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WMRR ALTS 2021

Efficiencies from adopting 3D electronic models in the direct placement of wastes

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Presentation:

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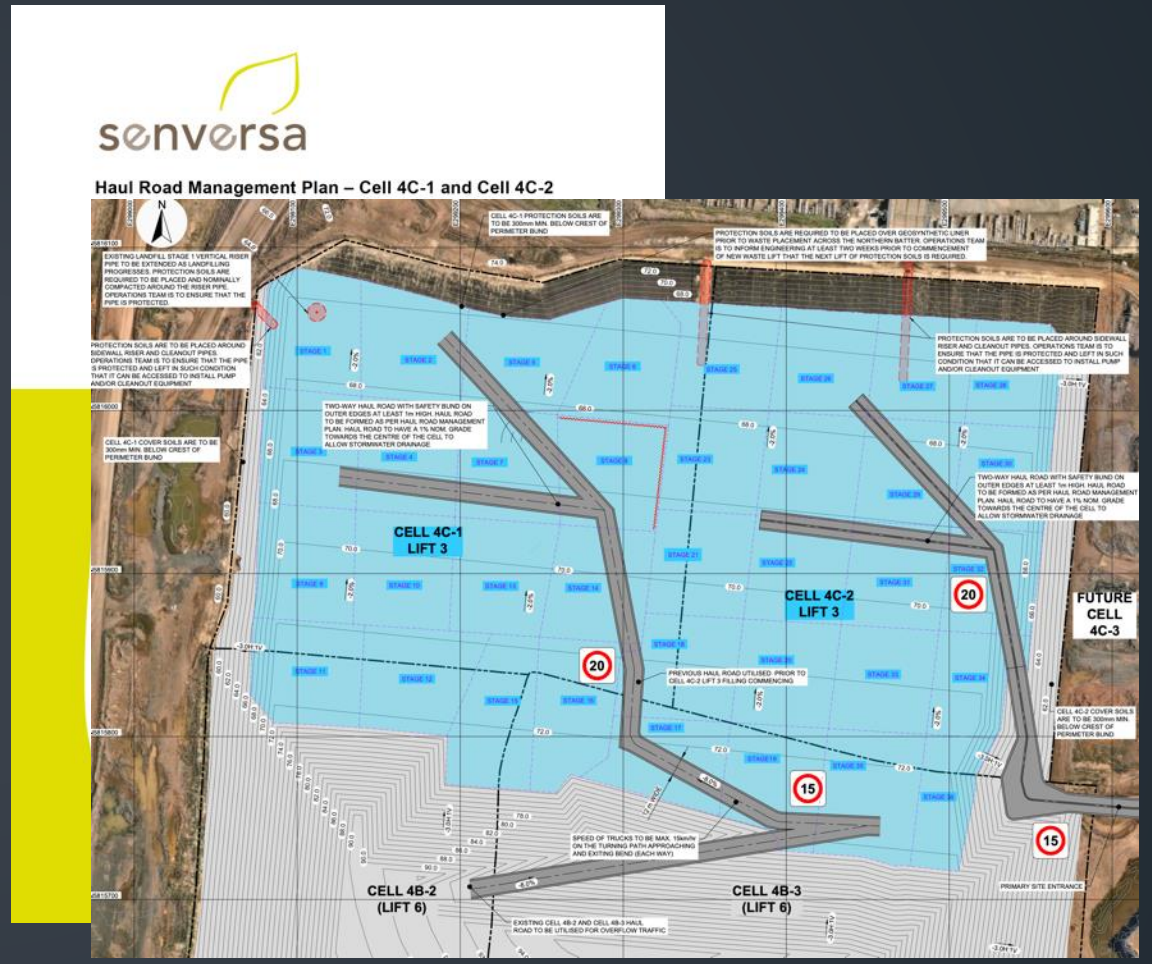
- Why do we need to increase efficiency in waste placement at a landfill facility?
- Fill Plans.
- Haul Road Management Plans.
- 3D electronic models.

Client

- How are Fill Plans used?
- What are the benefits to a landfill operator?



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Why the need for efficiency?

- Overfill
- Potential causes, e.g.:
  - Poor site controls.
  - Poor planning (next cell is not ready to receive waste).
- Outcomes from inefficiencies:
  - Cost to remove, double handle.
  - Additional time to haul and re-place waste.
  - Regulatory non-compliance.

What is a landfill's greatest asset?

- Available 'effective' airspace:

How can it be protected?

- Must be fully utilised.
- Keep waste within approved cell boundaries.
- Maximise compaction during waste placement.
- Optimise the location of haul roads.

Example:
Garbage overflows at a landfill
© Photographer: Pryzmat |
Agency: dreamstime

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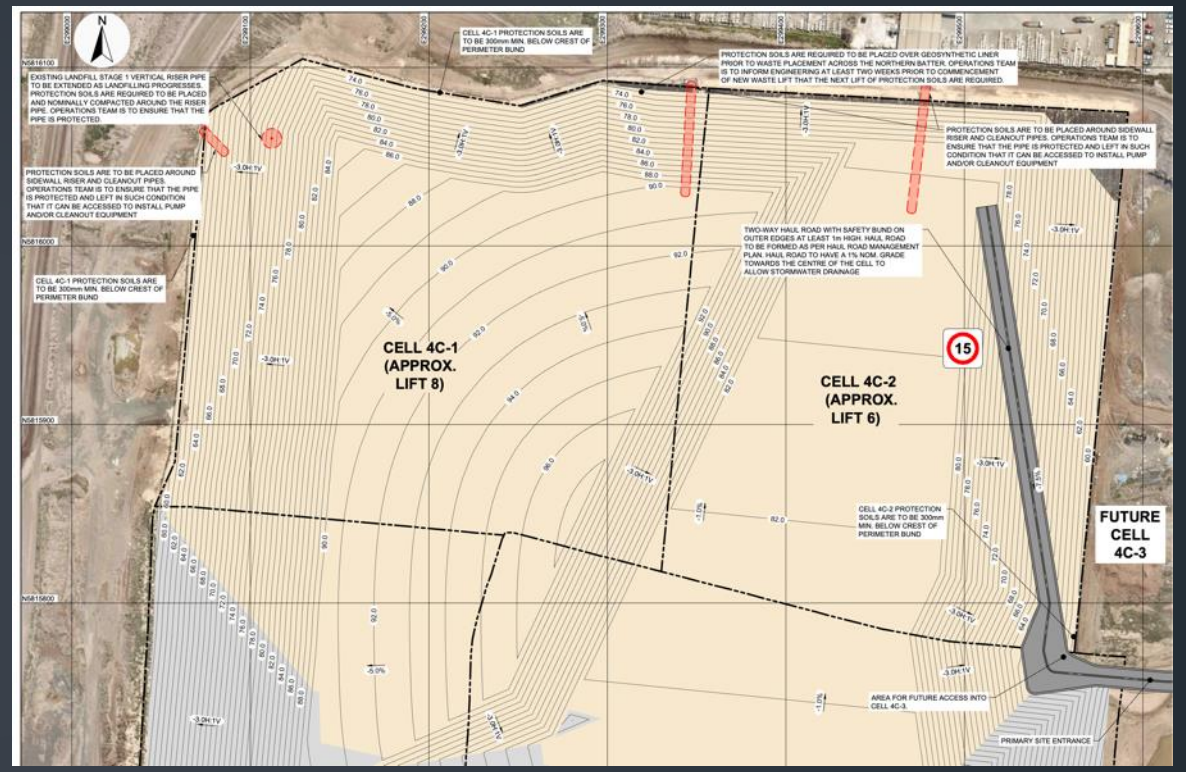
What are Fill Plans?

- Electronic model outlining waste placement per waste lift.
- Utilise data provided by the client, including:
  - As built landfill cell model – perimeter bunds, top of leachate collection system, etc.
  - Top of waste pre-settlement contours.
  - Average waste height per lift.
  - Estimate of the rate of airspace consumption.
- Volume between two surfaces provides total airspace per cell.
- From the lift height – understand the number of lifts.
- Locate haul roads to maximise ‘effective’ airspace and allow sufficient space to manage customer and operations traffic.



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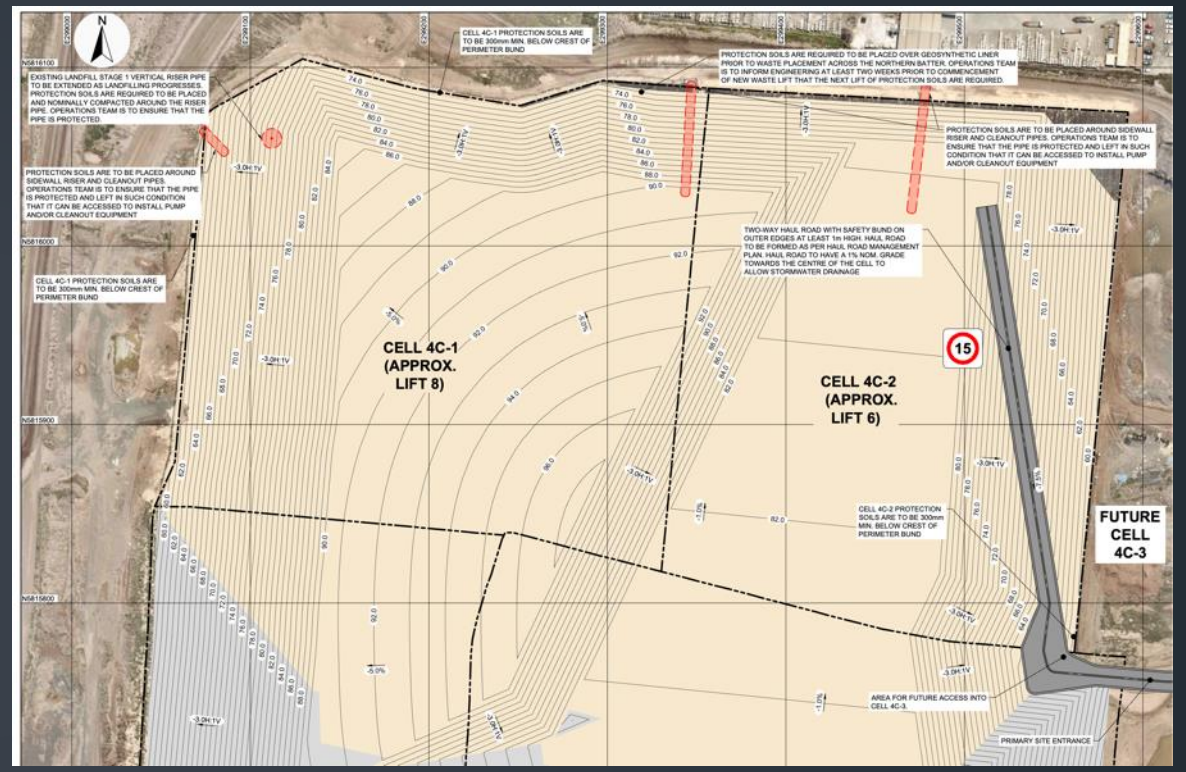
Fill Plans Inputs

- Top of lift surface level to m AHD.
- Lift height (m).
- Airspace volume being consumed by the lift (m^3), assuming waste density of 0.9 t/m^3 and cover soils are not recovered.
- Client provides an estimate of daily tonnages of material passing over the weighbridge.
- Estimated volume of daily cover soils required for Operations.
- Haul Road(s) locations.
- Tipping Pad location(s).
- Grade of Haul Road and Tipping Pad to shed stormwater.
- Filling sequence per lift.
- No. of operational days for each lift – can predict when the next cell is required to be licensed.
- Location of litter fencing – if required.



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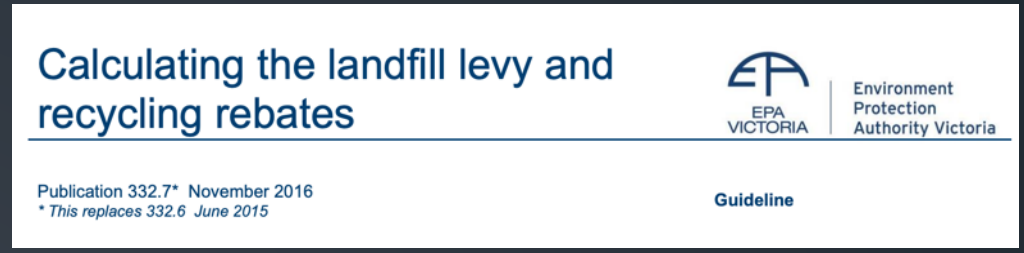
What is a Haul Road Management Plan?

- Document that outlines:
  - Construction and management of haul roads within the licensed landfill cell area.
  - Haul road alignments per waste lift.
  - Materials (types and quantities) to be used to form and maintain the haul roads.
  - Materials to be removed on completion of each lift.
  - Record keeping.



Calculating the landfill levy and recycling rebates

EPA VICTORIA | Environment Protection Authority Victoria

Publication 332.7* November 2016
*This replaces 332.6 June 2015

Guideline

Industrial waste

FACT SHEET
PUBLICATION 1624
MAY 2016

Haul road construction

Certain permitted industrial wastes may be used in the construction of temporary haul roads when it can be demonstrated that there is a need for one.

These roads are often constructed within landfills and fill material sites to provide access for haulage of plant, equipment and/or materials onto the site or part of the site. Haul roads are often relocated across the site to provide access to new areas to be filled and must be kept to the minimum required to safely operate the delivery plant and equipment.

The temporary nature of these roads means that the requirements on their construction are less stringent than for a permanent road. However, the road must meet a design specification that demonstrates that it is fit for purpose.

When the road is no longer required the materials used to construct the temporary haul road **must be removed** prior to the area being filled or used for other purposes.

Haul road construction should be completed to ensure the avoidance or minimisation of risk of harm to the environment or human health.

Construction requirements

- The haul road pavement (surface level) materials should have a maximum particle size not greater than 50 mm.
- Soil, broken rock, broken concrete, bricks, processed concrete and/or brick particles are permitted to be placed in temporary haul road formations, provided that no materials have a maximum particle dimension greater than 100 mm.
- Broken rock, broken concrete, bricks, processed concrete and/or brick particles may be used to mechanically stabilise soft, wet and unstable in-situ areas below the temporary road formation, provided that all materials have maximum particle dimensions no greater than 100 mm and that the particles can be fully embedded into the underlying material by compaction.

Haul road cross-section

Haul roads help avoid or minimise the risk of harm to the environment or human health

CHECKLIST FOR CONSTRUCTING A TEMPORARY HAUL ROAD

- ❑ The need for a temporary road has been demonstrated.
- ❑ Plans, specifications and reports have been produced.
- ❑ Details of the material's source(s) are provided.
- ❑ Materials to be used are not contaminated, are able to be assessed against the specification and are consistent and fit for purpose.
- ❑ The quantity of material to construct temporary roads is limited to that quantity required for construction.
- ❑ Stockpiling of material for future use is only permitted when the future use is clearly defined.
- ❑ Surplus materials to those required for temporary road construction must be removed from site.
- ❑ On completion of the use of a haul road, the formation and pavement materials containing industrial wastes must be removed from the site. The materials may be reused for another temporary road, provided they meet the requirements of this fact sheet.

The information provided in these fact sheets is intended as general guidance only and must not be relied upon solely as a basis for understanding legislative requirements.

Haul Road Management Plan to meet the following EPA documents:
EPA Victoria 2016, *Publication 332.7 – Calculating the landfill levy and recycling rebates,* EPA Victoria.
EPA Victoria 2016, *Publication 1624 – Industrial waste – Haul road construction fact sheet,* EPA Victoria.

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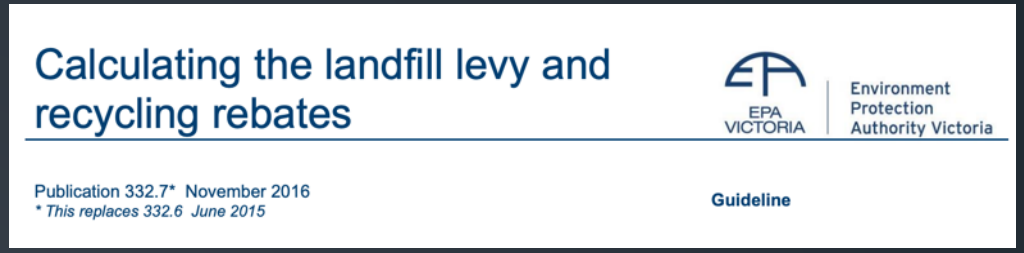
What is a Haul Road Management Plan?

- What is the plan used for?
  - Assess quantity of material that will be exempt from the EPA Levy.
  - Recommended to tie the Haul Road Management Plan to the financial year – for annual reporting purposes.



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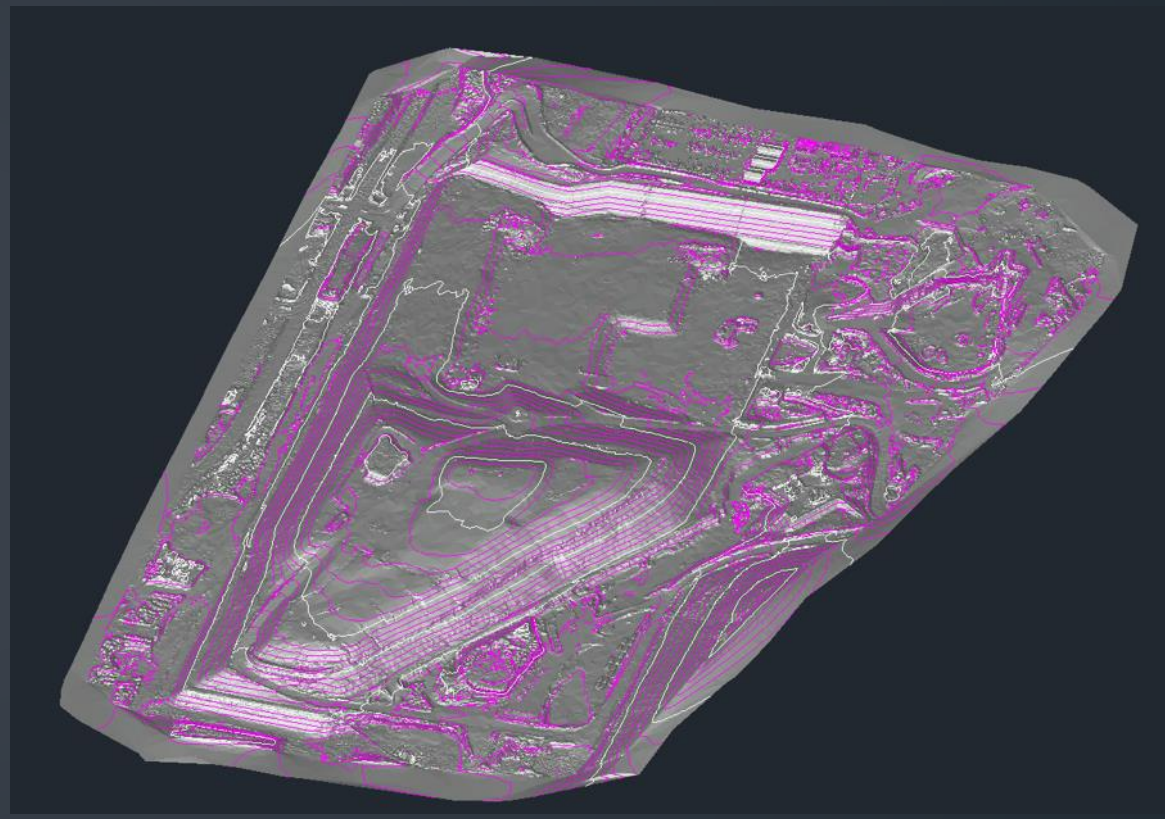
3D Electronic Models

- Working closely with the client:
  - Understand the ‘effective’ airspace volume.
  - Understand the waste placement lift height to optimise compaction.
  - Comply with the EPA Licence conditions; primarily the maximum waste tipping face area.
  - Prepare 3-D model using AutoCAD® and Civil 3D ®.
  - Model based on total airspace, which adopts:
    - Pre-settlement top of waste contours.
    - As-built cell records.
    - Understanding of the proposed future capping system (interim and final).
  - Optimise haul road locations.
  - Model saved in .dwg & .dxf formats.



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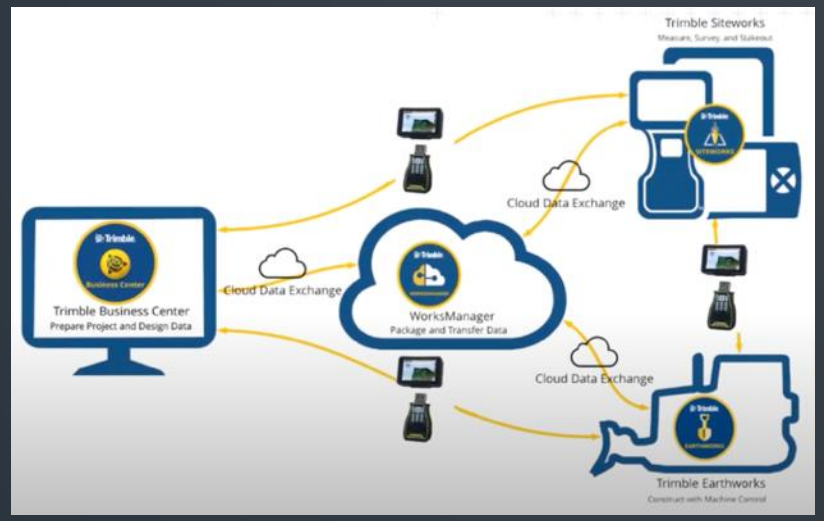
3D Electronic Models

- Waste placement / compaction plant has GPS system installed.
- Adopt Trimble ® system – compatible with Civil 3D®.
- Convert 3D model to .svd, .svl, & .ttm files.
- Upload files through Trimble Business Centre – dedicated portal for client and site.
- Client tracks waste compaction and fill though VisionLink®.

Source: https://positioningservices.trimble.com



Source: https://heavyindustry.trimble.com/en/products/trimble-business-center

Source: https://www.sitechnorcal.com/products/telematics/visionlink-fleet-and-asset-management

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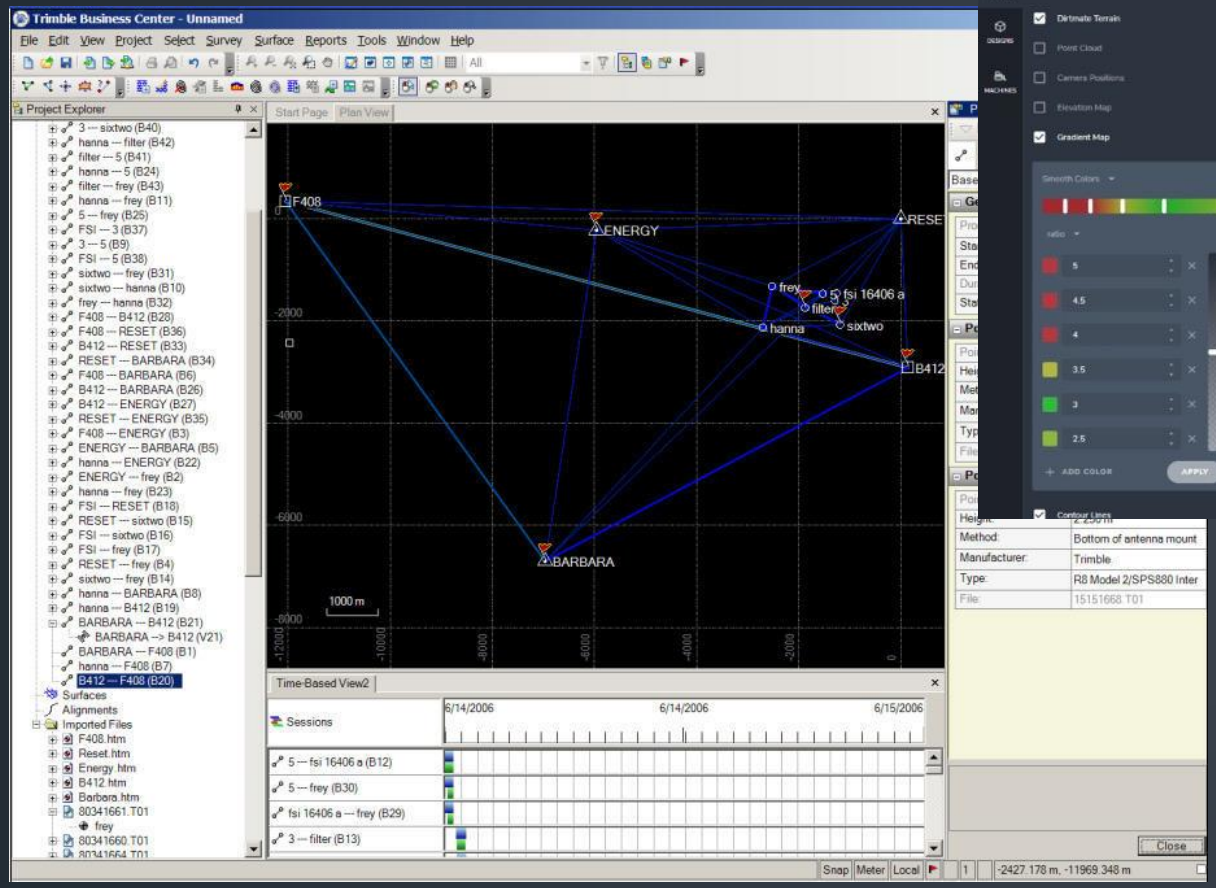
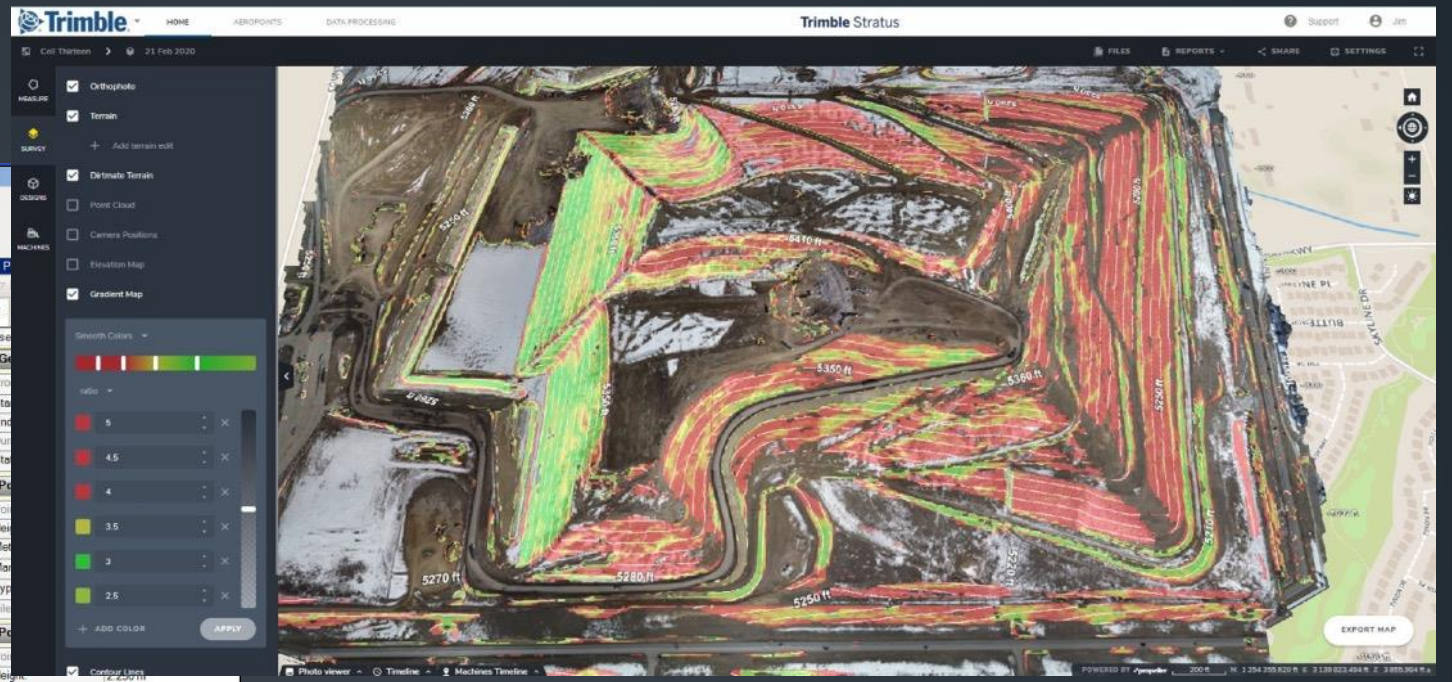
3D Electronic Models



https://trimble-business-center.software.informer.com/2.6/



Source: https://www.mswmanagement.com/landfills/article/21148951/the-gradecontrolled-landfill

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3D Electronic Models

Source: https://www.youtube.com/watch?v=9f689jKi_io

Source: https://sitechcs.com/index.php/landfill/

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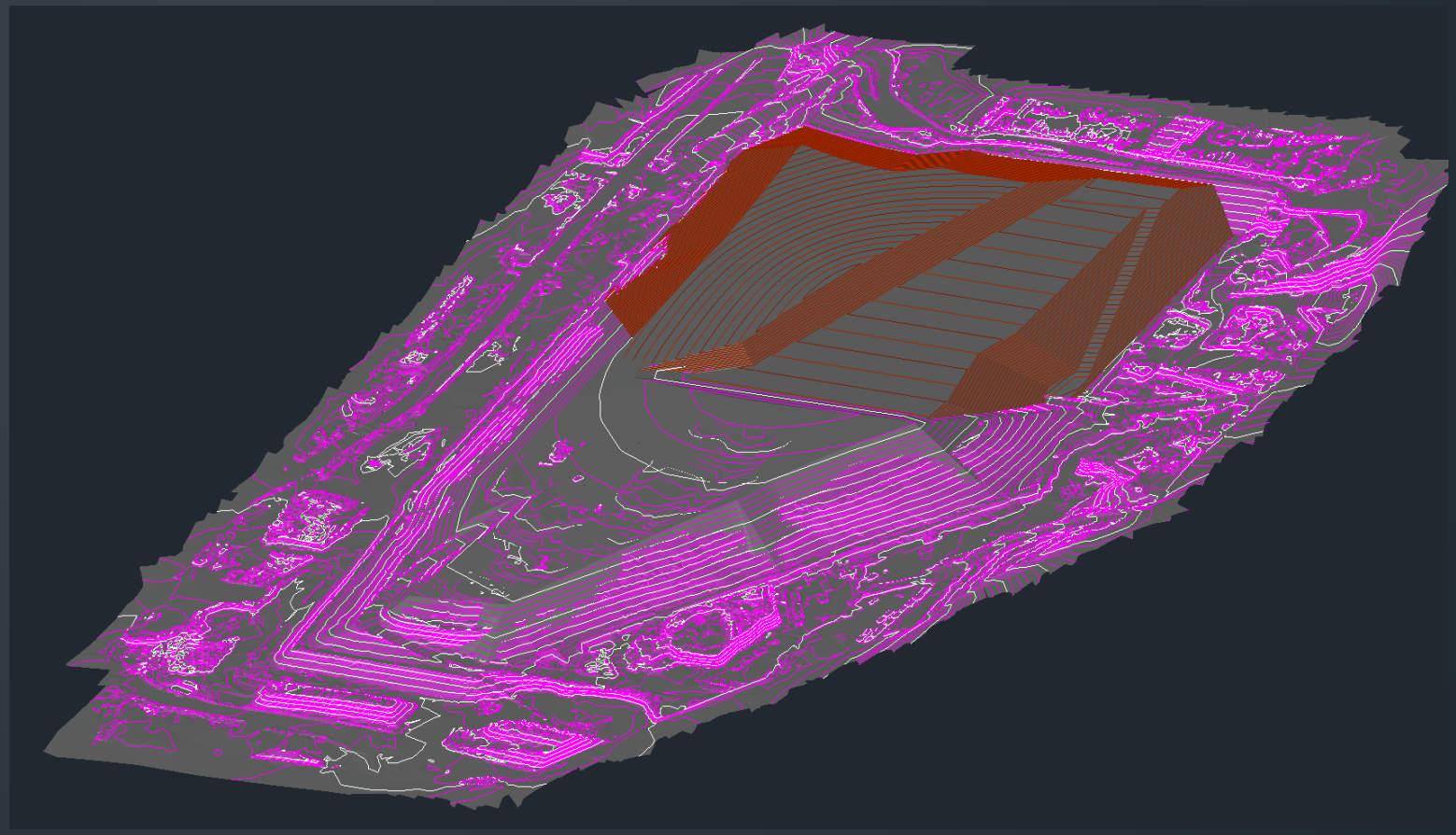
3D Electronic Models

- Allows incremental airspace assessments comparing as-placed waste with respect to design fill plan.
- Assesses potential overfill or underfill, particularly on slopes.
- Informs/allows adjustments to the design fill plan based on waste intake and seasonal differences.



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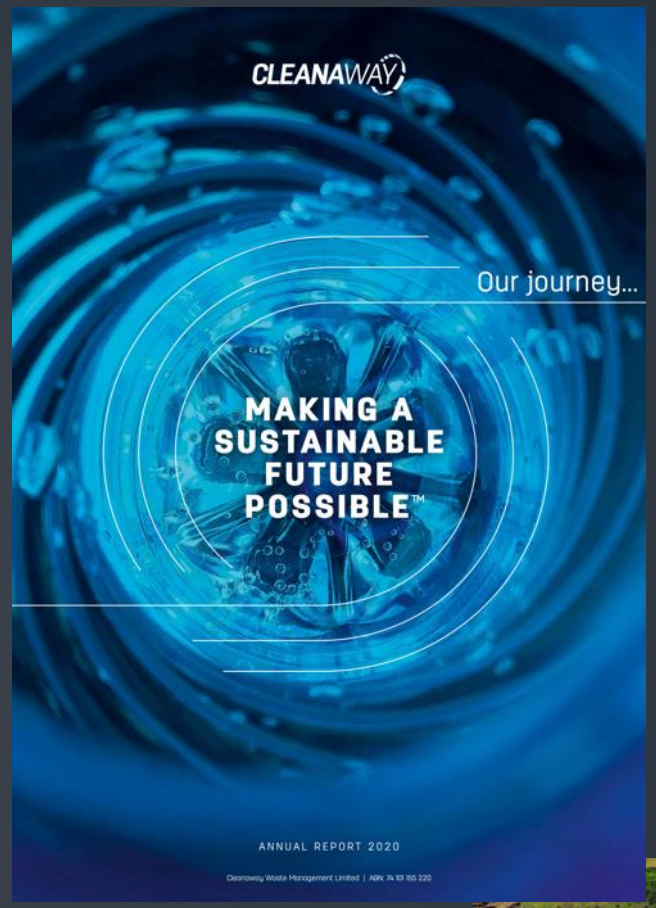
Client's perspective

- Risk of overfill is significantly reduced.
- Reduced labour, plant and fuel costs.
- Better understanding of airspace consumption rates – and increased compaction rates.
- Better understanding of the volume of cover soils required.
- Aid planning for future cells, budget and timing.
- More accurate prediction for whole of life model – year-on-year annual planning.
- Better estimation of the EPA Levy applied to haul road materials used within the licensed cell boundary.



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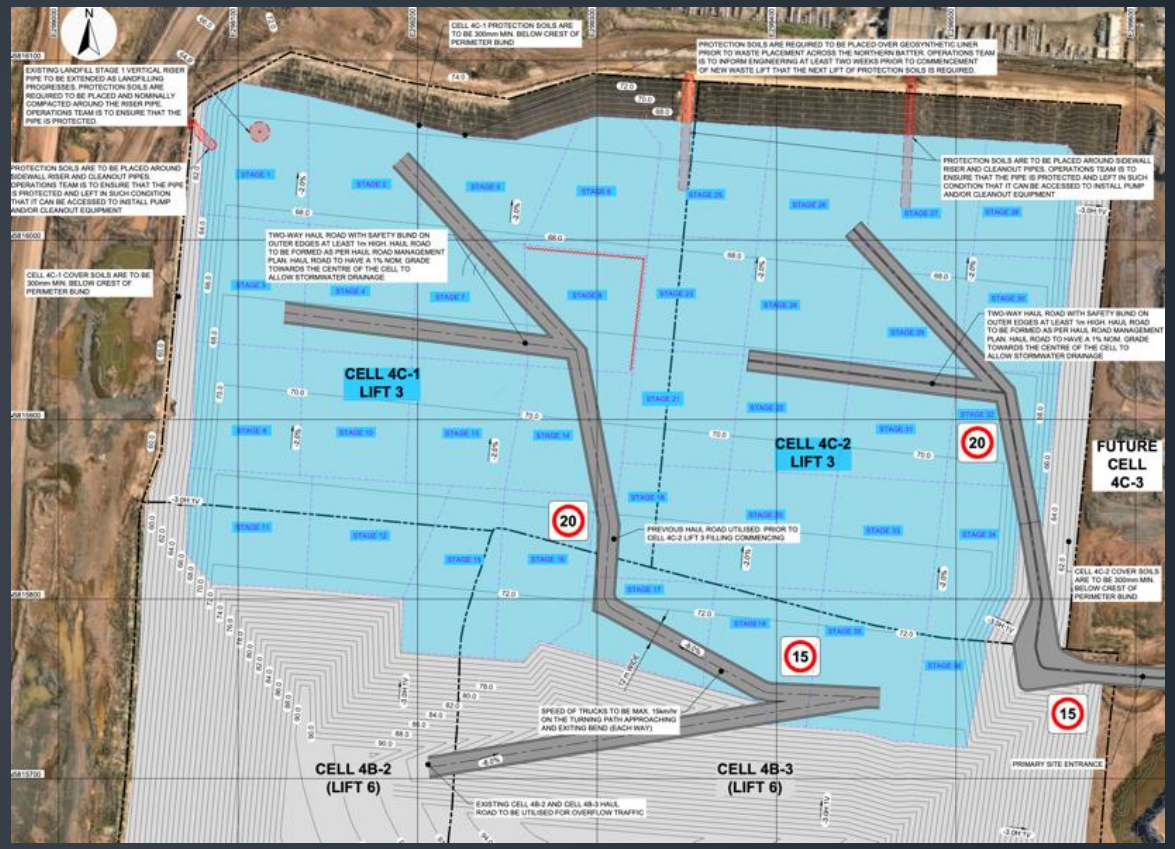
In Summary

- By embracing digital technology, significant efficiencies and cost savings can be made to landfill operations.
- Reduce overfill and, therefore, re-work.
- Optimise the location of haul roads and utilise the ‘effective’ airspace.
- Can better predict when the next cell is required to be licensed and ready to accept waste.
- Predict the volume of materials required for operations; e.g. cover soils, haul road construction and tipping pad materials.
- Better cost modelling for client – whole of life models.



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