

# Northern Downstream Flood Assessment

## Summary

A HEC RAS 2D model was created to assess the capacity of the existing downstream conveyance which includes existing channels and pipe crossings under Station Road for the 10year ARI climate change scenario. To reflect a conservative approach, the culverts under Station Road were assumed to be 50% blocked.

The 2D area comprises the downstream areas from our site (RV and Residential site), where the assessment is carried out. The model includes the land north of Station Road based on LiDAR data, as well as the surveyed Station Road culverts.

Inflow data into the 2D areas are built using HEC HMS hydrographs from our site at pre and post development stages for the 10year ARI cc event. The 2D area rain on grid rainfall data (hyetograph from HEC HMS) is also as per the 10year ARI cc event.

Predevelopment data represents flows prior to development and post reflects our design data discharging out of Wetland 1 (RV) and Wetland C (Residential) into these downstream areas.

HEC RAS results show either reduced downstream peak flows and lower water levels or negligible differences during the post development scenario. This outcome is consistent with our expectation considering the post development data reflects the attenuated discharge from the two wetlands mentioned. Note that both pre and post development models are using climate change adjusted values for this assessment to evaluate the impact downstream. However, note the wetlands are sized to discharge at 80% pre development flows (without climate change) as per RITS (refer to SMP for further information).

It is noted that during the 10year ARI cc event, results shows flow overtopping Station road for both RV and the Residential downstream areas, however during post development, peak water levels and depths decreases for both areas.

For the RV and Wetland 1 discharge crossing Station Road (RV Section 2A), the maximum flood depth at the crest of the road in the pre-development scenario is 70mm, compared with 50mm post-development. This reflects a 20 mm reduction in flood depth on the carriageway. Consequently, the post-development condition is expected to improve the existing flooding along Station Road adjacent to the RV development.

For the Residential development and Wetland C discharge crossing Station Road (Resi Downstream Section 03), the maximum flood depth the crest of the road in the pre-development scenario is 130 mm, compared with 90mm post-development. This reflects a 40 mm reduction in flood depth on the carriageway. Consequently, the post-development condition is expected to improve the existing flooding along Station Road north of the residential development.

The results indicate that flows are constrained at the Station Road crossings due to the small existing culverts and the road functioning as a weir. This throttle effect, rather than any downstream backwater effects, controls the flow.

## Model Summary, Data and Parameters

The Flood model created for this assessment focuses only on the downstream drainage and conveyance areas (refer to second paragraph of above section) and therefore do not show flooding within the project area for either the pre or post development scenarios. The inflows applied at the model boundaries are directly sourced from HEC HMS model result as hydrographs representing the discharge points from the site towards these downstream areas. As a result the internal site flooding is not shown nor available within this model.

Rainfall data: 167mm (cc 10yr ARI) – 2D Area and HEC HMS inflows.

Inflows (note Pre and Post are climate change adjusted) extracted from HEC HMS as hydrographs, however peak values only are shown below.

- Discharge @ wetland 1 Pre Development Peak Flow = 1.35 m<sup>3</sup>/s
- Discharge @ wetland 1 Post Development Peak Flow = 0.69 m<sup>3</sup>/s
- Discharge @ wetland C Pre Development Peak Flow = 0.79m<sup>3</sup>/s
- Discharge @ wetland C Post Development Peak Flow = 0.36 m<sup>3</sup>/s
- Discharge @ A7 (refer to Catchment Plan) Pre Development Peak Flow = 2.34m<sup>3</sup>/s
- Discharge @ A7 (refer to Catchment Plan) Post Development Peak Flow = 0m<sup>3</sup>/s

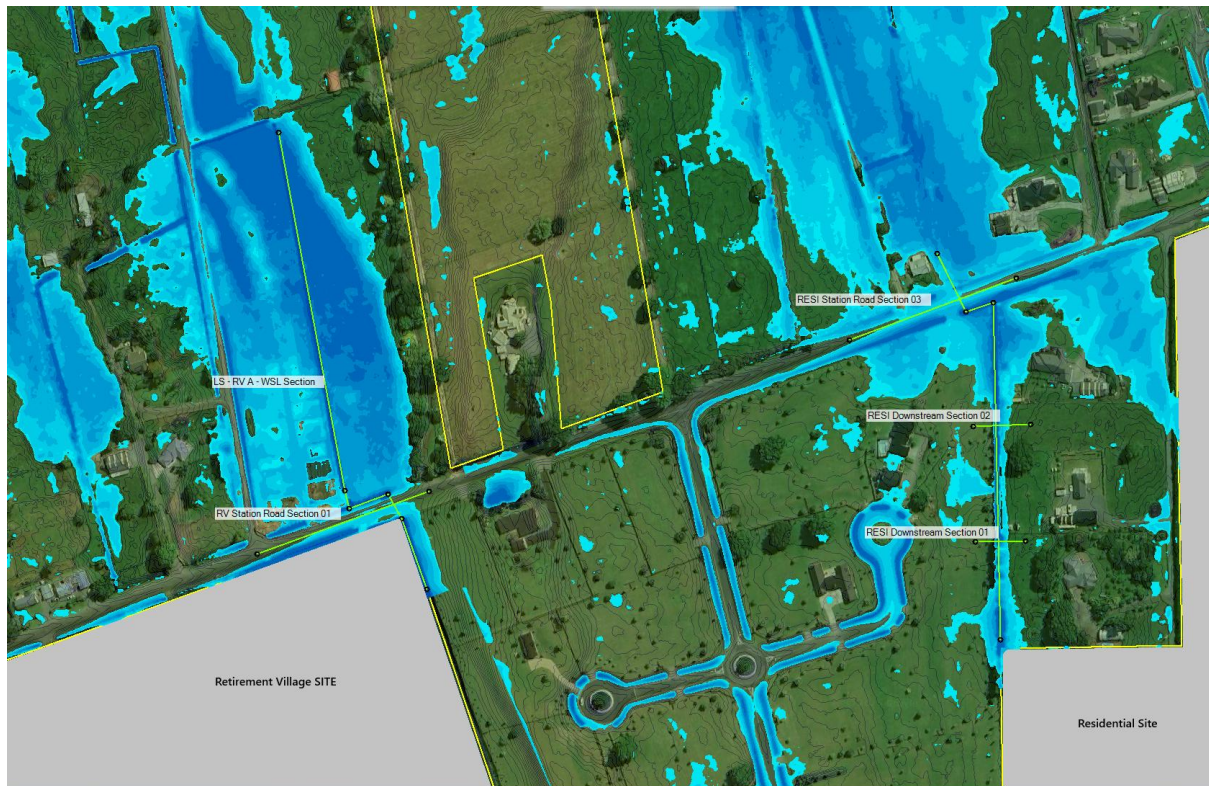
Model 2D Area



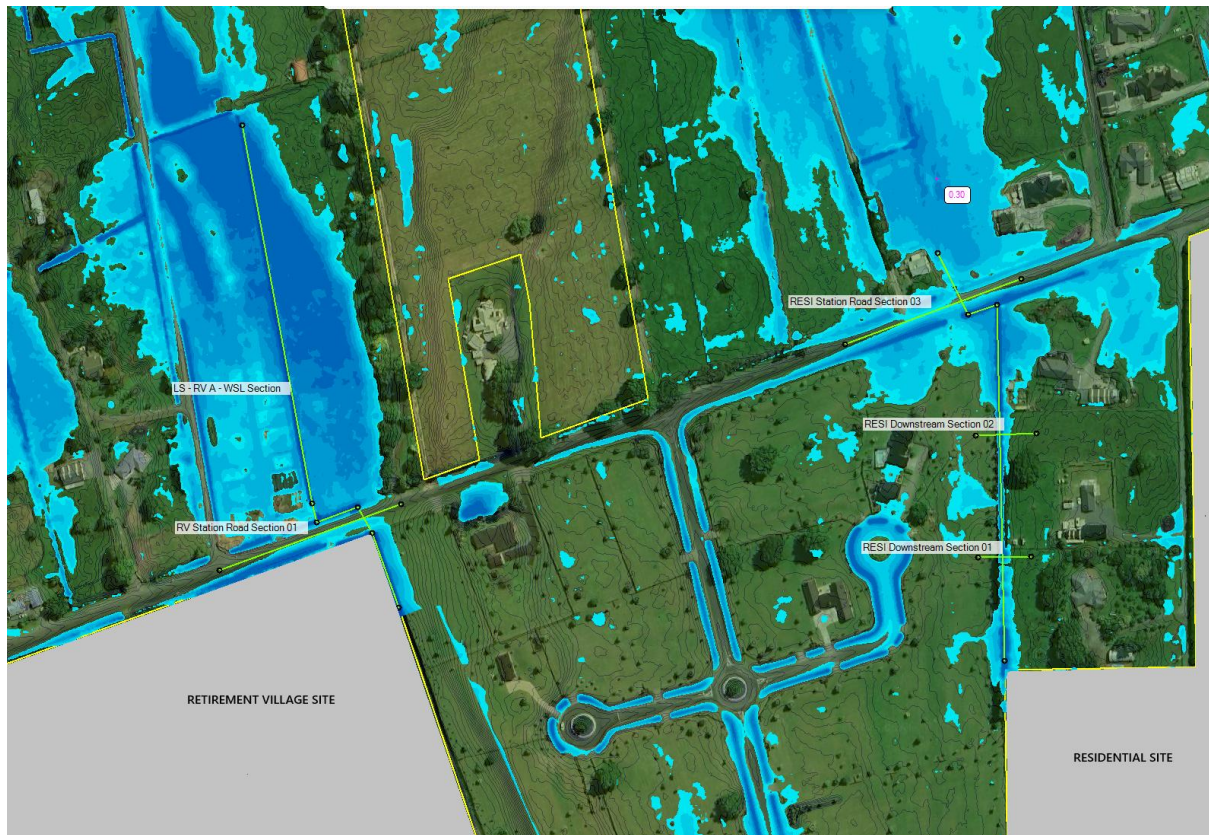


## Model Results

### Pre Development Result – Flood Map



## Post Development Result – Flood Map





Editing: Profile Lines

RV Station Road Section 01

LS - RV A - WSL Section

RV Station Road Section 02

RESI Station Road Section 03

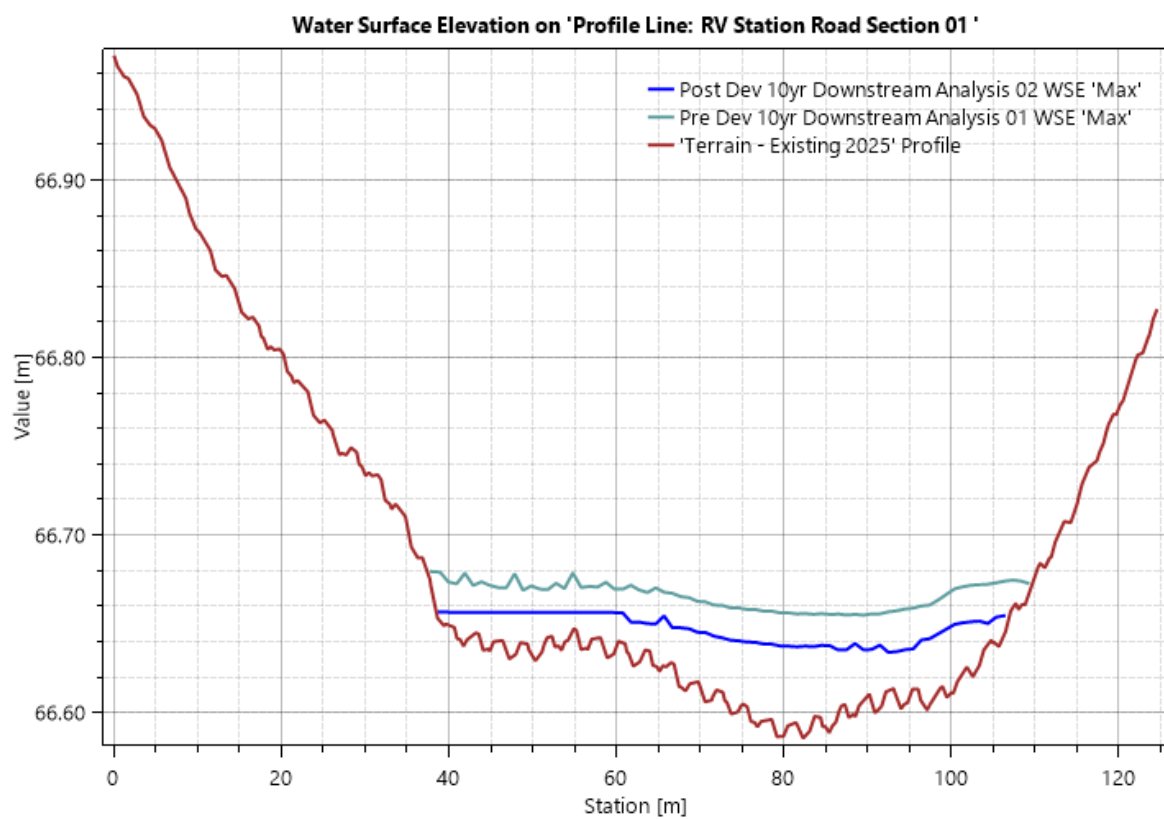
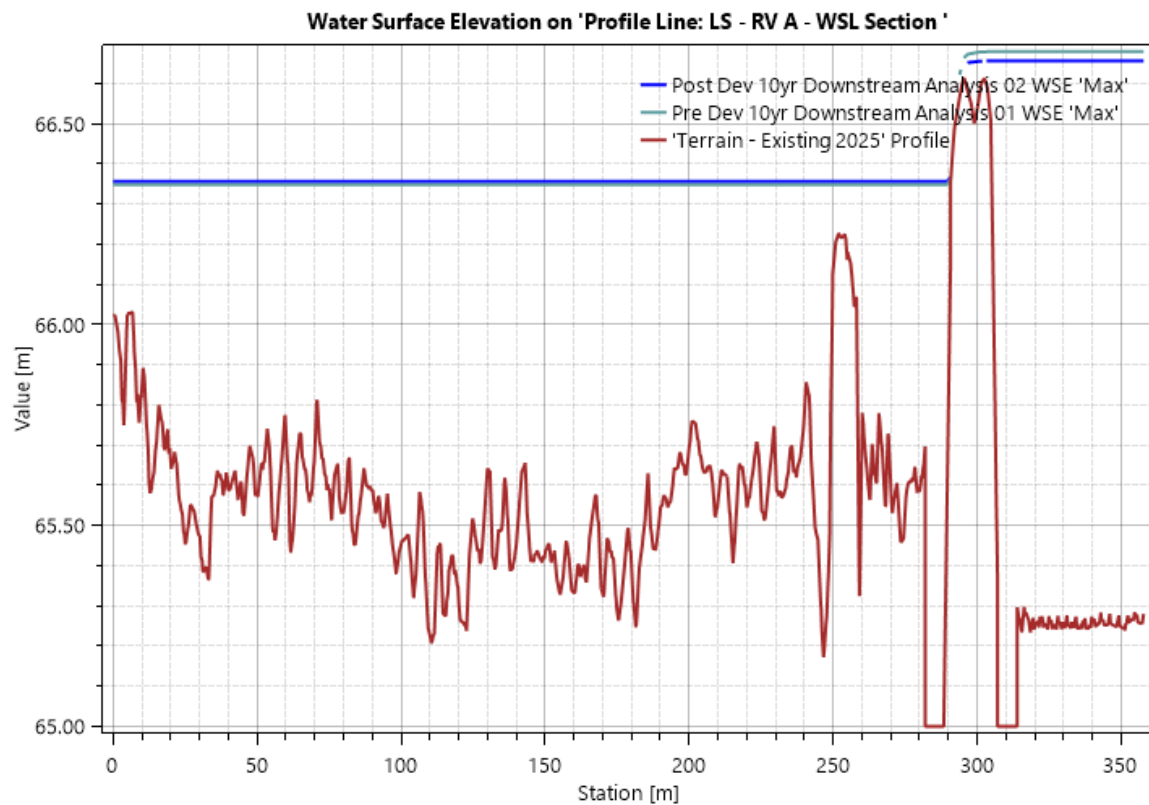
RESI Downstream Section 02

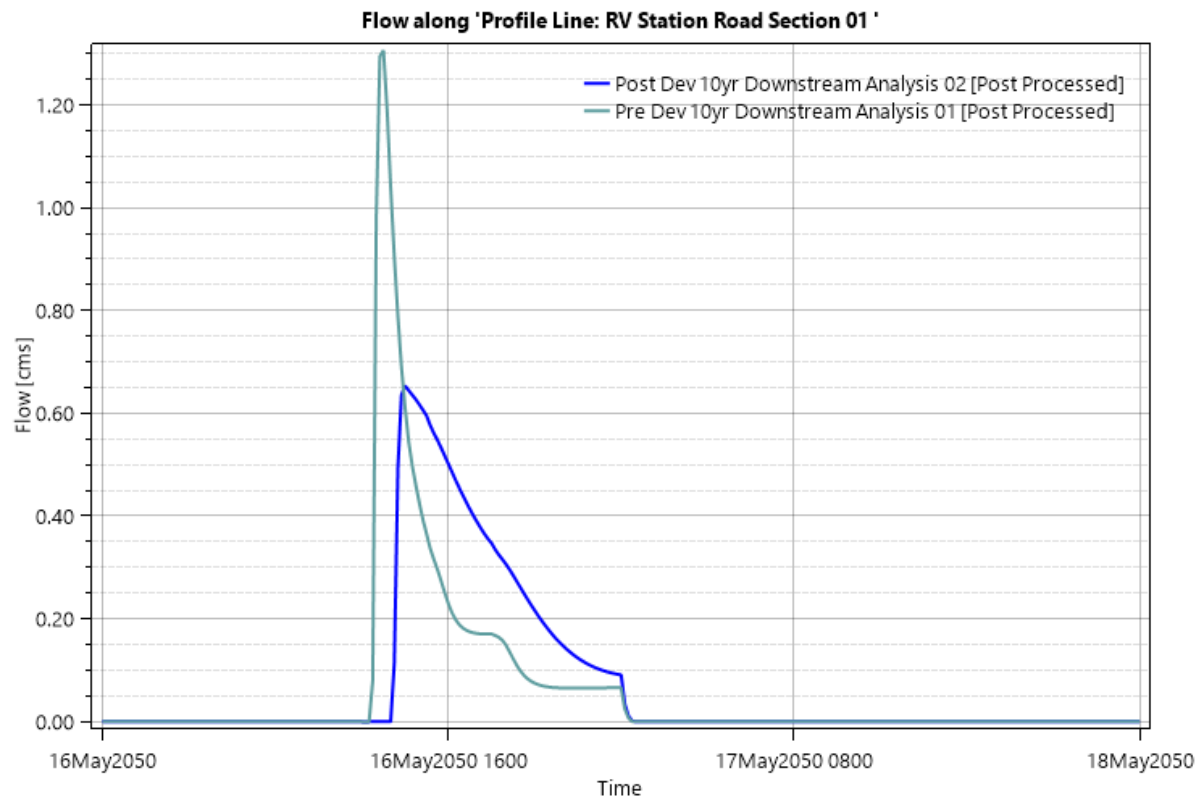
RESI Downstream Section 01

Retirement Village Site

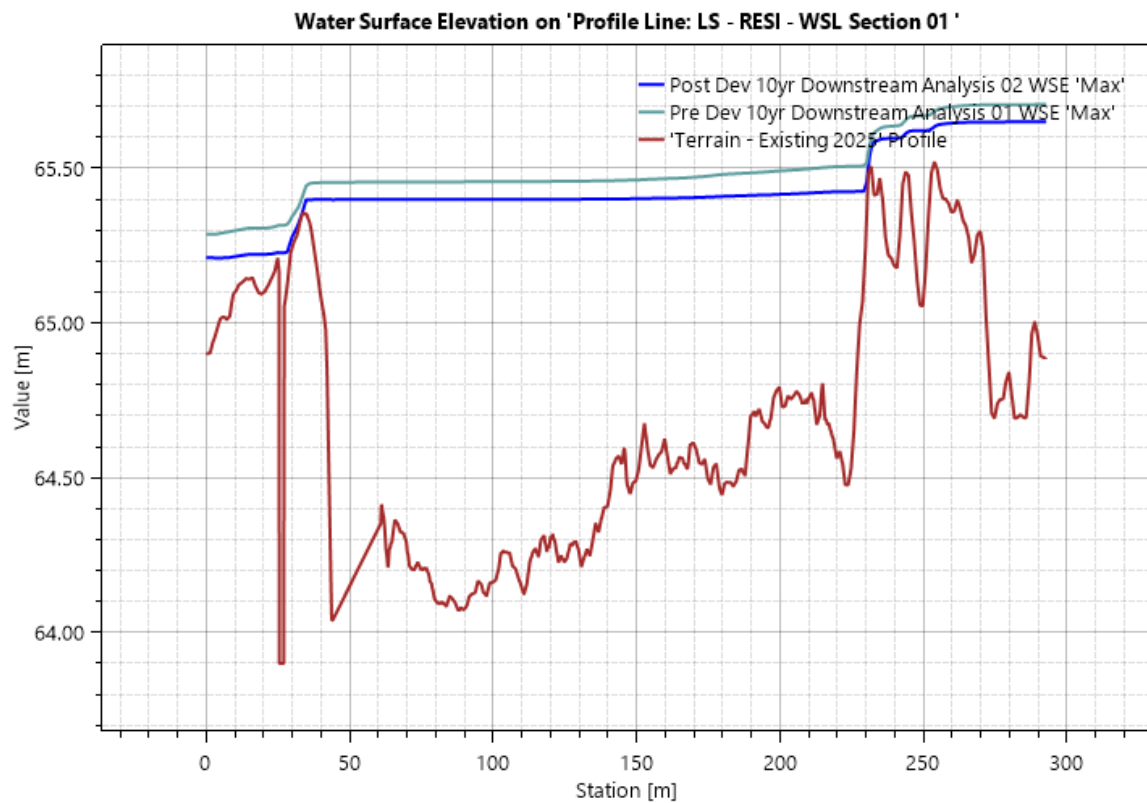
Residential Site

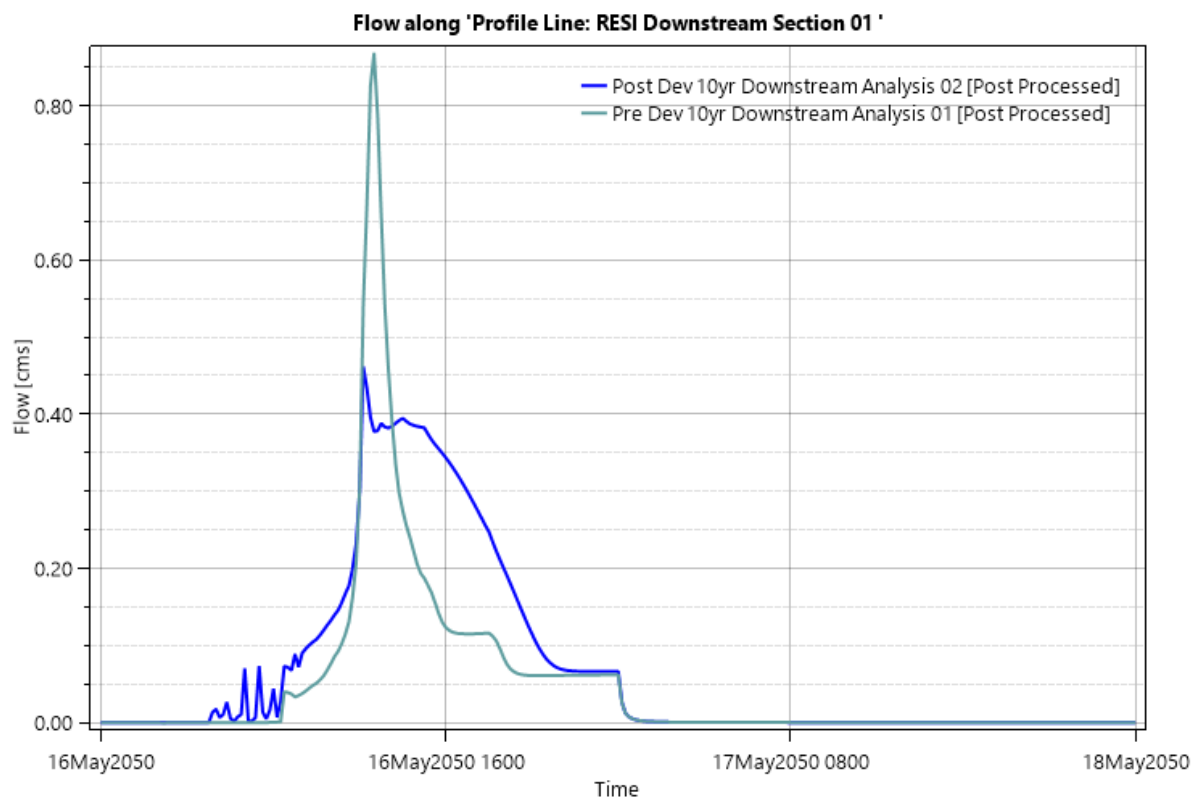
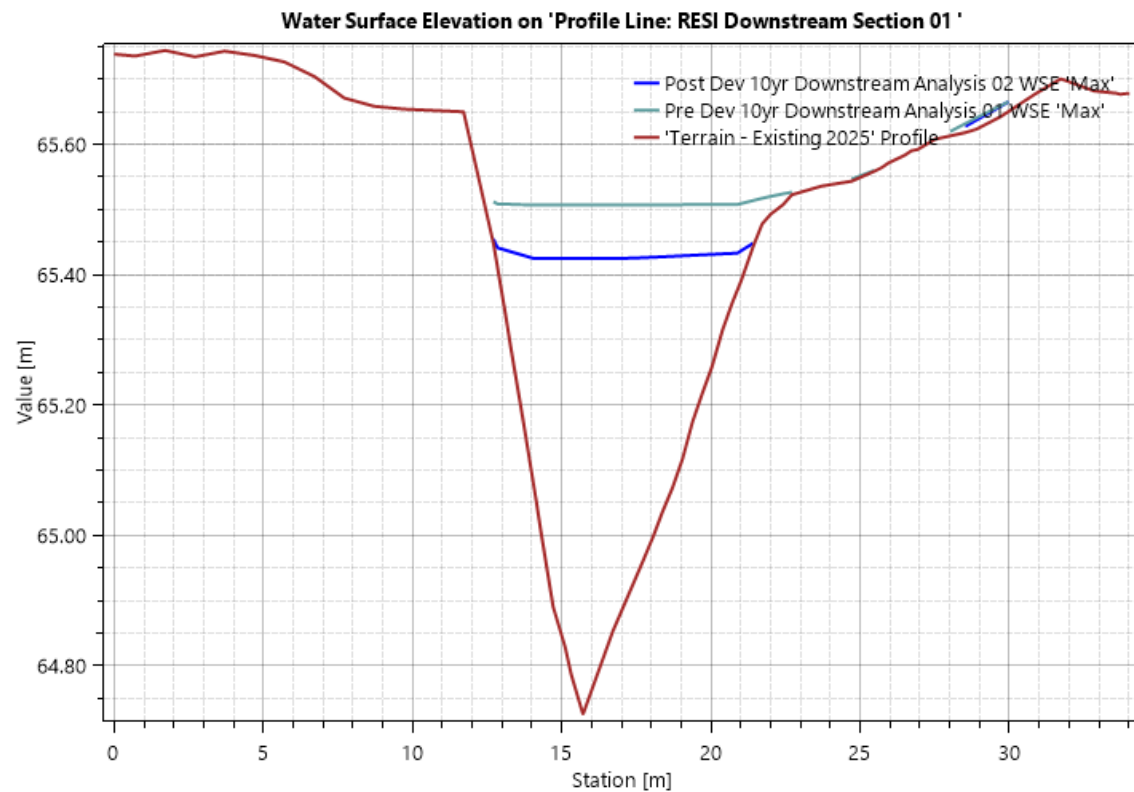
Combined Result – WSL and Flows



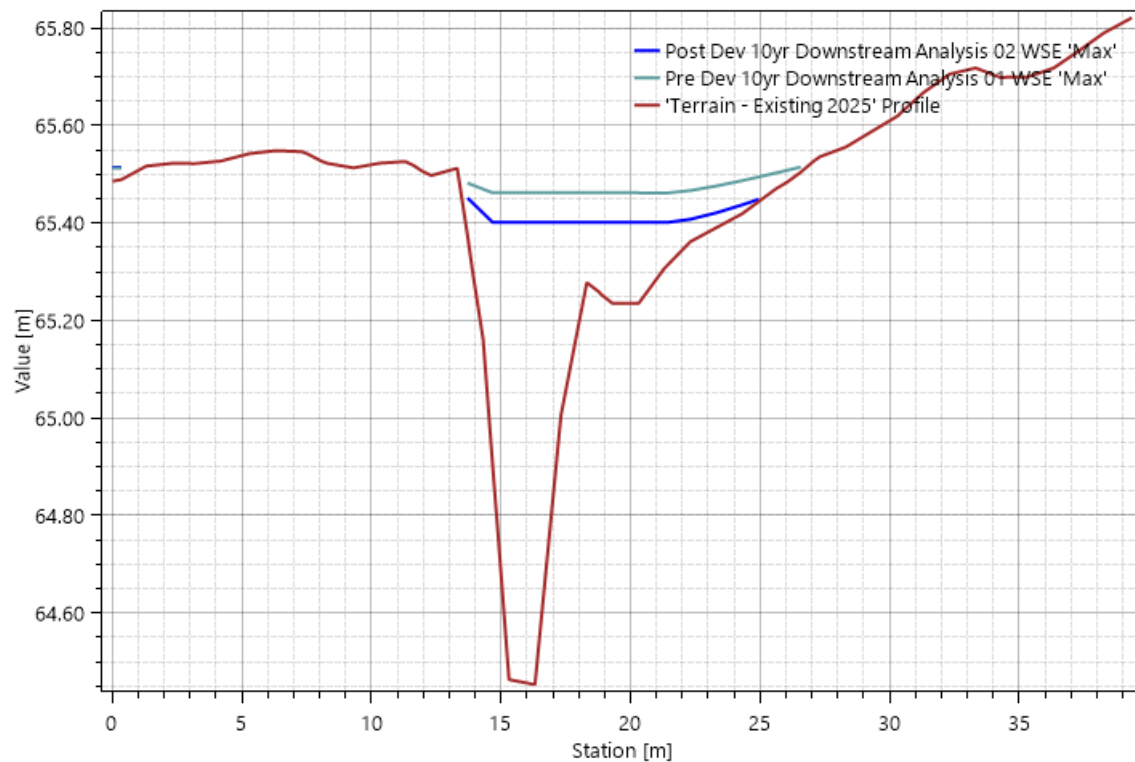




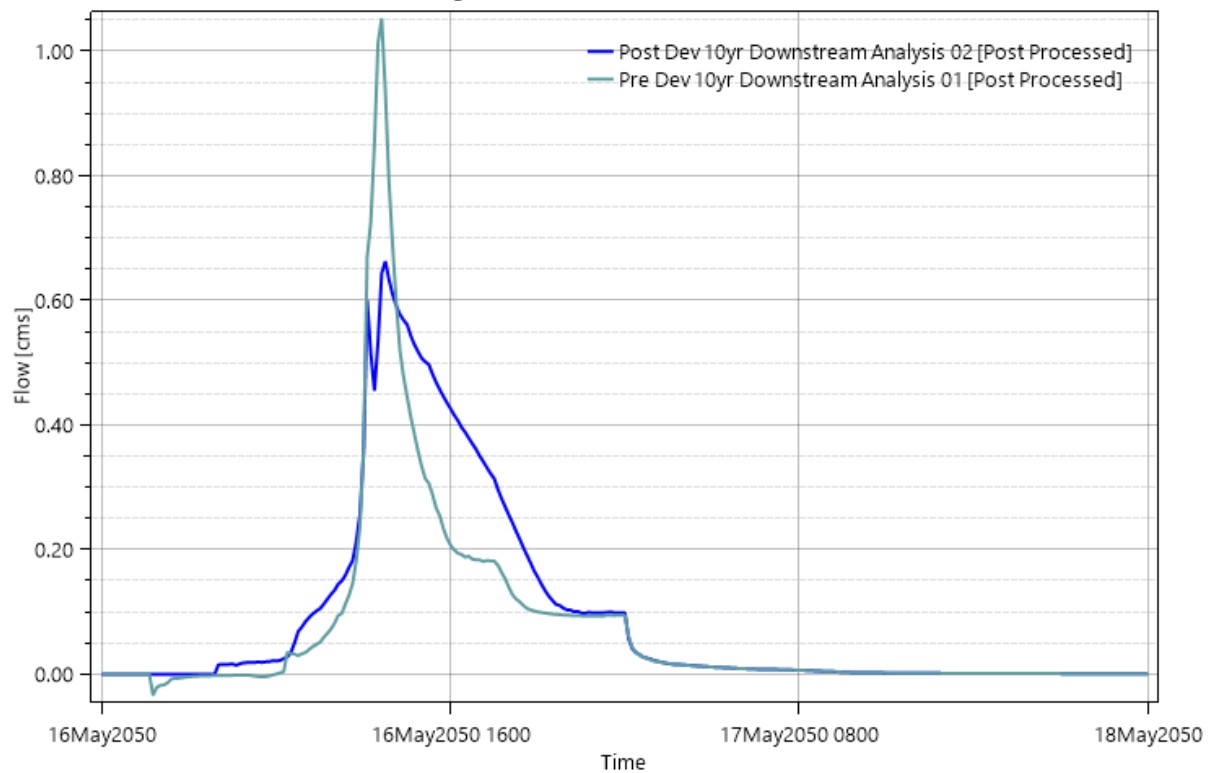




**Water Surface Elevation on 'Profile Line: RESI Downstream Section 02 '**

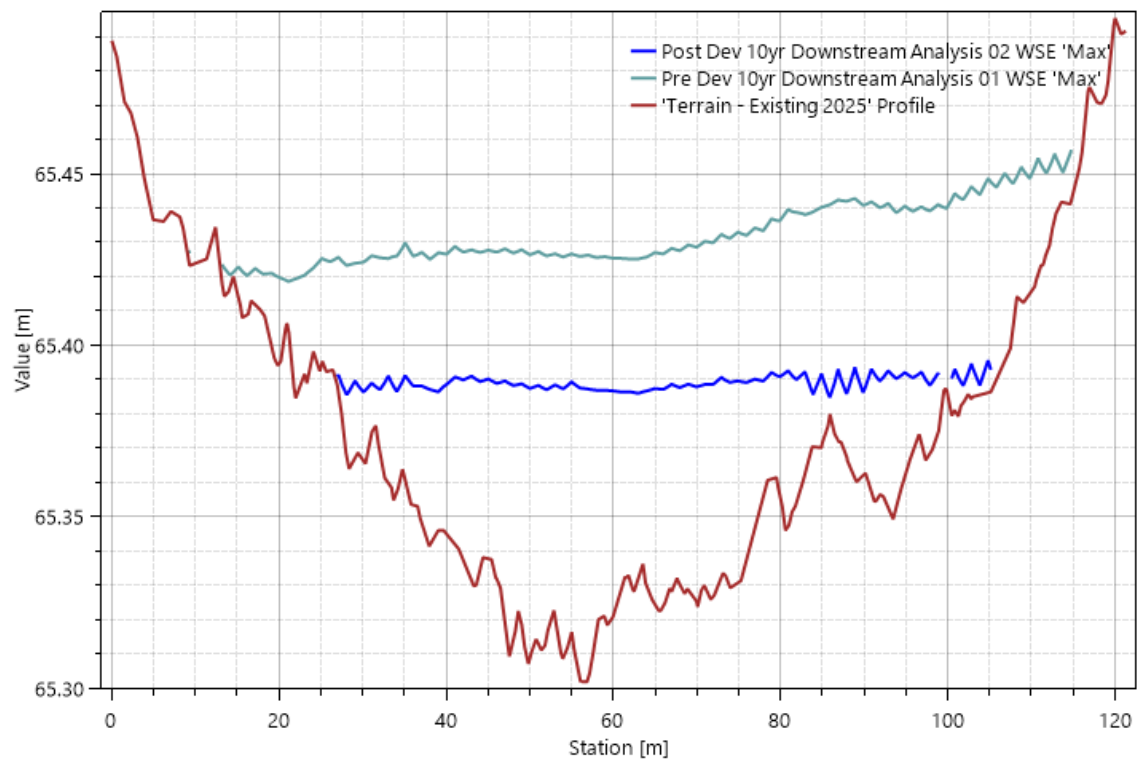


**Flow along 'Profile Line: RESI Downstream Section 02 '**

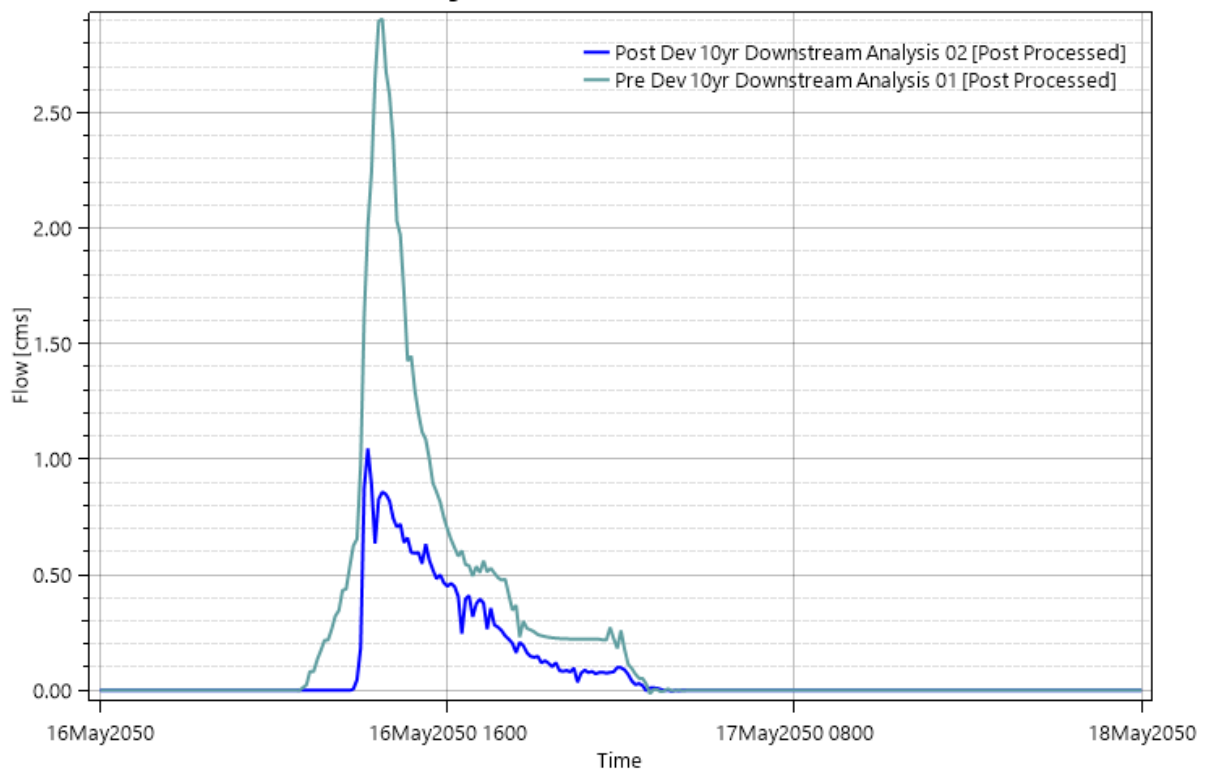




Water Surface Elevation on 'Profile Line: RESI Station Road Section 03 '



Flow along 'Profile Line: RESI Station Road Section 03 '



## Conclusion

The assessment was carried out downstream/North of the proposed sites ( RV and Residential) to confirm conveyance capability of the downstream areas and confirm downstream constraints.

The result confirms that the flows are constrained at the Station Road crossings due to the small existing culverts and the road functioning as a weir. This throttle effect, rather than any downstream backwater effects, controls the flow.

The results also confirm that at Station Road—where water overtops and flows toward the northern areas—peak flows, water levels, and depths are reduced in the post-development scenario compared with the pre-development scenario.

The assessment confirms the immediate downstream conditions from both the RV and Residential site will be improved based on the above.