7.0 AIR QUALITY & DUST

7.1 INTRODUCTION

This chapter presents the potential impacts to air quality that may arise as a result of the construction and operation of the proposed airport development and its supporting infrastructure. Further details regarding the methods used in the assessment, details of the predicted effects and the mitigation measures proposed are provided in Appendix 7, Volume 4 of this ES.

Potential impacts on local air quality during the key phases of construction will be related to dust generating activities, including the:

- Construction of the temporary and permanent wharfs in Rupert's Bay;
- Quarrying of construction materials;
- Set-up and use of the Contractor's lay down and compound areas;
- Construction of the bulk fuel installation;
- Construction of the access/haul road;
- Use of the haul road by construction vehicles;
- Construction of the airport, terminal building and associated buildings; and
- Impact of construction traffic exhaust emissions on local air quality.

In addition, once the construction works are completed there may be:

- Impacts from dust emissions post construction; and
- Impacts from operations associated with the airport, post construction, on local air quality.

Where adverse impacts are predicted, control and mitigation measures to minimise the impacts at sensitive receptors are proposed.

The existing conditions relating to air quality, temporary and permanent potential effects and mitigation and residual effects, are described in this Chapter. These are described in order of the following areas and topics:

- **Rupert's Bay** (temporary and permanent wharf);
- **Rupert's Valley** (Contractor's offices and compound areas, bulk fuel installation and temporary quarry);
- **Rupert's Bay to Prosperous Bay Plain** (access/haul road);
- **Prosperous Bay Plain** (airport and associated infrastructure, temporary runway);
- **Bradleys Government Garage & Prosperous Bay Plain** (construction compounds);
- **Water Supply** (Sharks Valley intake, Dry Gut reservoir, and Gill Point sea water abstraction); and
- **Ancillary Components.**

Emissions of carbon dioxide associated with accessing the island by air, post construction, are discussed in Chapter 8.

7.1.1 Background to Dust

The most significant impacts from construction and operation are likely to be associated with the generation, dispersion and deposition of dust.

Dust is a generic term used to describe fine particles that are suspended in the atmosphere. Dust is formed when fine particles become entrained in the atmosphere by the turbulent action of wind or by the mechanical disturbance of fine materials.

The potential for dust formation during construction activities is difficult to quantify and will be dependent on the type of activity to be undertaken, soil and substrata type, topographical features, precipitation, wind speed and direction as well as the shape, size, density and moisture content of the particles. Dust is dispersed by wind; smaller dust particles remain airborne for longer, dispersing widely and depositing more slowly over a wider area.

7.1.2 Dust Legislation and Guidance

Although coarse dust is not regarded as a threat to health, as it is not readily inhaled into the lungs, it can create a nuisance by depositing on surfaces. No statutory or official air quality criterion for dust annoyance has been set at a UK, European or WHO level. However, in England and Wales there is a ‘custom and practice’ dust deposition limit. This guideline has been used widely in environmental assessments in the UK, and is similar to criteria in other countries.

The deposition of dust on buildings, windows, cars and street furniture is the most likely reason for people to make a complaint regarding dust. It is recognised that people’s perception of when deposited dust becomes a serious nuisance varies considerably. The following are examples of factors which can be used to determine whether surface soiling by dust is considered a nuisance:

- Deposition on a surface which is usually expected to remain free from dust;
- The colour contrast between the deposited dust and the surface upon which it settles;
- The nature of the illumination of the surface - "dinginess";
- The identity of the area and the composition of the local community; and
- The personal experiences and expectations of the observer.

7.2 METHODS

7.2.1 Construction Dust Assessment Methodology

The impacts of the airborne dust generated during the various stages of construction were assessed qualitatively.

Due to the technical difficulties in quantifying meaningful dust emission levels and dispersion rates, emphasis is generally placed on identifying those particular activities which give rise to the greatest dust emissions and then formulating suitable control strategies. Premises and occupants within 100 m of construction site are generally considered to experience the most significant impacts from construction dust.

Activities and processes with the potential to give rise to dust emissions are likely to be as follows:

- Blasting;
- Surface stripping;
- Crushing and grading;
- Wind-blow from materials storage;
- Mechanical materials handling, processing and transport;
- Vehicle/plant movements on haul/access routes;
- Vehicle/plant movements over construction site;
- Surface soil restoration;
- Wind blown materials from disturbed areas with no natural crusting or local vegetative cover; and
- Concrete batching and finishing.

Certain receptors are more sensitive to dust than others. For example, receptors such as hospitals and food processing plants may be described as high sensitivity; schools and residential areas medium sensitivity; and farms low sensitivity (ODPM, 2005). Receptors on the island with the potential to be affected by one or more aspects of the proposals will fall within all these sensitivity categories.

7.2.2 Construction Vehicle Emissions Assessment Methodology

In the context of this project, the emission of pollutants from the exhausts of construction vehicles and plant machinery is likely to be a less significant issue than the generation of dust.

7.3 EXISTING CONDITIONS

7.3.1 Overview

Given its location and lack of industrial, transport or domestic pollution sources, air quality across the island is currently very good. The arid nature of parts of the island, including Prosperous Bay Plain, will however mean that given local topography and meteorology, local dust generation is commonplace. With the exception of some short-term dust monitoring, conducted during a site visit as part of this study, no air quality monitoring has been undertaken on St Helena.

A number of site visits have been undertaken along the proposed haul/ access routes and on the proposed airport site. Observations of relevance to air quality and dust are presented in the following text.

7.3.2 Environment

The island has a varied topography, local microclimates and local vegetation, dependent on the climatic conditions, in particular rainfall. Rupert's Valley is characterised by bare and exposed scree and rock, and receives little rainfall, whereas Deadwood receives far greater rainfall and is well vegetated. Most notably, Prosperous Bay Plain is particularly arid has very little vegetation and is characterised by its fine sands. Particular in the dry windy areas dust may easily be generated. During the site visits, samples of material

were taken from the Central Basin for analysis, to help determine how readily they could be picked up by the wind and dispersed.

To illustrate the impact of disturbing the surface and generating dust, a trial was carried out whereby a vehicle was driven back and forth along an unsurfaced track. Dust monitoring was carried out at various distances perpendicular and downwind of the track. Despite the vehicle being driven at just 15 km/h, a highly visible cloud of dust was produced. This observation was reinforced by the high particulate concentrations measured; even at 50 metres from the track, high concentrations were recorded.

7.3.3 Sensitive Receptors

Those people and areas susceptible to the impacts of dust (sensitive receptors) vary. In Rupert's Bay and Valley there are food processing premises and residential areas. In Deadwood and Bradleys Government Garage there are more residential areas, and in Longwood there is arable land. In Prosperous Bay Plain there are rare, sensitive ecological habitats (see Chapter 9).

7.4 CONSTRUCTION EFFECTS

7.4.1 Potential Effects

During construction, the most significant impacts will be associated with the generation of dust due to construction activities, construction vehicle movements and quarrying. A potentially less significant issue will be exhaust emissions from construction vehicles and plant machinery.

7.4.2 Mitigation

Dust is best controlled at source by the use of appropriate plant handling techniques and good maintenance and housekeeping. Dust control measures, to minimise the generation and dispersion of dust, will be proposed and agreed prior to commencement of any work. The measures employed will be dependent on the Contractor's final schedule of works. Measures such as those in Table 7.1 will be adopted. Measures of a more site and activity specific nature are discussed in the sub-sections following the table.

Table 7.1 General Mitigation Measures

General Mitigation Measures During Construction
Haul Roads and Vehicle Movements
1. The haul roads that are intended to be sealed will be sealed as early as is possible so as to reduce dust emissions and the greater demand for water for use in dust suppression;
2. Sealed haul roads will be mechanically cleaned and sprayed to suppress dust, where necessary. Care will be taken to prevent the emission of dust from the air outlets on vacuum road sweepers.
3. Areas affected by the construction of the haul/access routes will be re-vegetated appropriately and promptly in consultation with the project ecologists.
4. A speed limit of 10 mph on unpaved haul roads within and outside the Contractor's compounds will be enforced and such limits will be displayed on appropriately designed signs. A speed limit of 15 mph will be enforced for construction traffic passing along sections of the haul/access road through residential and commercial areas and ecologically sensitive areas.
5. Vehicle movements on unmade roads will be limited wherever possible.
6. Vehicles carrying dusty materials within and outside of construction sites will be sheeted.

7. Vehicle wheel and body washing stations will be installed at exit points from the Contractor's site and upon leaving unsurfaced roads, where necessary and practical.
Contractor's Compounds and Stockpiles
8. Potentially dusty Contractors compounds (and areas within these compounds) within and in close proximity to sensitive areas will be enclosed with solid hoardings to a height of at least 2 metres where appropriate.
9. Material stockpiles will be compacted and profiled where appropriate and possible to reduce wind blown dust.
10. The surfaces of stockpiles or exposed surface within the site will be sprayed regularly to maintain surface moisture, especially during dry windy conditions. A 'crust' is likely to form, after which spraying will be less important. Crusted surfaces will be protected from unnecessary disruption.
11. Where appropriate, re-vegetation of the surface of long-term soil stockpiles will be undertaken, depending on the end use of the material.
12. Cement and other dust generating materials will be stored in bags or silos with appropriate filters and overfill alarms.
General
13. Where feasible, construction plant and dust generating activities will be positioned at the maximum possible distances from sensitive receptors such as residential areas. Where appropriate such activities will be carried out in shelters.
14. Activities to minimise the area of land disturbed within all the working areas will be planned and controlled at all times during the works to limit the area from which dust can be generated.
15. Where conveyors are used they will be fitted with drop chutes. The surface of the material on the conveyor will be sprayed with water after deposit onto the conveyor if practicable, where there is a likelihood of a dust problem.
16. The potential for dust generation associated with the transfer of materials to/from vehicles will be controlled by the enclosure of materials transfer equipment, the wetting of materials where practicable, the minimisation of drop height, and loading areas to be protected from winds.
17. Cutting or grinding equipment will be fitted with dust suppression where practicable.
18. Equipment type and construction techniques will be suitable for working in arid environments for the construction of the haul/access route airport and quarry activities.
19. The programme will be designed to minimise unnecessary materials movements, by consideration of the locations of storage areas and by re-using materials wherever possible.
20. The use of dust suppressants will be used on both haul/access route alignments and the large open areas of the proposed airport, consistent with ecological mitigation requirements presented in Chapter 9.
21. All open fires will be prohibited: this includes fires for the disposal of vegetation, packaging, or any other material.
22. Construction vehicles and plant equipment will not be left operating unnecessarily, so as to minimise exhaust emissions.
23. Ageing equipment with poor emissions standards will not be used. Vehicles of Euro II emissions standard or equivalent should be used wherever possible.
24. Sea water and other dust suppressants will not generally be used, particularly for areas to be reinstated so as to support natural ecological communities as their use is likely to render conditions unsuitable for plant and animal re-colonisation. Nevertheless at times of major dust generation potential (dry windy weather) it may be appropriate for additives and binders to be added to water for dust suppression in less sensitive areas.

7.4.2.1 Rupert's Bay

Measures of particular relevance to minimise dust emissions associated with the construction of the wharfs will depend on the methods chosen by the Contractor. However, in addition to the measures listed above. Regular inspections will be carried out to confirm the effectiveness of the measures. If necessary, further measures would be identified and implemented to prevent the ingress of dust into the fish processing plant in consultation with the operators of the businesses concerned.

7.4.2.2 Rupert's Valley

Several Contractors' compounds are proposed for Rupert's Valley. The use of each compound will depend on the Contractor's detailed plans. In addition to the measures listed above, particular attention will be made to the location of the Contractors' compounds in relation to the sensitive receptors, namely the residential properties in the Valley, the cannery, and the fish processing plant. The storage of dust materials and activities with the potential to create most dust will be located in compounds further from these receptors.

There are various specific methods for minimising the impacts of dust from mineral operations at the proposed temporary quarry; they can be categorised as either:

- Minimising the creation of dust by appropriate planning and design; or
- Controlling the escape of dust and enabling the removal of dust where appropriate.

7.4.2.3 Rupert's Bay to Prosperous Bay Plain Haul Road

The haul road has been routed as far as possible to avoid sensitive receptors including residential properties and sensitive ecological sites. The design and the implementation of construction will be such that there will be minimal disturbance caused when working within sensitive areas. In addition, as discussed in the potential effects section, the haul road will be sealed where it passes sensitive locations.

7.4.2.4 Prosperous Bay Plain

The primary concern in this area is the potential detrimental impact that dust emissions may have on the sensitive ecological habitats. Due to the range of activities likely to take place during the construction of the airport and infrastructure a wide variety of mitigation measures will be required. The strong prevailing winds will carry the dust towards the Central Basin area, potentially affecting habitats there. In addition to the measures in the table above, it may be appropriate to use a series of high barriers to trap dust. These barriers will be particularly effective at trapping the larger fractions of dust. Due to the large areas, and the scarcity of water available for dust suppression (assuming sea water cannot be used in such an ecologically sensitive area) these barriers have the potential to be an effective form of mitigation, assuming they are appropriately positioned. Due to regulations regarding the height of obstacles around an airport, these barriers will need to be removed before the airport is operational.

7.4.2.5 Bradleys Government Garage and Prosperous Bay Plain

The use of each Contractor's compound would depend upon the Contractor's detailed plans. Particular attention will be made to their location and access, in relation to the sensitive receptors, namely the residential properties at Government Garage at Bradleys. The link road between the compound and the haul road will be sealed.

7.4.3 Residual Effects

7.4.3.1 Rupert's Bay

Assuming that appropriate mitigation is employed, as described, the residual dust impacts would be reduced to **minor adverse** significance overall. The sensitive receptor of greatest concern is the 'Argos' fish processing plant, located near the proposed wharf.

7.4.3.2 Rupert's Valley

Assuming that appropriate mitigation is employed, as described, the residual dust impacts associated with the Contractors' compounds would be reduced to **minor adverse** significance. Due to its location away from sensitive receptors, dust impacts associated with the construction of the BFI will be of **negligible** significance.

Assuming appropriate mitigation is employed, the residual impacts associated with the upper-valley quarry option would be of **negligible** significance and the residual impacts associated with the mid-valley quarry option would be of **minor adverse** significance.

7.4.3.3 Rupert's Bay to Prosperous Bay Plain Haul Road

Due to the construction of the haul road and its subsequent use the following residual impacts are predicted:

- Dust impacts of **minor** adverse significance are predicted in Rupert's Bay. The sensitivity of the fish processing plant and the cannery with respect to dust emissions will require regular inspections to ensure the successful implementation mitigation measures;
- Dust impacts of **minor** adverse significance are predicted at residential properties in Rupert's Valley, due to the large number of construction vehicle movements;
- Dust impacts of **minor** adverse significance are predicted at residential properties in Deadwood, particularly during construction/upgrading of the road;
- Dust impacts through Mulberry Gut, Longwood, Bilberry Field Gut and Bottom Woods are predicted to be of **negligible** significance;
- Dust impacts at Government Garage, Bradleys are predicted to be of **negligible** significance; and
- Dust impacts on the sensitive ecology of the Central Basin are discussed in Chapter 9 Ecology.

7.4.3.4 Prosperous Bay Plain

The primary concern is the detrimental impact that dust emissions will have on sensitive ecological habitats. Temporary effects are predicted, largely as a result of the ecological sensitivity of the area and the potential shortage of water for dust suppression, considering the size of the area affected and the dry and windy conditions (see Chapter 9). There will also be permanent effects which are discussed below.

7.4.3.5 Bradleys Government Garage and Prosperous Bay Plain

There are likely to be significant dust impacts at Government Garage at Bradleys, primarily due to vehicle movements to and from the Contractor's compound. The residual impacts are likely to be temporary and of **minor adverse** significance.

7.5 PERMANENT AND OPERATIONAL EFFECTS

7.5.1 Potential Effects

There are two categories of effects to consider:

- The potential for the construction of the airport (particularly the permanent changes to the topography) to have a permanent impact in terms of the dispersion and deposition of dust in Prosperous Bay Plain; and
- Once operational, there will be emissions of pollutants from aircraft, associated airport operations, and from vehicles travelling to and from the airport.

7.5.2 Mitigation

During construction high wind breaks may be used to minimise the dispersion of dust. However, due to regulations regarding the height of obstacles around an airport, these barriers will need to be removed before the airport is operational.

The access road has been routed as far as possible to avoid sensitive receptors including residential properties and sensitive ecological sites.

7.5.3 Residual Effects

The residual permanent effect of lowering the Eastern plateau, which currently provides shelter to the Central Basin, will result in a long-term impact in terms of dust emissions. Wind speeds on Prosperous Bay Plain, especially within the Central Basin will be affected, and areas which are currently sheltered will become exposed. Particles in these areas are predicted to be moved gradually and deposited in more sheltered areas. The effects of dust on ecology is discussed in Chapter 9.

The operational impact on local air quality of aircraft flights, airport vehicles and vehicles travelling to/from the airport will be **negligible.**

7.6 SUMMARY

Effective measures for activities elsewhere are predicted to be capable of minimising the predicted impacts to negligible or minor adverse in most instances (Table 7.2). The activities on Prosperous Bay Plain will be of a very large scale and duration: the area is dry and dusty with little vegetation, the sensitive ecosystem are dust-sensitive, it is exposed to strong to the prevailing south-easterly winds, and the water required for dust suppression may be scarce. See Chapter 9 for effects of dust on the ecology.

Table 7.2 Summary of Impacts

Area and Activity	Potential Impacts	Approach to Mitigation	Possible Residual Impact after Mitigation
Temporary Construction Effects			
Rupert's Bay (temporary and permanent wharf)	Moderate Adverse dust impact possible at the fish processing plant during wharf construction.	Refer to Table 7.1, and the measures relating to the Contractors' compounds.	**Minor Adverse** dust impact
Rupert's Valley (Contractor offices and compound areas; bulk fuel installation; and temporary quarry)	Moderate Adverse dust impact due to emissions from the Contractor's compounds. Relevant receptors include the fish processing plant and residential receptors in the valley.	Refer to Table 7.1. Activities with the potential to create dust will be located in compounds further from the sensitive receptors	**Minor Adverse** dust impact
	Negligible impact associated with the construction of the BFI.	Refer to Table 7.1.	**Negligible** impact
	Minor adverse dust impact associated with emissions from the upper-valley quarry option; moderate adverse impacts associated with emissions from the mid-valley quarry option	Various measures to minimise emissions from vehicles, stockpiles, material processing and excavation.	**Negligible** dust impact associated with the upper-valley quarry option; **minor adverse** impacts associated with the mid-valley quarry option
Rupert's Bay to Prosperous Bay Plain (access/haul road)	Rupert's Bay: Moderate to Major adverse dust impact, primarily due to the sensitivity of food processing receptors.	Refer to Table 7.1, and the mitigation measures relevant to the construction and use of the haul road. The haul/access road has been routed as far as possible to avoid sensitive receptors. The design and implementation of construction will be such that there will be minimal disturbance caused. The haul road is to be sealed where it passes sensitive locations. Preventing the ingress of dust into the cannery.	**Minor adverse** dust impact
	Rupert's Valley: Moderate Adverse dust impact due to emissions primarily from construction vehicles.		**Minor adverse** dust impact
	Deadwood: Moderate Adverse dust impact due to emissions during construction and during use, and the proximity of residential properties.		**Minor adverse** dust impact
	Mulberry Gut to Bottom Woods: Minor Adverse dust impacts due to presence of arable land.		**Negligible** impact
	Prosperous Bay Plain & Bradleys Government Garage: Potential adverse dust impacts primarily due to the ecological sensitivity of the area		See Chapter 9 for effects on Central Basin
	Negligible impacts associated with exhaust emissions during construction and use of the access/haul road.	Refer to Table 7.1.	**Negligible** impacts associated with exhaust emissions during construction and use of the access/haul road

Area and Activity	Potential Impacts	Approach to Mitigation	Possible Residual Impact after Mitigation
Prosperous Bay Plain (airport and associated infrastructure, any temporary runway)	Potential adverse dust impacts due to the scale and extent of the works.	Refer to Table 7.1 above. In addition to these measures a series of high barriers to trap dust and reduce wind speeds.	See Chapter 9 for effects on Ecology.
Bradleys Government Garage & Prosperous Bay Plain (construction compounds)	Minor to Moderate Adverse dust impacts at the receptors at Bradleys Government Garage due to activities within the compound and vehicle movements to and from the compound.	Refer to Table 7.1 and the measures relating to the Contractors' compounds. Possible sealing of the link road between the compound and the haul road.	**Minor adverse** dust impact
Water Supply (Sharks Valley intake, Dry Gut reservoir, and Gill Point sea water abstraction)	Negligible impacts	Refer to Table 7.1. Best practice will be adopted	**Negligible** impacts
Ancillary Components	Negligible impacts	Refer to Table 7.1. Best practice will be adopted	**Negligible** impacts
Permanent and Operational Effects			
Rupert's Bay (temporary and permanent wharf)	Negligible impacts	No mitigation required.	**Negligible** impacts
Rupert's Valley (Contractor offices and compound areas; bulk fuel installation; and temporary quarry)	Negligible impacts associated with the Contractors' compounds.	No mitigation required.	**Negligible** impact
	Negligible impact associated with the construction of the BFI.	No mitigation required.	**Negligible** impact
	Negligible impacts associated with either quarry	The quarry area will be restored after use.	**Negligible** impact
Rupert's Bay to Prosperous Bay Plain (access road)	Negligible impacts	No mitigation required.	**Negligible** impacts
Prosperous Bay Plain (airport and associated infrastructure, any temporary runway)	Negligible impacts associated with vehicle and aircraft emissions at the airport once operational.	Provision of public transport to the airport. Adherence to speed limits.	**Negligible** impacts associated with vehicle and aircraft emissions at the airport once operational
Bradleys Government Garage & Prosperous Bay Plain (construction compounds)	Negligible impacts	No mitigation required.	**Negligible** impacts
Water Supply (Sharks Valley intake, Dry Gut reservoir, and Gill Point sea water abstraction)	Negligible impacts	No mitigation required.	**Negligible** impacts
Ancillary Components	Negligible impacts	No mitigation required.	**Negligible** impacts