

South Humber Bank Energy Centre Project

Planning Inspectorate Reference: EN010107

South Marsh Road, Stallingborough, DN41 8BZ

The South Humber Bank Energy Centre Order

Document Reference: 8.12 Unmanned Aerial Vehicle (UAV) Flight Plan



Applicant: EP Waste Management Ltd
Date: January 2021

DOCUMENT HISTORY

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GLOSSARY

Abbreviation	Description
ACC	Air-cooled condenser.
AGI	Above Ground Installation.
ASI	Accompanied Site Inspection
AOD	Above Ordnance Datum
BAT	Best Available Techniques
BEIS	Department for Business, Energy and Industrial Strategy.
BoR	Book of Reference
CCGT	Combined Cycle Gas Turbine.
CEMP	Construction Environmental Management Plan
CFA	Continuous Flight Auger Piling
DCO	Development Consent Order: provides a consent for building and operating an NSIP.
DPIA	Data Protection Impact Assessment
DRS	Deposit Return Schemes
EfW	Energy from Waste: the combustion of waste material to provide electricity and/or heat.
EIA	Environmental Impact Assessment.
ELV	Emission Limit Value
EPUKI	EP UK Investments Ltd.
EPWM	EP Waste Management Limited ('The Applicant')
EPR	Extended Producer Responsibility
ES	Environmental Statement.
EU BPR	European Union Biocides Regulations
ExA	Examining Authority: An inspector or panel of inspectors appointed to examine the application.
FGT	Flue Gas Treatment
HRA	Habitats Regulations Assessment Signposting
IAQM	Institute of Air Quality Management
IED	Industrial Emissions Directive

LSE	Likely Significant Effects
mAOD	Metres Above Ordnance Datum.
MSW	Municipal Solid Waste
MHW	Mean High Water
MW	Megawatt: the measure of power produced.
NELC	North East Lincolnshire Council.
NGET	National Grid Electricity Transmission plc
NGG	National Grid Gas plc
NIC	National Infrastructure Commission
NPG	Northern Powergrid (Yorkshire) plc
NPS	National Policy Statement.
NSIP	Nationally Significant Infrastructure Project: for which a DCO is required.
PA 2008	Planning Act 2008.
PDAS	Planning, Design and Access Statement
PEIR	Preliminary Environmental Information Report - summarising the likely environmental impacts of the Proposed Development.
PINS	Planning Inspectorate.
PMP	Preventative Maintenance Plan
PPWs	Permitted Preliminary Works
PRoW	Public Rights of Way
Q1	Quarter 1
RDF	Refuse derived fuel.
SHBEC	South Humber Bank Energy Centre.
SHBPS	South Humber Bank Power Station.
SHG	South Humber Gateway
SoCC	Statement of Community Consultation: sets out how a developer will consult the local community about a proposed NSIP.
SoS	Secretary of State.
SPA	Special Protection Area
UK BPR	United Kingdom Biocidal Products Regulations
UAV	Unmanned Aerial Vehicle
ZTV	Zone of Theoretical Visibility

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1.0 INTRODUCTION

1.1 Overview

- 1.1.1 This 'Unmanned Aerial Vehicle (UAV) Flight Plan' document (Document Ref. 8.12) has been prepared on behalf of EP Waste Management Limited ('EPWM' or the 'Applicant'). It relates to the application (the 'Application') for a Development Consent Order (a 'DCO'), that has been submitted to the Secretary of State (the 'SoS') for Business, Energy and Industrial Strategy, under section 37 of 'The Planning Act 2008' (the 'PA 2008').
- 1.1.2 EPWM is seeking development consent for the construction, operation and maintenance of an energy from waste ('EfW') power station with a gross electrical output of up to 95 megawatts (MW) including an electrical connection, a new site access, and other associated development (together 'the Proposed Development') on land at South Humber Bank Power Station ('SHBPS'), South Marsh Road, near Stallingborough in North East Lincolnshire ('the Site').
- 1.1.3 A DCO is required for the Proposed Development as it falls within the definition and thresholds for a 'Nationally Significant Infrastructure Project' (a 'NSIP') under sections 14 and 15(2) of the PA 2008.
- 1.1.4 The DCO, if made by the SoS, would be known as the 'South Humber Bank Energy Centre Order' ('the Order').
- 1.1.5 Full planning permission ('the Planning Permission') was granted by North East Lincolnshire Council ('NELC') for an EfW power station with a gross electrical output of up to 49.9 MW and associated development ('the Consented Development') on land at SHBPS ('the Consented Development Site') under the Town and Country Planning Act 1990 on 12 April 2019. Since the Planning Permission was granted, the Applicant has assessed potential opportunities to improve the efficiency of the EfW power station, notably in relation to its electrical output. As a consequence, the Proposed Development would have a higher electrical output (up to 95 MW) than the Consented Development, although it would have the same maximum building dimensions and fuel throughput (up to 753,500 tonnes per annum (tpa)).

1.2 The Applicant

- 1.2.1 The Applicant is a subsidiary of EP UK Investments Limited ('EPUKI'). EPUKI owns and operates a number of other power stations in the UK and is a subsidiary of Energetický A Průmyslový Holding ('EPH'). EPH owns and operates energy generation assets in the Czech Republic, Slovak Republic, Germany, Italy, Hungary, Poland, Ireland, and the United Kingdom.

1.3 The Proposed Development Site

- 1.3.1 The Proposed Development Site (the 'Site' or the 'Order limits') is located within the boundary of the SHBPS site, east of the existing SHBPS, along with part of the carriageway within South Marsh Road. The principal access to the site is off South Marsh Road.

-
- 1.3.2 The Site is located on the South Humber Bank between the towns of Immingham and Grimsby; both over 3 km from the Site.
- 1.3.3 The Site lies within the administrative area of NELC, a unitary authority. The Site is owned by EP SHB Limited, a subsidiary of EPUKI, and is therefore under the control of the Applicant, with the exception of the highway land on South Marsh Road required for the new Site access.
- 1.3.4 The existing SHBPS was constructed in two phases between 1997 and 1999 and consists of two Combined Cycle Gas Turbine (CCGT) units fired by natural gas, with a combined gross electrical capacity of approximately 1,400 MW. It is operated by EP SHB Limited.
- 1.3.5 The Site is around 23 hectares ('ha') in area and is generally flat, and typically stands at around 2.0 m Above Ordnance Datum (mAOD).
- 1.3.6 A more detailed description of the Site is provided at Chapter 3: Description of the Proposed Development Site in the Environmental Statement ('ES') Volume I (Document Ref. 6.2 / APP-034 to APP-055).

1.4 The Proposed Development

- 1.4.1 The main components of the Proposed Development are summarised below:
- Work No. 1— an electricity generating station located on land at SHBPS, fuelled by refuse derived fuel ('RDF') with a gross electrical output of up to 95 MW at ISO conditions;
 - Work No. 1A— two emissions stacks and associated emissions monitoring systems;
 - Work No. 1B— administration block, including control room, workshops, stores and welfare facilities;
 - Work No. 2— comprising electrical, gas, water, telecommunication, steam and other utility connections for the generating station (Work No. 1);
 - Work No. 3— landscaping and biodiversity works;
 - Work No. 4— a new site access on to South Marsh Road and works to an existing access on to South Marsh Road; and
 - Work No. 5— temporary construction and laydown areas.
- 1.4.2 Various types of ancillary development further required in connection with and subsidiary to the above works are detailed in Schedule 1 of the DCO.
- 1.4.3 The Proposed Development comprises the works contained in the Consented Development, along with additional works not forming part of the Consented Development ('the Additional Works'). The Additional Works are summarised below:
- a larger air-cooled condenser (ACC), with an additional row of fans and heat exchangers;
 - a greater installed cooling capacity for the generator;
 - an increased transformer capacity; and

- ancillary works.

1.4.4 A more detailed description of the Proposed Development is provided at Schedule 1 'Authorised Development' of the draft DCO and Chapter 4: The Proposed Development in the ES Volume I (Document Ref. 6.2 / APP-034 to APP-055) and the areas within which each of the main components of the Proposed Development are to be built is shown by the coloured and hatched areas on the Works Plans (Document Ref. 4.3 / APP-010). Three representative construction scenarios (timescales) are described within Chapter 5: Construction Programme and Management in the ES Volume I (Document Ref. 6.2/ APP-034 to APP-055) and assessed in the Environmental Impact Assessment ('EIA').

1.5 Purpose of this Document

1.5.1 This document sets out the information in relation to the UAV video footage of the Site to be provided as requested by the ExA in the Rule 9 letter issued on 15th January 2021. The UAV video footage is to provide a "safer and more convenient means of understanding the Site" given the uncertainties around COVID-19 restrictions.

1.5.2 This document includes information on:

- the proposed methods including the specification of the UAV and camera type in Section 2; and
- a description of the proposed UAV flight path in Section 3.

2.0 SCOPE OF THE UAV SURVEY AND EQUIPMENT

2.1 Introduction

- 2.1.1 As outlined within the Rule 9 letter issued on the 15th January 2021 the ExA has requested UAV video footage be provided for the Site, to aid the ExA's and other interested parties' understanding of the Site.
- 2.1.2 The UAV will record images of the entire Site.
- 2.1.3 A UAV flight plan showing the take-off points for the UAV to collect data for the Site and the approximate route of the video flight path that will be provided from the UAV footage is presented in Appendix 1.

2.2 Equipment

UAV Type

- 2.2.1 Digital image and video data will be collected from different positions within the Site to provide visual data using a DJI Phantom 4 RTK UAS with a 20mp digital RGB sensor. This will produce 4k video and high definition imagery.
- 2.2.2 Further information on the UAV and camera specification is presented in Appendix 2.

UAV Speed and Elevation

- 2.2.3 The UAV will reach a speed of no more than 3.5 m/s (or a slow walking pace) as is specified by Civil Aviation Authority (CAA) commercial permissions that the UAV will be operated under.
- 2.2.4 The UAV will be operated at a minimum altitude of 100 m above ground level and maximum of 120 m above ground level. This is to ensure no conflict with the existing SHBPS stacks, which are 75 m tall.

2.3 Survey Timescales

- 2.3.1 The following outlines the proposed timescales for the survey and provision of the video the ExA:
- week commencing 1st February 2021 or 8th February 2021 (weather permitting) – UAV deployed at Site to collect imagery and video footage;
 - 8th February – 26th February 2021 – UAV imagery and footage edited and formatted (including the addition of labels to aid navigation and understanding of the Site) to meet with the ExA's requirements;
 - week commencing 1st March 2021 – UAV video footage published via link to a suitable external hosting site (likely to be YouTube).
- 2.3.2 As noted in the Rule 9 letter, the ExA is aware that weather conditions have the potential to influence the date of the UAV flight. The Applicant will update the ExA once the UAV flight has been completed and provide a more accurate date for the video footage to be provided.

2.4 Other Matters

- 2.4.1 The Applicant is aware of the legal and data protection matters relating to UAV flights and recording of images, and will adhere to all relevant legislation and CAA requirements.
- 2.4.2 The Applicant notes that a Data Protection Impact Assessment ('DPIA') must be issued to PINS prior to the provision of the UAV video footage and imagery, for review by PINS, and that images may need to be redacted to ensure individuals' privacy. The Applicant is in contact with PINS to agree the time required for review of the DPIA.
- 2.4.3 As context, owing to the remote and industrial context of the Site and the ongoing COVID-19 restrictions and 'lockdown', very low numbers of people are expected to be present in the vicinity.
- 2.4.4 The Applicant also notes the ExA's requirements for consideration of the file size of high resolution video footage and how this could be hosted so it is publicly accessible. The Applicant proposes to host the footage on a YouTube channel, with a link provided on the project website.
- 2.4.5 The Applicant will provide the following information requested by the ExA:
- details of the camera used;
 - details of any special camera functions used and when (setting, focus, zoom white balance, image sharpening etc.);
 - a clear overhead show of a structure of known size which can be used as a reference point; and
 - information on telemetry including the height of the UAV at any given time, direction of flight, wind speed and wind direction, GPS data, and orientation of the camera (both vertically and horizontally).

3.0 PROPOSED FLIGHT PATH DESCRIPTION

3.1.1 The Applicant will prepare a comprehensive high-resolution video of the Site that accords with the Applicant's suggested ASI routing as outlined on pages 2 and 3 of their letter submitted at Deadline 1 [REP1-015] which is as follows:

“Within the Proposed Development site, starting at the South Humber Bank Power Station gatehouse at the main entrance, taking a circular route by foot along the existing road between the Power Station and the Cooling Water Pumphouse; then across level grass to the northern or southern boundaries (ditch/fence); then returning to the internal road and walking westwards and southwards to Work No. 5 (proposed laydown areas); then by foot to Work No. 3 (areas of retained and proposed tree planting), passing Work no. 2 (utilities connections) and the existing National Grid 400kV substation”

3.1.2 In summary the following route is proposed as presented on Figure 1 (refer to Appendix 1).

3.1.3 From take-off location **1** within the Site, the video flight path will start at the SHBPS main entrance. After travelling over the northern part of the existing power station and past the National Grid Gas compound, the UAV will travel in an easterly direction over the Main Development Area (Work No. 1) taking in views of the northern part of the Main Development Area including the existing internal access road between the existing power station and the cooling water pumphouse and the location of the new site access for the Proposed Development.

3.1.4 From take-off location **2** the UAV will capture the eastern part of the Main Development Area, before returning westwards taking in views of the southern part of the Main Development Area.

3.1.5 Onwards from take-off location **3** the UAV will move south towards Work No. 5 (construction laydown area) and the southernmost parts of Work Nos. 2 (utility connections) and 3 (landscaping and biodiversity), taking in views of the southern part of the existing power station.

3.1.6 From take-off location **4** the UAV will travel westwards along the southern boundary of Work Nos. 2, 3 and 5 before passing over an area of existing trees (to be retained) towards take-off location **5**.

3.1.7 From take-off location **5**, the UAV will travel north through Work No. 3 and the western part of Work No. 2, passing the existing National Grid 400kV substation and the western part of the existing power station.

3.1.8 The UAV will depart take off location **6** in order to capture views of the north-western corner of the Site (existing trees to be retained).

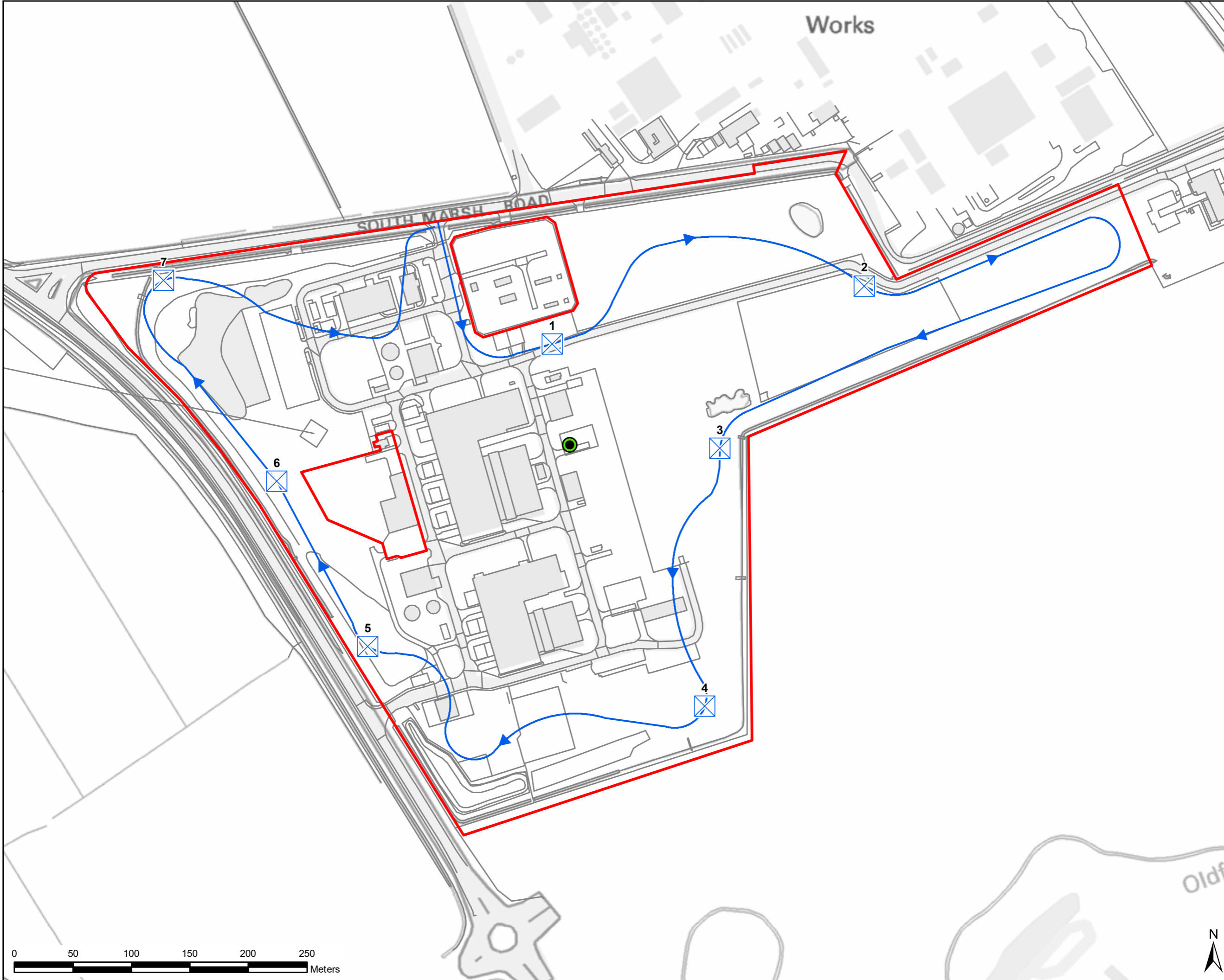
3.1.9 Finally departing from take off location **7** the UAV will capture views of the northern part of the existing power station and back towards the existing SHBPS site entrance.

3.1.10 In addition to the video footage the UAV camera will also capture a 360° view of the Site from the approximate location shown on Figure 1 (see Appendix 1).

APPENDIX 1 PROPOSED UAV FLIGHT PLAN

THIS DRAWING IS TO BE USED ONLY FOR THE PURPOSE OF ISSUE THAT IT WAS ISSUED FOR AND IS SUBJECT TO AMENDMENT

- LEGEND**
- Order Limits
 - Approximate Location for 360 Degree View
 - UAV Take Off Location
 - Approximate Route of Video Flight Path



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Purpose of Issue
SUBMISSION AT DEADLINE 3

Client
EP WASTE MANAGEMENT LTD

Project Title
SOUTH HUMBER BANK ENERGY CENTRE DCO

Application Document Ref
UAV SURVEY FLIGHT PLAN

Drawn LC	Checked LK	Approved KC	Date 20/01/2021
AECOM Internal Project No. 60580855		Scale @ A3 1:3,000	

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Drawing Ref FIGURE 1	Rev
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APPENDIX 2 UAV AND CAMERA TECHNICAL SPECIFICATION

PHANTOM 4 RTK

Quick Start Guide

v1.2



Phantom 4 RTK

The PHANTOM™ 4 RTK is a smart mapping and imaging drone capable of highly accurate mapping functions. The aircraft has a built-in DJI™ Onboard D-RTK*, which provides precision data for centimeter-level positioning accuracy. Multi-directional obstacle sensing is enabled by forward, rear, and downward vision and infrared sensors*. The camera features a 1-inch 20-megapixel CMOS sensor housed within a high stability gimbal. When it comes to mapping, the high-performance mechanical shutter eliminates rolling shutter distortion when capturing images at speed. Image data can be used to generate maps for field planning when operating a DJI AGRAS™ aircraft. Users can also import photos to the DJI PC GS Pro application or third-party mapping software to composite highly accurate maps for different applications.



- | | |
|--|--------------------------------|
| 1. Gimbal and Camera | 10. Propellers |
| 2. Downward Vision System | 11. Aircraft Status Indicators |
| 3. Micro USB Port | 12. OCUSYNC™ Antennas |
| 4. Camera/Linking Status Indicator and Link Button | 13. Onboard D-RTK™ Antenna |
| 5. Camera microSD Card Slot | 14. Rear Vision System |
| 6. Forward Vision System | 15. Intelligent Flight Battery |
| 7. Infrared Sensing System | 16. Power Button |
| 8. Front LEDs | 17. Battery Level Indicators |
| 9. Motors | |

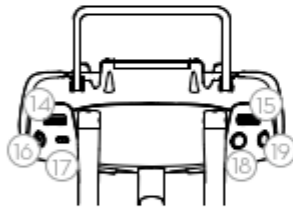


* This should be used with Network RTK service, a DJI D-RTK 2 High-Precision GNSS Mobile Station (purchased additionally) or post-processed kinematic (PPK) data (recommended when RTK signal is weak during operation). The Vision and Infrared Sensing Systems are affected by surrounding conditions. Read the Disclaimer and Safety Guidelines to learn more.

Remote Controller

The Phantom 4 RTK remote controller has a transmission range of up to 4.3 mi (7 km) * with controls for camera tilt and photo capture. DJI OcuSync is built into the remote controller, transmitting live HD imaging from the camera directly. Simply tap the screen in the DJI GS RTK app or import KML/KMZ files to plan an operation for convenient project management. Users can also connect the remote controller to a PC to access DJI PC GS Pro for planning and executing operations. The remote controller's Multi-Aircraft Control mode can be used to coordinate the operation of up to five aircraft at the same time, enabling pilots to work more efficiently. Replaceable batteries can be easily hot-swapped and the antennas are easily removable for quick maintenance.

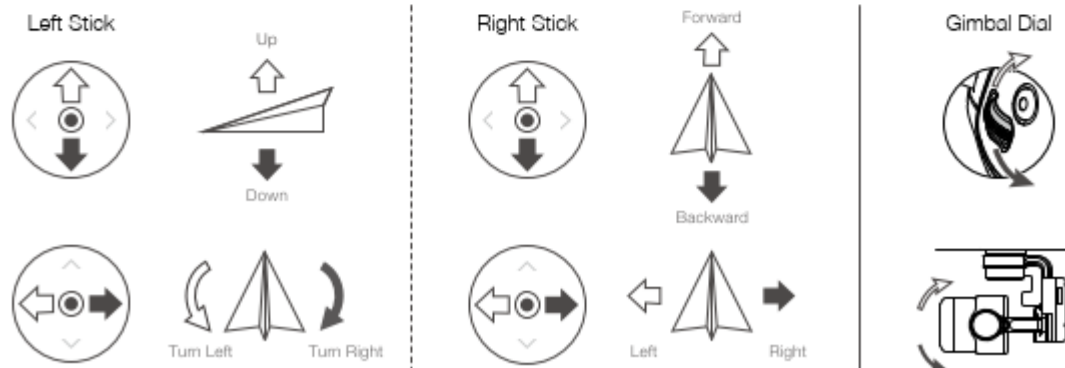
1. Power Button
2. RTH Button
3. Control Sticks
4. Speaker
5. Lanyard Attachment
6. Status LED
7. Battery Level LEDs
8. USB-C Port
9. 3.5 mm Audio Jack
10. MicroSD Card Slot
11. Display Device
12. Sleep/Wake Button
13. Antennas



14. Gimbal Dial
15. Aircraft Control Switch Dial
16. Record Button
17. Pause Switch
18. Shutter Button
19. Reserved Button

20. Button C1 (customizable)
21. Button C2 (customizable)
22. Battery Compartment Cover
23. Battery Compartment Cover Lock
24. Dongle Compartment Cover

The figure below shows the function that each control stick movement performs, using Mode 2 as an example. The left stick controls the aircraft's altitude and heading, while the right stick controls its forward, backward, left and right movements. The gimbal dial controls the camera's tilt.



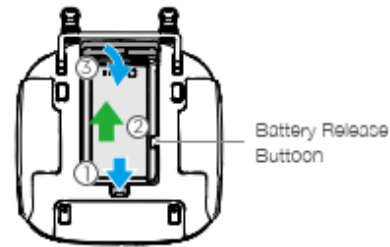
* The remote controller is able to reach its maximum transmission distance (FCC) in a wide open area with no Electro-Magnetic Interference, and at an altitude of about 400 feet (120 meters).

Using Phantom 4 RTK

1. Mount the Remote Controller Battery

The remote controller uses an easily removable interchangeable Intelligent Battery for long-term operation.

- ① Slide the battery compartment cover lock on the back of the remote controller down to open the cover.
- ② Insert the Intelligent Battery into the compartment and push it to the top.
- ③ Close the cover.



- To remove the Intelligent Battery, open the cover, press and hold the battery release button, then push the battery downward.

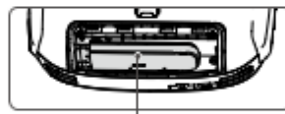
2. Mount the Dongle and SIM Card



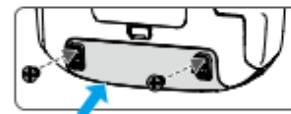
- The Phantom 4 RTK remote controller can access the Internet using a 4G dongle with SIM card or Wi-Fi signal. For UK, EU, ACUK, or ACEU versions, a Network RTK server can only be accessed using a 4G dongle with SIM card. For AU or AFUC versions, using a 4G dongle with SIM card is recommended, but a WiFi signal can also be used. To confirm the version of your unit, please view the version code after the product name on the label on the product packaging. When uploading or downloading system logs or operation data, using a Wi-Fi signal for Internet access is recommended.
- Only use a DJI approved dongle.
- The dongle supports various network standards. Use a SIM card that is compatible with the chosen mobile network provider and select a mobile data plan according to the planned level of usage.
- The dongle and SIM card are used to enable the remote controller to access to specific networks and platforms, such as the DJI AG platform. Be sure to mount them correctly, or else network access will not be available.



Lift the dongle compartment cover at the gap at its lower right corner, then remove it.



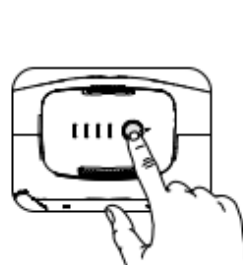
Insert the dongle into the USB port with the SIM card inserted into the dongle and test. *



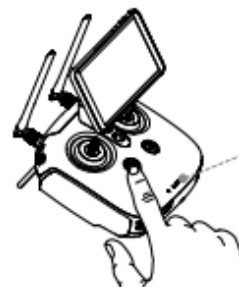
Re-mount the cover. To secure the cover, open the silicone protectors on it, insert and tighten two Phillips screws, then close the protectors.

* Test procedure: Press the remote controller power button once, then press again and hold to turn the remote controller on. In the DJI GO RTK app tap > and select Network Diagnostics. If the statuses of all the devices in the network chain are shown in green the dongle and SIM card are functioning properly.

3. Check the Battery Levels



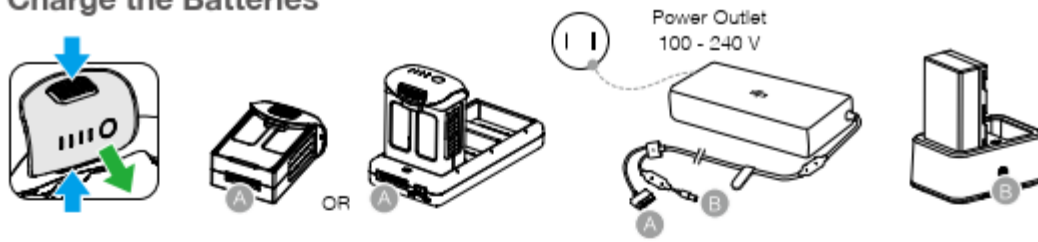
Low → High



Low → High

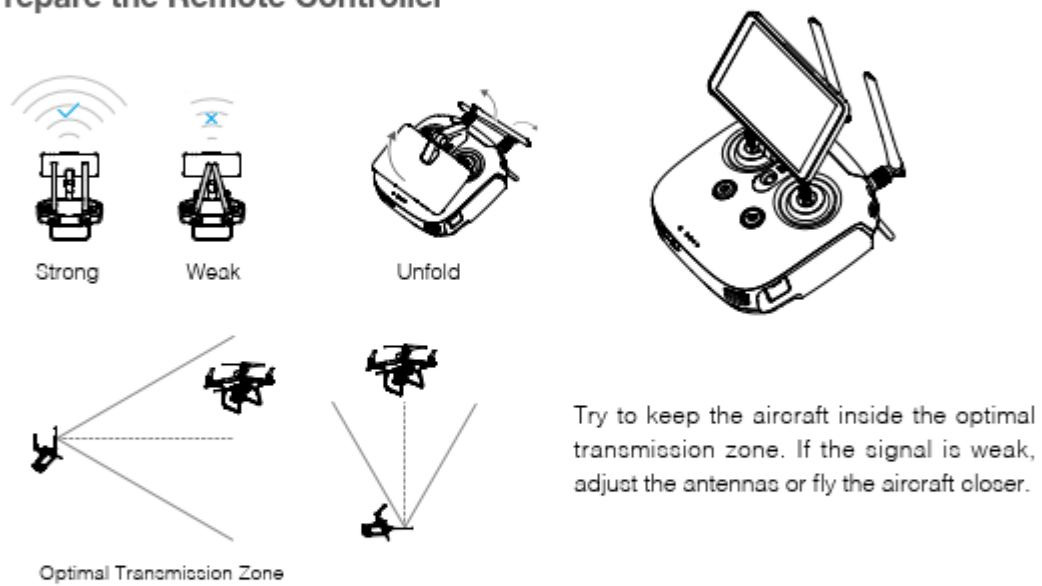
Press once to check the battery level. Short press once, then long press and hold to turn on/off.

4. Charge the Batteries



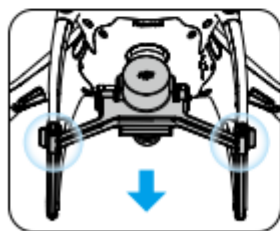
- Fully charge the batteries before first-time use.
- Ensure to connect the Intelligent Flight Batteries to the charging hub as shown in the figure above.
- Ensure that the Mode Switch of the Intelligent Flight Battery charging hub is set to the **Charging Mode** position.

5. Prepare the Remote Controller

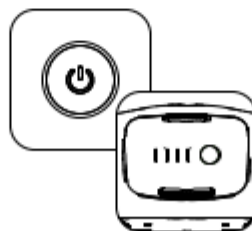


Try to keep the aircraft inside the optimal transmission zone. If the signal is weak, adjust the antennas or fly the aircraft closer.

6. Prepare for Takeoff



Remove the gimbal clamp from the camera.



Power on the remote controller and the aircraft.



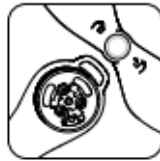
Enter the DJI GS RTK app.



When using your Phantom 4 RTK for the first time, activate it using the DJI GS RTK app. Ensure that the remote controller has access to the Internet.




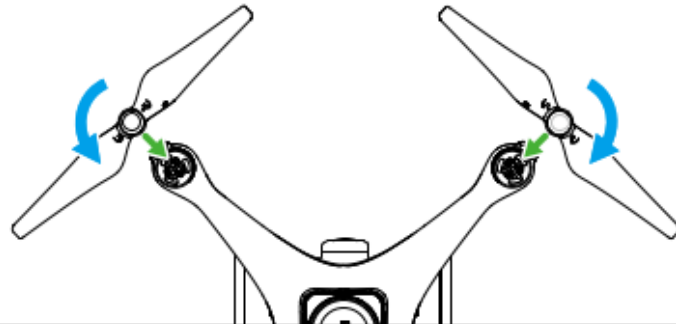
Black propeller rings go on motors with black dots.



Silver propeller rings go on motors without black dots.



Press the propeller down onto the mounting plate and rotate in the lock direction  until secure.



• Check that the propellers are secure before each flight.

7. Flight

Ready to Go (RTK)

Before taking off, make sure the Aircraft Status Bar in the DJI GS RTK app indicates Ready to Go (RTK)* or Ready to Go (GNSS).

Takeoff



Combination Stick Command to start/stop the motors



Left stick (in Mode 2) up slowly to take off

Landing



Left stick down slowly until you touch the ground

Hold for 3 seconds to stop the motors



• Spinning propellers can be dangerous. Stay away from spinning propellers and motors. DO NOT start the motors in confined spaces or when there are people nearby.

• Always keep your hands on the remote controller when the motors are spinning.

• Stopping motors mid-flight: Perform the CSC to stop the motors. This feature is disabled by default. It can be enabled in the app. Only stop motors mid-flight in emergency situations when doing so can reduce the risk of damage or injury.



It is important to understand basic flight guidelines, for the safety of both you and those around you. Do not forget to read the Disclaimer and Safety Guidelines.


* RTK positioning is recommended. Go to DJI GS RTK > Fly > ... > RTK to enable RTK module and select a method for receiving RTK signals.

8. Start Operations

Photogrammetry and waypoint actions can be performed using both PC GS Pro software and the DJI GS RTK app. The following example includes instructions for photogrammetry operation using the DJI GS RTK app. Refer to PC GS Pro User Manual for details (if in use).



* Users can also import KML/KMZ files to the app through a microSD card to plan photogrammetry operations. Refer to the Phantom 4 RTK User Manual for details.

** Select the operation again via the following method if the operation was not used immediately. Go to DJI GS RTK main screen > Fly >  on the left, select the operation from the planning list, and tap Invoke.

- ⚠ Only take off in open areas.
- An operation can be paused by toggling the Pause Switch. The aircraft will hover and record the breakpoint, and then the aircraft can be controlled manually. To continue the operation, select it from the list again and then resume. The aircraft will automatically return to the breakpoint and resume the operation.
- The aircraft will return to the Home Point automatically once the operation is complete. Instead of RTH, the aircraft can also be set to perform other flight actions within the app.

9. Applications



Field Planning

Import aerial photos into PC GS Pro to perform map post-processing. Then plan the field in PC GS Pro. Use a microSD card to import the plan file from PC GS Pro into the Agras MG-1S Advanced / MG-1P series remote controller. Refer to corresponding user manuals for more details.



High Accuracy Mapping

Import the original aerial photos into PC GS Pro and perform map post-processing to produce a high-accuracy map. Please refer to the PC GS Pro User Manual for more details.

Visit the link below to learn more about PC GS Pro:

<http://www.dji.com/po-gs-pro>

Specifications

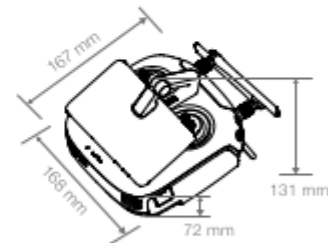
<ul style="list-style-type: none"> Aircraft 	
Weight (Battery & Propellers Included)	1391 g
Max Service Ceiling Above Sea Level	19685 ft (6000 m)
Max Ascent Speed	6 m/s (automatic flight); 5 m/s (manual control)
Max Descent Speed	3 m/s
Max Speed	31 mph (50 kph) (P-mode); 38 mph (58 kph) (A-mode)
Max Flight Time	Approx. 30 minutes
Operating Temperature	32° to 104° F (0° to 40° C)
Operating Frequency	2.400 GHz to 2.483 GHz (Europe, Japan, Korea) 5.725 GHz to 5.850 GHz (United States, China)
EIRP	2.4 GHz CE (Europe) / MIC (Japan) / KCC (Korea): < 20 dBm 5.8 GHz FCC (United States) / SRRC (Mainland China) / NCC (Taiwan, China): < 26 dBm
Hover Accuracy Range	RTK enabled and functioning properly: Vertical: ±0.1 m; Horizontal: ±0.1 m RTK disabled: Vertical: ±0.1 m (with vision positioning); ±0.5 m (with GNSS positioning) Horizontal: ±0.3 m (with vision positioning); ±1.5 m (with GNSS positioning)
Image Position Offset	The position of the camera center is relative to the phase center of the onboard D-RTK antenna under the aircraft body's axis: (36, 0, and 192 mm) already applied to the image coordinates in Exif data. The positive x, y, and z axes of the aircraft body point to the forward, rightward, and downward of the aircraft, respectively.
<ul style="list-style-type: none"> GNSS 	
Single-Frequency High-Sensitivity GNSS	GPS + BeiDou + Galileo* (Asia); GPS + GLONASS + Galileo* (other regions)
Multi-Frequency Multi-System High-Precision RTK GNSS	Frequency Used GPS: L1/L2; GLONASS: L1/L2; BeiDou: B1/B2; Galileo*: E1/E5 First-Fixed Time: < 50 s Positioning Accuracy: Vertical 1.5 cm + 1 ppm (RMS); Horizontal 1 cm + 1 ppm (RMS). 1 ppm indicates error with a 1 mm increase over 1 km of movement. Velocity Accuracy: 0.03 m/s
<ul style="list-style-type: none"> Mapping Functions 	
Mapping Accuracy**	Mapping accuracy meets the requirements of the ASPRS Accuracy Standards for Digital Orthophotos Class III.
Ground Sample Distance (GSD)	(H/36.5) cm/pixel, H indicates the aircraft altitude relative to the shooting scene (unit: m)
Acquisition Efficiency	Max operating area of approx. 1 km ² for a single flight (at an altitude of 182 m, i.e., GSD is approx. 5 cm/pixel, meeting the requirements of the ASPRS Accuracy Standards for Digital Orthophotos Class III).
<ul style="list-style-type: none"> Gimbal 	
Controllable Range	Pitch: -90° to +30°
<ul style="list-style-type: none"> Vision System 	
Velocity Range	≤ 31 mph (50 kph) at 6.6 ft (2 m) above ground with adequate lighting
Altitude Range	0 - 33 ft (0 - 10 m)
Operating Range	0 - 33 ft (0 - 10 m)
Obstacle Sensory Range	2 - 98 ft (0.7 - 30 m)
Operating Environment	Surfaces with clear patterns and adequate lighting (> 15 lux)
<ul style="list-style-type: none"> Infrared Sensing System 	
Obstacle Sensory Range	0.6 - 23 ft (0.2 - 7 m)
Operating Environment	Surface with diffuse reflection material, and reflectivity > 8% (such as wall, trees, humans, etc.)
<ul style="list-style-type: none"> Camera 	
Sensor	1" CMOS; Effective pixels: 20M
Lens	FOV (Field of View) 84°, 8.8 mm (35 mm format equivalent: 24 mm), f/2.8 - f/11, auto focus at 1 m - ∞
ISO Range	Video: 100 - 3200 (Auto), 100 - 6400 (Manual); Photo: 100 - 3200 (Auto), 100 - 12800 (Manual)



* supported later

** The actual accuracy depends on surrounding lighting and patterns, aircraft altitude, mapping software used, and other factors when shooting.

Mechanical Shutter	8 - 1/2000 s
Electronic Shutter	8 - 1/8000 s
Max Image Size	4864x3648 (4:3); 5472x3648 (3:2)
Video Recording Modes	H.264, 4K: 3840x2160 30p
Photo	JPEG
Video	MOV
Supported File Systems	FAT32 (\leq 32 GB); exFAT ($>$ 32 GB)
Supported SD Cards	microSD, Max Capacity: 128 GB, Class 10 or UHS-1 rating required
Operating Temperature	32° to 104° F (0° to 40° C)
● Remote Controller	
Operating Frequency	2.400 GHz to 2.483 GHz (Europe, Japan, Korea) 5.725 GHz to 5.850 GHz (United States, China)
ERP	2.4 GHz CE / MIC / KCC: $<$ 20 dBm 5.8 GHz FCC / SRRC / NCC: $<$ 26 dBm
Max Transmission Distance	FCC / NCC: 4.3 mi (7 km); CE / MIC / KCC / SRRC: 3.1 mi (5 km) (Unobstructed, free of interference)
Power Consumption	18 W (typical value)
Display Device	5.5 inch screen, 1920x1080, 1000 cd/m ² , Android system, 4G RAM + 16G ROM
Operating Temperature	32° to 104° F (0° to 40° C)
● Intelligent Flight Battery (PH4-5870mAh-15.2V)	
Capacity	5870 mAh
Voltage	15.2 V
Battery Type	LiPo 4S
Energy	89.2 Wh
Net Weight	468 g
Operating Temperature	14° to 104° F (-10° to 40° C)
Max Charging Power	180 W
● Intelligent Flight Battery Charging Hub (PHANTOM 4 CHARGING HUB)	
Voltage	17.5 V
Operating Temperature	41° to 104° F (5° to 40° C)
● Remote Controller Intelligent Battery (WB37-4920mAh-7.6V)	
Capacity	4920 mAh
Voltage	7.6 V
Battery Type	LiPo 2S
Energy	37.39 Wh
Operating Temperature	-4° to 104° F (-20° to 40° C)
● Intelligent Battery Charging Hub (WCH2)	
Input Voltage	17.3 to 28.2 V
Output Voltage and Current	8.7 V, 6 A; 5 V, 2 A
Operating Temperature	41° to 104° F (5° to 40° C)
● AC Power Adapter (PH4C160)	
Voltage	17.4 V
Rated Power	180 W



Download the user manual for more information:

<http://www.dji.com/phantom-4-rtk>

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PHANTOM 4 RTK