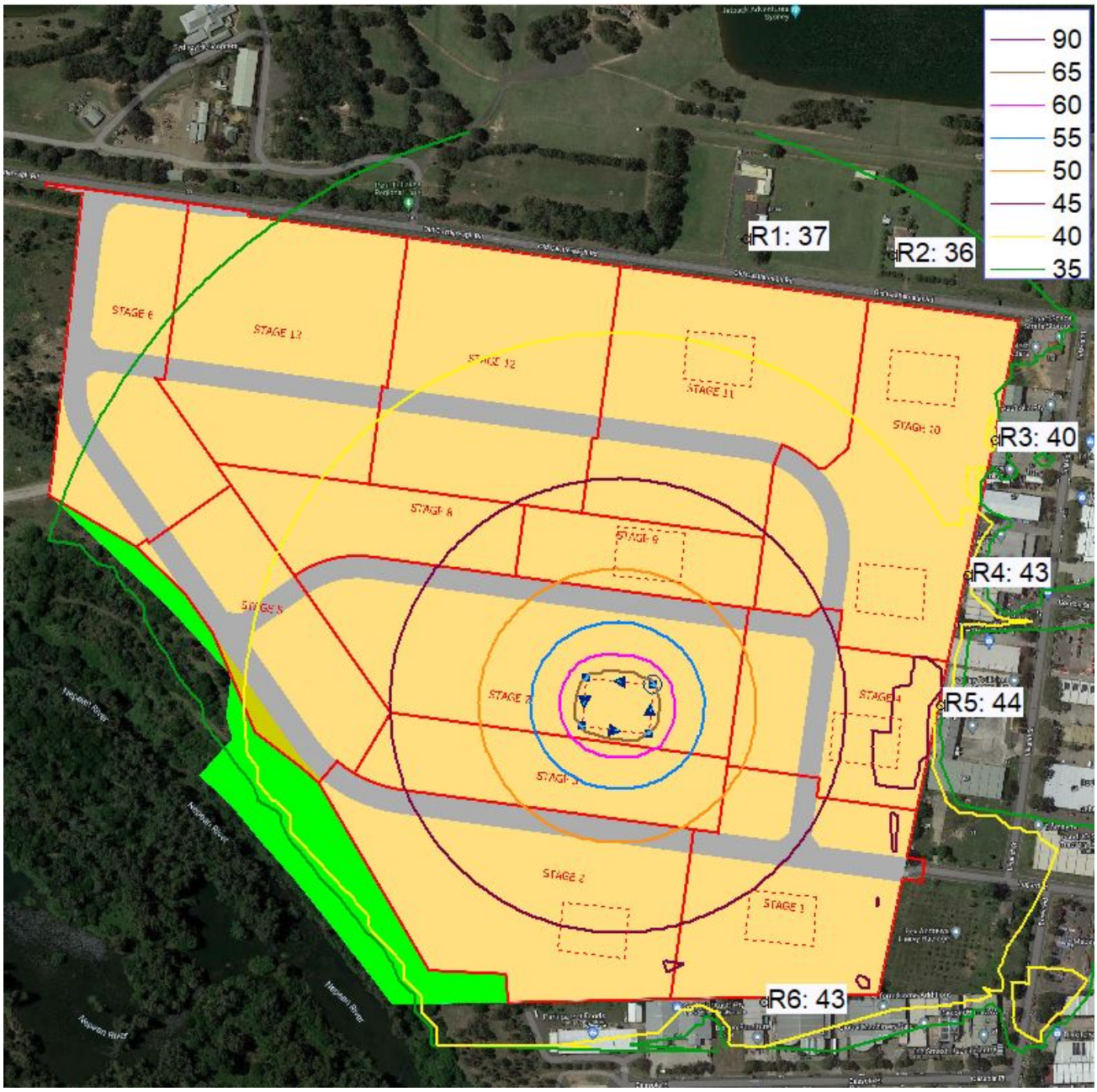


Figure 0-4 Stage 7 Excavation

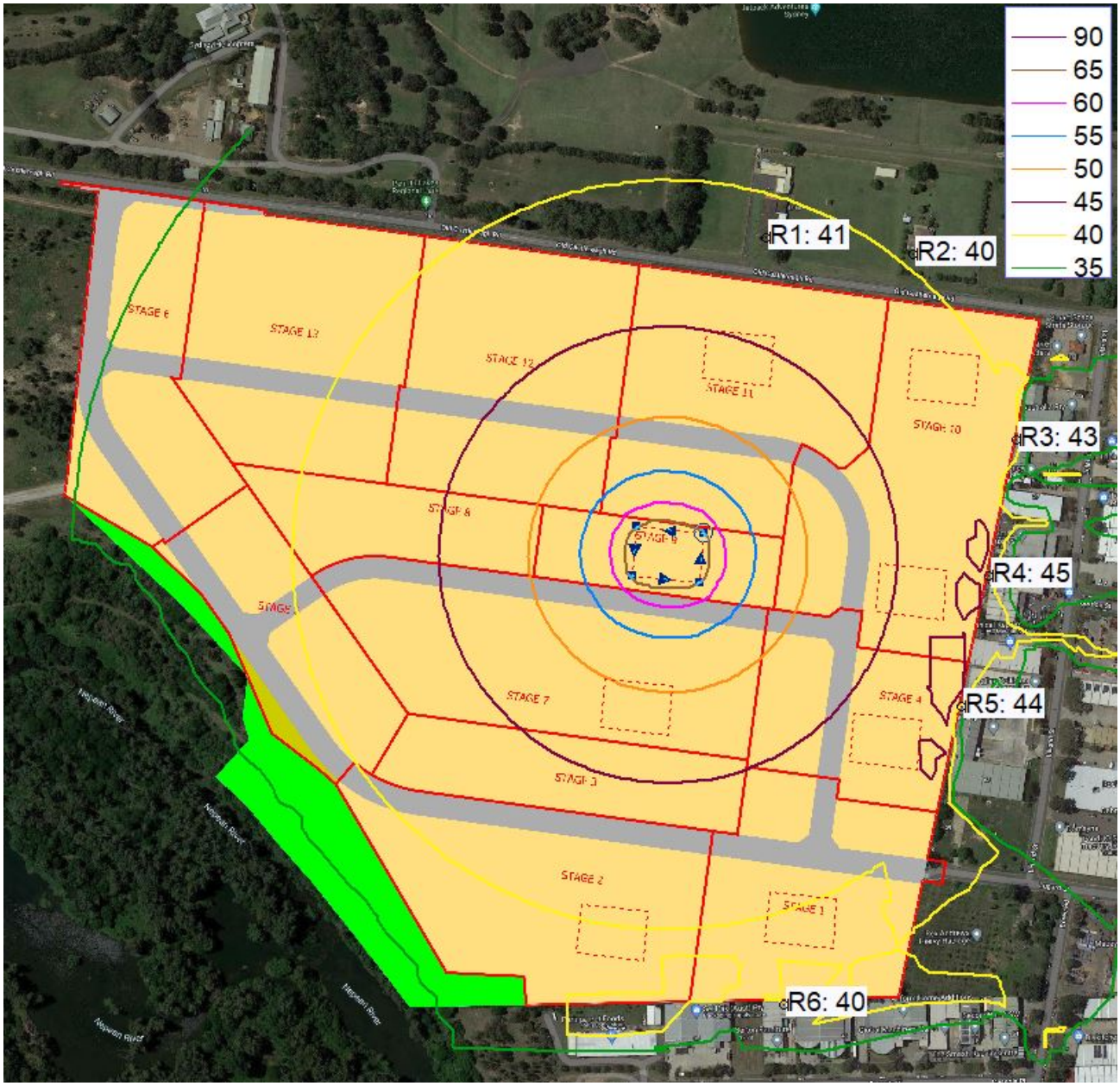


Figure 0-5 Stage 9 Excavation

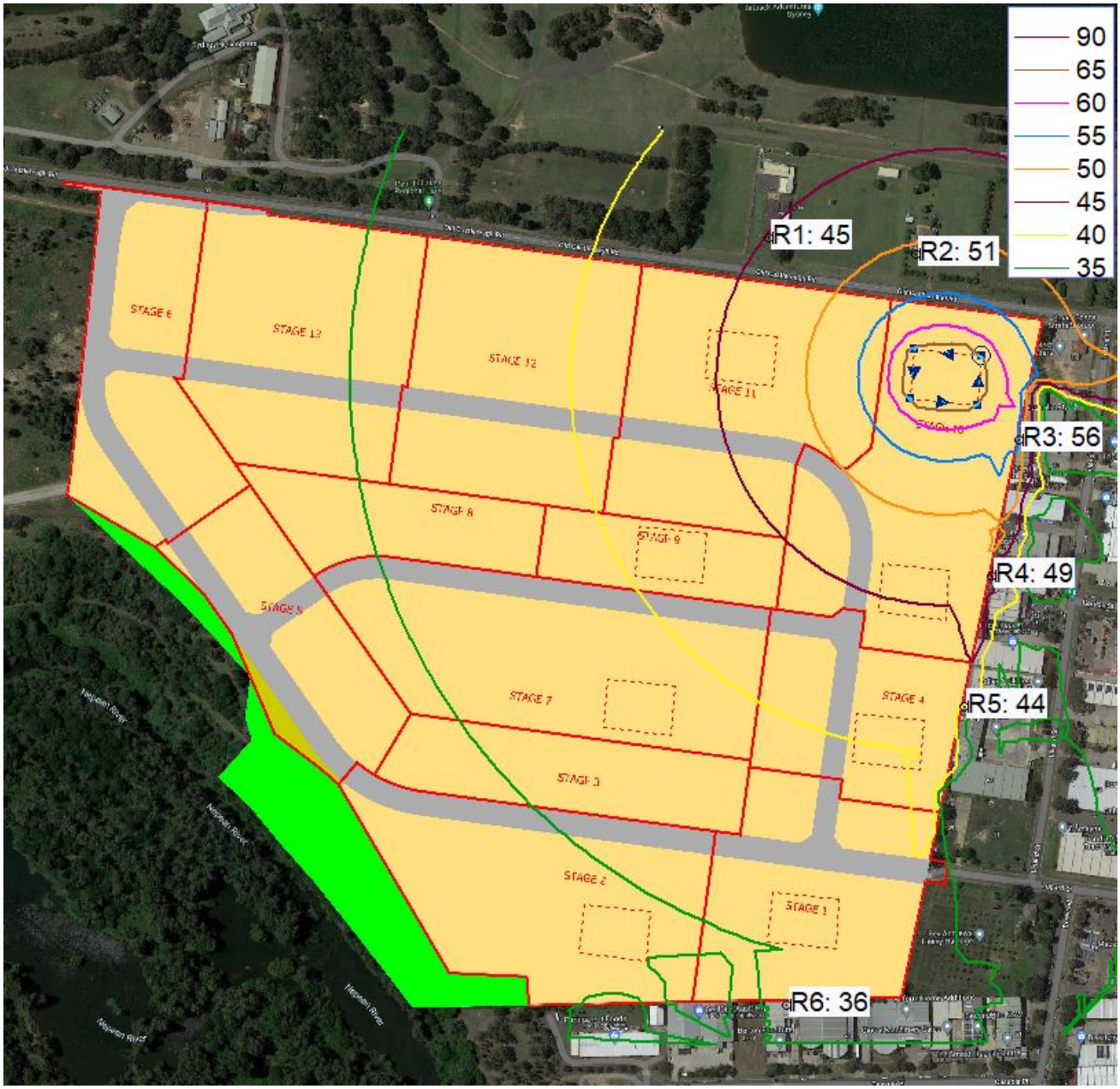


Figure 0-6 Stage 10A Excavation

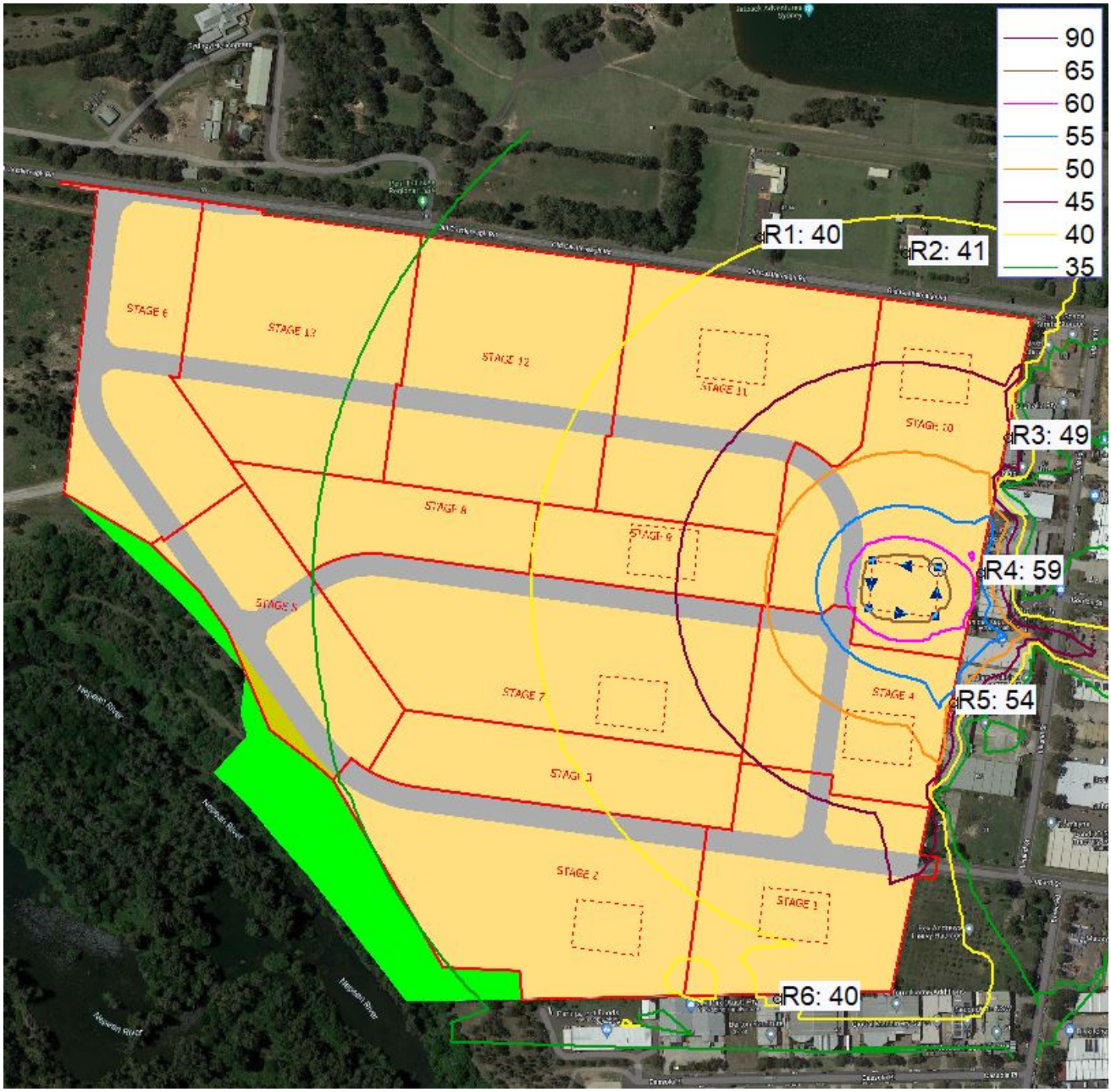


Figure 0-7 Stage 10B Excavation

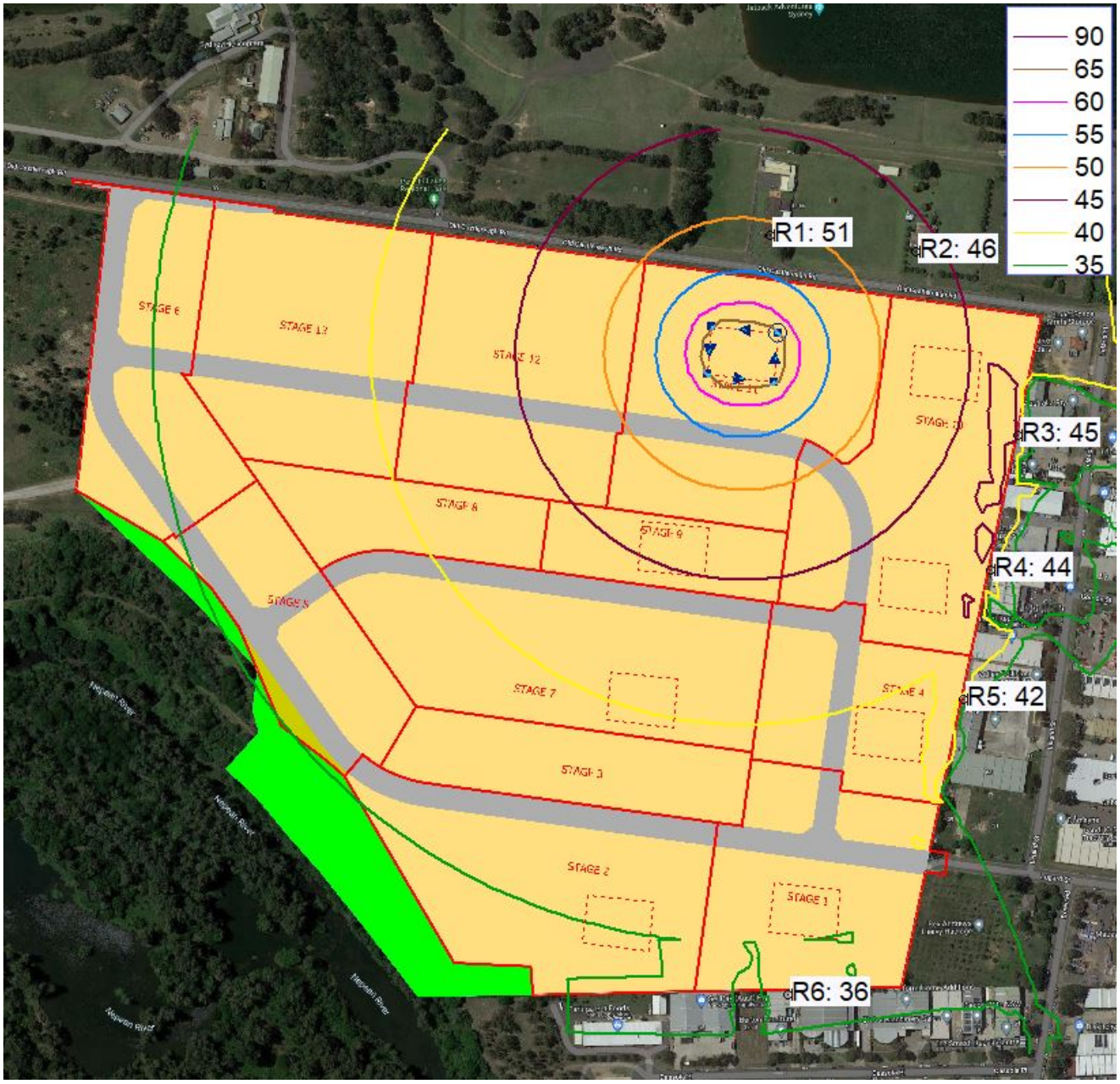


Figure 0-8 Stage 11 Excavation

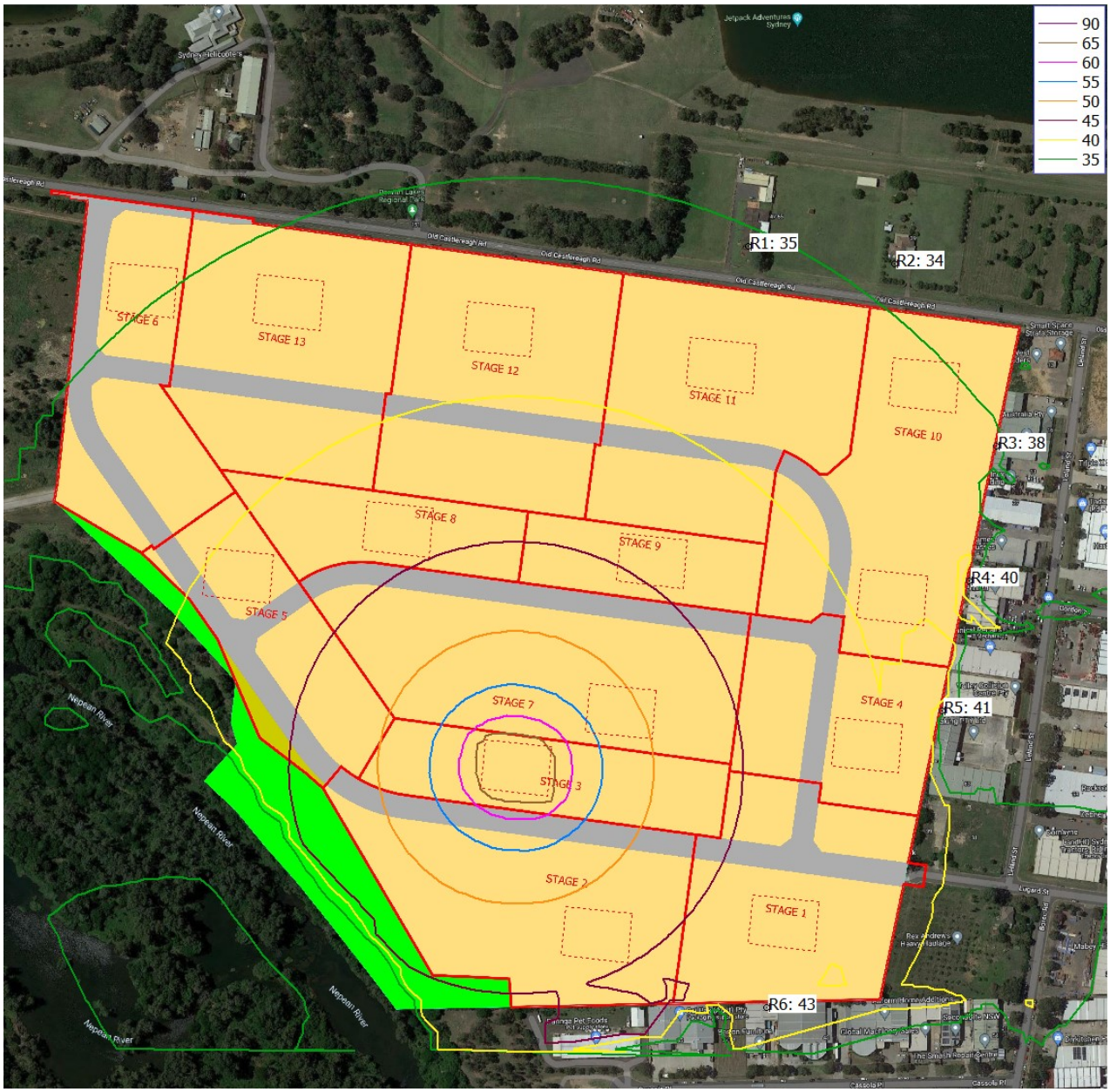


Figure 0-9 Stage 3 Excavation

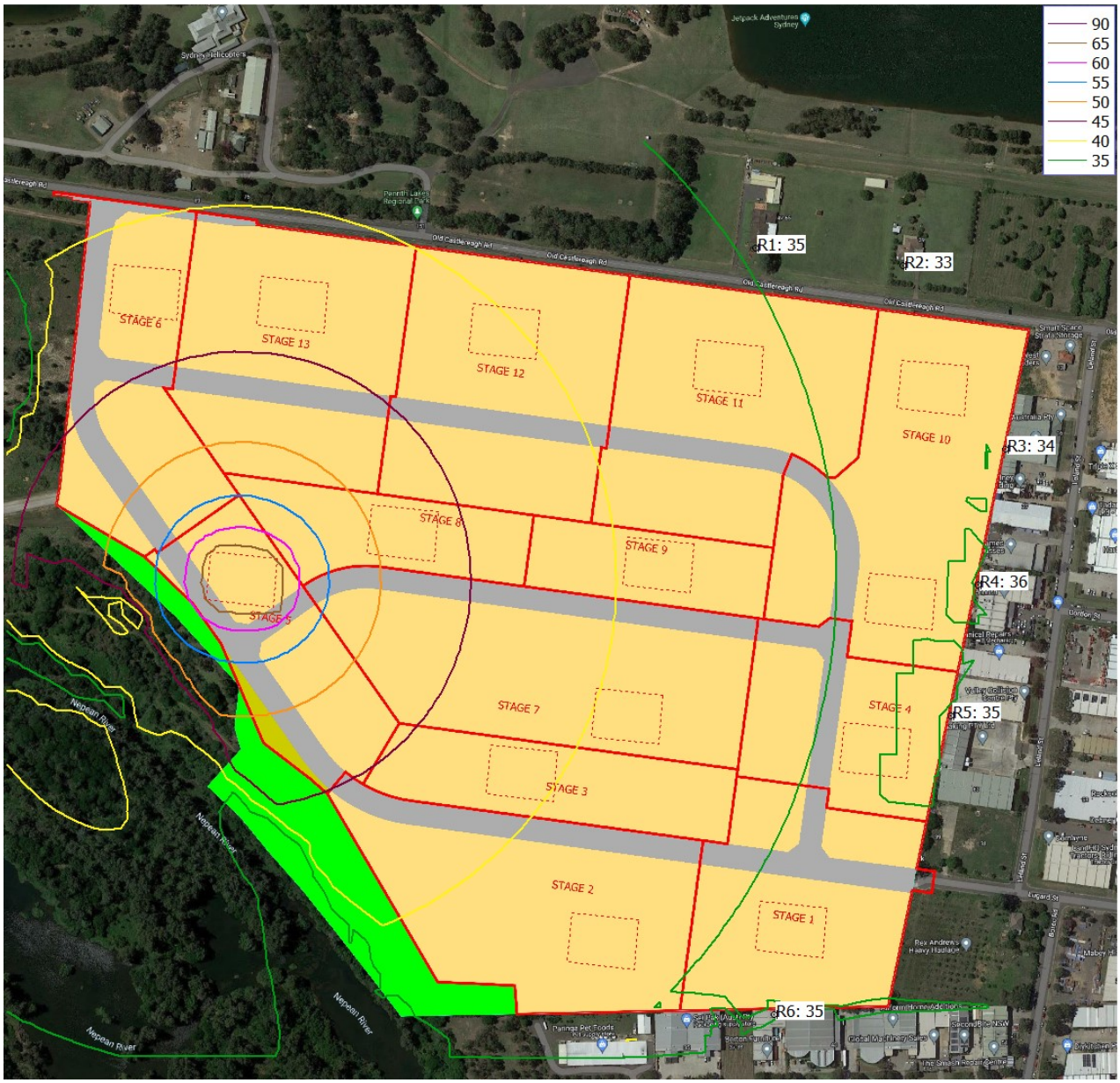


Figure 0-10 Stage 5 Excavation

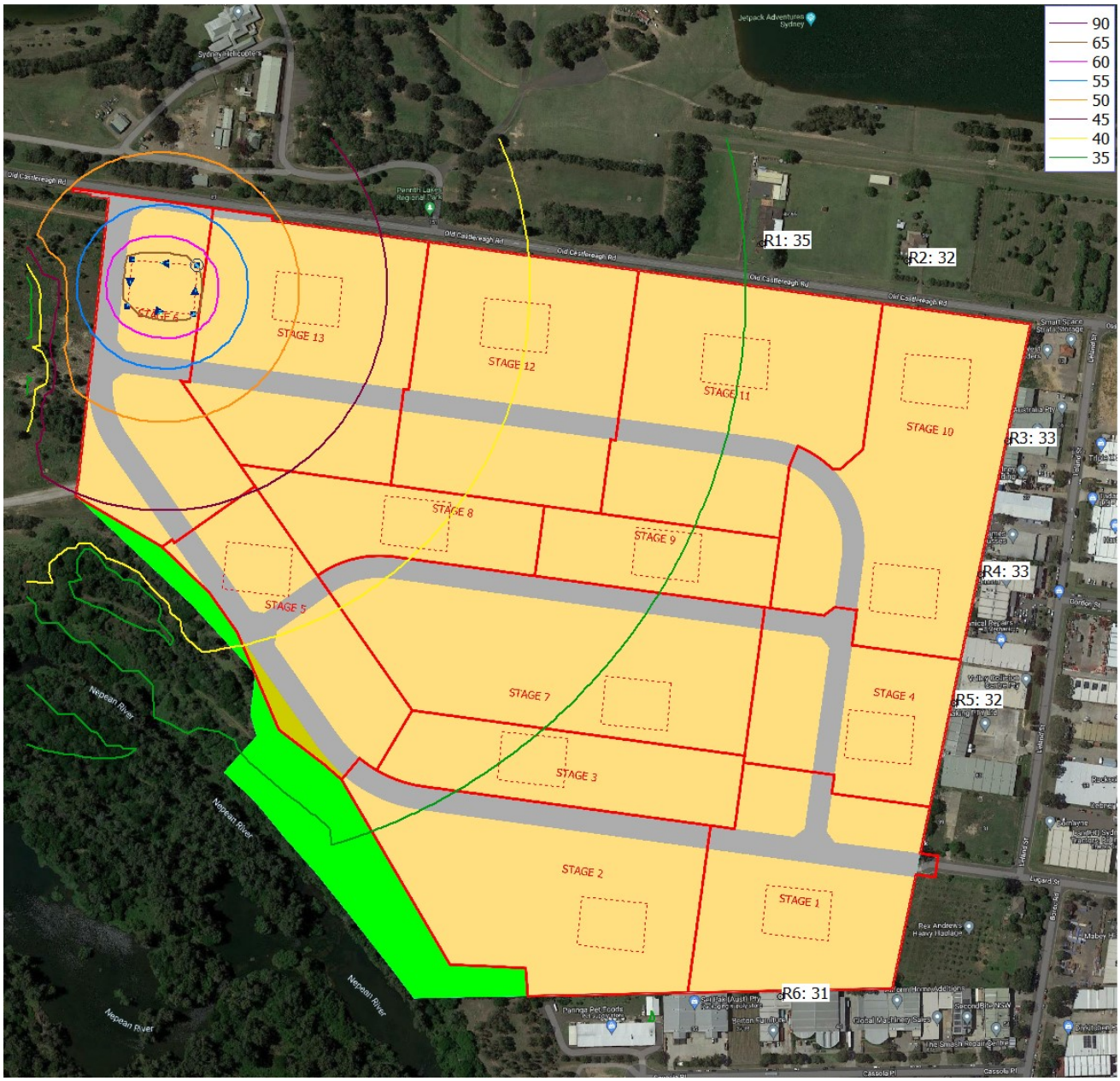


Figure 0-11 Stage 6 Excavation

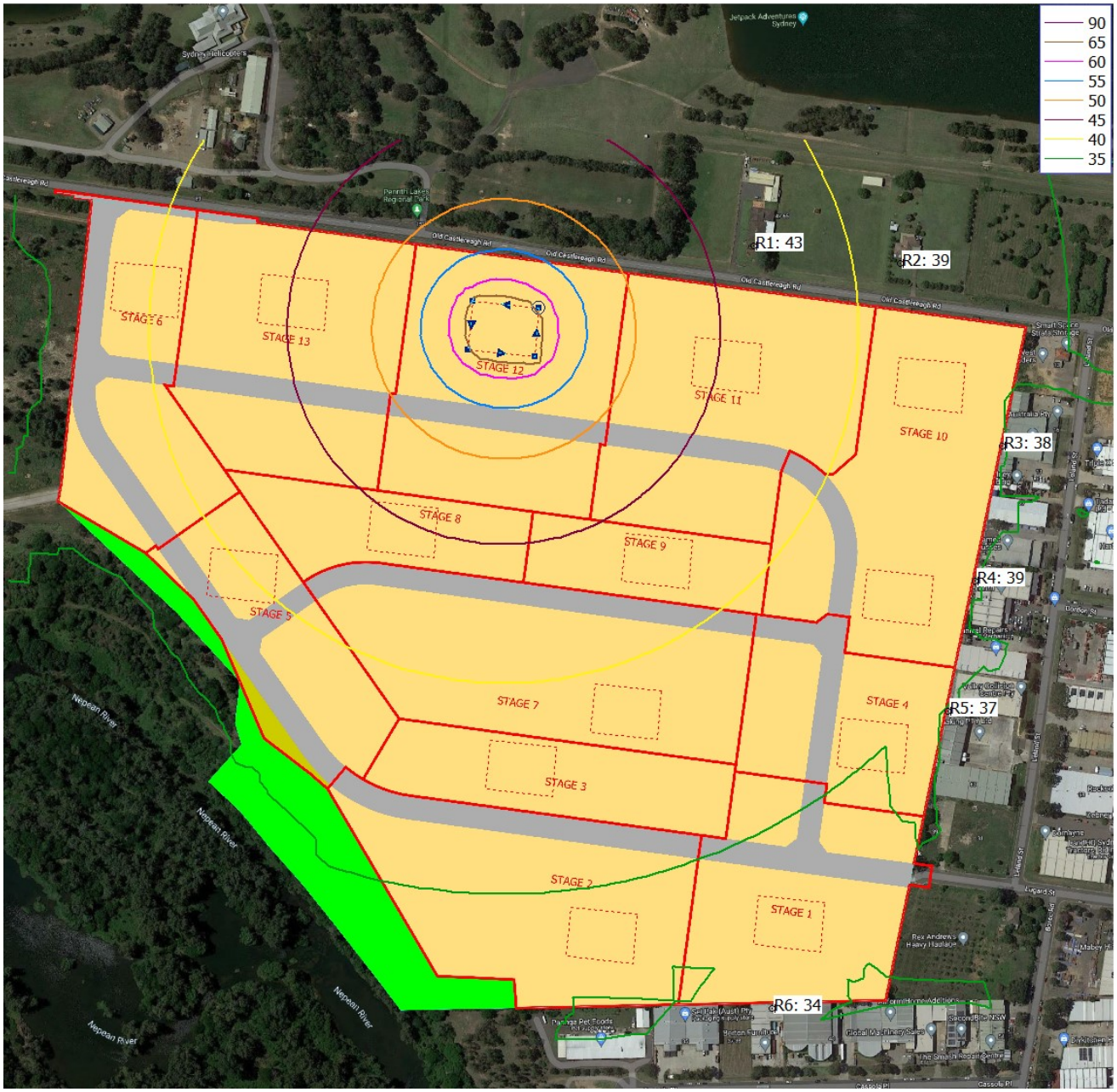


Figure 0-12 Stage 12 Excavation

Figure 0-13 Stage 13 Excavation

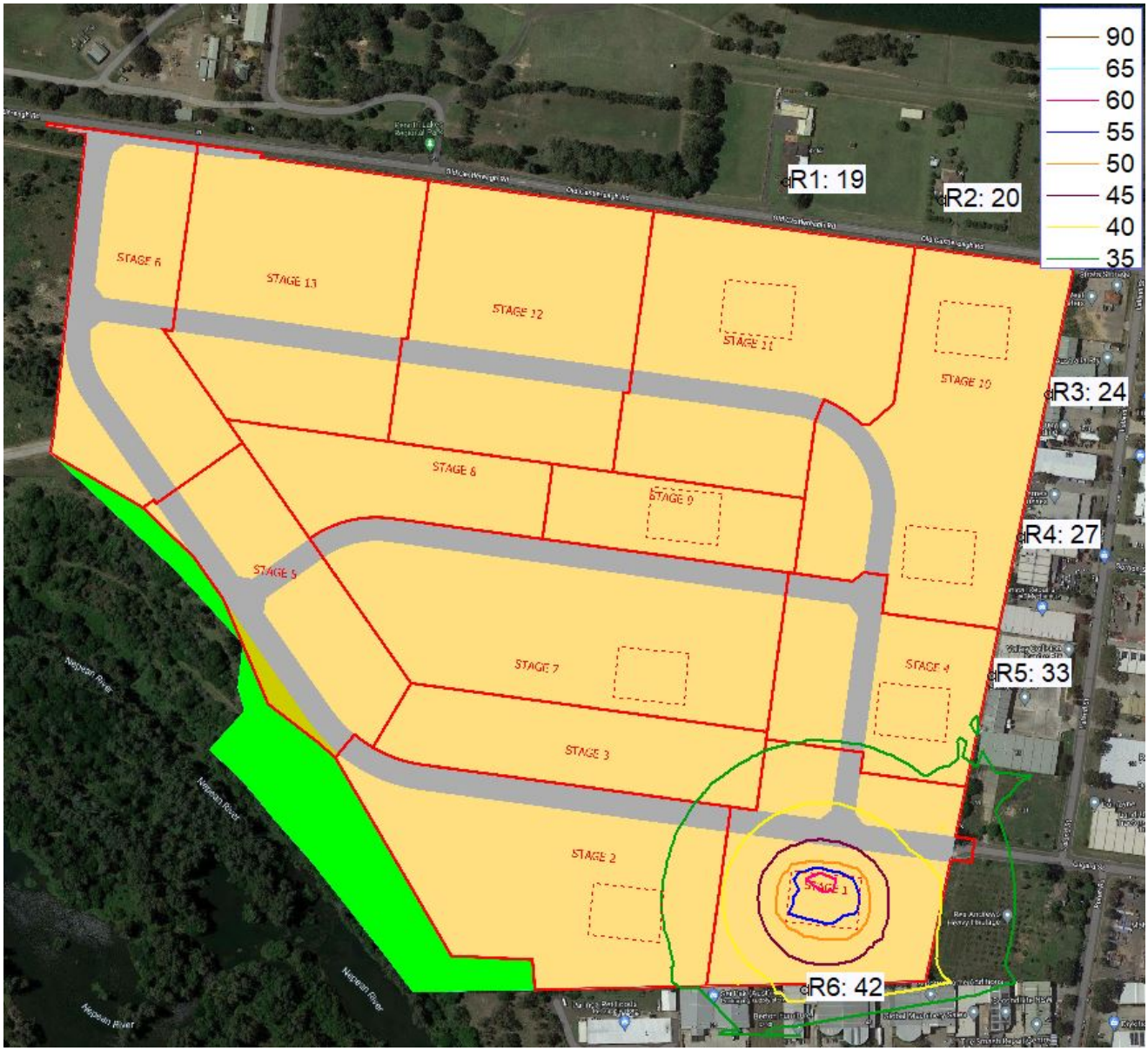


Figure 0-14 Stage 1 Building

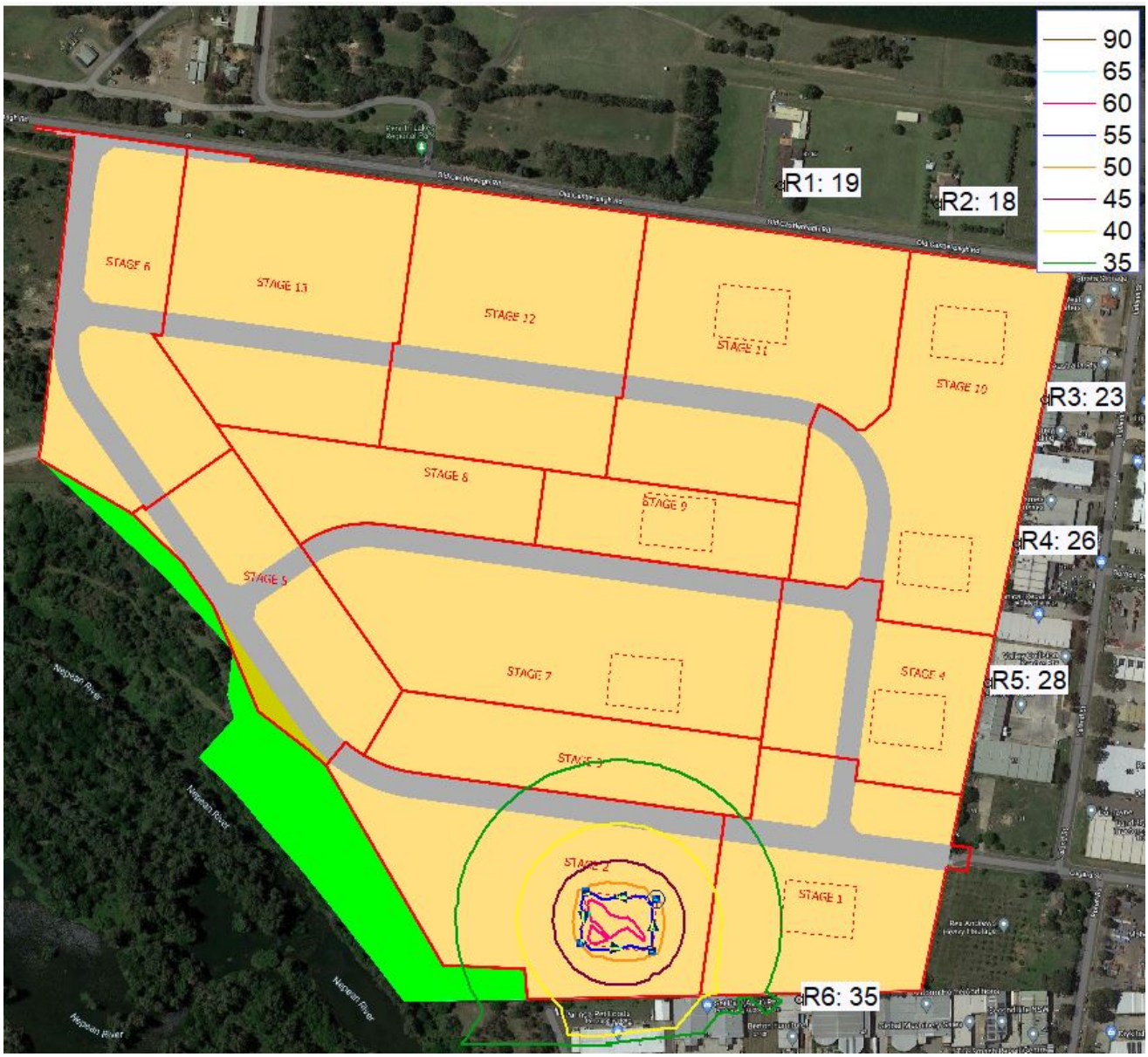


Figure 0-15 Stage 2 Building

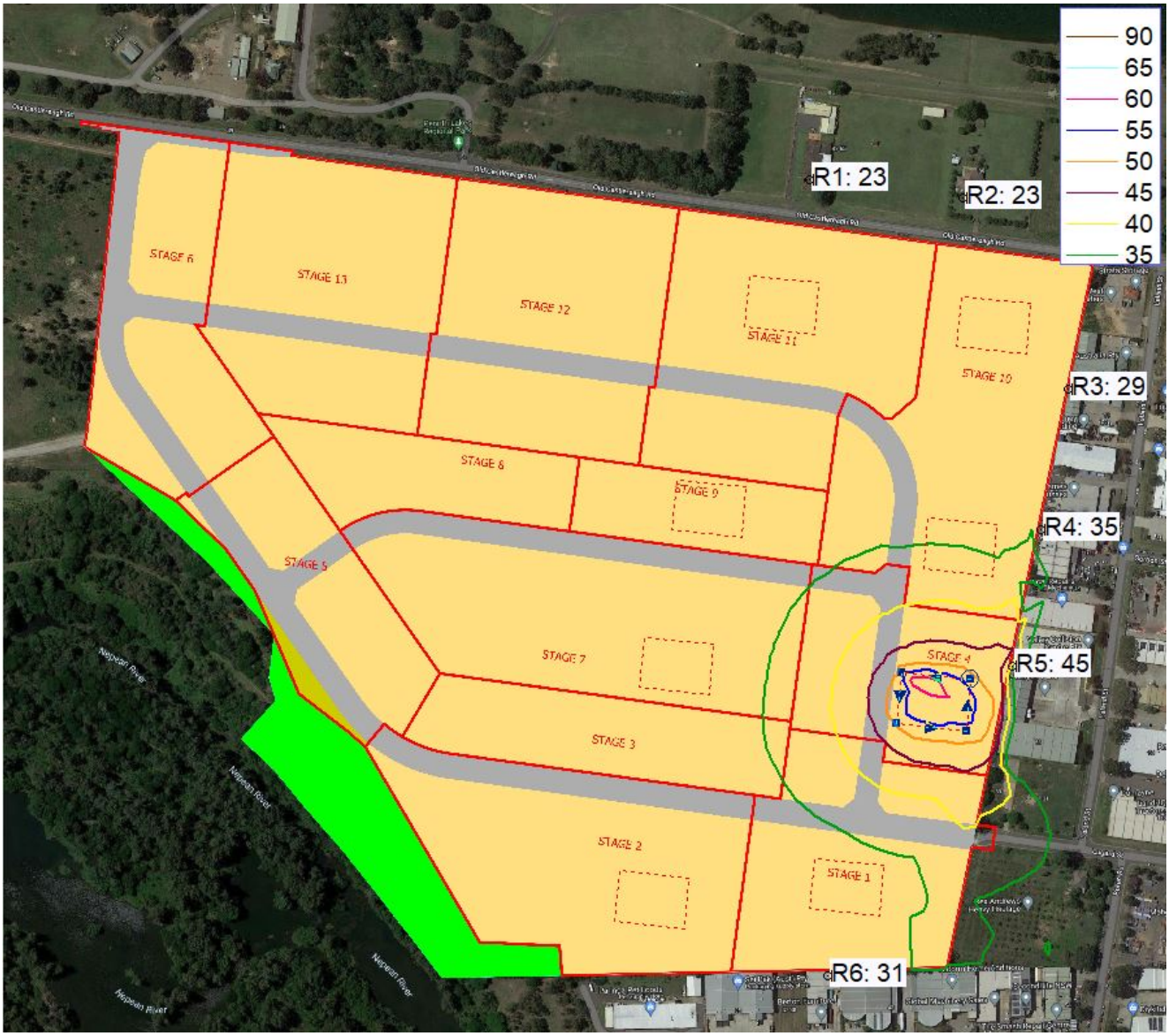


Figure 0-16 Stage 4 Building

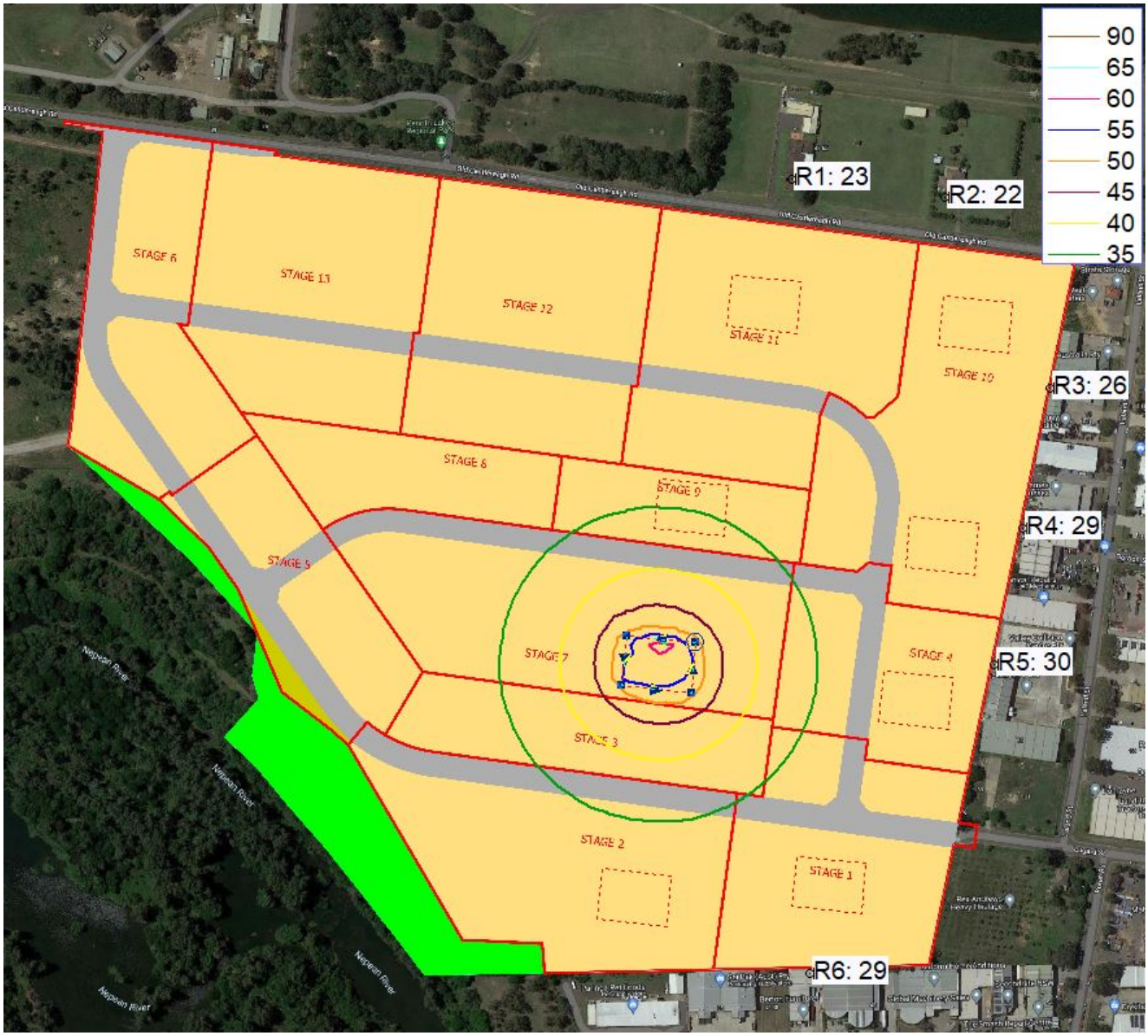


Figure 0-17 Stage 7 Building

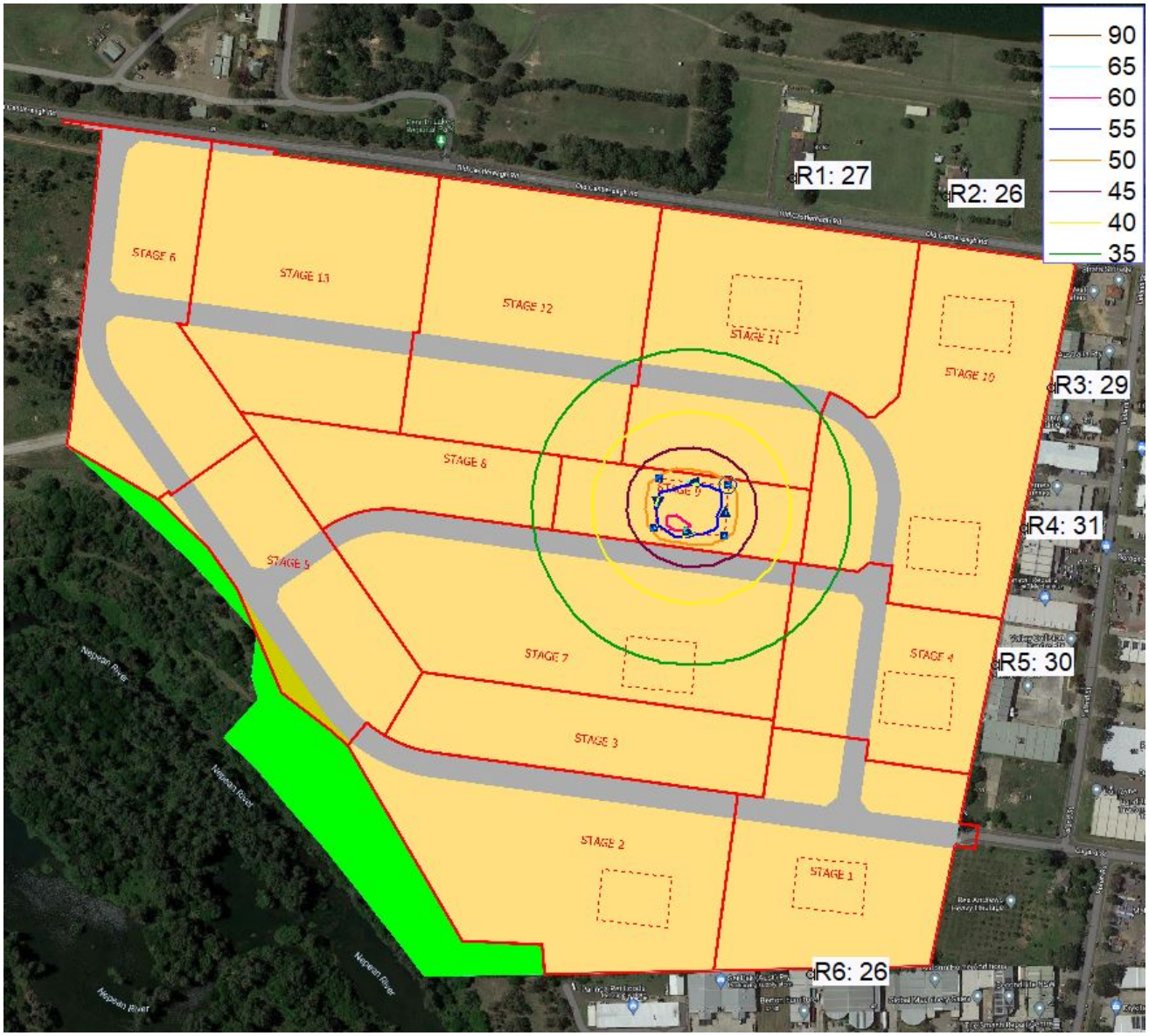


Figure 0-18 Stage 9 Building

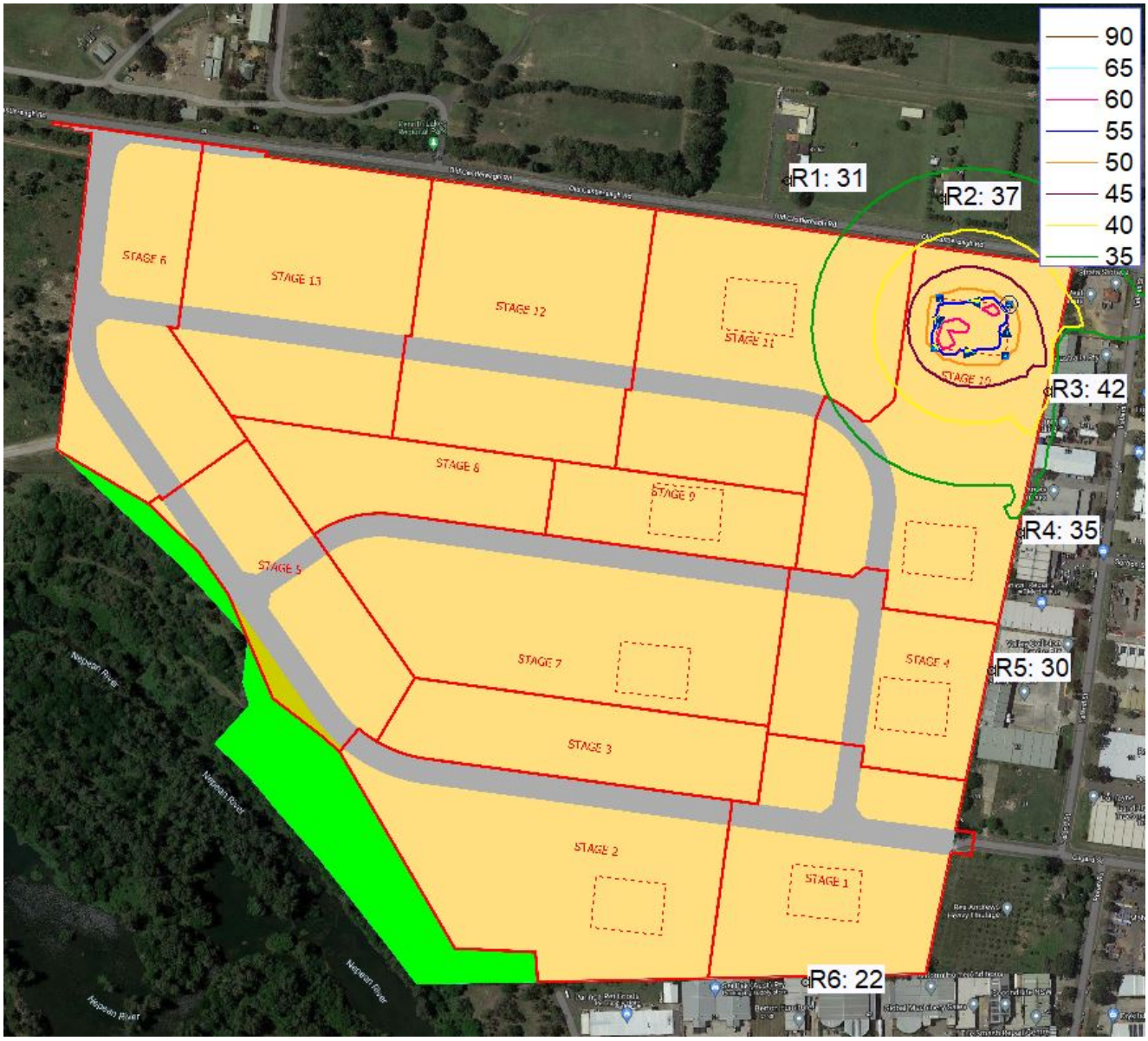


Figure 0-19 Stage 10A Building

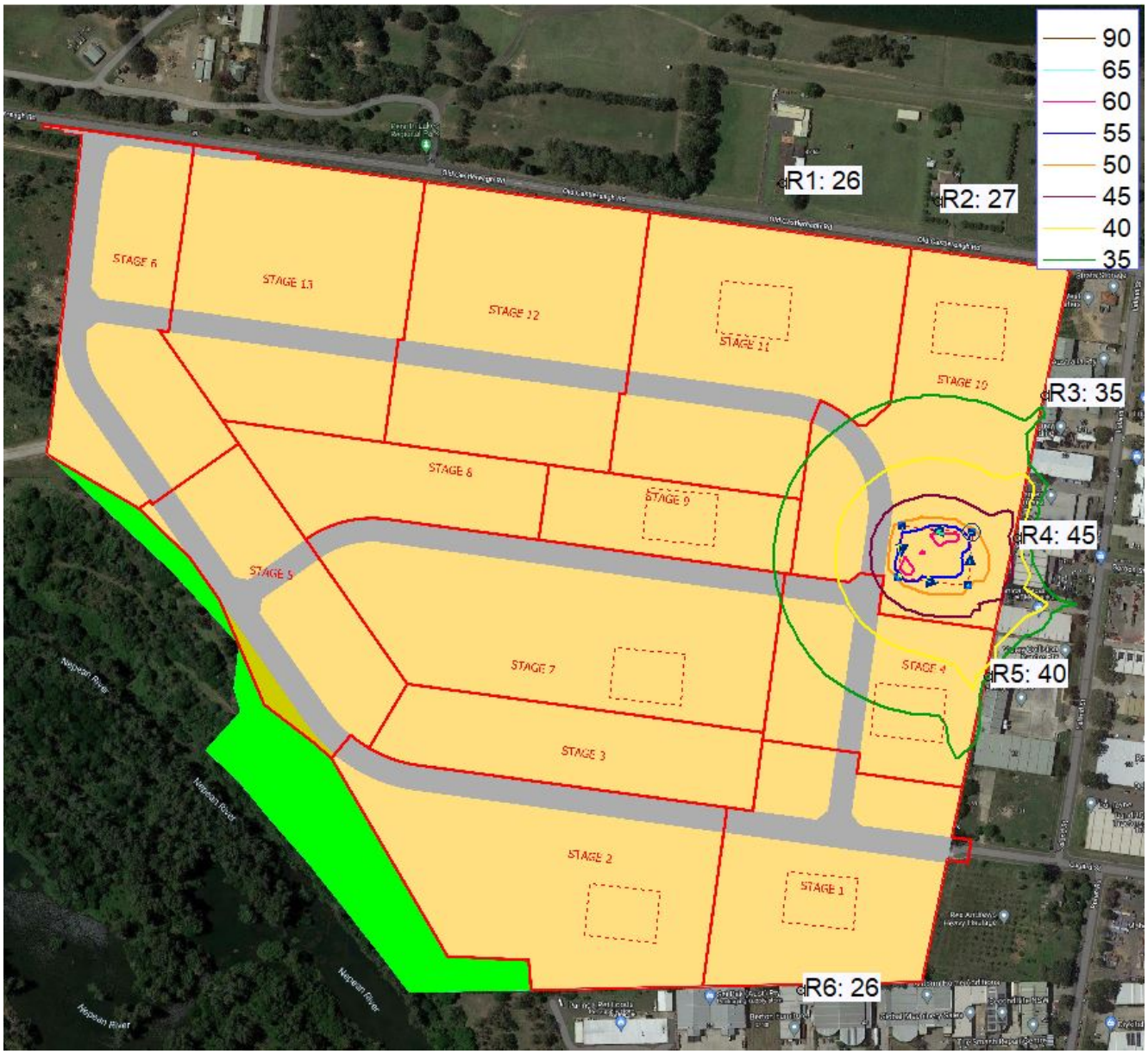


Figure 0-20 Stage 10B Building

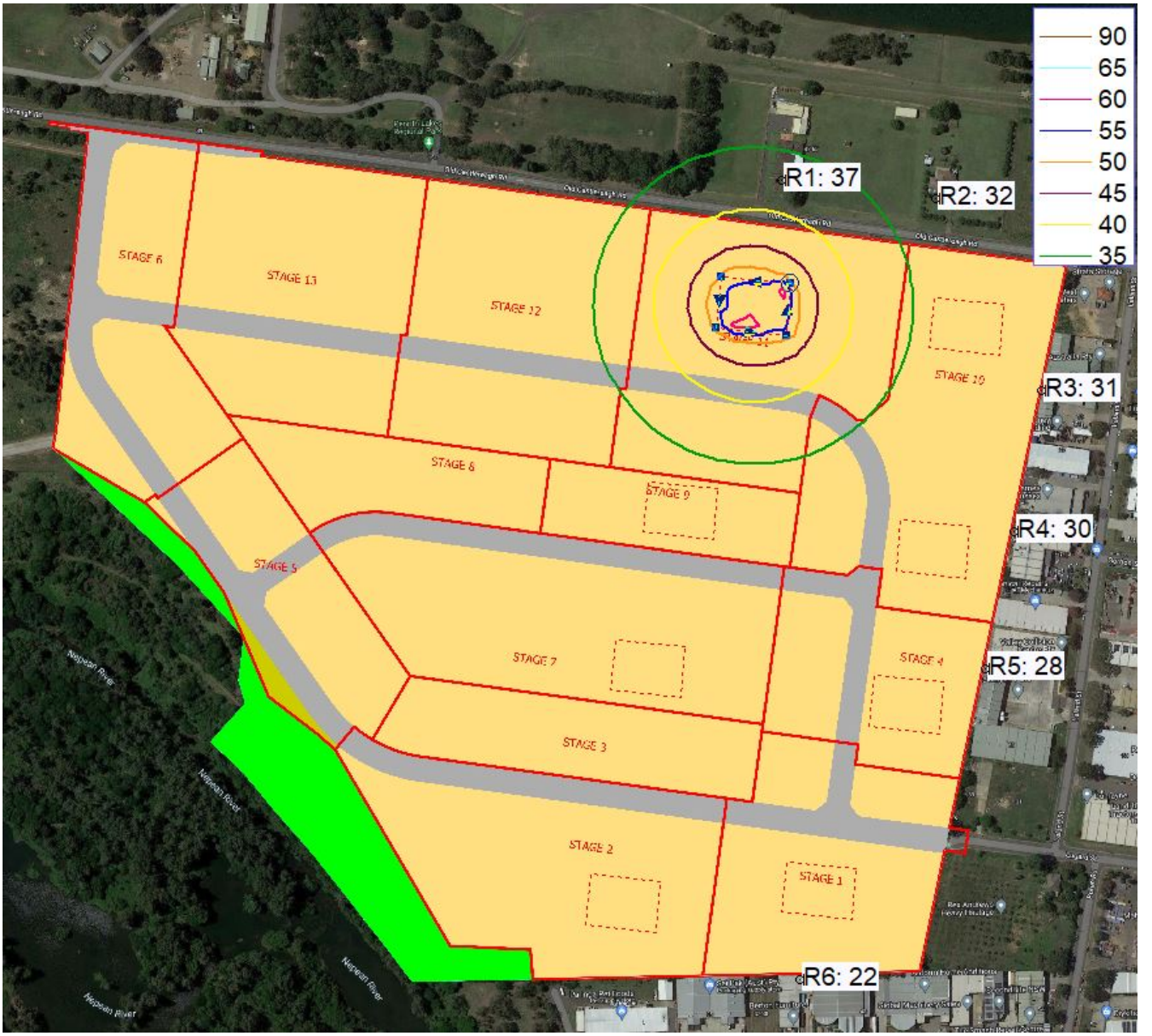


Figure 0-21 Stage 11 Building

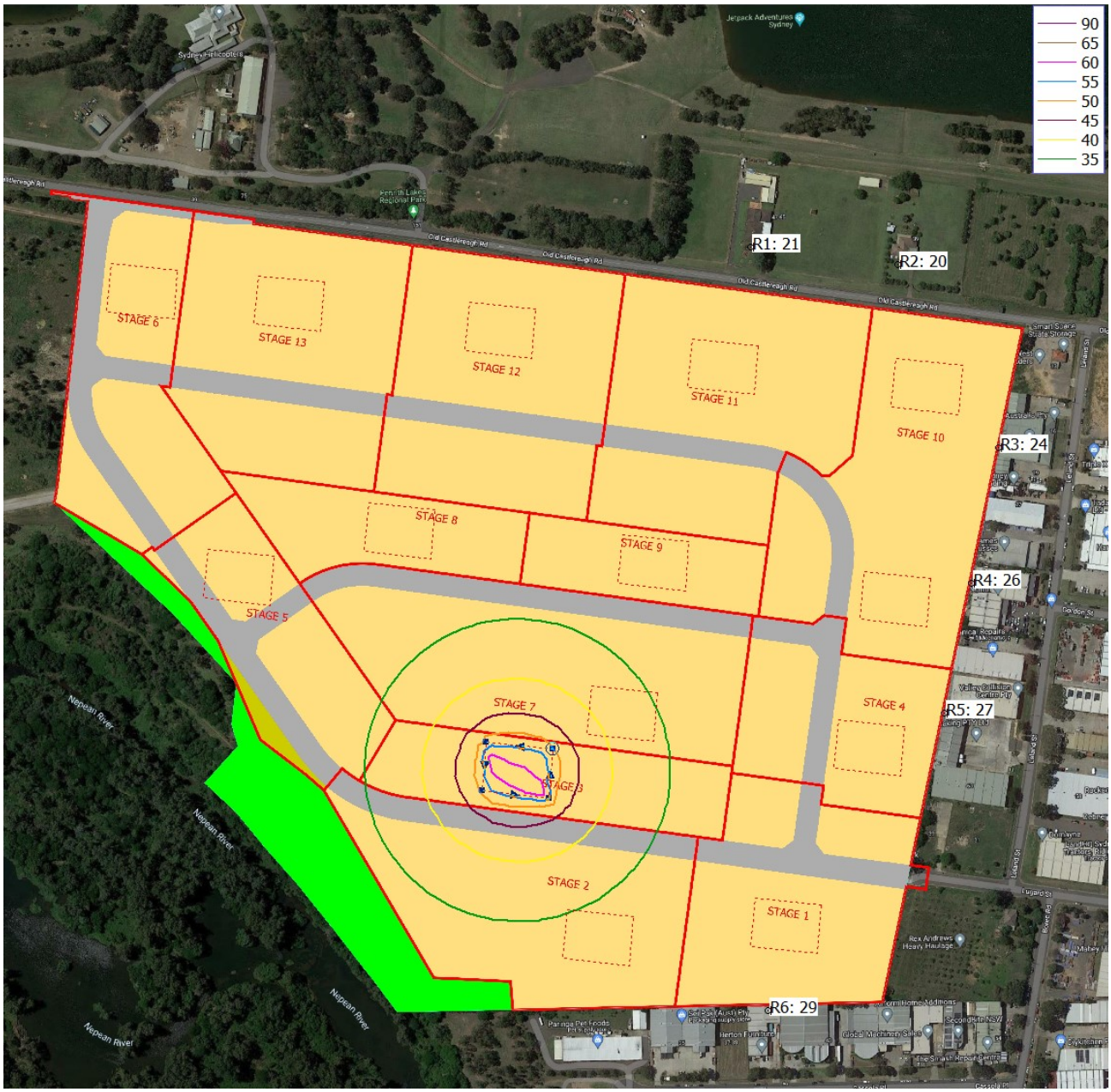


Figure 0-22 Stage 3 Building

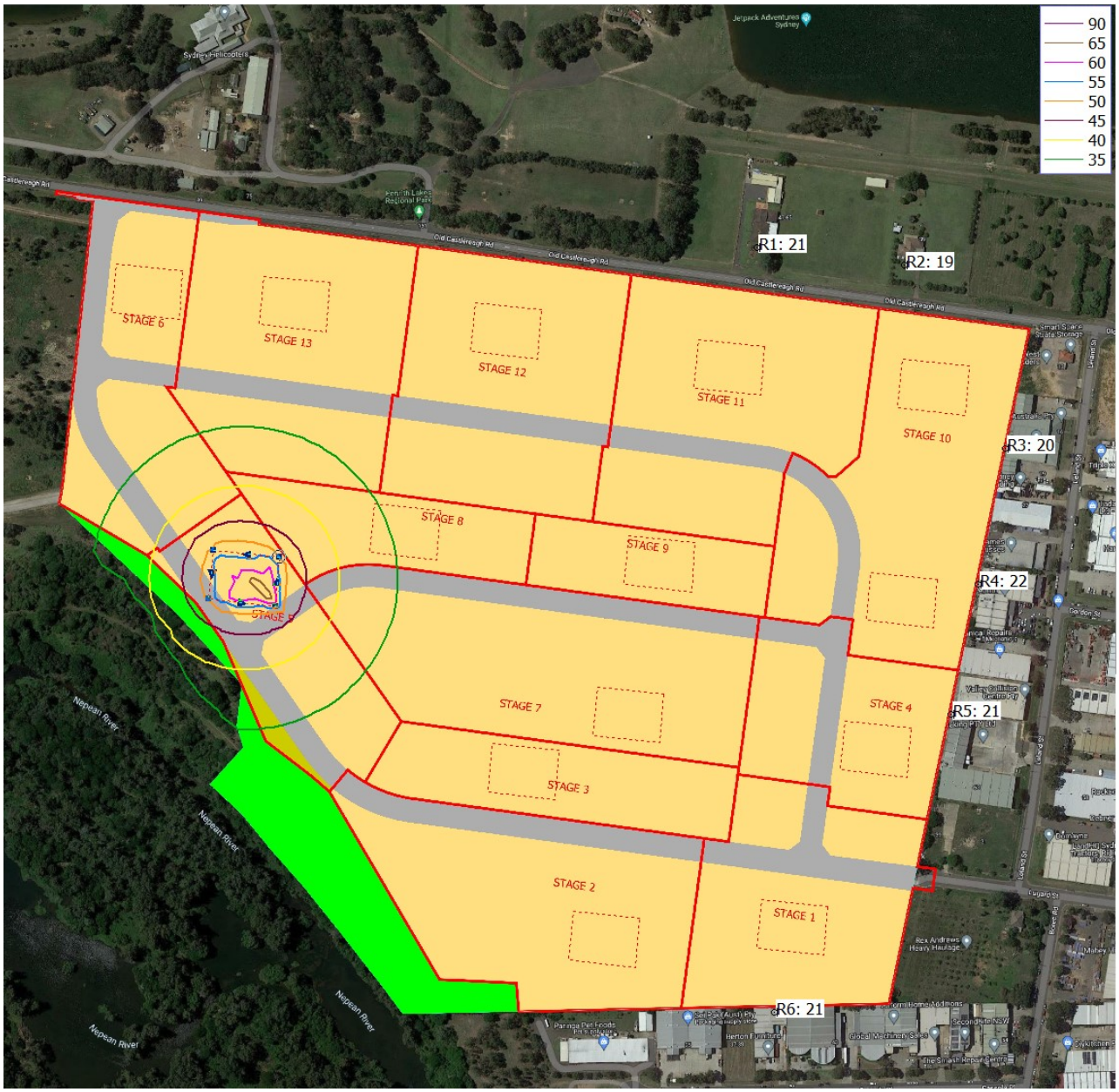


Figure 0-23 Stage 5 Building

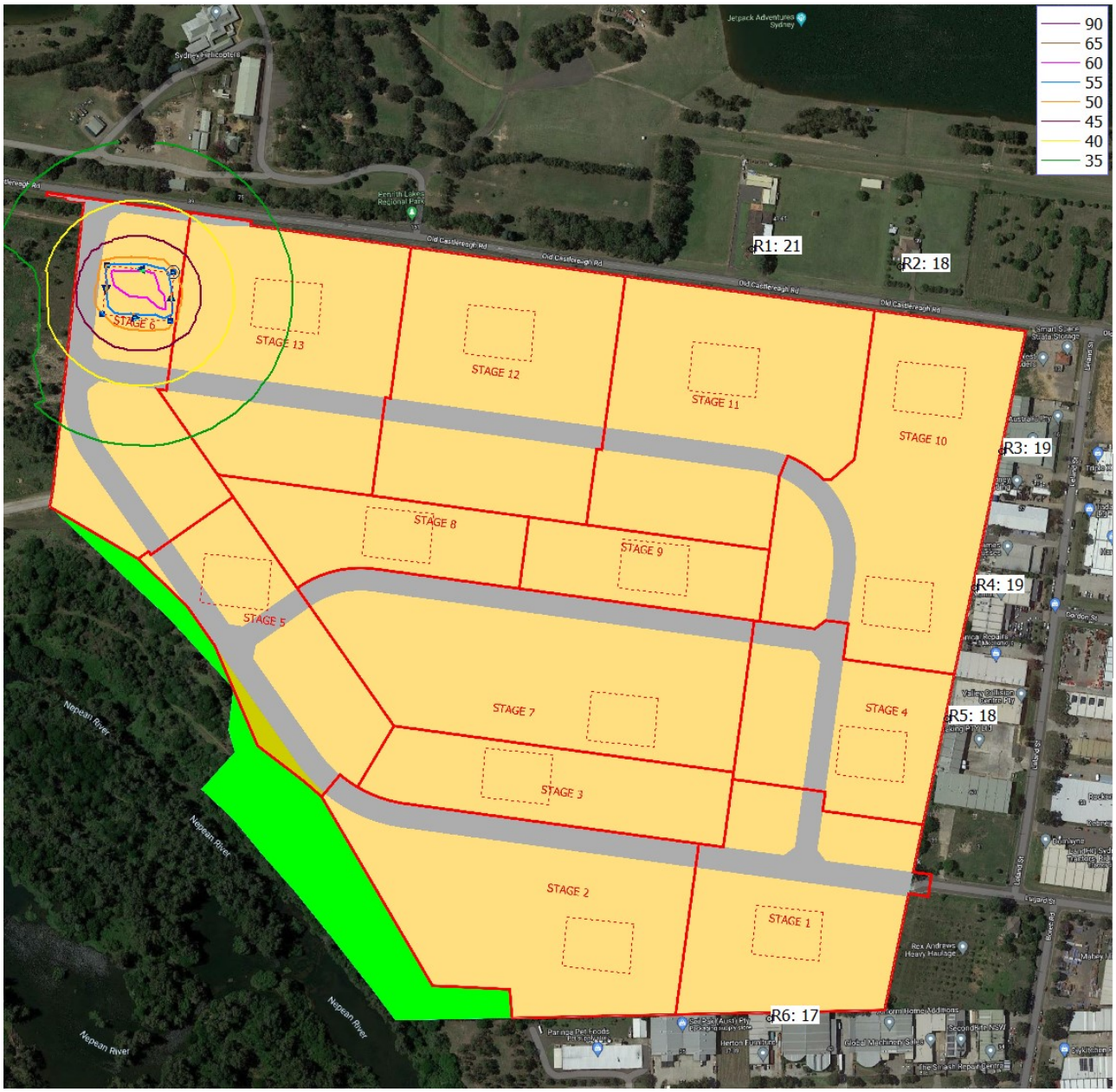


Figure 0-24 Stage 6 Building

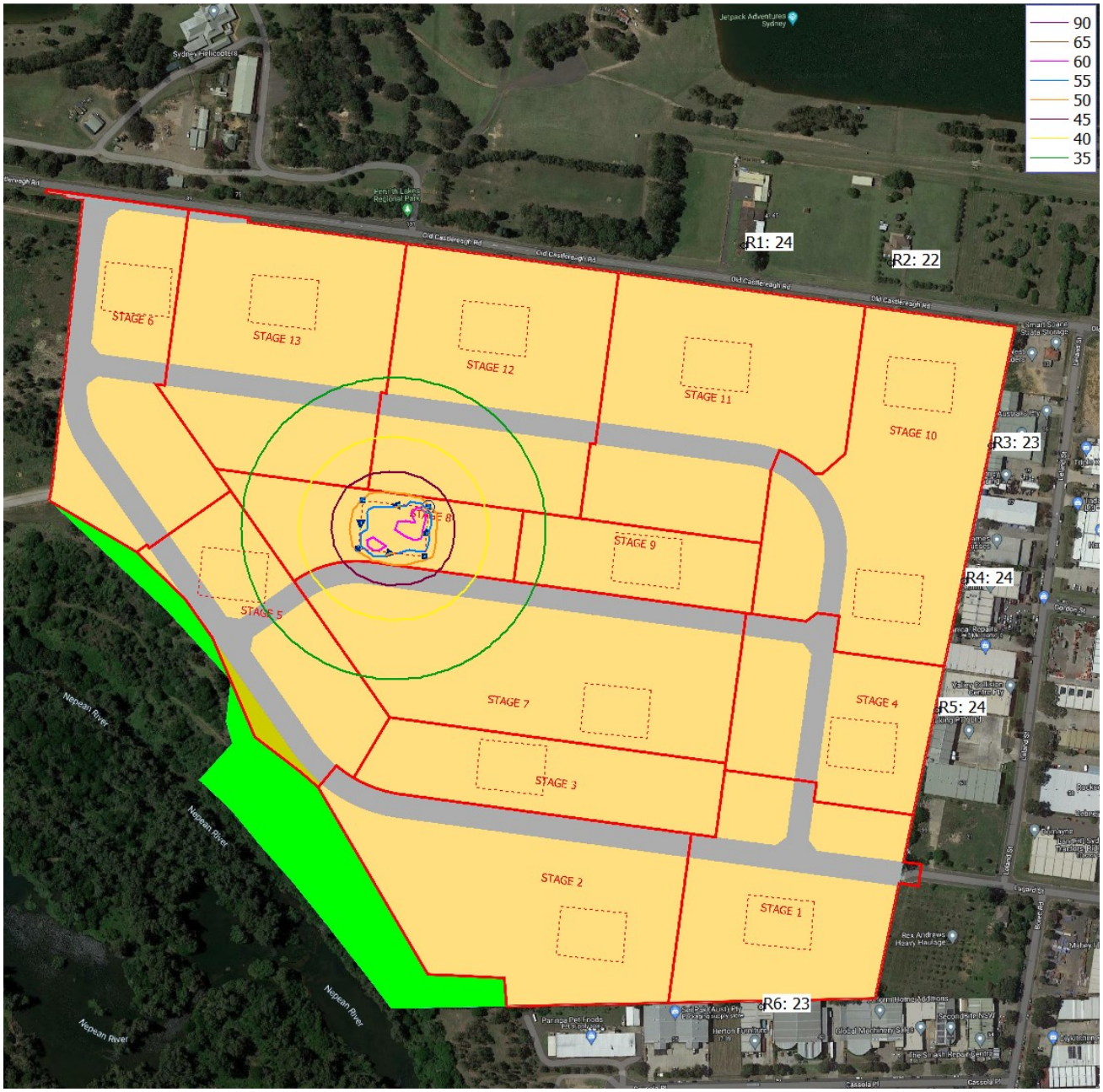


Figure 0-25 Stage 8 Building

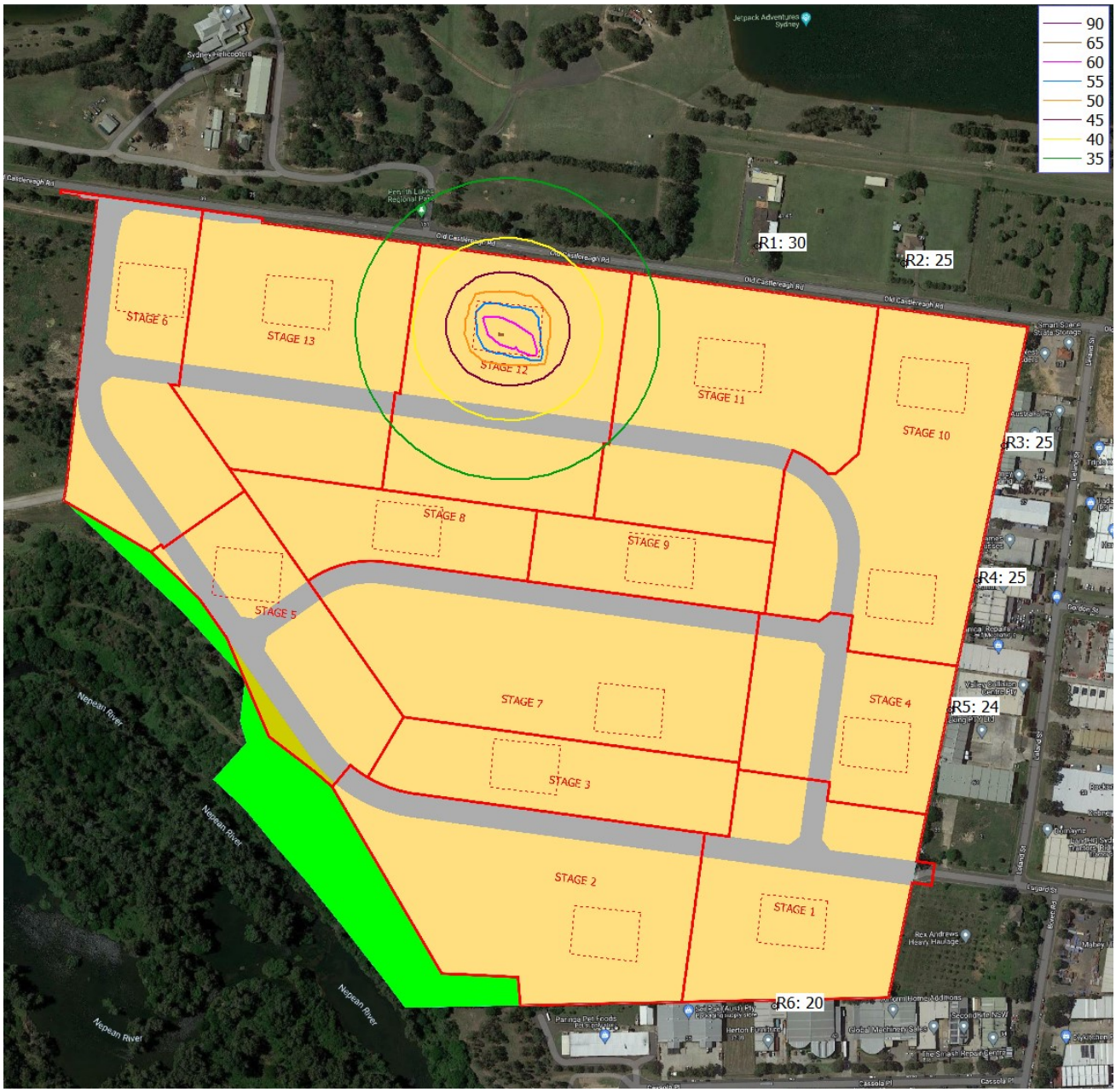


Figure 0-26 Stage 12 Building

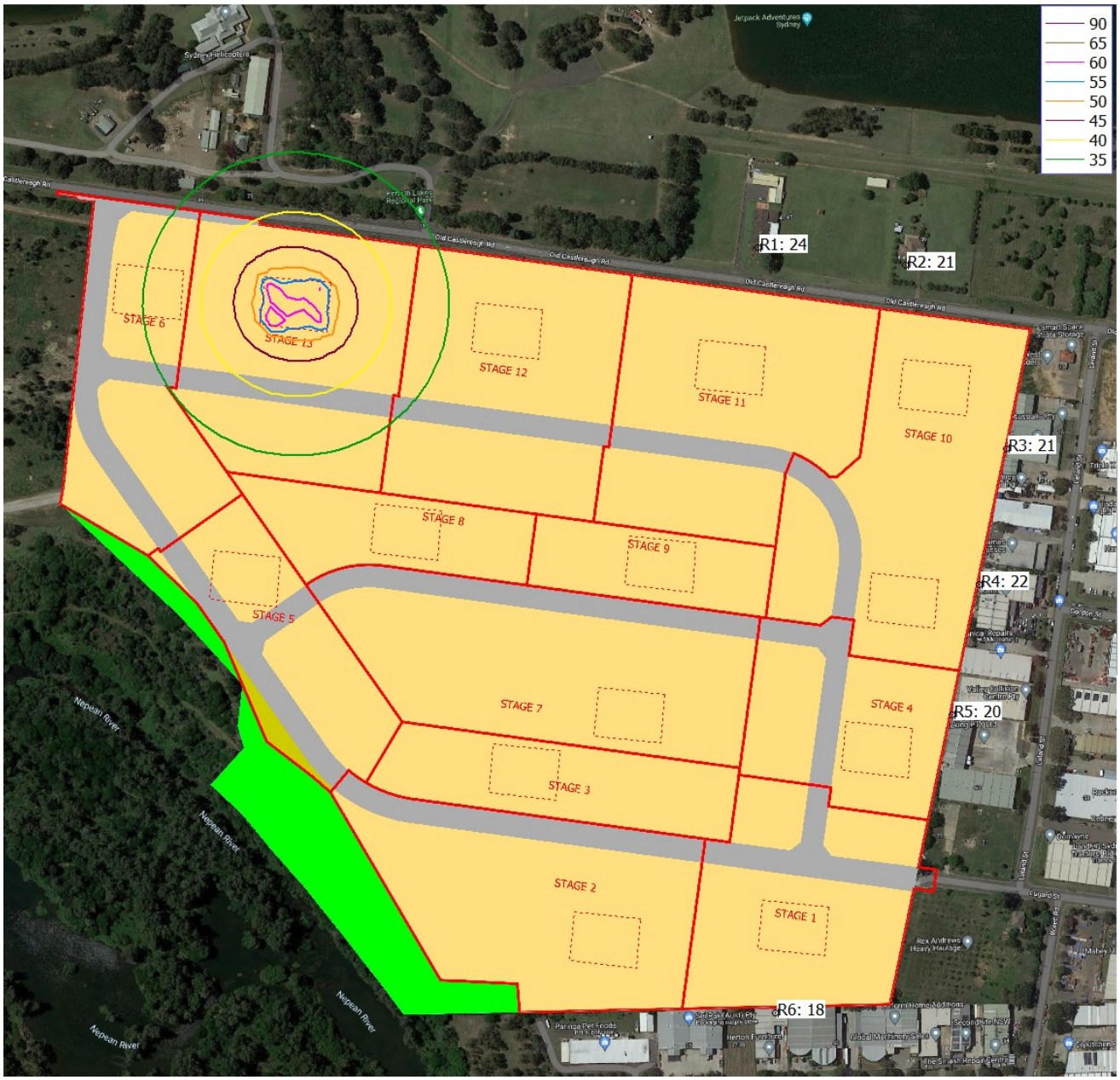


Figure 0-27 Stage 13 Building