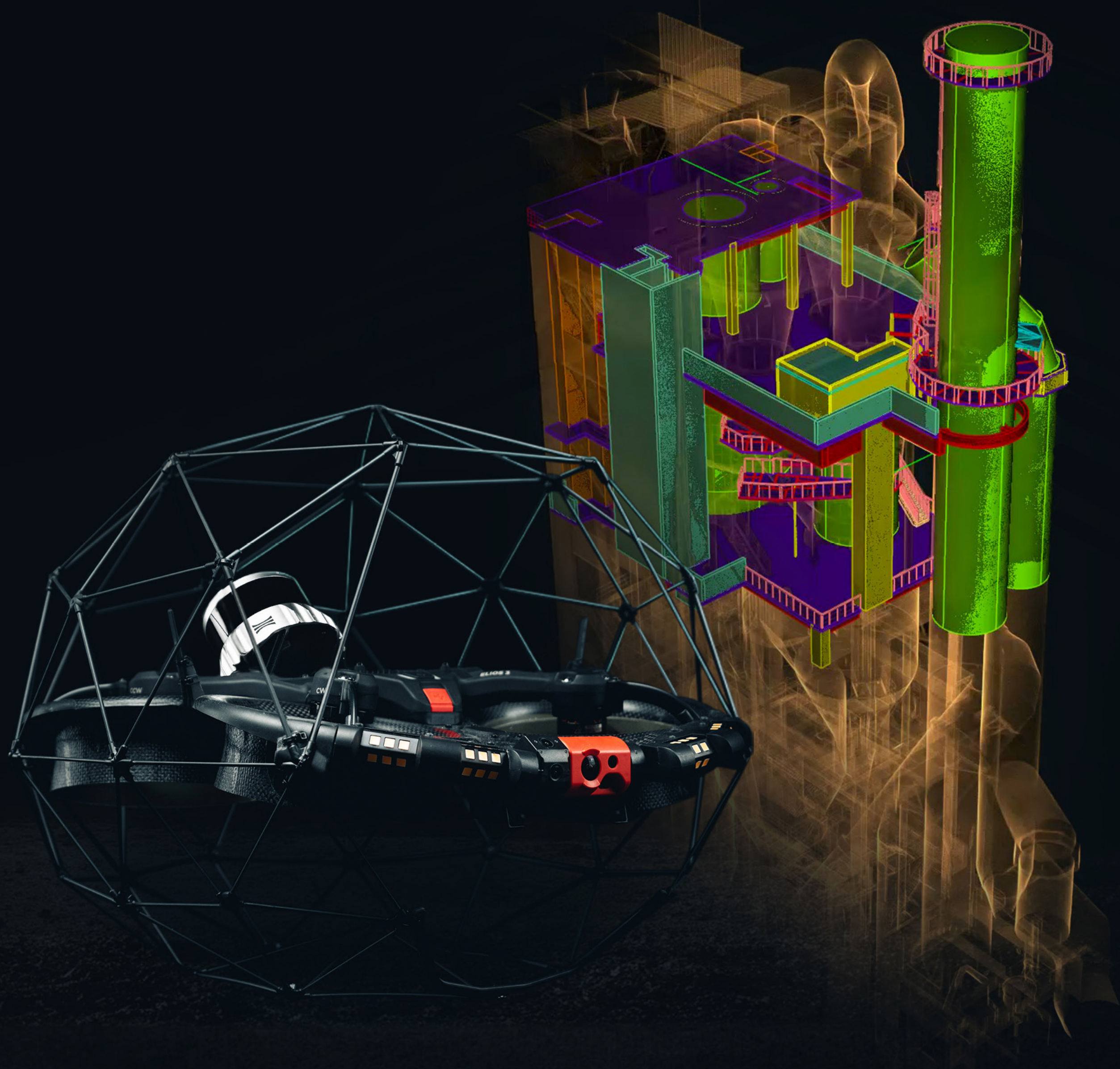


# Creating Scan to BIM models with the Elios 3: a step-by-step guide

The Elios 3 and its Surveying Payload are capable of gathering highly detailed data. This guide explains how to use that data for Scan to BIM, along with example workflows that use FARO Connect, AutoDesk, and Flyability's own Inspector 5 software.

FLYABILITY

The Elios 3, Flyability's flagship drone, is a powerful scanning and surveying tool. This drone is equipped with an Ouster OS0-128 Rev 7 LiDAR, that is capable of highly accurate scans. With results being accurate to within 1 cm and 0.1% drift, it is possible to use this data from the Elios 3 as part of Scan to BIM workflows.

Scan to BIM is a workflow or process that translates laser-scanned, point-cloud digital models into BIM (Building Information Modelling) platforms that interpret the data and integrate it into a 3D site or building model for development, design, and construction teams. These details offer visual accuracy and granular spatial awareness and help to automate building documentation.

## Why use Scan to BIM?

Scan to BIM is used across architecture and engineering projects as a means of faster, clearer communication and planning. It's applications include but are not limited to:

- ✓ Reporting
- ✓ As-built monitoring
- ✓ As-built vs as-designed comparisons to avoid rework
- ✓ Cost estimation
- ✓ Installation plans, eg in industrial sites to mount new equipment
- ✓ Analyzing building performance
- ✓ Prefabrication

BIM is used for construction projects for new builds as well as to plan ongoing work at existing sites. Its adaptability means it is used in managing residential and commercial structures as well as industrial sites, which may include power generation sites.

The amount of information captured in a BIM model is represented through its LOD - the level of detail/level of development. This defines the amount of detail and degree of development of elements within a BIM model. LOD categorizations span from LOD 100 to LOD 500.

This white paper will demonstrate the start-to-end process for creating a BIM model with data from the Elios 3. The unique features of the Elios 3, especially its adaptability and speed, make it a strong data collection option for challenging Scan to BIM projects, which will be covered in detail in the case study in this document.

For a Scan to BIM project with the Elios 3, there are 3 key steps:

1. Scanning, with the flight of the drone including its pre-planning
2. Point cloud processing, which was done with FARO Connect
3. Processing to BIM, which requires third-party software and results in CAD drawings

The following case study will explain each of these steps in detail with examples to give an idea of how to successfully create a BIM model with the Elios 3.

## Case Study: the Elios 3 in Scan to BIM for a cement plant

At a cement plant in France, a project started that aimed to create a BIM model. The intention for this BIM model was to use it for several projects:

- Create an initial BIM model, as no such resource existed already
- Update existing records of plant condition and layout
- Use the model to plan carbon capture technology installations, including ducts and ventilation systems
- Potentially apply for grants for funding as a result of carbon capture efforts

A scan of the site with a terrestrial laser scanner would likely cost around 30,000 Euros and span over several weeks. The team at the cement plant hoped that they could use the Elios 3, which was already onsite for inspections and stockpile monitoring, to complete the scan instead of relying on external contractors. The Elios 3 would also be better suited for gathering data between structures, such as pipes, staircases, and stacks, than a terrestrial laser scanner. This would make data collection faster, safer, and more efficient.

The Elios 3 was used for this project due to greater speed (1 day vs week), lower costs ( 30,000 Euros vs in-house), and safety (surveyors familiar with the site vs contractors). The highly accurate and reliable results meant there was no concern of loss of data quality compared to terrestrial scans.

## Step 1: Scanning and Data Capture with the Elios 3

Any flights with a drone must be in compliance with local laws. For this project in France, the local laws were considered in addition to national and EU regulations.

Due to the size of the site, the mapping was broken down into blocks to make planning and flight easier. The following list comprises of the recommended best practices for large surveys with drones:

1. Establishing takeoff and landing points throughout the structure (Land and takeoff within 1m)

2. Estimating how many blocks it will take to cover the building (Usually keeping the blocks in a 100m x 100m boundary as a rough guide)

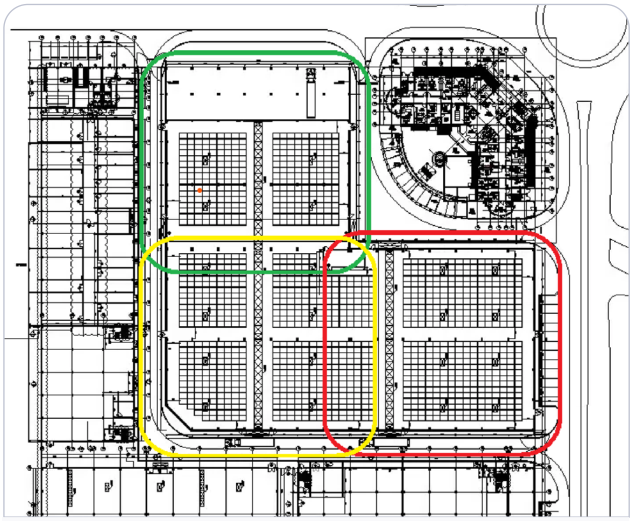
3. Understanding the complexity of the building and estimating how many flights are needed per block

4. Establishing the overlap between blockings for manual alignment (Usually 15-20%)

5. Understanding where and how to distribute the targets within the building if using the Retro-reflective target workflow

It is a good idea to plan ahead and utilize what CAD or paper drawings are available at the time of planning.

Below is an example of how the building can be divided into manageable blocks to help minimize the drift factor and to aid flight and processing management.



Plan view for a building sectioned for mapping

Learn more about the best practices for flying a drone for detailed mapping here. →

**Overview of Flight Practices for this Scan to BIM case study:**

Before take off:

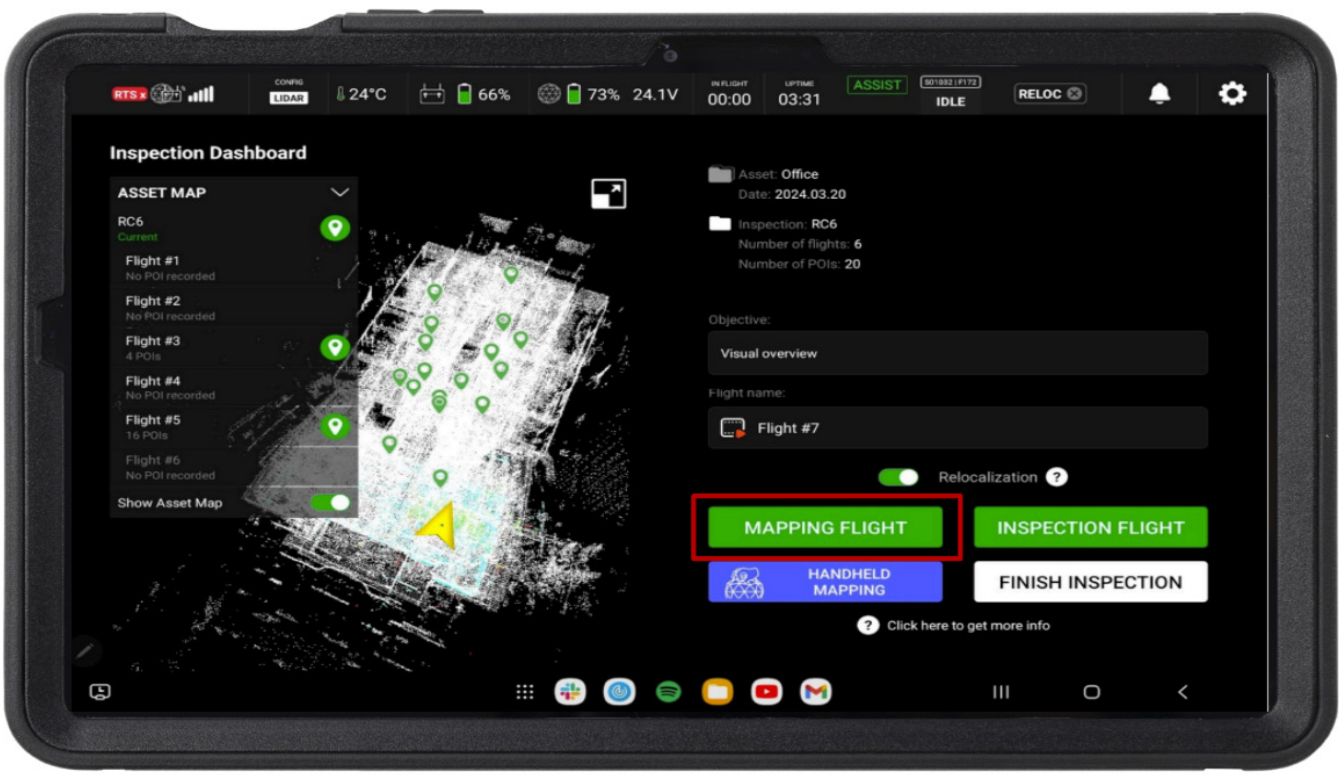
- The flight trajectory should planned ahead of time. For the size of structures used as the test subjects,  the flights were divided into mapping blocks (usually One block =  One flight) This makes it possible to manage the mapping throughout the structure.

- Retro-reflective targets were fixed in place at each block to ensure that adequate coverage was achieved to compute the retro-reflective target alignment or georeferencing.

- The LiDAR was properly connected and cleaned before every flight. This is best practice as dust on the LiDAR can affect the amount LiDAR returns. Please consult Flyability documentation on best practices for cleaning the LiDAR sensor.

- The mapping flight switch was activated in Cockpit and the 15sec calibration was performed as this will assist FARO Connect in computing a good loop closure on each flight.

- Physically define the take off point of the drone. All the flights conducted took off and landed in the same spot (within 1m). This helps the loop closure and global optimization of the LiDAR data in Faro connect and thus,  reduces the overall drift factor accumulated each flight and block.



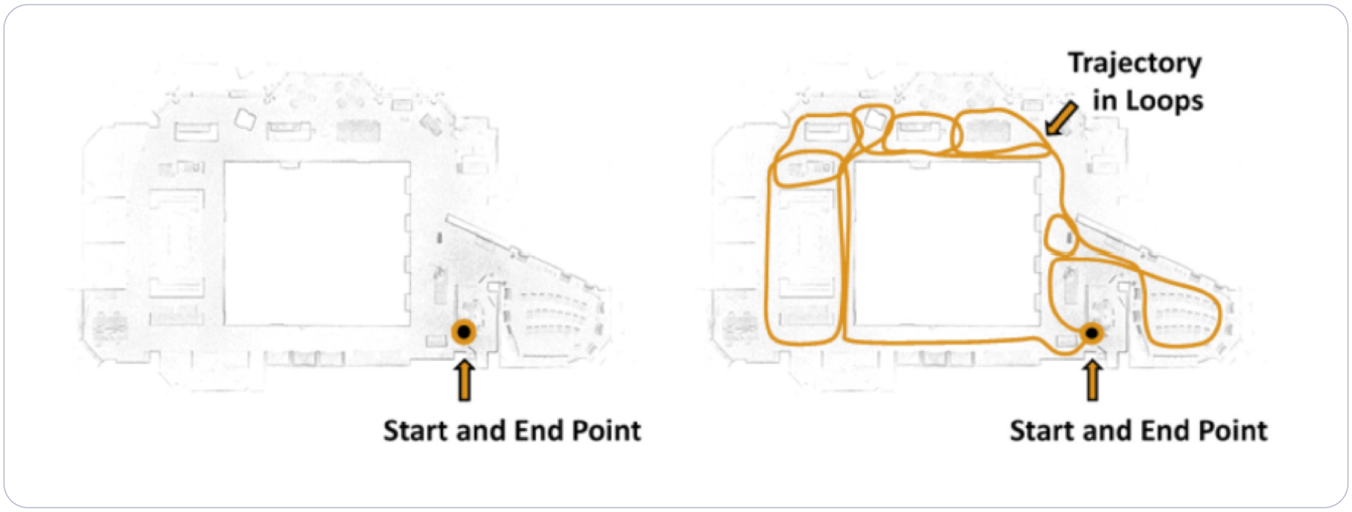

An example of mapping flight selected in Cockpit

**During flight**

- Every flight began and ended with an 8-shape turn around the take off area.
- All flights were performed in standard assist mode speed and sport mode was avoided as this may affect the LiDAR coverage and density. It was also important to avoid bumping the drone into structures at all times.
- A closed loop or track style of mapping flight was performed to make sure that adequate coverage of the entire building or structure was achieved.
- Take off and landing at the exact same position if possible (within 1 meters/3 feet)
- Moving objects/people in the flight area were limited during the duration of each flight.
- When transitioning to and from a room or section of a building with a small opening ( a doorway for example) the drone speed was reduced and the drone was flown sideways if possible to maximize the lidar coverage through the opening in each space.  This helps to eliminate any weak tie points in the 3D model which could lead to the accumulation of drift in the processed model

**After flight**

- The Live Map was checked to verify that the mapping block was correctly covered. In the case where another flight is needed to complete a block,  it is helpful to use the re-localization feature in the next flight to understand what has been and what needs to be covered in the next flight using the Live Map in real time.
- The data was downloaded from the drone using Flyability Inspector.  This is also to ensure that the internal memory of the drone does not become full and potentially interrupt the mission.
- Transverse to the next mission block and repeat.




Graphic representation of flight trajectory and loop closure

# Step 2: Post-Flight Processing

The data from the site was processed locally on FARO Connect. The .bag and .json files from each of the flights were first extracted using Inspector 5, Flyability's partner software for the Elios 3, which accesses the memory of the drone and can assist in downloading and viewing flights. The data was then treated, which would make it ready to be imported into CAD software.

## Workflow in FARO Connect

The system to treat the data was as follows:

### Project creation and sheets

In FARO Connect, it is important to log and task each of the Bag files (Flights) that have been made. These are the steps used to achieve this:

### Create new project


For each of the flights (Multiple in this case), the mapping area was divided into manageable blocks (One flight = one block).

Using the Sheet methodology in FARO Connect, it is straightforward to understand which flights are represented to each block flown.

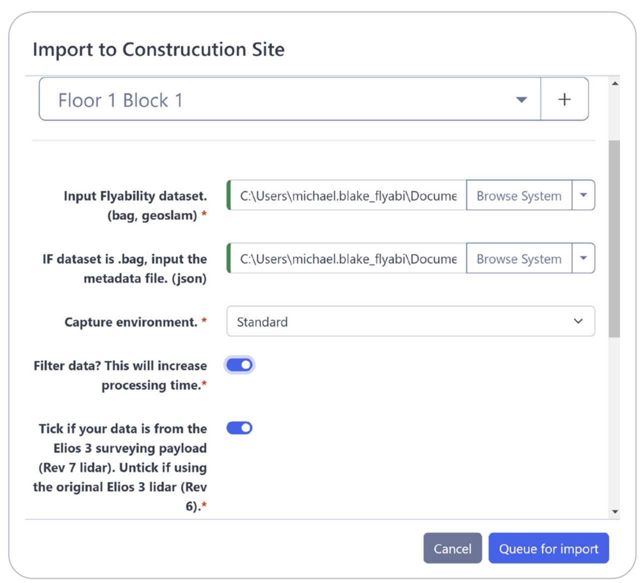

## Flyability Process SLAM

All flights are processed using the Flyability process SLAM option in Faro Connect. Each flight was assigned to a sheet to keep track of the processing.

The Flyability Process SLAM is a dedicated Flyability script for processing the raw LiDAR packets from the Elios 3. By processing the raw data in FARO Connect, FARO Connect will densify the point cloud by using all of the beams from the Ouster Rev 7. It will also add global optimization and loop closer which will assist in correcting any of the drift which was accumulated throughout the flights. On top of this, FARO Connect will add a quadratic subsampling and SOR filter to remove potential noise caused by dust in the environment.

Settings used in FARO Connect:

1. Add the BAG file from the drone
2. Add the JSON file on the drone.
3. Capture environment was set to standard for all flights.
4. Data was filtered to remove any noise



### Alignment and Georeferencing

For this project, the blocks were manually aligned using FARO Connect's Manual alignment tool and then each block was georeferenced into the correct transformation.

### Manual Alignment

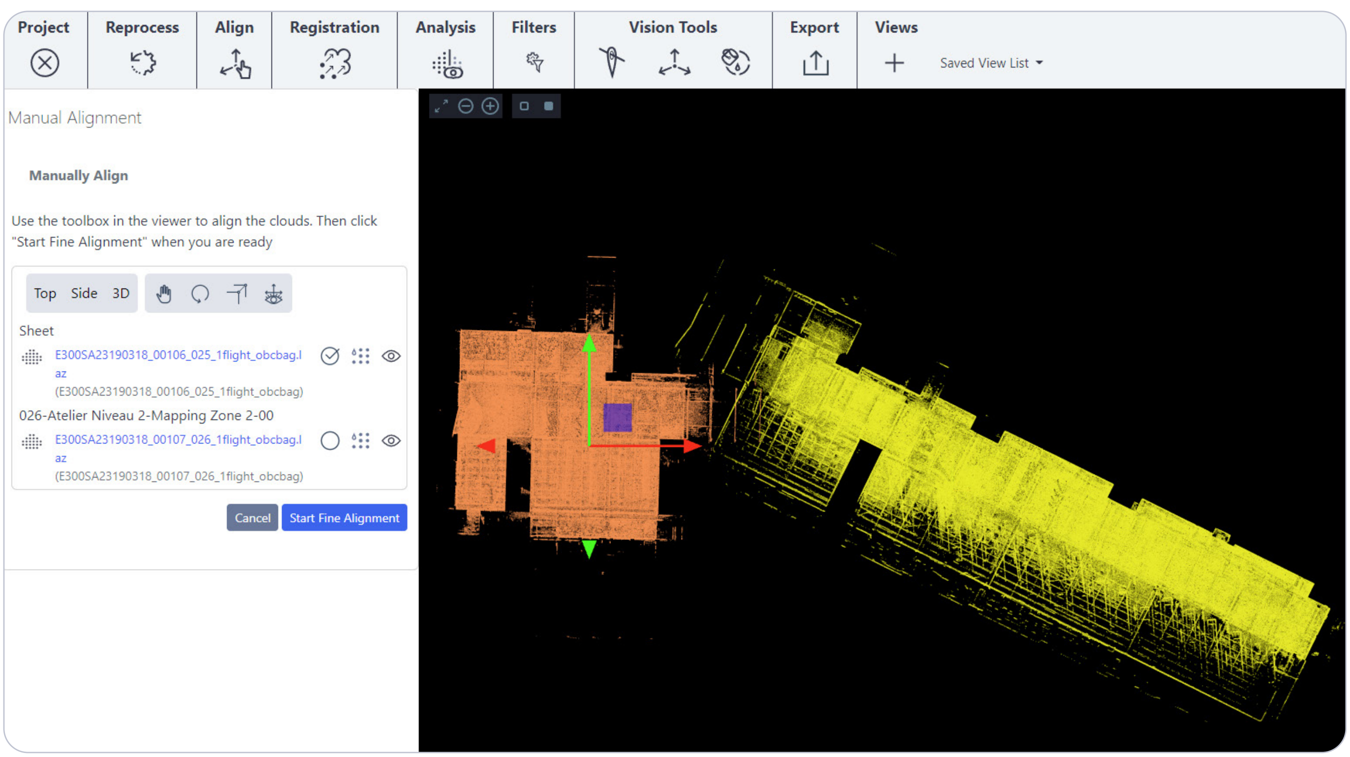
To manually align point clouds in FARO Connect you need to use the Manual Alignment feature. It is also possible to merge more than two point clouds in FARO Connect.

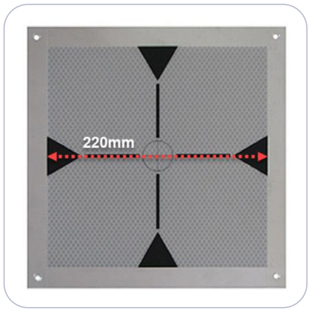
- A reference cloud can be assigned during the process and other scans can be translated and rotated to match against this.
- When the process is run, a best-fit algorithm is used to improve the accuracy of the alignment. For this to successfully compute, it is essential that adequate overlap is captured during the flights.
- At the beginning of this workflow, you can decide if you want to export individual aligned clouds or a single merged point clouds

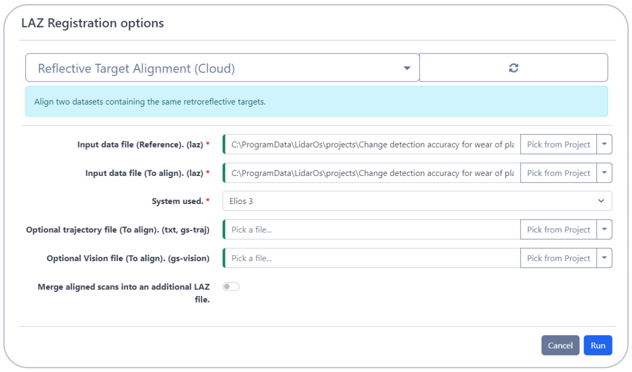
### Target Alignment & Georeferencing (Option)

FARO Connect can automatically detect reflective targets for georeferencing or alignment. For this, a couple of good practices need to be followed. Multiple flights can be automatically aligned using the "Reflective Target Alignment or Reflective Target Georeferencing " Workflow.

- Retro reflective targets will need to be placed in the flight area, especially where two to more flights overlap.
- The recommended size for reflective targets is 220mm X 220mm (8.7 in x 8.7 in).
- FARO Connect will automatically detect the centroid of each target in the reflective target alignment workflow.
- A minimum of 4 targets is required to perform the automatic target detection and centroid extraction. Ideal 6 or more targets overlapping flights will be best practice.

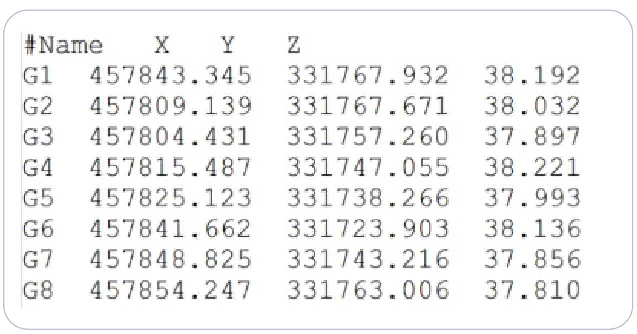





For geo-referencing, the control point file should be in a txt, csv, gs-control format in XYZ.

Please see the example below.



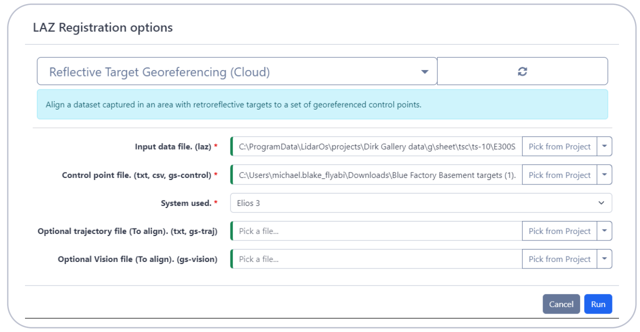
| #Name | X | Y | Z |
|---|---|---|---|
| G1 | 457843.345 | 331767.932 | 38.192 |
| G2 | 457809.139 | 331767.671 | 38.032 |
| G3 | 457804.431 | 331757.260 | 37.897 |
| G4 | 457815.487 | 331747.055 | 38.221 |
| G5 | 457825.123 | 331738.266 | 37.993 |
| G6 | 457841.662 | 331723.903 | 38.136 |
| G7 | 457848.825 | 331743.216 | 37.856 |
| G8 | 457854.247 | 331763.006 | 37.810 |

The reflective target georeferencing workflow.

1. Add process laz file

2. Add control point file

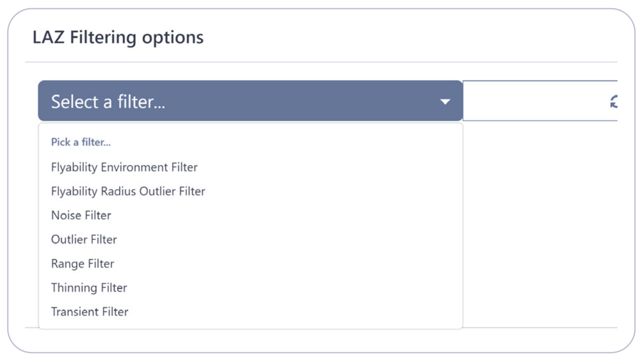
3. System: Elios 3




## Filtering

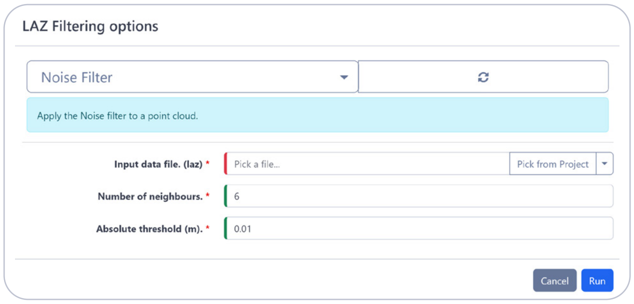
After the processing, it is still possible to apply single filters to the model. This can be simply done by selecting the point cloud, clicking on “filters” and selecting which workflow you want to apply.

Only one filtering workflow can be selected at a time but the action can be replicated across multiple point clouds and filters and all will process simultaneously.




## Noise Filter Workflow:

The noise filtering workflow was applied to all the point cloud models. This workflow improves the point cloud by removing Outlying data points on Planar Surfaces. This filter considers the distance to the underlying surface instead of the distance to the neighbors. This works well on planar surfaces such as walls and floors and thus is key for producing clean models with smooth planar surfaces for producing accurate Scan to BIM models

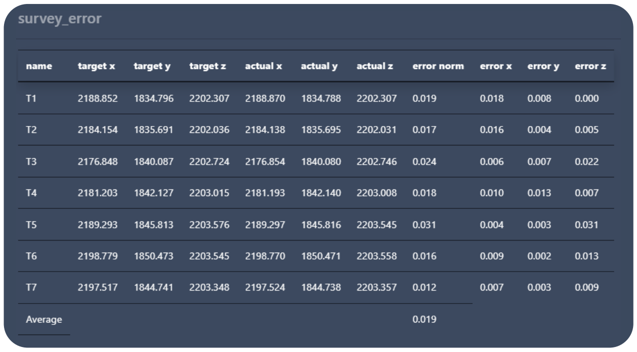



### Verification and Exportation

After post-processing, filtering, and merging /Alignment the results of the pointcloud accuracy can be checked and exported

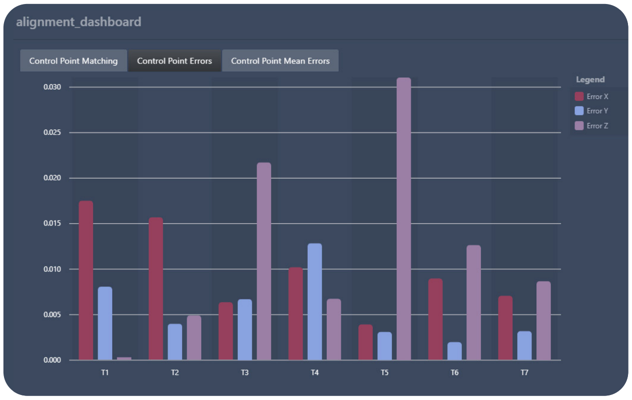
### Survey Accuracy

If using the Retro-reflective target georeferencing workflow, the survey error can be checked and verified in the Survey error report.


survey_error

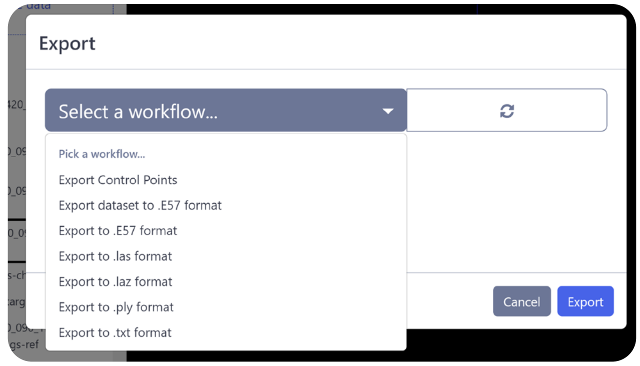
| name | target x | target y | target z | actual x | actual y | actual z | error norm | error x | error y | error z |
|---|---|---|---|---|---|---|---|---|---|---|
| T1 | 2188.852 | 1834.796 | 2202.307 | 2188.870 | 1834.788 | 2202.307 | 0.019 | 0.018 | 0.008 | 0.000 |
| T2 | 2184.154 | 1835.691 | 2202.036 | 2184.138 | 1835.695 | 2202.031 | 0.017 | 0.016 | 0.004 | 0.005 |
| T3 | 2176.848 | 1840.087 | 2202.724 | 2176.854 | 1840.080 | 2202.746 | 0.024 | 0.006 | 0.007 | 0.022 |
| T4 | 2181.203 | 1842.127 | 2203.015 | 2181.193 | 1842.140 | 2203.008 | 0.018 | 0.010 | 0.013 | 0.007 |
| T5 | 2189.293 | 1845.813 | 2203.576 | 2189.297 | 1845.816 | 2203.545 | 0.031 | 0.004 | 0.003 | 0.031 |
| T6 | 2198.779 | 1850.473 | 2203.545 | 2198.770 | 1850.471 | 2203.558 | 0.016 | 0.009 | 0.002 | 0.013 |
| T7 | 2197.517 | 1844.741 | 2203.348 | 2197.524 | 1844.738 | 2203.357 | 0.012 | 0.007 | 0.003 | 0.009 |
| Average | | | | | | | 0.019 | | | |

The alignment dashboard also displays the accuracy of the model, relative to the targets in XYZ.




### Export

The export of the pointcloud can be made in different formats, however standard E57 or Las files are most commonly used in all Scan to BIM software.




After these steps were completed, the cement plant project reached the third stage of Scan to BIM, which is the creation of the BIM model itself.

## Step 3: Transforming from Scan to BIM

At this point, the outputs from FARO Connect can be imported to BIM appropriate software. For the cement plant, the decision was made to use AutoDesk, but there are several other BIM software options that would be applicable.

When selecting the right Scan to BIM software, there are several factors to consider:

- Project needs → What is the level of detail required and the complexity of the site? In this case, the project needed LOD 200.
- Existing ecosystem → Select software that integrates with your existing software/tools. FARO Connect and AutoDesk can be used in harmony and were thus appropriate choices for this project.
- Feature set → Evaluate the unique features and strengths of each software according to your needs.

AutoDesk's Recap and Revit are software programs used by construction and architecture offices worldwide, setting a good standard for BIM modeling.

Autodesk Revit is a powerful Building Information Modeling (BIM) software developed by Autodesk. It is widely used in architecture, engineering, and construction (AEC) industries for designing, modeling, and documenting building projects. Revit allows architects, structural engineers, MEP (mechanical, electrical, plumbing) engineers, and other professionals to collaborate on a single unified platform, facilitating coordination and communication throughout the entire building lifecycle.

In this case, we will use the processed model of the Elios 3 scan from Autodesk Recap Pro and turn it into a BIM model using Autodesk Revit's tools and features. Scan to BIM in Revit refers to the process of creating a digital 3D model of an existing building or structure by using point cloud data obtained from 3D laser scanning technology. This process allows architects, engineers, and other professionals to incorporate accurate as-built information into their design and renovation projects.

ReCap Pro is primarily used for reality capture and 3D scanning. It allows users to import, view, organize, and edit point cloud data obtained from laser scans or photogrammetry.

ReCap Pro enables users to work with large sets of point cloud data obtained from laser scans or photogrammetry. It provides tools for organizing, cleaning, and editing point clouds to create accurate 3D models. It facilitates the registration and alignment of multiple scans or images to create a unified 3D model. This process involves aligning overlapping point clouds to ensure accuracy and consistency throughout the model, similar to the process in FARO Connect. Users can perform measurements, analysis, and comparisons within the software environment. This includes distance measurements, volume calculations, and deviation analysis.

The software is also the first step of converting a LAS, LAZ, or E57 scans from the Elios 3 into the correct format for Autodesk products for further design, modeling, and analysis. The file format for Autodesk Revit or BIM 360 is an RCP file. ReCap will convert the scan data into an RCP file so it can be seamlessly opened on other Autodesk platforms. For this, we will use it in Revit to convert the scan to BIM.

Lastly, ReCap Pro will compute Normals. Normals help in understanding the orientation of surfaces in the point cloud, and they are essential for accurate modeling and analysis. ReCap processes the point cloud data to generate these normals, enhancing the usability of the data in downstream applications like Revit.

The key benefits of computing the normals are as follows:

✓ **Surface Orientation:** Normals provide information about the surface orientation, which is crucial for rendering and visualization.

✓ **Feature Extraction:** Normals help in identifying edges and corners, which can be used to extract features and create detailed models.

✓ **Improved Accuracy:** Using normals can enhance the accuracy of surface reconstruction and modeling efforts in Revit.

This duo of Autodesk software is used in architecture, engineering, and construction for designing, modeling, and documenting building projects.

## Process for using Recap in this project:

1. Import files in LAS, LAZ, or E57 format.

- Open Recap Pro and select the Import option from the top menu.
- Select the preferred import option, either individual files or .las folder
- Click index scans, and then launch the project
- The LAST file is converted to an RCP file.

2. Normals calculation

- Autodesk ReCap automatically calculates normals during the initial processing stage. You can refine the normals by adjusting the settings in the software if required. This might include specifying the radius or neighborhood size used to estimate the normals.

- If the scan files are properly recognized then you will see an import window with some presets. You can experiment with these settings but the default settings ought to be fin (The aggressive filter scan option is good for reducing the scan to just strong, clear measured points but will throw a lot away)

3. Visualization

- Recap was used to Visualize the pointcloud which came directly from Faro Connect post-processing.
- The display settings can be easily changed for classification and intensity. The point size can also be adjusted to better visualize the areas that may need to be clipped and removed.

4. Clipping

- Recap was used to clip and clean the raw point cloud. Areas of poor scan coverage which are not essential for the scan to BIM modeling were easily clipped and removed using Recap.
- Select the area that you would like to clip and remove (this can be within the model as a section or external of the model)
- Select to 'clip in' or 'clip out'

5. Exportation

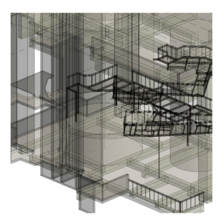
- The pointcloud is exported as an RCP file format.
- An RCP file references and manages multiple RCS files, which are the individual scan files containing the raw point cloud data. This file format is key for importing single or multiple files into Autodesk Revit as Revit will not read a standard LAS, LAZ, or E57 format.

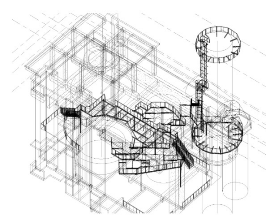
## Process for using Revit in this project:

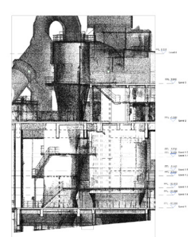
*Note: Revit was not critical to this case study, however, this example workflow highlights the key parts of the process.*

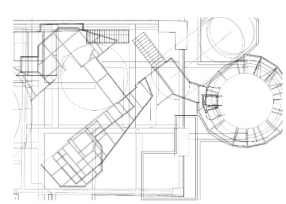
1. The point cloud data from Recap was imported to Revit
2. An initial step was to set floor levels for the building modeling process.
3. Next, the modeling began. Walls and exterior elements can be manually inputted, along with beams and columns. The doorways and floor levels can also be carefully shown as close to reality as possible.
4. The model was then completed with higher detail to include platform floors, stairs and railings, and MEP systems. This helps the overall result achieve LoD 200.

A BIM model for LoD 200 will include mechanical, electrical, and plumbing (MEP) systems, although it may not have specific information about their precise dimensions. Similarly, HVAC systems should have a basic defined layout for LoD 200. This includes visualizing HVAC equipment, ducts, connections, etc.


Structure and substructure layout


Isometric wireframe views

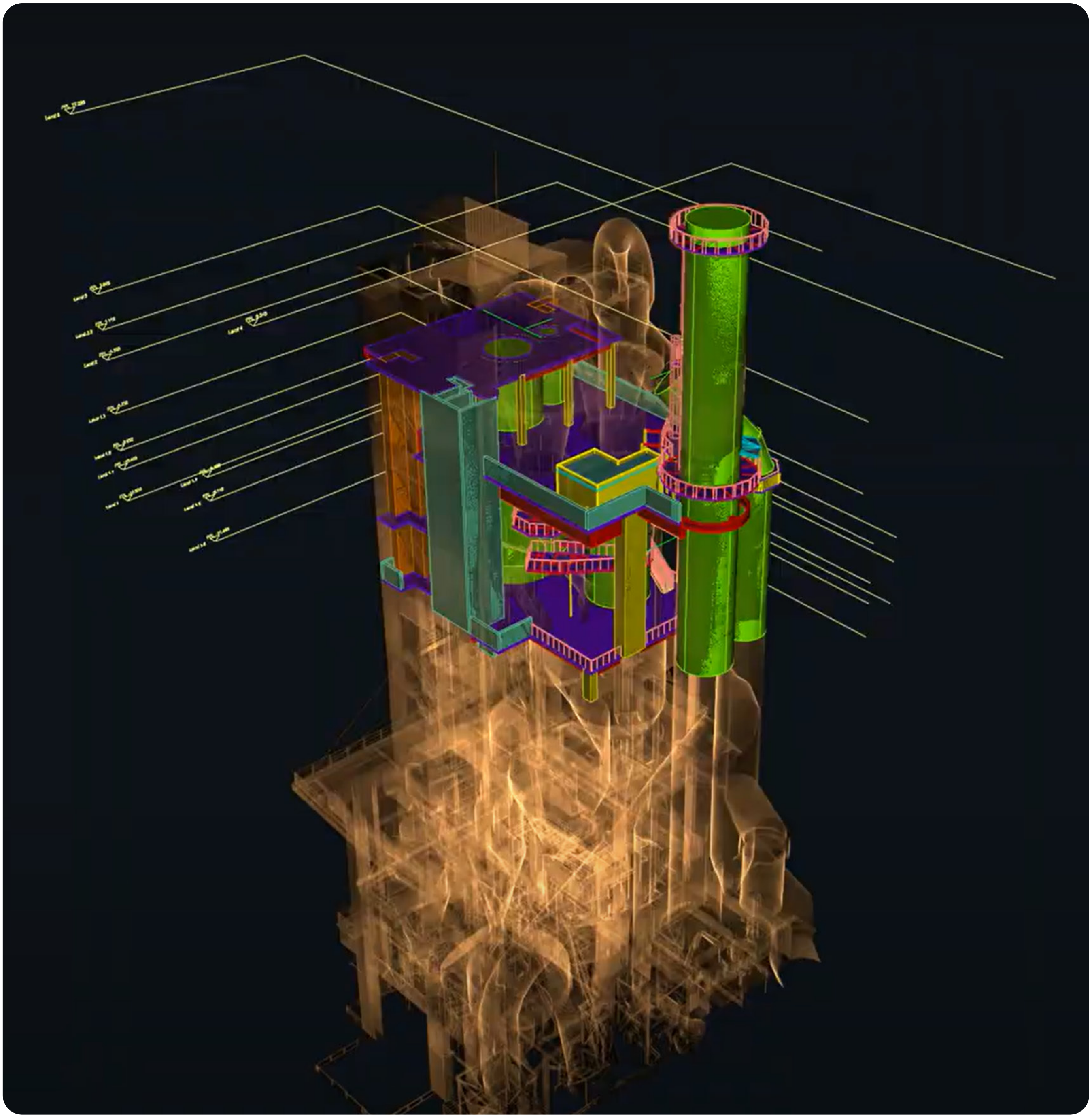

Cross section


Floor plans

As part of the overall best practices for LoD 200, the BIM model should include floor plans and section views for ease of analysis and reporting.

The results can then be exported to CAD. In the case of AutoDesk Revit, this can be in various file formats that include .dwg, .dxf, .dgn, .acis sat, .dwf, .adsk, .fbx, .nwc, .gbXML.

The final model, shown here, has elements of the point cloud as well as design and analytical details included.



# Results and Comparisons

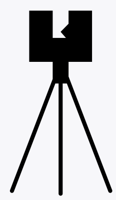
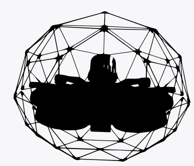
## Elios 3 vs Terrestrial means

When it comes to capturing detailed 3D data of existing conditions for use in Scan to BIM modeling, both the Elios 3 Surveying payload and terrestrial scanning have distinct advantages and use cases. When it comes to both scenarios and what to consider, it will come down to the four main pillars of Speed, Data Quality, Access, and Safety.

### Comparison: The Elios 3 vs Terrestrial Laser Scanners

### Speed and Efficiency

- In terms of speed and efficiency, the Elios 3, depending on the complexity of the environment in question, can capture equivalent data to terrestrial scanning methods but in a fraction of the time. For example; When it comes to simple block and beam structures with internal walls and passageways, the Elios 3 offers 2 - 2.5 times the capture efficiency in comparison to terrestrial means. In more complex environments like plant structures with multiple sections of MEP, this efficiency can increase to 5-10 fold and even offer scan data that is sometimes impossible to capture due to the environment geometry, access, or hazards. The

| |  **TLS** |  **Elios 3** |
|---|---|---|
| Accuracy | Sub-millimeter precision | Centimeter precision |
| Data output | Point cloud | Point cloud, 4K images, opt. sensors |
| Coverage | Shadows, limited to safe access | No shadows, beyond safe access |
| 3D live map | No | Yes |
| Mobility | Low | High |
| Speed | Fixed scan frame | 2x faster vs TLS on average |
| **Takeaways** | | |
| Wins | MUST-HAVE tool, others are incremental.<br>Extremely precise | Uniquely suitable for scanning large, complex, hazardous areas.<br>100% data coverage thanks to live map & exceptional mobility |
| Trade-offs | Less suitable for large surfaces (slow process), significant shadows, and limited to safe access | Limited by flight time with trade-offs on accuracy |

terrestrial equipment is generally bulkier and less portable than the Elios 3, requiring more effort to transport and set up for each scan, which in turn, hampers the efficiency of terrestrial usage.

- A final limiting factor with terrestrial vs Elios 3 is that terrestrial equipment requires more care when setting up each station point. In some cases, multiple scan setups are required (anything from 10 -50 sets) to cover the same area as the Elios 3 in one flight. This can lead to accumulation or alignment errors over the entire project, which can be very costly to rectify.

**Data quality**

- In terms of data quality, alignment, and accuracy, while the Elios 3 Survey package data is suitable for general schematic design assessments and inspections, the data resolution may not be as high as that of terrestrial scanners for detailed modeling. This is one of the general disadvantages of dynamic LiDAR applications for surveying in comparison to Static or kinematic scanning systems.

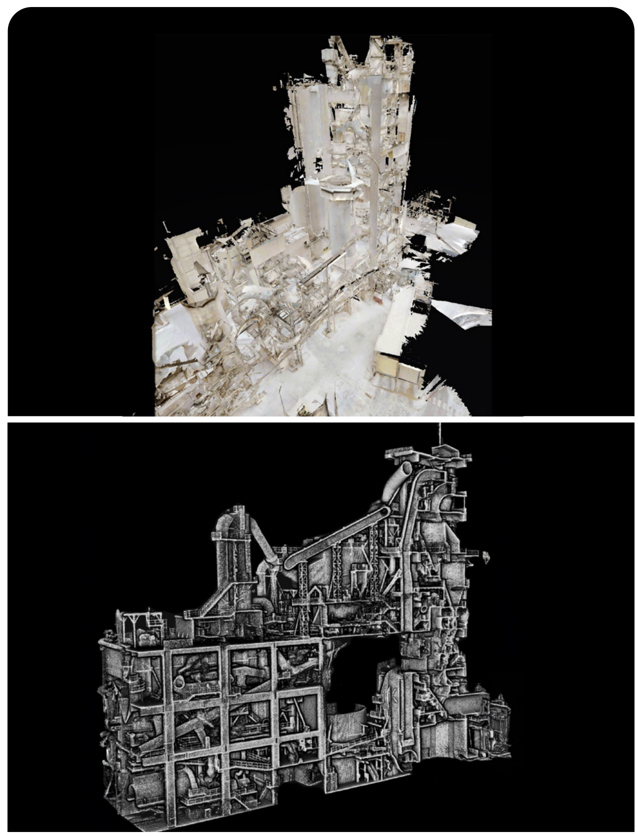
- Due to the nature of dynamic LiDAR and SLAM, drift can be a major cause of error in the project so great care must be taken, and following best practices on site is a must. When using the retro-reflective target workflow, especially for georeferencing, this requires more preplanning and additional sets in the process to make sure that the target workflow methodology is correctly followed and in coordination with the Flyability training material. With modern static or kinematic terrestrial scanners, features such as auto-calibration, self-leveling, and automatic scan rectification and merging mean that less training is required to use such a device. The Elios 3 requires skilled operators to navigate the drone and ensure accurate data capture.

- A LOD of 200 is achievable with the data quality of the Elios 3 Survey Package, which in basic terms means that the data is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. This falls within the bracket of Schematic design, meaning the BIM model becomes more refined, incorporating approximate quantities, sizes, shapes, and locations of elements. It helps in analyzing spatial relationships and early design concepts

- With Terrestrial laser scanning the achievable LOD is in the region of 300-350 where the modeling elements are graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, location, orientation, and interfaces with other building systems.

**Access**

- The Elios 3 can access areas that are difficult or impossible for terrestrial scanners, such as inside pipes, tunnels, and hazardous environments. This makes the survey package a defining solution for these types of environments.



On the top, a TLS scan with a LiDAR tripod taking 3-4 days with 2 people, compared to a scan captured with the Elios 3 on the bottom.

- A limiting factor with the Elios 3 can be operational range which is limited by battery life and signal strength, however, this can be combated by good pre-flight planning.

- For access to terrestrial equipment, more physical contrasts are in place. Terrestrial scanners may struggle to access confined or hazardous areas without additional equipment or measures such as confined space training, MEP or Electrical lock-out, chemical hazards, or even rope access requirements. One of the main limitations also is that terrestrial scanners require a clear line of sight, which can be challenging in complex environments with many obstructions.

**Safety**

- The Elios 3's remote operation reduces the need for human presence in dangerous environments, which means there is less need for advanced training in the context of confined space, gas hazard environments, and also plant MEP lockout. In most cases, operations can continue while the Elios 3 flies, and operational shutdown can be avoided.

- The Eliso 3 is also less invasive and is less likely to disturb the environment, making it ideal for sensitive or delicate sites in comparison to terrestrial scanning where sometimes access is needed with the aid of model lift platforms or scaffolding.

# Conclusion

This extensive guide demonstrates the process, from start to finish, of creating a BIM model using data captured with the Elios 3. The BIM LOD 200 is achievable with the Elios 3 and proves the value of drone data in architectural, engineering, and construction projects. The speed, data quality, and accessibility of the drone can be combined with the value of its data and the deliverables possible to elevate the return on investment of drone data - as well as exemplify its long-term benefits.

As the Elios 3 can be deployed in minutes and capture data without shadows (unlike laser scanners that must be manually carried around and can be affected by shadow in assets that humans cannot safely access), it is a highly attractive alternative to traditional surveying methods.

The success of a Scan to BIM project is ultimately defined by the understanding of the client and the service provider on the purpose of the model. In the case study presented here, the results have been accepted by the plant owner and are intended to be used for updating records and planning new infrastructure installations to empower carbon capture. These records can be used to show compliance with local and international climate change efforts, which can result in funding being given to the site. This overall aim was kept at the forefront of this mission and was used to inform the data capture and processing, which resulted in the desired outputs.

It is important that the Elios 3's ability to collect data from inaccessible spaces, such as between pipe racks or even in unfinished construction spaces, makes it a valuable tool for reporting and documenting progress alongside its BIM capabilities. The Elios 3 is a multi-dimensional tool that can have a variety of applications. This demonstration of BIM is yet another capability added to its extensive list of use cases.

This is just one example of a Scan to BIM project with the Elios 3, outlining the best practices and processes that will result in an accurate BIM model based on drone data. It is not the only way of creating a BIM model with the Elios 3, but a strong example. The results achieved with the Elios 3, FARO Connect, and AutoDesk workflow are already in use at this cement plant for reporting and planning, as well as documenting the efforts of the site owners in meeting global carbon targets. Although the Elios 3 is a small drone, it is playing a major part in an immense industry, and helping take BIM a step further in the face of challenging scanning environments.

Discover the Elios 3 for infrastructure and construction management. →