

# CAA REPORT

## Heathrow Q6 Capex Efficiency Review

SEPTEMBER 2020

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# CAA Q6 Capex Efficiency Review Report

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This report dated 07 November 201907 November 201907 November 2019 has been prepared for Civil Aviation Authority (CAA) Civil Aviation Authority (CAA) Civil Aviation Authority (CAA) (the "Client") in accordance with the terms and conditions of appointment dated 02 May 201702 May 201702 May 2017 (the "Appointment") between the Client and Arcadis UK Limited ("Arcadis") for the purposes specified in the Appointment. For avoidance of doubt, no other person(s) may use or rely upon this report or its contents, and Arcadis accepts no responsibility for any such use or reliance thereon by any other third party.



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# Glossary

| Abbreviation | Description                                                                |
|--------------|----------------------------------------------------------------------------|
| ALARP        | As Low as Reasonably Possible                                              |
| AOC          | Airline Operators Committee                                                |
| XXX          |                                                                            |
| CAA          | Civil Aviation Authority                                                   |
| CAPEX        | Capital Expenditure                                                        |
| CCD          | Cost Control Document                                                      |
| CEMAR        | Contract Event Management and Reporting                                    |
| DI           | Delivery Integrators                                                       |
| EAC          | Estimate at Completion                                                     |
| XXX          | XXXXXXXXXX XXXXXXXX XX                                                     |
| G3 G4        | Governance Investment Decision Gateways                                    |
| HAL          | Heathrow Airport Limited                                                   |
| HLC          | High-Level Controls                                                        |
| IDL          | International Departures Lounge                                            |
| IFS          | Independent Fund Surveyor                                                  |
| ISG          | Infrastructure Steering Group                                              |
| L & L        | Leadership and Logistics                                                   |
| MPR          | Monthly Project Review                                                     |
| NCE's        | Notified Compensation Events                                               |
| NEC          | New Engineering Contract                                                   |
| OHP          | Overhead and Profit                                                        |
| PPR          | Post Project Review                                                        |
| Q6           | Heathrow Airport's 6 <sup>th</sup> Regulatory Control Period (2014 – 2018) |
| QA           | Quality Assurance                                                          |
| QSM          | Quality Service Measure                                                    |

|      |                               |
|------|-------------------------------|
| RAB  | Regulated Asset Base          |
| SEB  | Supplier Evaluation Board     |
| T3IB | Terminal 3 Integrated Baggage |
| WBU  | Western Baggage Upgrade       |
| WI   | Works Information             |

# 1 Introduction

Towards the end of each control period, the Civil Aviation Authority (CAA) carries out an assessment of Heathrow Airport Limited's (HAL's) performance in relation to the efficiency of its capital expenditure programme to support any decisions it makes relating to allowing or disallowing capital expenditure to be added to the RAB.

Arcadis has been asked by the CAA to advise on HAL's capital efficiency and in particular identify and estimate any inefficiency in a sample of HAL's capital projects during the Q6 regulatory control period.

The Q6 regulatory period at Heathrow ran from 2014 and was due to expire in December 2018. Following the Government's 2016 decision to support Heathrow expansion, the CAA extended the current Q6 regulatory period by one year, until 31 December 2019.

To ensure that the price control period remains aligned with the process of expansion, the CAA has since decided to further extend the Q6 period by two additional years, until 31 December 2021. The CAA is currently consulting on the methodology to be used for this further extension.

The CAA, in discussions with the airline community and HAL has selected ten projects to be reviewed as part of this process. It should be noted that Arcadis has not been involved in the selection process of the projects being assessed as part of the Q6 Capex Efficiency review.

The scope of this report is to test whether HAL has been efficient with their spending of CAPEX, on the selected projects, during the Q6 regulatory period to date. Arcadis has used its professional judgment to determine efficiency or inefficiency and our decisions will be based on the evidence and information that has been gathered and assessed as part of this review.

Arcadis' objectives were to engage with HAL, the IFS and Airlines, to review the projects identified by the CAA and, building on and furthering the work of the IFS, provide a transparent assessment of whether capital expenditure has been efficiently incurred.

Arcadis was asked to review the following projects identified by the CAA in three separate "Pots":

## Pot 1a – IFS Assured Projects (completed)

- B051 - Terminal 3 Integrated Baggage (T3IB)
- B238 - Terminal 5 Western Baggage Upgrade (T5WBU)

## Pot 1b – IFS Assured Projects (incomplete)

- B131 - Main Tunnel
- B131 - Cargo Tunnel

## Pot 2 – Non-IFS Assured Projects

- B066 - Energy and Utilities Management – Supply
- B101 - Terminal 3 Pier 7 Main Roof Works
- B101 - Terminal 4 Rooflight Replacement
- B101 - Terminal 4 CPS1548 & CPS1918 -T4 Toilets & Finishes
- B316 - Terminal 3 Refurbishment & Enhancement – International Departures Lounge (IDL)
- B009 - Northern Perimeter Parking

## The role of the Independent Fund Surveyor

During the Q6 period an Independent Fund Surveyor (IFS) has been employed on behalf of HAL and the Airlines to provide assurance on key capital projects. In its Capital Efficiency Handbook HAL states the objective of the IFS as being, "to provide an ongoing assessment of the reasonableness of all key decisions made on key projects and, in undertaking projects the capital is being used effectively to deliver the outcomes

determined by the business case". In carrying out its review of the specified projects Arcadis have proceeded, where applicable and appropriate, to build on and further the work already done by the IFS.

Note: The price base for the figures contained within this report are nominal and as reported at the time of undertaking the review. These numbers have not been adjusted to consider inflation or where there have been further updates to the prices based on subsequent amendments from HAL or where projects are still on-going.

## 2 Executive Summary

Arcadis has been asked by the CAA to advise on HAL's capital efficiency and in particular identify and estimate any inefficiency in a sample of HAL's capital projects during the Q6 regulatory control period. The scope of this report is to test whether HAL has been efficient with their spending of CAPEX, on the ten selected projects, during the Q6 regulatory period to date.

### Key findings:

- Seven of the selected ten projects reviewed have been delivered efficiently.
- Potential inefficiency in two projects (B051: T3 Integrated Baggage and B238: T5 Western Baggage Upgrade) has been identified and HAL's actions may have contributed to this however this is hard to quantify or easily attribute.
- Potential inefficiency has been identified in one project (B131 – Cargo Tunnel). There is clear evidence that the actions of HAL may have directly contributed to a financial or benefits loss.

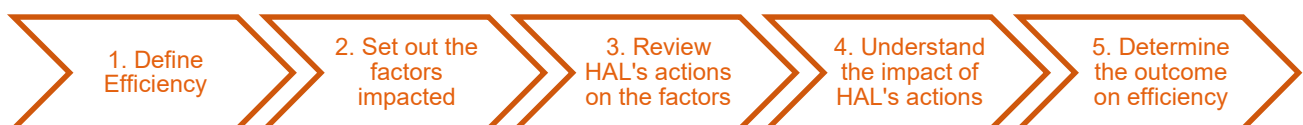
Towards the end of each price control period, the CAA carries out an assessment of HAL's performance in relation to the efficiency of its capital expenditure programme to support any decisions it makes relating to allowing or disallowing capital expenditure to be added to the RAB.

Arcadis has been appointed by the CAA to provide technical advice in support of their end of control period assessment of HAL's performance in relation to the efficiency of the capital expenditure programme. Arcadis' scope of work has been to capture and analyse data and information regarding the selected projects delivered as part of the Q6 regulatory period to provide assurance to the CAA that the use of capital expenditure by HAL through the Q6 regulatory control period has been efficient.

The CAA, in discussions with the airline community and HAL has selected ten projects to be reviewed as part of this process. It should be noted that Arcadis has not been involved in the selection process of the projects being assessed as part of the Q6 Capex Efficiency review.

In undertaking this review, Arcadis has assessed whether the selected projects have been delivered efficiently or potentially inefficiently and set out the reasoning behind these conclusions. This report does not set out to determine the quantum or value of any inefficiency however, it will support the CAA to focus any further analysis as part of the Q6 review workstream.

### Arcadis process when undertaking review



### 2.1 Defining Efficiency

The starting point for the review was to set a definition of efficiency that could be used to assess HAL's Capex expenditure performance across the Q6 projects selected for review by the CAA. All well run projects will have a set of criteria (or factors) that, if managed appropriately, will usually result in a project being delivered efficiently. These are the project:

- Scope
- Time
- Cost

- Risk
- Gateway Process
- Procurement
- Programme Governance
- Development Process
- Stakeholder Engagement

HAL's Capital Efficiency Handbook (April 2015) is intended to act as a reference source providing detail and guidance to those involved in the Heathrow Gateway Lifecycle process. The Handbook has set out a clear definition of both efficient and inefficient Capex:

- **Efficient Capex** is the delivery of an asset in a manner which optimises and balances scope, time, cost, and risk, procured in an appropriate manner having followed a structured Development Process with appropriate decision points and governance.
- **Inefficient Capex** is the delivery of an asset in a manner which significantly fails to balance scope, time, cost, and risk, or which is procured in an inappropriate manner or has failed to follow a structured Development Process with appropriate decision points and governance; and which has directly resulted in a financial or benefit loss.

Arcadis has considered other examples of capital efficiency assessment and referenced HAL's approach against other examples of best practice including the work undertaken by the Transport Infrastructure Efficiency Taskforce in December 2017 in publishing its Transport Infrastructure Efficiency Strategy.

Arcadis has not constrained its view when assessing the capital efficiency of the selected projects on just the content of the HAL Capital Efficiency Handbook (April 2015) but concludes that definitions of efficiency and inefficiency contained within this document reflect the efficiency criteria required to effectively manage and govern projects.

## 2.2 Factors Impacted by efficiency

As part of this review, Arcadis has focused on the factors (levers) that influence the efficient delivery of a project. These factors, although not explicitly described are also used in HAL's own definition of efficiency set out in 2.1. These factors are the project:

- **Project Brief** that states the objectives and intended benefits of the project
- **Scope** that determines and documents the specific project goals, deliverables, tasks, costs and deadlines;
- **Time** where a timeline is developed for the completion of a project or deliverable;
- **Cost** that considers the total funds needed to complete the project or work that consists of both Direct Cost and Indirect Cost;
- **Risk** where an uncertain event or condition that, if it occurs, influences at least one project objective;
- **Procurement** which involves obtaining all of the materials and services that are required for the project ;
- **Development processes** which is the planning, organizing, coordinating, and controlling of the resources required to accomplish specific goals;
- **Gateway process** which is a project assurance methodology designed to support the effective development, planning, management and delivery of projects, services and programs;
- **Programme governance** that oversees multiple projects and includes approval gates at which viability is reviewed and approved; and
- **Stakeholder engagement** where interacting with and influencing project stakeholders to the overall benefit of the project takes place.

Arcadis, as part of its review, assessed how HAL has dealt with these factors across the selected Q6 projects and has sought to determine whether this has potentially resulted in any financial or benefits loss as an outcome of HAL's inefficient project delivery. There are factors within any project that may not be delivered 'as planned' however those in themselves may not result in an inefficiency at the end of the project. The key to this review was to consider how HAL has delivered these projects and to determine whether their actions are the cause of any potential inefficiency.

## 2.3 Understanding HAL's Actions

The first phase in understanding HAL's actions was to undertake a detailed review of the project and to run through the key documentation associated with its delivery. This supported the development of a chronology of events with key issues that potentially impacted on the project and set out HAL's actions in relation to the delivery of the project.

The second phase was to undertake interviews with the individual(s) involved in delivering the project or who had detailed knowledge of the project from HAL. In addition, where the IFS were involved, separate interviews were undertaken to ensure as much of the first phase information and understanding was validated and discussed.

Finally, a meeting was held with the representatives of the Airline community to understand their position on the delivery of the selected projects. The aim being to gather the Airline community perspective on how they thought the selected projects had been delivered.

## 2.4 Reviewing the Impact

Having gathered the evidence relating to the selected projects, Arcadis has reviewed this in relation to the definition of efficiency as set out in 2.1 above and used the information provided, both written and through the interview process, to assess whether HAL has delivered either an efficient or inefficient project.

Arcadis has shared its draft findings with HAL, the IFS and Airline community for comment and where any factual inaccuracies have occurred, Arcadis has then corrected these and reviewed the conclusions considering any changes. These have been incorporated into this final version of the report.

## 2.5 Summary of Project Costs

The table below sets out the last approved budget, the final or forecast cost and any variance between these two numbers. The last approved budget is the budget that has been agreed by HAL with the airline community. The final cost is the outturn cost of the completed projects. The forecast cost is used on projects that are yet to be completed at the time of this review.

| Project                             | Last Approved Budget £m | Final Cost £m | Forecast Cost £m | Variance £m |
|-------------------------------------|-------------------------|---------------|------------------|-------------|
| B051: T3 Integrated Baggage         | 92.2                    | 136.1         | -                | 43.9        |
| B238: T5 Western Baggage Upgrade    | 20.7                    | 25.9          | -                | 5.2         |
| B131: Main Tunnel Refurbishment     | 86.0                    | -             | 146.3            | 60.3        |
| B131: Cargo Tunnel Refurbishment    | 44.9                    | -             | 197.0            | 152.1       |
| B066: Energy & Utilities Management | 51.3                    | 48.2          | -                | 3.1         |
| B101: T3 Pier 7 Roof Works          | 29.9                    | 29.7          | -                | 0.2         |

|                                          |      |      |   |     |
|------------------------------------------|------|------|---|-----|
| B101: T4 Rooflight Replacement           | 13.1 | 11.3 | - | 1.8 |
| B101: T4 Toilets & Finishes              | 14.5 | 15.2 | - | 0.7 |
| B316: T3 IDL Refurbishment & Enhancement | 18.6 | 18.5 | - | 0.1 |
| B009: T5 Northern Perimeter Parking      | 3.1  | 4.9  | - | 1.8 |

## 2.6 Efficiency Determination

The table below sets out Arcadis' determination on whether the project was delivered efficiently or inefficiently. Arcadis has set out the main conclusion it has drawn from its review in the table below, and there is a detailed analysis of every project set out in the review section of this report that explains Arcadis' determination.

| Project Name                                | Delivered efficiently* or potential inefficiency identified? | Review Conclusion                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| B051 - Terminal 3 Integrated Baggage (T3IB) | Potential inefficiency identified                            | <p>The lateness and content of the major variation on the project would lead us to consider there had been a degree of inefficiency on the part of HAL in dealing with the issue.</p> <p>Quantifying to any extent what HAL could have done, by way of earlier identification of scope, is extremely difficult. The unknown complexity of the project has made it difficult to appreciate when clarity of scope became obvious.</p> <p>Arcadis could not establish, definitively, whether any inefficiency on the part of HAL led to any capital inefficiency. It is difficult to demonstrate that HAL paid more for the works than they reasonably should have.</p> <p>There is insufficient evidence for a firm conclusion that the project was inefficient, however Arcadis has not been convinced that the project was delivered efficiently.</p>                                       |
| B238 – T5 Western Baggage Upgrade (T5WBU)   | Potential inefficiency identified                            | <p>On the first of the two stoppage issues on the project it would appear the underlying cause of the issue was supplier performance and [REDACTED]'s inability to adequately resource the project. Arcadis can find no evidence of HAL directly contributing to the cause of the issue. HAL's actions were in mitigation of the impacts.</p> <p>The circumstances and impacts surrounding the second postponement are not so clearly identifiable. It would appear the cause for the need to defer was an increase in risk to airline operations as a result of changes introduced by the airlines to their existing schedules and further complications with the delivery of the new baggage system.</p> <p>There is insufficient evidence for a firm conclusion that the project was inefficient, however Arcadis has not been convinced that the project was delivered efficiently.</p> |
| B131 - Main Tunnel                          | Efficiently delivered                                        | <p>In reviewing HAL's procurement of [REDACTED] and the project's state of readiness to proceed, on the balance of the information reviewed, Arcadis consider it was fit to do so.</p> <p>In relation to [REDACTED]'s poor performance throughout the period 2015 and early 2016, Arcadis would consider HAL did</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

|                                                 |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                 |                                   | <p>everything that could reasonably have been expected to mitigate the impacts.</p> <p>Arcadis considers the removal of the Cargo Tunnel scope and change in the form of contract to have been the correct course of action.</p> <p>The assessment of XXX's contract price at £XXXm for the Main Tunnel was appropriately calculated and is not considered inefficient.</p> <p>From the period post the Deed of Amendment HAL did everything that could reasonably have been expected to mitigate the impacts of the contractor's poor performance.</p> <p>In summary Arcadis would consider the project to have been properly and efficiently managed during the periods pre and post the Deed of Amendment and HAL did not contribute to capital inefficiency.</p>                                                                                                                                                            |
| B131 - Cargo Tunnel                             | Potential inefficiency identified | <p>In recommending the project, and with reference to the significant variance between budget and solution, HAL made no attempt to gain any form of alignment. HAL progressed the project with little chance of making any meaningful savings and without setting any realistic cost limits for which the design team to work within.</p> <p>Throughout 2017 and early 2018, as the design progressed, there is still no evidence of HAL having introduced any form of structured, meaningful cost limits for the design team to work within.</p> <p>In addition to the budget, there appears to have been no ongoing review of the forecast schedule duration.</p> <p>In summary, Arcadis considers the project not to have been properly and efficiently managed post the period of re-commencement to stand-down and as a consequence there being an element of capital inefficiency that is likely attributable to HAL.</p> |
| B066 - Energy and Utilities Management – Supply | Efficiently delivered             | <p>Due to safety concerns the project was commenced when levels of risk and uncertainty of scope were high. Despite this, it was delivered under budget and in accordance with the planned schedule.</p> <p>Management in all areas of project performance was shown to be good.</p> <p>Arcadis considers that value for money was achieved and that the project was well managed throughout and delivered efficiently.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| B101 - Terminal 3 Pier 7 Main Roof Works        | Efficiently delivered             | <p>Following commencement of the project it was ascertained that the roof structure was not as initially envisaged, and areas of paintwork contained asbestos. Both of these issues impacted on the cost of the project. Arcadis are satisfied that the late discovery of the above did not result from a lack of pre-work and that they were managed effectively.</p> <p>Management in all areas of project performance was shown to be good.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

|                                                           |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                           |                       | Ultimately the project was delivered under budget but several months late. Arcadis considers that value for money was achieved and that the project was well managed throughout and delivered efficiently.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| B101 -Terminal 4 Rooflight Replacement                    | Efficiently delivered | <p>Management in all areas of project performance was shown to be good.</p> <p>The project was ultimately delivered under budget and slightly early. Arcadis considers that value for money was achieved and that the project was well managed throughout and delivered efficiently.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| B101 - Terminal 4 CPS1548 & CPS1918 -T4 Toilet & Finishes | Efficiently delivered | <p>Two issues had a detrimental effect on the final outturn costs; IT scope that had not been identified, and a specification change that was discovered late in the project. The latter led to a need to change fittings (not sanitary ware) extending the handover.</p> <p>Management in all other areas of project performance was shown to be reasonable.</p> <p>The overall project was ultimately delivered slightly over budget with the Toilets slightly late. Arcadis view the issues with IT and specification changes were foreseeable. The element of extra work involved with the change of fittings although abortive, the value of the works would not categorise the overall project as being inefficient.</p>                 |
| B316 - Terminal 3 Refurbishment & Enhancement – IDL       | Efficiently delivered | <p>The discovery of asbestos and issues with the floor both impacted on the project. However, due to limited opportunity to conduct intrusive surveys in an operational area it is not a reflection of inefficient management of the project.</p> <p>Management in all areas of project performance was shown to be good.</p> <p>The project was ultimately delivered under budget and slightly late. Arcadis consider that value for money was provided and that the project was well managed throughout and delivered efficiently.</p>                                                                                                                                                                                                       |
| B009 – Northern Perimeter Parking                         | Efficiently delivered | <p>Unforeseen ground conditions had a significant cost impact on the project as only a visual survey was carried out prior to the commencement of the works. The reason for this is understandable under the circumstances and HAL have taken this on board as learning.</p> <p>Due to scheduling issues with the Contractor the contract was amended to a fixed price form which benefited the project by way of providing cost certainty.</p> <p>Management in all areas of project performance was shown to be reasonable.</p> <p>The project was ultimately delivered over budget and later than initially planned, however Arcadis consider that value for money was achieved and that the project was adequately managed throughout.</p> |

\*Based on the definition of efficiency contained within the Capital Efficiency Handbook (April 2015)

## 2.7 Common Issues

From our review of the projects the following factors were seen to have negatively contributed to their outcomes:

### **Lacking Clarity of Scope**

For all of the four major projects in Pot 1 and three of the Pot 2 projects there would appear to have been a lack of definition of scope at the time of HAL entering into contract with its contractor. This may have contributed to the cost and time overruns on these projects. There is evidence of significant extra scope having been required to be instructed into these projects by HAL which, had more detailed development work been carried out, would have been known about earlier in the project lifecycle and initially budgeted for in the project brief and business case.

### **Inappropriate Contract Model**

Across the majority of the projects reviewed, HAL's chosen form of contract has been the Target Cost Option C form with a Contractor favourable pain/gain mechanism. In the case of T3IB, An Option E Cost Reimbursable type of contract was used for part of the delivery. In its adopted form it is clear that the contracts used did not incentivise the Contractors to the degree required, and, other forms, or different pain/gain structures, might have been better suited. Proof of this is self-evident from three of the projects, B238 – T5 Western Baggage Upgrade, B131 – Main Tunnel and B009 - Northern Perimeter Parking reviewed which had their contracting basis changed during the course of the works. There is clearly a need for a more considered approach to contract selection based more around project maturity and levels of risk.

## 2.8 Next Steps / Further Considerations

Arcadis' review can assign the ten projects assessed as part of this review into three categories:

- Delivered efficiently;
- Potentially delivered inefficiently but inefficiency difficult to quantify or easily attribute; and
- Potentially delivered inefficiently with clear evidence that HAL's actions have directly led to this outcome.

Arcadis has determined that seven of the ten projects have been delivered efficiently. This is not to say that there were no delays, over-runs or issues within these projects but the impact of these is not considered substantial enough to have delivered a financial or benefits loss to customers due to the actions of HAL.

Arcadis does not recommend that any further analysis or investigation is required on these projects.

Potential inefficiency in two projects (B051: T3 Integrated Baggage and B238: T5 Western Baggage Upgrade) has been identified. Arcadis considers that HAL's actions may have contributed to this however this is hard to quantify or easily attribute. The issues surrounding this determination are set out more fully within the individual project reviews contained in section 4 of this report.

Potential inefficiency has been identified in one project (B131 – Cargo Tunnel). There is clear evidence that the actions of HAL may have directly contributed to a financial or benefits loss. Arcadis is aware that a further report has been produced by the IFS (December 2019) relating to this project however the main findings of this report do not alter with regard to the determination on efficiency.

Arcadis considers the work carried out on this project between Q2 2017 to Q2 2018 as inefficient. The £12.25m identified for design and on-costs associated with the design should be included within the inefficiency range.

In addition, the Stand Back Review cost of £0.49m, should also be considered within the context of any inefficiency range. We consider the £12.25m to be the main element of inefficient spend and the inclusion of the Stand Back Review of £0.49m as an additional inefficiency spend to create a value at the high end of the inefficiency range of £12.74m.

Where Arcadis has highlighted potential inefficiency, the CAA will need to undertake further analysis of these projects to determine the quantum and value of this inefficiency to take into account the range of inefficiency identified. This analysis will require a more detailed and potentially forensic financial analysis of the projects to assign a cost value to this inefficiency.

A further consideration outside of this review and looking beyond the Q6 regulatory period is whether the CAA develops its own definition of efficiency (and therefore inefficiency) which it can then assess and test HAL's CAPEX spend against. Although HAL did produce its own Q6 Capital Efficiency Handbook in April 2015, in consultation with the airline community, there may be merit in the CAA developing its own definition and 'tests' in line with industry best practice for the future.

### 3 Assessment Methodology

Arcadis has been asked by the CAA to advise as to whether HAL has been efficient in how it has spent Capital Expenditure (CAPEX) during the Q6 regulatory control period. The first element of this advice is to set out a clear definition of efficiency so that, when examining the projects given to Arcadis to assess by the CAA, Arcadis has a definition it is assessing these against.

#### 3.1 Defining Efficiency

The starting point for the review was to set a definition of efficiency that could be used to assess HAL's Capex expenditure performance across the Q6 projects selected for review by the CAA. All well run projects will have a set of criteria (or factors) that, if managed appropriately, will usually result in a project being delivered efficiently. These are the project:

- Scope
- Risk
- Gateway Process
- Time
- Procurement
- Programme Governance
- Cost
- Development Process
- Stakeholder Engagement

HAL has produced the Capital Efficiency Handbook (April 2015). The Handbook is intended to act as a reference source providing detail and guidance to those involved in the Heathrow Gateway Lifecycle process and is a companion document to both the Q6 Capital Investment Triggers Handbook, and the Capital Protocol. The vision of the Handbook was to '*Optimise the use of capital to create valued benefits, making Heathrow successful for all, through visible and measurable improvements*'.

The Handbook has set out a clear definition of both efficient and inefficient Capex:

- **Efficient Capex** is the delivery of an asset in a manner which **optimises and balances** scope, time, cost, and risk, procured in an appropriate manner having followed a structured Development process with appropriate decision points and governance
- **Inefficient Capex** is the delivery of an asset in a manner which significantly **fails to balance** scope, time, cost, and risk, or which is procured in an inappropriate manner or has failed to follow a structured Development process with appropriate decision points and governance; and which has directly resulted in a **financial or benefit loss**

Arcadis has considered other examples of capital efficiency and referenced HAL's approach against other examples of best practice including the work undertaken by the Transport Infrastructure Efficiency Taskforce in December 2017 in publishing its Transport Infrastructure Efficiency Strategy.

Arcadis has not constrained its view when assessing the capital efficiency of the selected projects on just the content of the HAL Capital Efficiency Handbook (April 2015) but concludes that definitions of efficiency and inefficiency contained within this document reflect the efficiency criteria required to effectively manage and govern projects.

#### 3.2 Factors Impacted by efficiency

As part of this review, Arcadis has focused on the factors (levers) that influence the efficient delivery of a project. These factors are also set out in HAL's own definition of efficiency and are scope, time, cost, risk, procurement, development processes, gateway process, programme governance and stakeholder engagement.

It is Arcadis' view that there is no project, even the most meticulously planned, that does not experience some form of issue that can influence the efficient delivery of a project. The purpose of the review was to identify the factors being influenced within each of the projects and to determine whether HAL dealt with these factors appropriately so as to limit or remove their influence in the efficient delivery of the project. There will have been some influences on a project that were outside of HAL's control and these have been taken into account when concluding the review.

In assessing how HAL has dealt with these factors across the projects, Arcadis has sought to determine whether this has resulted in any financial or benefits loss, an outcome of inefficient project delivery.

### 3.3 Information and data gathering

Arcadis has sought to gather information from HAL and the IFS where appropriate and it should be noted that both HAL and the IFS have been cooperative in supplying the information requested by Arcadis.

Aligned to the scope of the Q6 Capex Efficiency Review, Arcadis submitted formal information requests to HAL and the IFS to gather data and supporting evidence necessary to inform our analysis and to advise the CAA.

A summary of the information requested is as follows:

- Business case and supporting documents presented at Gateway reviews;
- Main Contractor contract documentation;
- Deeds of Amendment to above;
- Specified Project Team Monthly Progress Reports;
- Latest published Benefits Realisation Plans;
- IFS Project Monthly and Commissioned Reports;
- Various subject specific documents.

Full details of documentation requested is included in Appendix A.

Arcadis notes that whilst the majority of the information has been provided, some documents remain outstanding and have not formed part of our analysis and assessment. In addition, the date and timing of this information becoming available, in places, has imposed constraints on the level and depth of the Arcadis review.

Arcadis' report seeks to provide an appropriate review and analysis of the information that was made available and Arcadis has referenced those documents reviewed throughout this review. For the benefit of familiarisation and context other publicly available documents on both HAL's and the CAA's websites have also been reviewed.

### 3.4 Stakeholder Engagement

In addition to the review of documentation, Arcadis has initiated ongoing engagement and meetings with HAL, the IFS and the Airline Operator Committee (AOC) IFS Co-ordinators.

These meetings were undertaken to obtain further relevant information and to gain a clearer understanding of how each project progressed through its lifecycle and to understand the changes to the planned deliverables which took place during that time. Where relevant, comment received from those meetings has been used in the preparation of this report.

The following meetings and workshops were held with HAL, the IFS and the AOC:

| Date             | Description                                                                                                                                   | Attendees                                                                                                         |
|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| 3 June 2019      | HAL Introduction: <ul style="list-style-type: none"> <li>Confirmation of scope</li> <li>Information gathering</li> <li>Methodology</li> </ul> | <ul style="list-style-type: none"> <li>CAA</li> <li>HAL</li> <li>HAL</li> <li>Arcadis</li> <li>Arcadis</li> </ul> |
| 24 July 2019     | Pot 1a IFS review <ul style="list-style-type: none"> <li>T3IB</li> </ul>                                                                      | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>IFS</li> </ul>                           |
| 29 July 2019     | Pot 1a IFS review <ul style="list-style-type: none"> <li>T5WBU</li> </ul>                                                                     | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>IFS</li> </ul>                           |
| 18 July 2019     | Pot 1b IFS review <ul style="list-style-type: none"> <li>Main Tunnel</li> <li>Cargo Tunnel</li> </ul>                                         | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>IFS</li> </ul>                           |
| 13 August 2019   | Pot 1a HAL review <ul style="list-style-type: none"> <li>T3IB</li> </ul>                                                                      | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>HAL</li> <li>HAL</li> </ul>              |
| 15 August 2019   | Pot 1a HAL review <ul style="list-style-type: none"> <li>T5WBU</li> </ul>                                                                     | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>HAL</li> <li>HAL</li> <li>HAL</li> </ul> |
| 6 September 2019 | Pot 1b HAL review <ul style="list-style-type: none"> <li>Main Tunnel</li> </ul>                                                               | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>HAL</li> <li>HAL</li> <li>HAL</li> </ul> |
| 6 September 2019 | Pot 1b HAL review <ul style="list-style-type: none"> <li>Cargo Tunnel</li> </ul>                                                              | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> <li>HAL</li> <li>HAL</li> <li>HAL</li> </ul> |
| 8 August 2019    | Pot 1 Airlines review                                                                                                                         | <ul style="list-style-type: none"> <li>Arcadis</li> <li>Arcadis</li> </ul>                                        |

|                |                                                                                                               |                                                                                                                             |
|----------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
|                |                                                                                                               | <ul style="list-style-type: none"> <li>• Airlines</li> <li>• Airlines</li> </ul>                                            |
| 1 August 2019  | Pot 2 HAL review <ul style="list-style-type: none"> <li>• Energy &amp; Utilities Management</li> </ul>        | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> <li>• HAL</li> </ul> |
| 30 July 2019   | Pot 2 HAL review <ul style="list-style-type: none"> <li>• T3 Pier 7 Main Roof works</li> </ul>                | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> </ul>                |
| 8 August 2019  | Pot 2 HAL review <ul style="list-style-type: none"> <li>• T4 Rooflight Replacement</li> </ul>                 | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> <li>• HAL</li> </ul> |
| 8 August 2019  | Pot 2 HAL review <ul style="list-style-type: none"> <li>• T4 Toilets &amp; Finishes</li> </ul>                | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> <li>• HAL</li> </ul> |
| 7 August 2019  | Pot 2 HAL review <ul style="list-style-type: none"> <li>• T3 Refurbishment &amp; Enhancement - IDL</li> </ul> | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> <li>• HAL</li> </ul> |
| 15 August 2019 | Pot 2 HAL review <ul style="list-style-type: none"> <li>• Northern Perimeter Parking</li> </ul>               | <ul style="list-style-type: none"> <li>• Arcadis</li> <li>• Arcadis</li> <li>• HAL</li> <li>• HAL</li> <li>• HAL</li> </ul> |

Arcadis would note that the meetings with HAL, the Airlines and the IFS have been of a productive nature and the exchange of information and response to queries direct and forthcoming.

## 4 Q6 Selected Project Reviews

## 4.1 Approach

### 4.1.1 IFS Assured Projects (Pots 1a & 1b)

For those IFS monitored projects Arcadis' approach in reaching a view on efficiency has been to build on the work already undertaken by the IFS. In their assurance of capital delivery against the Capital Efficiency Handbook the IFS has prepared reports both on a periodic, generally monthly basis, and also specifically to cover areas of particular concern.

Having reviewed these reports, Arcadis considers them to sufficiently cover those aspects of performance that would be expected in relation to capital efficiency, they are well founded and thorough. There would be no justification for Arcadis carrying out additional work to verify the findings made by the IFS in these reports.

Within their reports the IFS has identified and discussed specific issues relating to the non-delivery of planned project outcomes, amongst these being programme overruns, cost increases and non-delivery of benefits. Whilst explanations are to a large degree provided for these diversions from plan, it is within these specific areas that Arcadis has focussed our attention and interrogated more closely for the purposes of this review.

Arcadis has set out its findings in the following chapters:

- Overview;
- IFS work to date;
- Chronology (Where appropriate);
- Commentary on information, and;
- Conclusion.

### 4.1.2 Non-IFS Assured Projects (Pot 2)

The principal source of information used for reviewing the Pot 2 Projects was HAL's 'Post Project Review' (PPR) document. In addition to this, Arcadis requested and has used other documents including the relevant business case and gateway documents.

The purpose of the PPR is to evaluate how the project has performed against delivering its objectives and its performance in key areas of control e.g. safety, cost, time, quality, etc. it also captures key areas of learning for the business to take forward on delivery of future projects.

Arcadis considers the PPR document to provide considerable benefit and the output report has been a good source of information for our review. Having reviewed the above documents, project specific queries were scheduled and issued to HAL in advance of project specific review meetings.

At our meetings with HAL, Arcadis reviewed and discussed responses to queries including further documentation provided in support of these.

In addition to our queries a review was carried out on how the project had performed against recognised areas of project control, and documentary evidence to demonstrate compliance with good practice was requested to be available for inspection at the meetings. The key areas of focus and the format in which Arcadis has presented its findings in this report comprise the following:

- **Scope definition, procurement and contract strategy** - to include the scope presented at Governance Investment Decision Gateway (G3) (Cost plan or benchmarking report) and the Project Procurement Plan
- **Schedule management** – to include the schedule narrative report issued in response to the Contractor's submitted monthly schedules for acceptance

- **Contract management** - administration of the contract to include extracted schedules from the Contract Event Management and Reporting (CEMAR) system of the Contractor's compensation events, early warnings, notifications of compensation events, submitted quotations and accepted compensation events
- **Risk and Opportunities management** – to include examples of the status of the register at the project start, middle and end
- **Change management** (Client and Contract) – to include Client Change Request Sheet (CCRS) register and Monthly Progress Review (MPR) or other report
- **Commercial management:**
  - Benchmarking – to include G3 Gateway Cost Plan, G3 Should Cost Estimate, G3 Value for Money Report;
  - Estimating / Cost forecasting – To include reference to Monthly Progress Review reports (or other equivalent);
  - Value engineering examples where available;
  - Cashflow management – To include reference to Monthly Project Review reports (or other equivalent); and
  - Final account agreement – To include the Summary of Final Account and signed Statement.
- **Benefits management** – Planned v Delivered with explanation for variance
- **Stakeholder management** – To include the Stakeholder Management Plan
- **Governance**
- **Conclusion**

## 4.2 Pot 1a: Terminal 3 Integrated Baggage System (T3IB)

### 4.2.1 Project Overview

|                                       |                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Project Background:                   | The T3 Integrated Baggage Project has been in process for a number of years and commenced on site in 2012. It was included within the Q5 CIP at £234m. At the start of Q6 the budget had increased to £435m and shortly afterwards the Project reported a £43.8m increase in cost and 3-month delay.                                                |
| <b>Q5 Overview:</b>                   |                                                                                                                                                                                                                                                                                                                                                     |
| Business Case                         | Designed to provide a modern, highly automated baggage system for T3 carriers, which integrates with T5 to provide quick and reliable baggage transfers.                                                                                                                                                                                            |
| Project Scope (Q5 & Q6)               | Construction of a new 'Main Building' incorporating baggage sortation, screening and make up capability. T3 cut in works to enable connection of the new baggage feed lines from the new Integrated Baggage Facility into the existing operational system. All Transfer bag feed lines into and out of the systems including the T5 Baggage System. |
| Development Budget and EAC: Q5 - Q6   | Included within the Q5 CIP at £234m. In March 2012 the Estimate at Completion (EAC) increased to £360m, and in June 2013 increased to £435m.                                                                                                                                                                                                        |
| Project Manager                       | HAL                                                                                                                                                                                                                                                                                                                                                 |
| Designer                              | Main Building: XXXX<br>Baggage: XXXXXXXXXXXXXXXXXXXXXXXX                                                                                                                                                                                                                                                                                            |
| MSP                                   | XXXXX                                                                                                                                                                                                                                                                                                                                               |
| Main Contractors                      | Main Building: XXXXXXXXXXXXXXXXXXXXXXXX<br>Baggage: XXXXXXXXXXXXXXXXXXXXXXXX                                                                                                                                                                                                                                                                        |
| <b>Q6 Overview (Remaining works):</b> |                                                                                                                                                                                                                                                                                                                                                     |
| Project Scope: (Q6)                   | Completion of Main Building<br><br>T3 cut in works to enable connection of the new baggage feed lines to the new Integrated Baggage Facility.<br><br>All transfer bag feed lines into and out of the systems including the T5 Baggage System and other terminals via the WIB.                                                                       |
| Development Budget and EAC: Q6        | £92.2m (out of £435m EAC at end of Q5) remaining spend at start of Q6. In December 2014 the remaining spend increased by £43.9m £136.1m (EAC increasing to £478.9m).                                                                                                                                                                                |
| Project Manager                       | HAL                                                                                                                                                                                                                                                                                                                                                 |
| Designer                              | Baggage: XXXXXXXXXXXXXXXXXXXXXXXX                                                                                                                                                                                                                                                                                                                   |
| MSP                                   | XXXXXX                                                                                                                                                                                                                                                                                                                                              |