steer davies gleave

Dublin Airport Supplementary CIP Efficiency Assessment

Commission for Aviation Regulation

Draft Report v.4.0
19 February 2018

Our ref: 23235601
Client ref: SRFT 4/2017

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Disclaimer

This Report by Steer Davies and Gleave Limited ("Steer Davies Gleave", "we" or "us"), prepared for the Commission for Aviation Regulation (CAR or "Client") pursuant to our Engagement Letter, dated 13 November 2017, summarises our review of the Dublin Airport Supplementary Capital Investment Plan (the "Project").

This Report, which speaks as of the date thereof, provides our assessment of the efficient nature of the costings for the Project and potential material cost over- and under-runs. It is not intended to, and it does not, provide a detailed review of all the aspects in relation to the Project and does not opine on the justification for the Supplementary Capex Investment projects.

The comments and opinions contained within this Report are based on the review of documents and information (both written and oral) provided by the Client, Dublin Airport and a visit of the site. Steer Davies Gleave shall not be held responsible for the inaccuracy of any such comment and/or opinion based on incomplete information supplied by the Client and Dublin Airport. In any event, responsibility for decisions taken on the basis of the comment and/or opinion given by Steer Davies Gleave shall remain with the Client.

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Executive Summary

Overview

Steer Davies Gleave has been appointed by the Commission for Aviation Regulation ("Commission" or CAR) to review Dublin Airport's Supplementary Capital Investment Plan (CIP) projections and to suggest alternative capital expenditure forecasts where appropriate. This is our Draft Report.

Our specific scope is as follows, for each of the 23 projects in the Supplementary CIP presented in Dublin Airport's proposed 'Programme of Airport Campus Enhancement' (PACE) consultation document, dated December 2017:

- Assess the project's specification given the output it is intended to deliver, to determine whether it is over or under specified;
- Review the proposed costings to determine if they are reasonable and efficient for the project; and
- Highlight any incidents of double-counting.

The issue of whether the proposed projects are necessary and desired by users is not included in the scope, and will be separately assessed by CAR.

Approach

This review was undertaken based on expert opinion and the information supplied to us by CAR and Dublin Airport. To further inform our review we made use of our own and publicly available benchmarking data.

We have reviewed the efficiency of specifications and costings of each project individually and also considered them in aggregate to assess whether any synergies can be assumed, or whether double counting exists. More specifically, for each project we have consequently:

- Reviewed the efficiency of the project's specifications, with specific attention paid to:
  - consistency in scope and quantity assumptions between the PACE document and underlying Dublin Airport specifications;
  - Dublin Airport applied capacity and constraints assumptions;
  - effectiveness and quality of scope;
  - project phasing and procurement; and
  - existing asset conditions;
- Assessed potential synergies and double counting with:
  - other projects within the Supplementary CIP;
  - projects within the 2014 CIP; and
  - planned major maintenance;
- Reviewed Dublin Airport's cost estimates and developed our own independent cost estimates, adjusted for assessed inconsistencies, synergies, double counting and taking into account our own cost benchmarks.

We have developed a RAG (Red/Amber/Green) assessment methodology to assist in summarising our views on each of the projects. This RAG assessment has been applied separately to consideration of whether (i) the scope and dimensioning and (ii) PACE level 1 cost assumptions are efficient in our opinion. The RAG categories are defined as follows:

Coding	Definition
Green	We believe that the project scope dimension / costs estimate is plausible, and have assessed that the difference between the cumulative sum estimated by Dublin Airport and a likely project cost outturn will be up to: • +/- 7.5% of the Dublin Airport estimates for Feasibility stage based projects; • +/- 5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 2.5% of the Dublin Airport estimates for Construction stage based projects.
Amber	We believe that the project scope dimension / costs estimate is generally plausible, but consider it possible that the difference between forecast cost and actuals will be between: • +/- 7.5% and 10% of the Dublin Airport estimates for Feasibility stage based projects; • +/- 5% and 7.5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 2.5% and 5% of the Dublin Airport estimates for Construction stage based projects.
Red	We believe that the project scope dimension / costs estimate is not efficient and consider it possible that the difference between forecast cost and actuals will be more than: • +/-10% of the Dublin Airport estimates for Feasibility stage based projects; • +/-7.5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 5% of the Dublin Airport estimates for Construction stage based projects.

Key findings

The table below provides a summary of the findings of our assessment. We identify a **€16.3m** cost savings opportunity across the projects examined.

Category	No	Project	Cost est. basis	RAG – Dimensions	RAG - Costs	daa cost est. (€m)	SDG cost est.* (€m)	Cost diff. (€m)
Passenger Processing	1	Terminal 1 and Terminal 2 Common User Self Service (CUSS)	Ph. 1&2: Handover Ph. 3: Design/ Procurement		-7.6%	5.9 **	5.5	-0.4
	2	Pier 1 Extension	Construction		-15.0%	7.6	6.5	-1.1
	3	South Apron PBZ	Construction		-3.8%	21.8	21.0	-0.8
	4	Terminal 1 and Terminal 2 Immigration Facilities	Feasibility		-2.0%	11.3	11.1	-0.2
	5	Additional Bus Gates	Feasibility		-33.9%	8.7	5.8	-3.0
Stands and Associated Projects	6	South Apron Stands	Construction	PCN value of 85 used on basis of Code E aircraft, however only Code C will access these stands	-9.4%	10.5	9.5	-1.0
	7	Apron 5H and Taxiway Rehabilitation	Feasibility	Pavement design optimisation could be considered	-5.5%	52.0	49.2	-2.8

Category	No	Project	Cost est. basis	RAG – Dimensions	RAG - Costs	daa cost est. (€m)	SDG cost est.* (€m)	Cost diff. (€m)
	8	Upgrade and Realignment of Stands 101–104	Design/ Procurement	Additional pavement strengthening may be necessary to support full taxi weight Code E aircraft.	-5.0%	5.0	4.7	-0.2
	9	Hangar 1 and Hangar 2 Stands	Feasibility	PCN target might be lowered	-5.0%	14.3	13.6	-0.7
	10	West Apron Stands	Feasibility		-10.5%	2.5	2.2	-0.3
	11	Pier 2 Underpass	Feasibility	Additional surveys may provide options for reducing the roadway level	-9.5%	5.0	4.5	-0.5
	12	Pier 3 Underpass	Design/ Procurement		+4.2%	0.2	0.2	+0.0
	13	West Apron Surface Access	Feasibility		+0.9%	3.0	3.0	+0.0
	14	Advanced Visual Docking Guidance System (A-VDGS)	Feasibility		-3.2%	5.0 ***	4.8	-0.2
	15	Fixed Electrical Ground Power	Feasibility		+3.4%	4.6	4.8	+0.2
	16	South Apron Stands Phase 2	Feasibility		-1.6%	37.9	37.3	-0.6
	17	Apron Wide CCTV	Feasibility		-9.7%	1.1	1.0	-0.1
Airfield/ Taxiways	18	Link 3 Extension Taxiway	Feasibility	Although still high level, dimensions appear efficient. However, integrated early contractor involvement in these projects may lead to optimisations.	-5.1%	5.0	4.7	-0.3
	19	Realignment of Taxiway A	Feasibility		-5.2%	5.6	5.3	-0.3
	20	Dual Taxiway F	Feasibility		-5.6%	39.5	37.3	-2.2
	21	Link 6 Extension Taxiway	Feasibility		-4.3%	5.8	5.6	-0.3
	22	South Apron Taxiway Widening (Dual Code E)	Feasibility		-6.3%	14.7	13.7	-0.9
	23	Runway 10 Line-Up Points	Feasibility		-3.6%	16.8	16.2	-0.6
		Total			**-5.7%**	**283.8**	**267.5**	**-16.3**

* Benchmarks based on a EUR to GBP conversion of 1.135:1.00
** Includes adjustment for EUR 1.0m allocation from 2014 CIP
*** Includes adjustment for EUR 5.4m allocation from other funds

Glossary

Acronym / Definition	Meaning
2014 CIP	Dublin Airport's core Capital Investment Programme for the 2015-2019 period
A-CDM	Airport Collaborative Decision Making
AOS	Airport Operation System
A-VDGS	Advanced Visual Docking Guidance System
CAR	Commission for Aviation Regulation or the "Commission"
CIP	Capital Investment Programme
daa	Dublin Airport
FEGP	Fixed Electrical Ground Power
INIS	Irish Naturalisation and Immigration Service
OTP	On time performance
PACE	Dublin Airport's proposed supplementary Capital Investment Programme formal documentation, dated December 2017 and named 'Programme of Airport Campus Enhancement'
PCN	Pavement Classification Number, from the standardized method known as the Aircraft Classification Number – Pavement Classification Number (ACN-PCN) method to determine the strength of runway, taxiway or apron pavement.
Q&A	Questions & answers process between Steer Davies Gleave and Dublin Airport on PACE document and provided information
RAG	Red/Amber/Green assessment methodology
SDG	Steer Davies Gleave
Supplementary Capital Investment Plan or Supplementary CIP	Dublin Airport's proposed supplementary capital investment programme following CAR's December 2016 decision to provide enhanced flexibility to allow Dublin Airport to respond to changing circumstances, especially an unforeseen increase in passenger traffic.
TOBT	Target Off-Block Time
TSAT	Target Start Up Approval Time

1 Introduction

This report

1.1 Steer Davies Gleave has been appointed by the Commission for Aviation Regulation ("CAR") to provide an independent review of the Supplementary Capital Investment Plan ("Supplementary CIP") developed by Dublin Airport.

1.2 This document presents our Draft Report.

Background

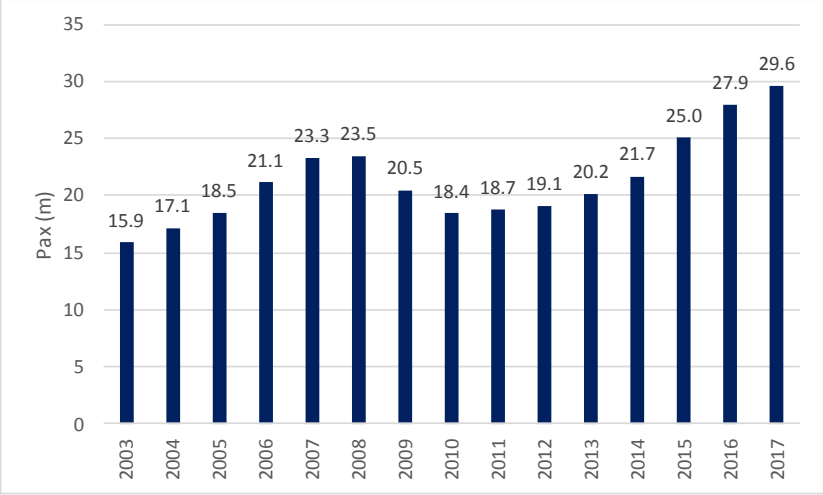
Traffic

1.3 Dublin Airport is by far Ireland's busiest airport. In 2016, Dublin Airport handled a record 27.9 million passengers (+11.4% versus 2015), and volumes grew by a further 6% in 2017, to a total for CY2017 of 29.6 million passengers.

1.4 The airport is served by two runways (runway 10/28: 2.637m; runway 16/34: 2.072m) and two passenger terminals. A third (Northern) runway is under construction and currently planned to be completed in 2021.

1.5 Dublin Airport's traffic volumes have experienced mixed fortunes in recent years, with booming passengers in the early part of the last decade giving way to falling passenger numbers after the economic crisis in 2008, but now rising rapidly again, putting renewed pressure on facilities. The recent traffic history of the airport is illustrated in Figure 1.1.

Figure 1.1: Dublin Airport Historical Passenger Traffic



Source: Anna.Aero, Dublin Airport (2017)

1.6 The 2014 Determination assessing aeronautical tariffs for the 2015-2019 period provided a non-trigger capital allowance for Dublin Airport of €341 million, allocated between a number of discrete groupings, some of which contained specific deliverables.

Table 1.1: 2014 Determination – Capital Allowances

Group	Capital Allowance €m	Deliverables
Airfield Maintenance	€125m	• Runway 10/28 overlay • Runway 16/34 overlay • Pollution control
Landside & Terminal Maintenance	€39m	-
Business Development	€67m	• Cargo gate redevelopment
Revenue	€56m	• Completion of Terminal 2 MSCP
IT	€41m	-
Other	€14m	-
Total	**€341m**	

Source: Dublin Airport's PACE

1.7 In addition, the following projects were identified as potential further areas for the capital allowance, subject to specified triggers being met:

Table 1.2: 2014 Determination – Capital Allowances (Trigger projects)

Project	Capital Allowance €m	Has Trigger been met?
North Runway	€247m	[1]
Additional Runway 28/10 line up points	€30m	-
Terminal 2 Hold Baggage System Standard 3	€13m	-
Pier 2 segregation	€18m	Met in 2017
Total	**€308m**	

Source: Dublin Airport's PACE

1.8 The 2014 Determination was supported by Dublin Airport's traffic forecasts, which projected annual passenger traffic throughput of 23.6 million passengers for 2019, within a range of 21.8 – 24.5 million. Air Transport Movement volumes were projected to grow to between 178-196,000 by 2019. In practice actual traffic growth has been far faster than anticipated, triggering the requirement for the Northern Runway.

1.9 In addition, CAR's December 2016 Decision[2] on a 'Process for Consideration of a Supplementary Capex Allowance' facilitates additional investment within a determination period. This therefore provides a process for dealing with the additional pressure for

[1] Original trigger was revised from demand based (25mppa) to a project milestone trigger in CP1/2017.

[2] *Decision Process for Consideration of a Supplementary Capex Allowance*, Commission for Aviation Regulation Paper 7/2016, 9 December 2016

investment arising from the additional and unexpected growth in traffic arising since the 2014 Determination.

1.10 Dublin Airport responded to this decision with the 'Programme of Airport Campus Enhancement' (PACE) consultation document which was issued to stakeholders in October 2017, followed by a revised PACE document submitted in December 2017[3] after the conclusion of the Airport's consultation. The latter provides the substantiation for the Supplementary CIP that is the subject of this review.

Scope of review

1.11 This review focuses on the 23 Supplementary CIP projects set out in Dublin Airport's PACE consultation document, which in aggregate has a combined planned enhancement Capital Expenditure (Capex) of €283.9 million, see Table 1.3. The list of projects comprises proposed spending on passenger processing facilities, stands and related infrastructure, and airfield/taxiway enhancements.

Table 1.3: Supplementary Capital Investment Plan

Category	No	Project	Cost estimate basis	daa cost estimate (€m)
Passenger Processing	1	Terminal 1 and Terminal 2 Common User Self Service (CUSS)	Ph. 1&2: Handover Ph. 3: Design/ Procurement	5.9
	2	Pier 1 Extension	Handover	7.6
	3	South Apron PBZ	Handover	21.8
	4	Terminal 1 and Terminal 2 Immigration Facilities	Feasibility	11.3
	5	Additional Bus Gates	Feasibility	8.7
Stands and Associated Projects	6	South Apron Stands	Handover	10.5
	7	Apron 5H and Taxiway Rehabilitation	Feasibility	52.0
	8	Upgrade and Realignment of Stands 101–104	Design/ Procurement	5.0
	9	Hangar 1 and Hangar 2 Stands	Feasibility	14.3
	10	West Apron Stands	Feasibility	2.5
	11	Pier 2 Underpass	Feasibility	5.0
	12	Pier 3 Underpass	Design/ Procurement	0.2
	13	West Apron Surface Access	Feasibility	3.0
	14	Advanced Visual Docking Guidance System (A-VDGS)	Feasibility	5.0
	15	Fixed Electrical Ground Power	Feasibility	4.6
	16	South Apron Stands Phase 2	Feasibility	37.9
	17	Apron Wide CCTV	Feasibility	1.1
Airfield/ Taxiways	18	Link 3 Extension Taxiway	Feasibility	5.0
	19	Realignment of Taxiway A	Feasibility	5.6

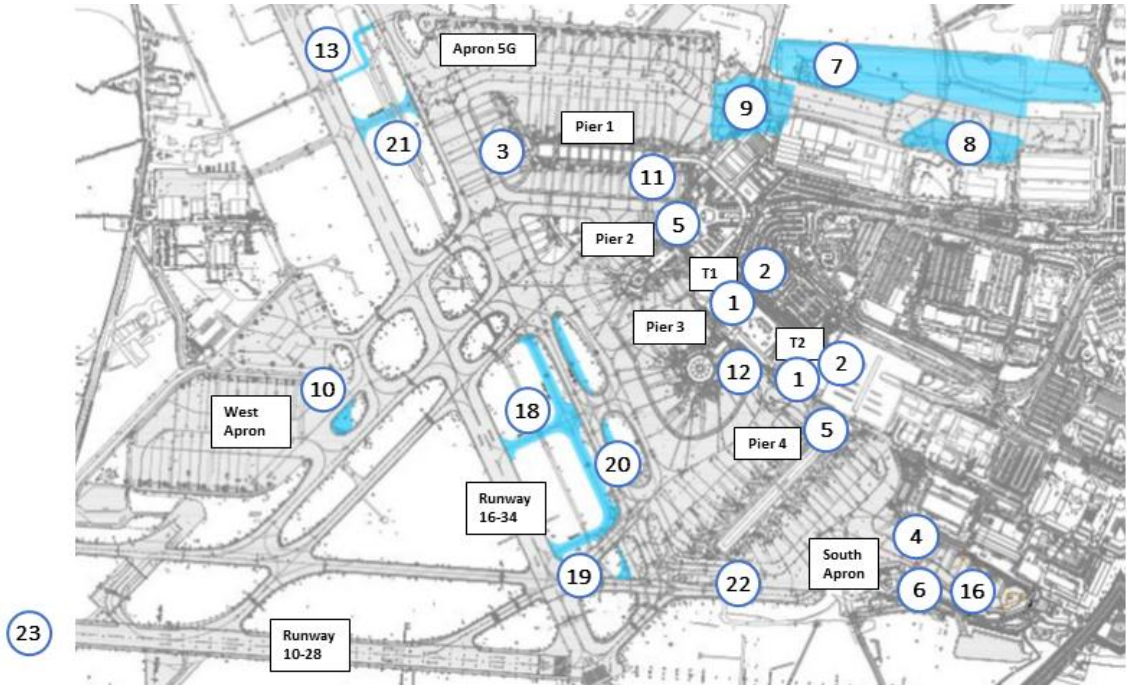
[3] *Programme of Airport Campus Enhancement*, Dublin Airport, December 2017

Category	No	Project	Cost estimate basis	daa cost estimate (€m)
	20	Dual Taxiway F	Feasibility	39.5
	21	Link 6 Extension Taxiway	Feasibility	5.8
	22	South Apron Taxiway Widening (Dual Code E)	Feasibility	14.7
	23	Runway 10 Line-Up Points	Feasibility	16.8
		Total		**283.8**

Source: Dublin Airport's PACE

1.12 The projects are located across the airport campus as indicated in Figure 1.2:

Figure 1.2: Supplementary CIP project locations



Source: Dublin Airport and Steer Davies Gleave

1.13 For each of the projects we have, whilst accounting for the specific local conditions that exist at Dublin:

- Assessed its specification given the output it is intended to deliver, to determine whether it is over or under specified;
- Reviewed the proposed costings to determine if they are reasonable and efficient for the project; and
- Highlighted any incidents of double-counting across projects.

1.14 The issue of whether the proposed projects are necessary and desired by users is not included in the scope, and will be separately assessed by the Commission.

2 Approach

Introduction

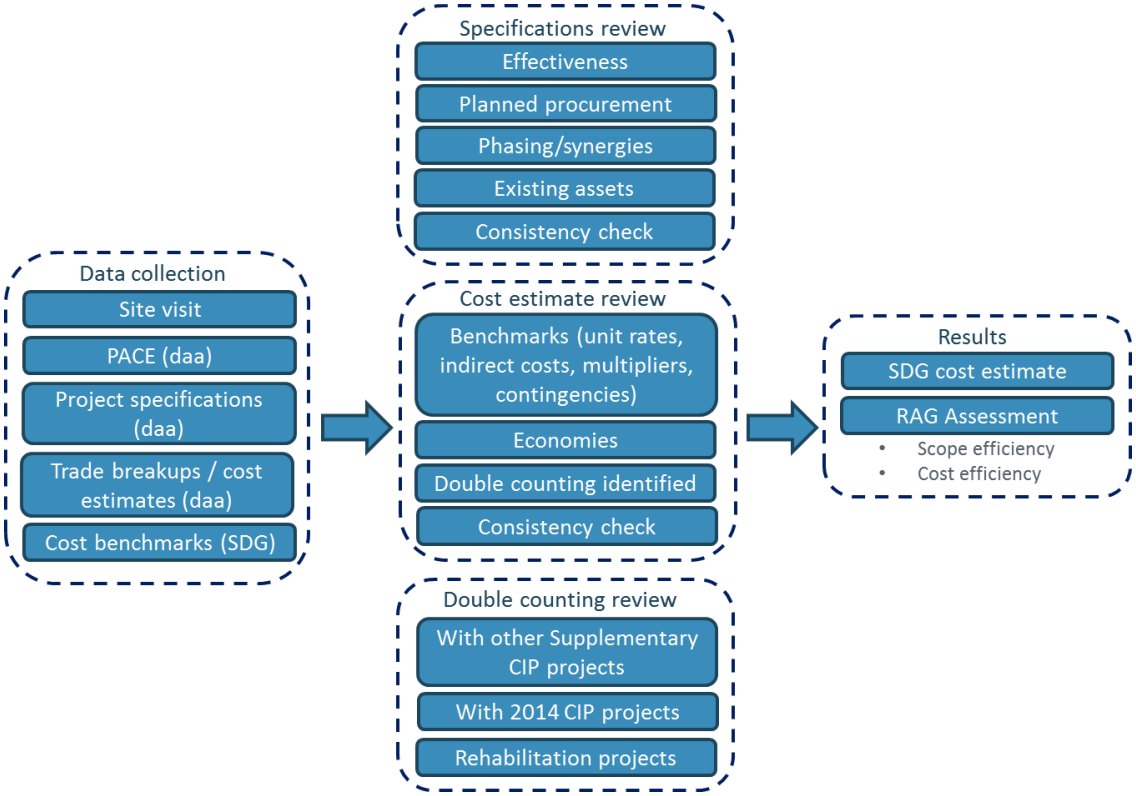
2.1 In line with the earlier stated objectives our review has:

- Assessed the efficiency of the specifications of each Supplementary CIP project with respect to the outputs expected to be delivered as defined in the PACE document;
- Assessed the efficiency of Dublin Airport's cost estimates for each of the projects of the Supplementary CIP and obvious inefficiencies in project planning and procurement; and
- Identified any incidences of double counting.

Methodology

2.2 We followed the three-stage methodology shown in Figure 2.1 below, including iterations as needed, in order to ensure that all review objectives are consistently met for each project.

Figure 2.1: Overview of our methodology



Source: Steer Davies Gleave

Stage 1 - Data collection

2.3 We received the December 2017 PACE document which outlines the projects' specifications and includes high-level (Level 1 and 2) project cost estimates for all 23 projects.

2.4 On 13 November 2017, Dublin Airport presented all 23 projects under consideration for the Supplementary CIP during a site visit to Dublin Airport, including their management, scoping and estimation approaches. Subsequently, Dublin Airport shared data on each project, including:

- Detailed project specifications;
- Engineering drawings; and
- Level 3 cost estimates, mostly through so called "Trade break-ups" derived from their industry standard estimation software 'Cubit' and some actuals for projects that are (near) completion.

2.5 Additional information was provided through a questions & answers (Q&A) process between Steer Davies Gleave and Dublin Airport.

2.6 Finally, benchmarking data was provided by Steer Davies Gleave.

Stage 2 - Review

2.7 All 23 projects have been considered separately to assess their respective specifications and cost estimates, as well as in aggregate to identify potential synergies in procurement and/or planning and double counting.

Specifications review

2.8 We firstly assessed the comprehensiveness of the scope of each project considering the current and forecasted future capacity constraints as well as the existing asset conditions. We then assessed each project's specifications' efficiency in achieving the required outputs, taking note of:

- The scope's quality, considering its stage;
- Planned procurement efficiency;
- Phasing and synergies with other projects;
- Relationship with existing asset conditions and lifecycles; and
- Any alternative scopes.

2.9 Finally, we examined the consistency of the provided dimensions between different levels of specifications (PACE and detailed project specifications and drawings).

2.10 Where we found a significant divergence from Dublin Airport's estimates on specific line items, we then produced an alternative estimate following our benchmarks, and included this in our Steer Davies Gleave cost estimate.

Cost estimate review

2.11 The next step involved the assessment of the efficiency of the Level 1 project cost estimates provided in the PACE document. This was done using a bottom-up approach, starting from Dublin Airport's Level 3 cost estimates which were analysed using a range of cost benchmarks.

2.12 The applied unit rates, design and management cost multipliers, associated indirect costs and contingency assumptions have been benchmarked. Additionally, economies (i.e. from synergies with other projects or clustered procurement) have been considered.

2.13 The cost review has, furthermore, taken account of any efficiencies from tendering strategies and clustering of projects and identified instances of double counting. Plus, we checked the consistency between the cost estimate Levels 1 and 2 provided in the PACE documentation and underlying Level 3 costings provided by Dublin Airport to us separately.

2.14 We have not accounted for any of the assessed efficiencies in dimensions, as it is difficult to price these reasonable and accurately when these concern scopes and cost estimates that are still at these feasibility stage. We treat these separately in our conclusions.

Double counting review

2.15 We scanned the 23 projects' cost estimates for double counting with:

- Other projects of the Supplementary CIP;
- Projects included in the 2014 CIP; and
- Rehabilitation projects.

2.16 Any double counting identified has been accounted for in our cost estimate review.

Stage 3 - Results

2.17 Based on our review, we have developed a principal Steer Davies Gleave cost estimate for each individual project at Level 3, against which the PACE Level 1 costs assumed by Dublin Airport have been compared.

2.18 We additionally developed a RAG (Red/Amber/Green) assessment methodology to assist in summarising our views on each of the projects. This RAG assessment has been applied separately to consideration of whether (i) the scope and dimensioning and (ii) PACE level 1 cost assumptions are efficient in our opinion. The RAG categories are defined as follows:

Table 2.1: RAG Assessment Methodology

Coding	Definition
Green	We believe that the project scope dimension / costs estimate is plausible, and have assessed that the difference between the cumulative sum estimated by Dublin Airport and a likely project cost outturn will be up to: • +/- 7.5% of the Dublin Airport estimates for Feasibility stage based projects; • +/- 5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 2.5% of the Dublin Airport estimates for Construction stage based projects.
Amber	We believe that the project scope dimension / costs estimate is generally plausible, but consider it possible that the difference between the forecast cost and actuals will be between: • +/- 7.5% and 10% of the Dublin Airport estimates for Feasibility stage based projects; • +/- 5% and 7.5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 2.5% and 5% of the Dublin Airport estimates for Construction stage based projects.
Red	We believe that the project scope dimension / costs estimate is not efficient and consider it possible that the difference between the forecast cost and actuals will be more than: • +/-10% of the Dublin Airport estimates for Feasibility stage based projects; • +/-7.5% of the Dublin Airport estimates for Design / Procurement stage based projects; • +/- 5% of the Dublin Airport estimates for Construction stage based projects.

3 Conclusion

Key Results

3.1 Our key results are presented in Table 3.1. For each project, we provide:

- a summary RAG critique of the assumed dimensions and costs, as per Table 2.1; and
- a Steer Davies Gleave Level 3 cost estimate and how it differs from Dublin Airport's PACE document Level 1 cost projection.

Table 3.1: Key results

Category	No	Project	Cost est. basis	RAG – Dimensions	RAG - Costs	daa cost est. (€m)	SDG cost est.* (€m)	Cost diff. (€m)
Passenger Processing	1	Terminal 1 and Terminal 2 Common User Self Service (CUSS)	Ph. 1&2: Handover Ph. 3: Design/ Procurement		-7.6%	5.9 **	5.5	-0.4
	2	Pier 1 Extension	Construction		-15.0%	7.6	6.5	-1.1
	3	South Apron PBZ	Construction		-3.8%	21.8	21.0	-0.8
	4	Terminal 1 and Terminal 2 Immigration Facilities	Feasibility		-2.0%	11.3	11.1	-0.2
	5	Additional Bus Gates	Feasibility		-33.9%	8.7	5.8	-3.0
Stands and Associated Projects	6	South Apron Stands	Construction	PCN value of 85 used on basis of Code E aircraft, however only Code C will access these stands	-9.4%	10.5	9.5	-1.0
	7	Apron 5H and Taxiway Rehabilitation	Feasibility	Pavement design optimisation could be considered	-5.5%	52.0	49.2	-2.8

Category	No	Project	Cost est. basis	RAG – Dimensions	RAG - Costs	daa cost est. (€m)	SDG cost est.* (€m)	Cost diff. (€m)
	8	Upgrade and Realignment of Stands 101–104	Design/ Procurement	Additional pavement strengthening may be necessary to support full taxi weight Code E aircraft.	-5.0%	5.0	4.7	-0.2
	9	Hangar 1 and Hangar 2 Stands	Feasibility	PCN target might be lowered	-5.0%	14.3	13.6	-0.7
	10	West Apron Stands	Feasibility		-10.5%	2.5	2.2	-0.3
	11	Pier 2 Underpass	Feasibility	Additional surveys may provide options for reducing the roadway level	-9.5%	5.0	4.5	-0.5
	12	Pier 3 Underpass	Design/ Procurement		+4.2%	0.2	0.2	+0.0
	13	West Apron Surface Access	Feasibility		+0.9%	3.0	3.0	+0.0
	14	Advanced Visual Docking Guidance System (A-VDGS)	Feasibility		-3.2%	5.0 ***	4.8	-0.2
	15	Fixed Electrical Ground Power	Feasibility		+3.4%	4.6	4.8	+0.2
	16	South Apron Stands Phase 2	Feasibility		-1.6%	37.9	37.3	-0.6
	17	Apron Wide CCTV	Feasibility		-9.7%	1.1	1.0	-0.1
Airfield/ Taxiways	18	Link 3 Extension Taxiway	Feasibility	Although still high level, dimensions appear efficient. However, integrated early contractor involvement in these projects may lead to optimisations.	-5.1%	5.0	4.7	-0.3
	19	Realignment of Taxiway A	Feasibility		-5.2%	5.6	5.3	-0.3
	20	Dual Taxiway F	Feasibility		-5.6%	39.5	37.3	-2.2
	21	Link 6 Extension Taxiway	Feasibility		-4.3%	5.8	5.6	-0.3
	22	South Apron Taxiway Widening (Dual Code E)	Feasibility		-6.3%	14.7	13.7	-0.9
	23	Runway 10 Line-Up Points	Feasibility		-3.6%	16.8	16.2	-0.6
		Total			**-5.7%**	**283.8**	**267.5**	**-16.3**

* Benchmarks based on a EUR to GBP conversion of 1.135:1.00
** Includes adjustment for EUR 1.0m allocation from 2014 CIP
*** Includes adjustment for EUR 5.4m allocation from other funds

3.2 While our estimates for the 23 projects is already less than Dublin Airport's overall forecast, consideration could be given to whether there is scope for further cost savings to be realised as each of the schemes is further developed.

Scope efficiencies

3.3 We have assessed five main dimension efficiencies that may need to be further researched:

- The PCN value for the South Apron Stands may have been lowered compared to current Dublin Airport assumptions. A roughly estimated cost saving of €30 per m^2 on our Steer Davies Gleave applied rate of €297.39 per m^2 may then have been applicable, or €510,000 in construction costs. We note that this project has been completed.
- Apron 5H and Taxiway Rehabilitation, which is reportedly still in the design stage, may significantly benefit from further design optimisation:
  - The PCN value for the eastern part of the new 64,800m^2 section may be lowered compared to current Dublin Airport assumptions on the Eastern side, where only Code C may be applicable. A roughly estimated cost saving of €30 per m^2 on our Steer Davies Gleave applied rate of €277 per m^2 may then be applicable. This is a matter of detailed design, but significant savings could be gained in construction costs and an additional 16% of that figure in contingencies and escalation.
  - Furthermore, some efficiencies may be gained if overlaying of the existing pavements would be feasible. This may reduce Steer Davies Gleave unit rates from €286 per m^2 to €131 per m^2. Determining the exact potential location is a matter of detailed design, but significant savings could be gained in construction costs and an additional 16% of that figure in contingencies and escalation.
- The PCN value for the Hangar 1 and 2 Stands may be lowered compared to current Dublin Airport assumptions. A roughly estimated cost saving of €30 per m^2 on our Steer Davies Gleave applied rate of €303 per m^2 may then be applicable, or €531,000 in construction costs over the total 17,700m^2 section, plus an additional 16% of that figure in contingencies and escalation.
- Additional surveys may provide options for reducing the roadway level for the Pier 2 Underpass Widening project. We have not been able to provide a robust view on the level of savings that may apply for our current Steer Davies Gleave Level 3 estimate, as this requires more research on the actual implications of such a strategy.

3.4 We have *not* included any of these efficiencies in our Steer Davies Gleave Level 3 estimates.

3.5 We have included assessed efficiencies and increases in design and management and from procurement in our Steer Davies Gleave Level 3 estimates.

Cost estimates review

Provided information and approach

3.6 We received Level 3 estimates for all 23 projects from Dublin Airport. The structure and level of detail of cost information that was provided to us by Dublin Airport varied from project to project. Some of the projects under review are either in delivery or almost complete and these projects generally provided more detail. Where projects were in the early stages of definition or design, the costs that were issued were generally high-level estimates of the forecast cost of the works.

3.7 A number of the estimates contained little detail in terms of quantification of the works in question. Most of the cost breakdowns provided contained lump sum allowances with relatively little detail to explain what extent of scope the item was intended to cover.

3.8 We note that Dublin Airport's Level 3 estimates on occasion vary greatly from their Level 2 estimates for commercial sensitivity reasons.

3.9 In reviewing the costs of the projects, we focused primarily on the elements of work that had been quantified. We have used the Dublin Airport Level 3 estimates for each project as the basis for working up our own equivalent Level 3 estimate for each project.

3.10 Where we have relevant cost data or benchmark information we have used what we believe a sensible provision is for the quantified items listed in the Dublin Airport build ups. This allowed us to review and analyse the rates that Dublin Airport had included in their submission and compare them with equivalent cost data that we have from our extensive experience working in the aviation sector. We have predominantly used benchmarks from similar projects at South-East England airports. These airports are considered to be of similar size and complexity as Dublin Airport, especially Gatwick Airport.

Main assumptions

3.11 **Consultants' fees and design and management costs**: 15% is a recognised benchmark allowance in cost estimates for consultants' fees and design and management costs in airport projects. This is the basis of most of our estimates.

3.12 Per project we have then taken a global view of the design and management costs rather than analysing them against the three headings listed in the Dublin Airport Level 2 estimates. There are some projects where we believe the allowance should be less than 15%. These projects are where there will be significantly less design input required than other projects. For example, the Terminal 1 and Terminal 2 Common User Self Service (CUSS) project requires significantly less design input than most other terminal projects as the main inputs required are about agreeing a layout for the machines and how they are serviced and connected into a wider IT network. Similarly, The Advanced Visual Docking Guidance System (A-VDGS) project will require less design input that other airfield or stands projects as the main design inputs are about the positioning, support structure and connectivity of the units.

3.13 These cost estimates pivot off construction costs projections, so will move linearly with construction cost estimates.

3.14 **Common unit rates**:

- Generally, our rate for the electrical installation of €20.20 per m^2, based on outturn cost data from airfield projects at various UK airports, is lower than the €25.00 per m^2 assumed by Dublin Airport.
- Dublin Airport's generally assumed €311 per m^2 of pavement for apron and taxiways (and on one occasion €295 per m^2) is significantly more expensive than we would generally expect at €277-278 per m^2 (on occasion €303-333 per m^2). Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.
- More specific unit rate differences have been elaborated per project.

3.15 **Escalation**: This is the main driver of the "Others" cost line in the Dublin Airport Level 2 estimates and pivot off construction costs. From the responses provided by Dublin Airport we

have assumed escalation to be an inflationary allowance within the cost estimate, applied from the base date of the cost estimate to the mid-point of the construction programme.

3.16 Based on our recent experience in the UK and Irish markets we have seen annual inflationary increases of between 2.5% to 3.0%. Therefore, based on our review of the 23 project estimates and in particular those where an escalation allowance has been included, we believe that the allowances included are reasonable. Where the design stage has been concluded we have varied from Dublin Airport on the scope over which the escalation should be applied by excluding design related costs.

3.17 **Contingency**: This is an allowance to cover the risk of increased costs as a result of issues that are unknown or not defined at the time of preparing the estimate. We would normally expect to see the following contingency allowances:

- Feasibility stage: 20% of construction and design costs;
- Design stage: 10-15%, depending on the complexity of the project.
- Construction stage: 10%.

Our review of the projects submitted by Dublin Airport has been on this basis and our Level 3 estimates for some of the projects include a contingency allowance that is higher than the provision included in the Dublin Airport estimates. Where the design stage has been concluded we have varied from Dublin Airport on the scope over which the contingency should be applied by excluding design related costs.

3.18 **Lump sum allowances**: Where only Level 2 lump sum allowances have been provided by Dublin Airport with no further Level 3 detail or transparency to support them, it has not been possible to carry out any meaningful Level 3 analysis of the figures contained within them to establish how they have been calculated or whether they represent value for money. We have provided our own Level 3 estimates to compare against the Dublin Airport Level 2 lump sum allowances.

3.19 **Exchange rates applied to our benchmarks**: As all of the projects that we have used to source cost information to compare against Dublin Airport's costs are from UK airports, we have used a conversion factor of 1.135 Euros to the Pound. This conversion factor was determined based on the averages of the last 30 and 90 day periods at the time of preparation of this Report, as per Table 3.2 below. The 2017 yearly average was approximately 1.14 and the rate closed on 3 February 2018 at 1.135. The costs are not very sensitive to this conversion rate and applying different assumptions would only marginally change our review. For example, at a £:€ conversion factor of 1.15 our aggregate cost estimate for the 23 projects would reduce our variance with Dublin Airport Level 1 estimate from EUR 16.3 (-5.7%) to EUR 12.8m (-4.5%); representing a difference of EUR 3.5m (-1.2%).

Table 3.2: Euros to the Pound conversion rate

Rate	Last 30 days	Last 90 days
High	1.148	1.148
Low	1.123	1.116
Average	1.133	1.130

Source: www.xe.com - 3 February 2018

3.20 No further indexation has been applied converting from UK to Irish airport construction market, as we believe the differences in market circumstances are negligible at this level of review.

Double counting review

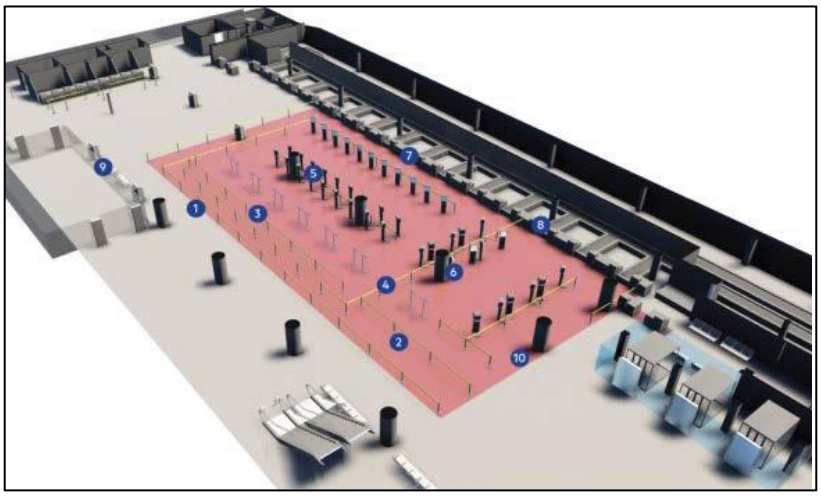
3.21 We have not found any instances of double counting.

4 Project-by-project review

1 - Terminal 1 and Terminal 2 Common User Self Service (CUSS) [SCP 17.1.001]

Introduction

Figure 4.1: Terminal 1 and Terminal 2 Common User Self Service (CUSS)



Source: Dublin Airport's PACE

4.1 The project objectives are:

- Provision of additional and more efficient check-in capacity through CUSS technology
- More efficient utilization of existing and limited space in check-in halls T1&T2
- Postponement of check-in hall extensions
- Mitigation of existing and future bottlenecks
- Enhancement of the passenger experience

4.2 Dublin Airport has outlined some key benefits from their existing CUSS setups which could be used to justify the project:

- Reduction in queue times of up to 75%
- The Self-Service Bag Drop can process up to 60 passengers per hour, while 24 passengers are processed by a check-in agent.

4.3 The time of our visit was not a peak time, however from what we could observe it was clear that the concept of self service to produce a boarding pass (if the passenger had not checked in on line) and baggage tag was a simple and efficient process, enabling the passenger to then

easily deposit the bag on the bag drop conveyor. The essence of the system is to split the process of checking in into two discreet sub-processes, one printing the boarding pass and bag labels, the other dropping off the bag at a separate machine (bag drop). This has the effect of increasing the check-in concourse capacity because while the bag is being dropped off, another passenger can be commencing the check-in process.

4.4 In both T1 and T2 the check-in concourses are prescribed spaces and fixed in size and configuration, so to increase the capacity of a traditional check-in desk layout and its queuing system is both difficult and expensive, without a major terminal re-configuration or extension, neither of which is realistic at each terminal. By using modern CUSS technology and the separation of processing that is required, this enables the capacity of a given space to be increased relatively economically.

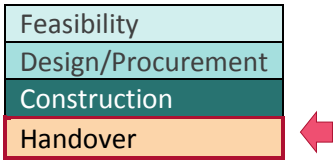
4.5 Project was completed in Q2 2017 in both terminals, T1 and in T2 West and at the time of our inspection was in use. Phase 3 has been designed and work is planned to commence in Q2 2018.

Key project metrics

Table 4.1: Terminal 1 and Terminal 2 Common User Self Service (CUSS) – Key project metrics

Metric	Value
SSK Units	98
BDK Units	41
Existing CIP allowance	€1,000,000

Current project status



Specifications review

Table 4.2: Terminal 1 and Terminal 2 Common User Self Service (CUSS) – Specifications review

Subject	Comments
Effectiveness of scope	Based on the successful installation and implementation of the CUSS system it is clear that the scope of works is effective. We understand that Phase 2 is not 100% complete as 6 bag drops are recorded as in store pending airlines readiness to proceed. The applied 2 step process including the weighing of bags at the kiosks is the most efficient setup available. However, one risk remains for phase 3 where mainly US flights are involved: Passengers of US-flights have more bags than the average Air Lingus or Ryanair passengers and they often have an onward journey. These 2 facts will make the self-service process more complicated and time consuming. Therefore, the help by additional staff would be essential to increase the capacity in the same way as for the existing setups.
Quality of specifications	The specifications that we have seen are schedules of SSK's (self-service kiosks) and BDK's (bag drop kiosks) and layout drawings.
Procurement efficiency	As far as we can understand the procurement route appears to be efficient and we have not found any evidence of claims for delays. The equipment is specialised, supplied by ARINC, and accounts for approximately 90% of the Capex. The majority of the contractors were engaged to a competitive bidding process.

Subject	Comments
Phasing and synergies with other projects	The phasing appears to have been well planned with Phase 1 providing separate installations in both T1 and T2, including testing the concept (POC) with a pilot installation. Phase 2 then followed with separate installations in both T1 and T2. These projects have a synergy with other projects that are providing general terminal capacity improvements. The relevant projects are gate improvements, i.e. the South Apron PBZ and Pier 1 Extension.
Existing asset conditions	The asset life of CUSS systems is 5 – 7 years; the terminal asset lives will exceed this life cycle.
Alternative scopes	The carefully planned and gradual phased installations would appear to be an optimum solution and it is difficult to envisage a more appropriate result.

4.6 In overall terms, the scope of the project meets the requirements of the objectives (i.e. increase the check-in capacity in T1 and T2) and appears efficient.

Cost estimate review

Table 4.3: Terminal 1 and Terminal 2 Common User Self Service (CUSS) – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€506,827	€484,637	-€22,190
Construction Costs	€6,075,336	€5,101,443	-€973,893
Design Development and Contingency	€317,838	€867,245	€549,407
Total	**€6,900,000***	**€6,453,325***	**-€446,675**

* EUR 1.0m will be covered by a 2014 CIP allowance.

Table 4.4: Terminal 1 and Terminal 2 Common User Self Service (CUSS) – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.5%	€72,404	€76,522
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.0%	€204,047	€153,043
Project Management/Other Costs	n/a	3.8%	5.0%	€230,376	€255,072
Total				**€506,827**	**€484,637**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Preliminaries	1	€1,152,110	€664,031	€1,152,110	€664,031
Building works	170 m²	€1,852	€1,687	€314,784	€286,792
Equipment; SSK Units incl elec works	98	€31,832	€28,225	€3,119,560	€2,766,050
Equipment; BDK Units incl elec works	41	€36,314	€33,770	€1,488,881	€1,384,570
Total				**€6,075,336**	**€5,101,443**
Design Development and Contingency	**Quantity**	**% of daa C-C**	**% of SDG C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development (Phase 3 only)	n/a	6.0%	7.0%	€173,366	€357,101
Contingency (Phase 3 only)	n/a	5.0%	10.0%	€144,472	€510,144
Others	n/a	0%	0%	€0	€0
Total				**€317,838**	**€867,245**

4.7 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.5: Terminal 1 and Terminal 2 Common User Self Service (CUSS) – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Cost	-€74,271.6	16.6%	n/a	n/a
SSK Units	-€142,880.0	32.0%	€28,000.0	€24,240.0
BDK units	-€124,800.0	27.9%	€28,000.0	€20,200.0
Allowance for design development	-€40,000.0	9.0%	€190,000.0	€150,000.0
Total	**-€381,951.6**	**85.5%**		

4.8 The design and management costs are generally estimated as a percentage of the construction costs. However, in this project we believe that the design costs are higher than we would expect bearing in mind that the level of architectural input should be very limited on this project.

4.9 In regards to the reduced cost of the SSK and BDK units, similar units have been installed at leading UK airports and the costs data for these indicates a slight reduction in the cost of the units compared to Dublin Airport estimates. However, the reduction on a per unit basis is marginal and our opinion is that the costs presented by Dublin Airport for these units are reasonable. The design development allowance is reduced compared to Dublin Airport's estimate because it is a percentage of the construction costs. As the construction costs in our estimate are less than DAA, this has resulted in a reduced design development allowance.

2 - Pier 1 Extension [SCP 17.1.002]

Introduction

Figure 4.2: Pier 1 Extension

Source: Dublin Airport's PACE

4.10 It is clear that the extension provided a dedicated walk on access to 2 additional stands which were previously remote stands. With L and R permutations for some stands there is significant flexibility for different aircraft parking configurations and therefore optimisation of stand use. The extension provides 4 dedicated gates, but there are 6 doors leading to the apron, so walk on access to a variety of stands is possible, again improving flexibility and optimising the benefits provided by the pier extension. The project objectives of providing additional capacity of gates and access to walk on stands have been met.

4.11 At most airports the configuration and location of the pier, or satellite is determined by the aircraft stand layout, which in turn is determined by the taxiway layout. This is especially true for an established airport, such as Dublin. In this context of the existing Pier 1, surrounded by the taxiway/apron layout, it is very difficult to provide more gates/stands without major re-planning and re-construction of the taxiway/apron system; this is a very expensive operation.

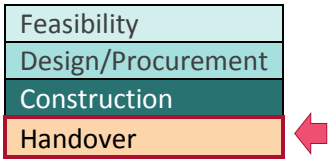
4.12 The Pier 1 extension manages to provide more gates and walk on stands without major taxiway/apron re-construction and so optimises this part of the airfield very successfully.

Key project metrics

Table 4.6: Pier 1 Extension – Key project metrics

Metric	Value
Construction area	860m^2
Project cost estimate (Level 1)	€7,600,000
Cost per square metre	€ 8,837/m^2
Net gain in number of boarding gates	4
Net gain in walk on stands	2

Current project status



Specifications review

Table 4.7: Pier 1 Extension – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirements of providing access to more walk on stands from Pier 1. It also enables the number of contact stands to be increased from 21 to 23, thus reducing the need for bussing to remote stands. The scope successfully optimises a constrained space at the end of Pier 1 and incorporates enabling works such as re-locating the battery chargers and fuel tank as well as providing a new toilet block in the existing Pier and re-locating existing GSE parking. The scope embraces all the objectives and includes ramp alterations to provide additional walk on contact stands.
Quality of specifications	The project is well documented with drawings and specification notes on these covering all aspects of the works. The built project reflects the comprehensiveness of the documentation.
Procurement efficiency	As far as we can understand the traditional procurement route appears to be efficient and we have not found any evidence of claims for delays. There was a workmanship issue with the vinyl floor covering to a portion of the gate lounge area which is being rectified.
Phasing and synergies with other projects	The phasing in this case required the enabling works (battery charging, fuel tank and GSE parking) to be carried out first followed by the Pier extension itself and appears to have been well planned. This project has a synergy with the other capacity improvement projects, principally the T1 CUSS installation and therefore maintains the overall capacity improvement objectives.
Existing asset conditions	The asset life is 40 years and the remaining theoretical asset life of Pier 1 is 30 years, so the airport will realise the full value of the Capex. We would expect the internal finishes and IT to be renewed within the life of the building. We also note that the structure is future proofed so that a 1st floor could be built if required at a later date.
Alternative scopes	The carefully planned and phased project would appear to be an optimum solution and it is difficult to envisage a more appropriate result.

4.13 In overall terms, the scope of the project meets the requirements of the objective of increasing gate capacity and access to contact stands and appears efficient.

Cost estimate review

Table 4.8: Pier 1 Extension – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€585,200	€500,496	-€84,704
Construction Costs	€7,014,800	€5,958,282	-€1,056,518
Design Development and Contingency	€0	€0	
Total	**€7,600,000**	**€6,458,778**	**-€1,141,222**

Table 4.9: Pier 1 Extension – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.2%	€83,600	€71,499
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.4%	€235,600	€202,582
Project Management/Other Costs	n/a	3.8%	3.8%	€266,000	€226,415
Total				**€585,200**	**€500,496**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Enabling Works	860 m²	€838	€838	€720,605	€720,745
Construction Cost	860 m²	€5,562	€4,459	€4,783,588	€3,834,740
Mechanical Costs	860 m²	€1,159	€871	€997,000	€749,198
Electrical Costs	860 m²	€597	€760	€513,606	€653,600
Total				**€7,014,800**	**€5,958,282**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	0%	0%	€0	€0
Contingency	n/a	0%	0%	€0	€0
Others	n/a	0%	0%	€0	€0
Total				**€0**	**€0**

4.14 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.10: Pier 1 Extension – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design & Planning Fees	-€88,766.7	7.8%	n/a	n/a
Substructure	-€127,125.2	11.1%	€452.0	€304.2
External Walls (Cladding)	-€388,161.0	34.0%	€894.0	€442.7
Roof Finishes	-€222,632.5	19.5%	€344.0	€85.1
Total	**-€826,685.4**	**72.4%**		

4.15 The benchmark data that we have for pier projects indicated that the substructure unit cost included in Dublin Airport's estimate is a lot higher than we would expect, bearing in mind that the extension to the Pier has been constructed on what we assume was previously pavement/hardstanding construction. The cost of the external cladding at €894/m^2 is extremely expensive for a cladding solution for an airport building, particularly when it is in an airside location and there should be no bomb blast enhancements required that would push up the unit cost. We have a lot of data from airports across the UK that would support this position.

3 - South Apron PBZ [SCP 17.1.003]

Introduction

Figure 4.3: South Apron PBZ

Source: Dublin Airport's PACE

4.16 The PBZ provides a dedicated walk on access to a range of 9 Code C stands; which were not previously available with walk on access. The PBZ provides 5 dedicated gates and can accommodate passengers for 5 Code C flights (circa 900 pax simultaneously). The project objectives of providing additional capacity of gates and access to walk on stands have been met.

4.17 At most airports the configuration and location of the pier or satellite is determined by the aircraft stand layout, which in turn is determined by the taxiway layout. This is especially true for an established airport, such as Dublin. In this context of the constrained South Apron and the existing taxiway/apron layout it is difficult to provide more stands/gates without major re-planning and re-construction.

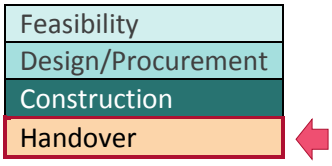
4.18 The PBZ manages to provide 5 more gates and 9 walk on stands in a constrained part of the airport and so optimises this part of the airfield very successfully.

Key project metrics

Table 4.11: South Apron PBZ – Key project metrics

Metric	Value
Construction area	2,200m^2
Project cost estimate (Level 1)	€21,832,392
Cost per square metre	€9,924/m^2
Net gain in number of boarding gates	5

Current project status



Specifications review

Table 4.12: South Apron PBZ – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirements of providing 5 gates for pre-boarding to improve on-time performance of aircraft stands. Passengers access the PBZ via a bussed access from Pier C. It also enables the existing constrained South Apron to provide 9 Code C walk on stands. The number of buses required is also reduced. The scope successfully optimises the constrained existing South Apron by providing a building of 2,200m^2 for the gates/lounges, new head of stand road, dedicated covered walkway to stands, bussing drop- off area and Code C stands. The scope embraces all the objectives and includes a re-modelled Pier C bus lounge.
Quality of specifications	The project is well documented with drawings and specification notes on these covering all aspects of the works. The built project reflects the comprehensiveness of the documentation.
Procurement efficiency	The criticality of this project required that it be delivered by Q4 2017. From the documents we reviewed the procurement process required planning consent, but it is not clear when this process started, although outline design is recorded complete in Q2 2016 and planning complete in Q3 2016. Given the tight time scale the decision was taken to prefabricate the structure (off site) to save construction time on site. Site construction started in Q1 2017 and the project was completed in Q4 2017. 3 works packages were let as follows: 1. Works package 1 • Civils enabling works • Electrical enabling works 2. Works package 2 • Pier C bussing gate modifications 3. Works package 3 • PBZ lounge (modular building) design and build package • Miscellaneous works, including covered walkways, bus turning circle, seating etc. Given the short time scale, the decision to procure the project with different packages of work is appropriate.
Phasing and synergies with other projects	The phasing in this case required the enabling works (civil and electrical site clearance) to be carried out first followed by the PBZ building construction and the other miscellaneous works, and appears to have been well planned. This project has a synergy with the other capacity improvement projects, principally the T2 CUSS installation and therefore maintains the overall capacity improvement objectives.
Existing asset conditions	The asset life is 20 years which is surprising as that of the Pier 1 extension is 40 years. We assume that this reflects long term plans for gate and walk on stand capacity and possible other uses envisaged in the South Apron zone.
Alternative scopes	The carefully planned and phased project would appear to be an optimum solution and it is difficult to envisage a more appropriate result.

4.19 In overall terms, the scope of the project meets the requirements of the objective of increasing the number of gates and walk on stands and appears efficient.

Cost estimate review

Table 4.13: South Apron PBZ – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€1,689,603	€1,627,759	-€61,844
Construction Costs	€20,151,298	€19,378,080	-€773,218
Design Development and Contingency	€0	€0	€0
Total	**€21,832,392**	**€21,005,839**	**-€826,553**

Table 4.14: South Apron PBZ – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.2%	€241,372	€232,537
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.4%	€680,230	€658,855
Project Management/Other Costs	n/a	3.8%	3.8%	€768,002	€736,367
Total				**€1,689,603**	**€1,627,759**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Enabling Works	2,200 m²	€3,104	€3,103	€6,828,083	€6,826,600
Terminal 2 Alterations	1	€1,592,337	€1,593,544	€1,592,337	€1,593,544
Construction Cost	2,200 m²	€4,657	€3,505	€10,245,307	€7,711,286
Mechanical Costs	2,200 m²	€448	€752	€985,265	€1,653,861
Electrical Costs	2,200 m²	€228	€724	€502,307	€1,592,789
Total				**€20,153,737**	**€19,378,080**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG total fee**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	0%	0%	€0	€0
Contingency	n/a	0%	0%	€0	€0
Others	n/a	0%	0%	€0	€0
Total				**€0**	**€0**

4.20 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.15: South Apron PBZ – Main Level 3 variances

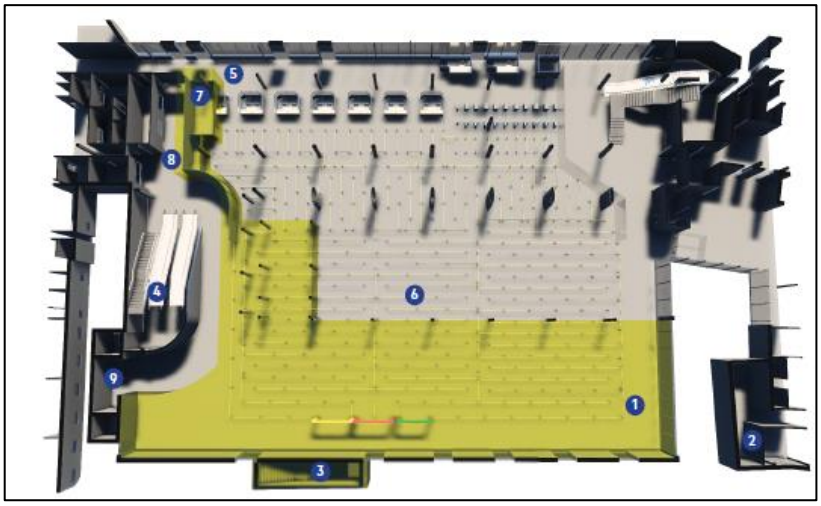
Item	Variance	% of total variance	daa rate	SDG rate
Multi-discipline design team	-€75,080.6	9.1%	n/a	n/a
Doors & Ironmongery	-€229,295.0	27.7%	€178.0	€73.8
Floor Finishes	-€203,566.0	24.6%	€231.0	€138.5
Electrical Installation	-€173,800.0	21.0%	€760.0	€681.0
Mechanical installation	-€103,950.0	12.6%	€785.0	€737.8
Total	**-€785,691.6**	**95.1%**		

4.21 The allowances included in Dublin Airport's estimates for floor finishes are higher than we would expect for a facility of this type. The mechanical and electrical installation costs provided by Dublin Airport are also higher than expected for when compared to other similar projects. Based on the number of doors included in the door schedule for the PBZ (41 No) the allowance of €391,600 for doors and ironmongery is extremely high, particularly if not all of the doors are security controlled doors. Our allowance has been prepared based on benchmark data for doors in UK airports in similar facilities.

4 - Terminal 1 and Terminal 2 Immigration Facilities [SCP 17.1.004]

Introduction

Figure 4.4: Terminal 1 Immigration Facilities



Source: Dublin Airport's PACE

4.22 The objective of this project is to increase the processing capacity of the Immigration Control in T1 and in T2 and to comply with the current strategy of the Irish Naturalisation and Immigration Service (INIS) by installing e-readers.

4.23 In T1 the current Immigration Control is in a relatively small Immigration Hall, with the result that at busy times passengers cannot all queue in the Immigration Hall and are forced to wait in the Skybridge connected to Pier 1. Part of this project will be to expand the current Immigration Hall, therefore removing queueing from the Skybridge. This is scheduled to be complete by Q2 2019.

4.24 In T2 there is adequate queuing space and the capacity addition is relatively minor, increasing the peak hour capacity from 3,200 to 3,400 passengers.

4.25 The driver for the project is both capacity improvements and moving forward with INIS's strategy of installing e-gates for improved EU processing of chipped passport holders.

4.26 In both T1 and T2, existing manned booths are being replaced by e-readers in the ratio of 1 booth to 2 e-readers. The e-readers are being supplied by INIS and so do not figure in the project costs.

4.27 The extension of T1 immigration hall is at early feasibility stage with a handover in Q2 2019.

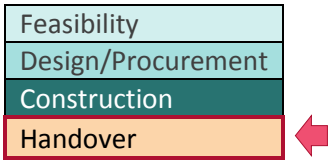
Key project metrics

Table 4.16: Terminal 1 Immigration Facilities – Key project metrics

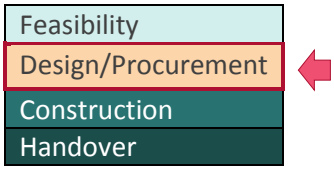
Metric	Value
Construction area (Immigration Hall expansion)	870m^2
Number of e-gates (T1&T2)	20

Current project status

E-gates:



Terminal 1 extension:



Specifications review

Table 4.17: Terminal 1 Immigration Facilities – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirements of providing 5 additional immigration processing positions (5 manned booths are replaced by 10 e-readers in each terminal) to increase capacity in T1 and T2 and for the expansion of the Immigration Hall in T1. It also complies with the current strategy of INIS for the provision of e-readers.
Quality of specifications	The concept design drawing and specification for the location of the e-readers and the extension of the T1 Immigration Hall cover the functional issues and design concepts, but detailed architect's and engineer's drawings are required for construction tender purposes. The e-reader layout for T2 is shown on a layout plan, but more information is required for dealing with the finishes after the removal of the current booths. The e-readers are supplied and installed by INIS's nominated supplier. The project briefing document is very thorough and covers all aspects of the e-readers installation requirements.
Procurement efficiency	The procurement route for the E-gates appears to be efficient and we have not found any evidence of claims for delays. We have not received any detail on the procurement route for the Immigration Hall expansion in T1, and expect that first detailed architects and engineers' drawings are needed.
Phasing and synergies with other projects	It would appear that the timing of these projects is driven by INIS's desire to implement their new e-reader strategy. In the case of T1 it is more than necessary as there is clearly a capacity issue in this terminal. In T2 the capacity increase is marginal. However, to make the installation successful in T1, the expansion of the Immigration Hall is highly desirable. It is possible that the restricted flow of passengers from Immigration could impact on the T1 re-claim belts in extended occupancy. Because the passenger flow capacity will be increased from 2,897 pax/hr to 4,300 pax/h with the e-gate installations, the additional capacity will lead to less queues and therefore validation of the planned Immigration Hall expansion could benefit from further optimisation studies.
Existing asset conditions	The asset life of the e-readers is 10 years. Terminal T2 asset life will exceed this life cycle by circa 30 years, however the T1 asset life for the future Immigration Hall expansion is 15 years, so it will be important to optimise this investment.
Alternative scopes	The driver for this project is the strategy of INIS and the location of the installation determined by the current terminal planning, so it is difficult to envisage a more appropriate solution.

4.28 In overall terms, the scope of the project meets the requirements of the objectives, i.e. increase the capacity of the Immigration process in T1, and comply with the strategy of INIS for installing e-readers. The scope appears efficient, however the additional capacity provided by the e-gates will lead to less queues and therefore validation of the planned Immigration Hall expansion could benefit from further optimisation studies.

Cost estimate review

Table 4.18: Terminal 1 Immigration Facilities – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€774,885	€1,242,901	€468,016
Construction Costs	€9,288,561	€8,286,007	-€1,002,554
Design Development and Contingency	€1,243,797	€1,557,595	€313,798
Total	**€11,307,243**	**€11,086,503**	**-€220,740**

Table 4.19: Terminal 1 Immigration Facilities – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	2.0%	€110,698	€165,720
Civil/Airfield/Environmental Engineer	n/a	3.4%	6.5%	€311,967	€538,590
Project Management/Other Costs	n/a	3.8%	6.5%	€352,221	€538,590
Total				**€774,885**	**€1,242,901**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New build extension with improved specification	870 m²	€5,500	€4,738	€4,785,000	€4,122,060
Immigration e-gates T1 and T2	1	€1,067,911	€1,067,911	€1,067,911	€1,067,911
Mechanical works	1	€993,524	€993,524	€993,524	€993,524
Electrical works	1	€702,512	€702,512	€702,512	€702,512
Ext Building works, cladding etc incl. car parking, paving	700 m²	€2,485	€2,000	€1,739,614	€1,400,000
Total				**€9,288,561**	**€8,286,007**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	6.7%	6.0%	€678,435	€604,705
Contingency	n/a	5.6%	10.0%	€565,362	€952,891
Others	n/a	0%	0%	€0	€0
Total				**€1,243,797**	**€1,557,595**

4.29 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.20: Terminal 1 Immigration Facilities – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	-€222,217.9	100.7%	n/a	n/a
New build extension - Higher spec wall and ceiling finishes and glass wall cladding	-€362,502.9	164.2%	€5,500.0	€5,083.3
Escalation Allowance (3%)	€346,420.0	-156.9%	n/a	n/a
Contingency Allowance (10%)	€96,182.9	-43.6%	n/a	n/a
Total	**-€142,117.9**	**64.4%**		

4.30 The design and management costs for this project have been estimated as a percentage of the construction costs. We believe that the design and management costs are higher than other projects considering the level of architectural input required and the logistics and integration required for such a project.

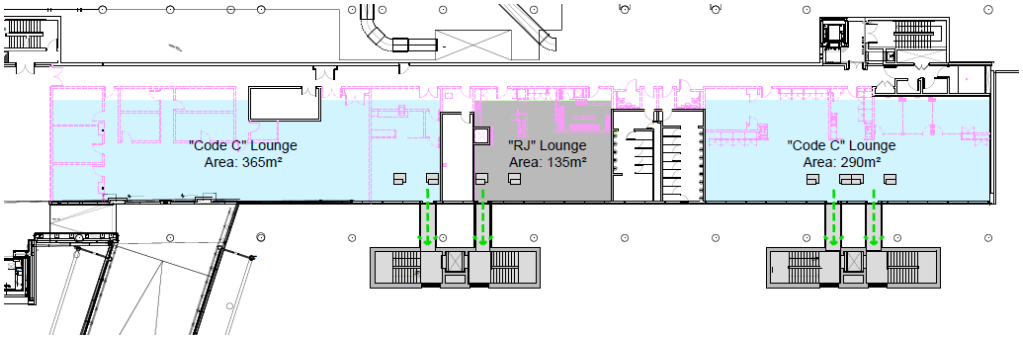
4.31 We believe that the rate used for the new build extension to the Immigration Hall is higher than it should be. The rate used by Dublin Airport reflects what we would expect to see for a new terminal construction, and while this project involves the construction of a new extension, it is to an existing facility that is to provide additional capacity. Therefore, we would expect to see a reduction in the rate as we would assume that some of the existing services infrastructure will have capacity to service the additional space.

4.32 We have applied a higher percentage for escalation than the Dublin Airport estimate which is why there is a significant difference between our figure and Dublin Airport's.

5 - Additional Bus Gates [SCP 17.1.005]

Introduction

Figure 4.5: Additional Bus Gates (Option 1)



Source: Dublin Airport

4.33 The objective of this project is to increase the capacity of T2 by providing additional gates.

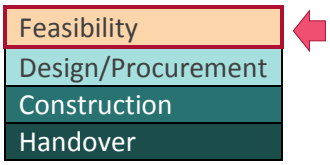
4.34 It optimises critical infrastructure in T2, as it proposes to use existing office support accommodation (which can be relocated to a less critical area) to provide additional passenger processing capacity. It also uses the existing airside road infrastructure.

Key project metrics

Table 4.21: Additional Bus Gates – Key project metrics

Metric	Value
Project cost estimate (Level 1)	€8,744,936
Gates	• 4 x Regional Jet type aircraft; or • 2 x full code C and 1 x Regional Jet.
Vertical Circulation Cores	2

Current project status



Specifications review

Table 4.22: Additional Bus Gates – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirements of providing additional gates in a flexible configuration to suit a range of flight mix from Regional Jet (RJ) type aircraft to full Code C aircraft. Access to the new gate lounges is not clear from the project data, but from our knowledge of the terminal the route is via the pier connector, after the main terminal processing and retail concourse. Vertical circulation cores and bus parking is provided. The scope successfully optimises a part of the existing terminal T2 for a passenger processing function as opposed to providing support offices. Whilst offices are necessary they can often be located in parts of the terminal which are not considered prime passenger processing floor space. The scope clearly identifies a flexible arrangement for the gate lounge functions and access to the bus pick up kerb.
Quality of specifications	The project documentation is in its early stages and whilst the intent is conveyed clearly, more detailed drawings, specifications and construction/operational methodologies will be required. It is an airside site and the impact of this needs to be covered in both the project costings and site access.
Procurement efficiency	It is not clear what the criticality is with regard to project delivery. The high-level time line is quite generous and there could be advantages in splitting the construction into 2 packages: 1. The construction of the external vertical circulation cores, which by their very nature, and being an airside site, located adjacent a busy airside road are potentially more complicated (than internal alterations), would benefit from a fast-tracked procurement process. 2. The internal re-planning to create the gate lounges from the current offices could be executed, possibly from a landside access, at a point in time to suit the completion of the vertical circulation cores. These benefits will need to be assessed against any loss of efficiency of engaging a single contractor in a single contract. This potential efficiency has therefore not been assessed by us in our cost estimates. We are not clear if Planning consent is required for the airside external works, but if this is the case, delays are possible which could drive the whole program.
Phasing and synergies with other projects	Phasing has not been identified, however as outlined above there may be some advantages to phasing the design, tendering and construction. This project has a synergy with the other capacity improvement projects, principally the T2 CUSS installation, and therefore maintains the overall capacity improvement objectives.
Existing asset conditions	The asset life identified is 30 years which is complimentary with the remaining asset life of T2.
Alternative scopes	The carefully planned concept for the additional gate lounges is an optimum solution and it is difficult to envisage a more effective solution.

4.35 The scope of the project meets the user requirements supporting airline growth by increasing the number and flexibility of gates available. The scope appears efficient.

Cost estimate review

Table 4.23: Additional Bus Gates – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€717,000	€639,241	-€77,759
Construction Costs	€6,693,962	€4,261,608	-€2,432,354

Design Development and Contingency	€1,333,973	€882,153	-€451,820
Total	**€8,744,936**	**€5,783,002**	**-€2,961,934**

Table 4.24: Additional Bus Gates – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	2.0%	2.0%	€125,000	€85,232
Civil/Airfield/Environmental Engineer	n/a	5.0%	6.5%	€367,000	€277,004
Project Management/Other Costs	n/a	3.0%	6.5%	€225,000	€277,004
Total				**€717,000**	**€639,241**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Lounge Area Demo and Build	1,136 m²	€1,772	€1,350	€2,013,402	€1,533,600
Mechanical and Electrical/LSS	1,136 m²	€1,381	€1,125	€1,569,520	€1,278,000
Works to Existing Façade Works	1	€140,000	€140,000	€140,000	€140,000
Link and Vcc Structure	1,672 m²	€839	€445	€1,567,040	€743,288
Rain Screen	1,012 m²	€750	€560	€759,000	€566,720
Lifts Incl. Interlocks	2	€150,000	€112,500	€300,000	€225,000
Protection to Existing Services and Road Markings	1	€345,000	€1,350	€345,000	€345,000
Total				**€6,693,962**	**€4,261,608**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Contingency	n/a	15.0%	15.0%	€1,111,644	€735,127
Others	n/a	3.0%	3.0%	€222,328	€147,025
Total				**€1,333,973**	**€882,153**

4.36 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.25: Additional Bus Gates – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Back painted Glass to Walls	-€584,758.9	19.7%	€1,200.0	€151.5
Mechanical & electrical Installation	-€560,048.0	18.9%	€1,200.0	€707.0
Vertical Circulation Structure	-€327,712.0	11.1%	€600.0	€404.0
Steel Stairs in VCC	-€200,000.0	6.8%	€80,000.0	€30,000.0
Rainscreen equiv. Cladding to VCC	-€360,711.5	12.2%	€750.0	€393.6
Protection of existing services in vicinity of VCC	-€200,000.0	6.8%	€300,000.0	€100,000.0
Contingency Allowance (15%)	-€379,271.5	12.8%	n/a	n/a
Total	**-€2,612,502.0**	**88.2%**		

4.37 Based on the experience of our advisors in delivering VCC's and fixed links in airside locations at airports across the UK we believe that a number of the rates in the Dublin Airport Level 3

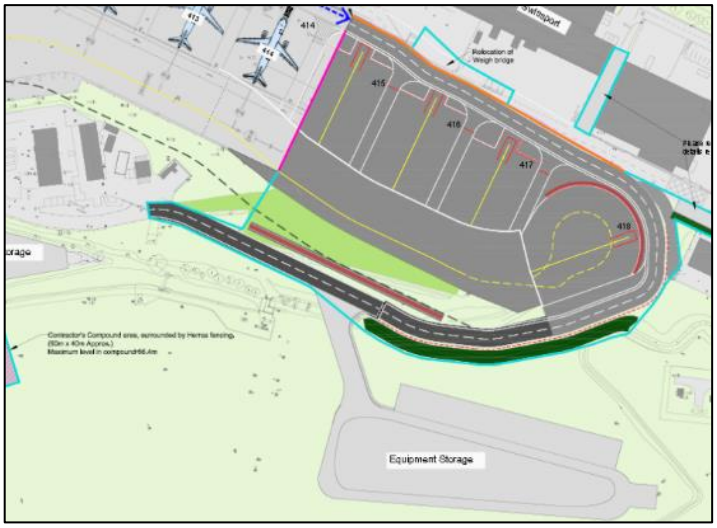
estimate are a lot higher than we would expect for this type of work. In particular, the rates for rainscreen cladding, stairs, back painted glass and mechanical and electrical services are considered very high.

4.38 The contingency allowance we have proposed is at 15% and the variance is due to the overall reduced Design, Management and the construction for the project in comparison with the Dublin Airport assumption. The reduced contingency allowance in our estimate is as a result of the reduction in our construction costs due to the rate differentials noted above.

6 - South Apron Stands [SCP 17.2.001]

Introduction

Figure 4.6: South Apron Stands



Source: Dublin Airport

4.39 This project provides 4 Code C aircraft parking stands (NBEs–B737, A320, A321) including a self-manoeuvring ATR-72 type and 8,000sqm of ground service equipment (GSE) parking on the South Apron.

4.40 This project is intended to address the shortfall in stands of 11 NBEs. The project was commenced in advance of the Supplementary CIP process and expands the number of stands on the South Apron by 4 NBEs, in order to accommodate the 2017 demand.

4.41 There is currently a shortage of aircraft stands on the eastern side of RWY 16/34. The South Apron Stands were commenced to meet the demand and also to respond to customer requests.

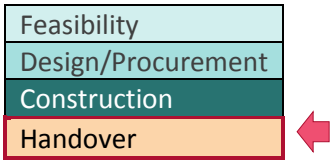
4.42 The South Apron Stand development delivers 4 NBEs increasing the South Apron capacity to 9 NBEs.

Key project metrics

Table 4.26: South Apron Stands – Key project metrics

Metric	Value
New Pavement Construction Area	17,000m^2
Net gain in number of NBE stands	4
Project cost estimate (Level 1)	€10,484,604
Cost per stand gained	€2,621,151

Current project status



Specifications review

Table 4.27: South Apron Stands – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code. The scope of works appears to be consistent with the project need with the following exception: The document "Target PCN for PACE Airfield Taxiway and Stands Project" indicates that for this project a target PCN value of 85 has been used on the basis of Code E aircraft. Given that only Code C aircraft will access these new stands, the pavement design for this project may have been inefficient and over specified.
Quality of specifications	As the project is now handed over, the quality of specifications and drawings received has been detailed and comprehensive.
Procurement efficiency	The project was procured on a design and build basis which was sensible to achieve further efficiencies in pavement design and construction.
Phasing and synergies with other projects	The phasing appears to have been well planned with the enabling works packages providing timely relocation of GSE parking and storage. Furthermore, this project is part of a cluster of projects relating to overall stand capacity improvements, with which this project successfully aligns.
Existing asset conditions	Few existing assets have been retained. The existing pavements have required replacement to permit aircraft weights to be accommodated. It is evident that where possible, existing assets, such as high mast lighting, have been re-used where possible.
Alternative scopes	Other than pavement design optimisation, the carefully planned installation would appear to be an optimum solution and it is difficult to envisage a more appropriate solution.

4.43 In overall terms, while some efficiencies in pavement design could have been considered, the overall conclusion is that this project is scoped in an effective manner. Given that only Code C aircraft will access these new stands, the pavement design for this project may have been inefficient and over specified.

Cost estimate review

Table 4.28: South Apron Stands – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€807,315	€1,231,875	€424,560
Construction Costs	€9,677,289	€8,271,902	-€1,405,387
Design Development and Contingency	€0	€0	€0
Total	**€10,484,604**	**€9,503,777**	**-€980,827**

Table 4.29: South Apron Stands – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	n/a	€115,331	€562,500
Civil/Airfield/Environmental Engineer	n/a	3.4%	n/a	€325,023	€669,375
Project Management/Other Costs	n/a	3.8%	n/a	€366,961	€0
Total				**€807,315**	**€1,231,875**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New Pavement	17,000 m²	€290	€276	€4,935,418	€4,691,575
Electrical Work	17,000 m²	€74	€83	€1,258,048	€1,417,758
Drainage	17,000 m²	€154	€76	€2,612,868	€1,291,613
Temporary works to maintain aircraft operations	1	€870,956	**€870,956**	€870,956	€870,956
Total				**€9,677,289**	**€8,271,902**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	0%	0%	€0	€0
Contingency	n/a	0%	0%	€0	€0
Others	n/a	0%	0%	€0	€0
Total				**€0**	**€0**

4.44 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.30: South Apron Stands – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design Fees	€219,166.0	-22.3%	€343,334.0	€562,500.0
Project Management Fees	-€729,622.0	74.4%	€1,398,997.0	€669,375.0
Preliminaries -Enabling Works & New Equipment Parking Area	-€137,981.0	14.1%	€477,731.0	€339,750.0
Preliminaries - Apron works	€165,105.0	-16.8%	€611,145.0	€776,250.0
Drainage Works	-€130,475.0	13.3%	€36.1	€28.4
Electrical Installations (HML, AGL etc)	-€297,075.0	30.3%	€57.2	€39.7
Total	**-€910,882.0**	**92.9%**		

4.45 Our allowance for design and management costs is 15% of construction costs which is a recognised benchmark for airport projects. We believe that this is a more realistic allowance than the Dublin Airport estimate.

4.46 We have amended the allowance for preliminaries in both the enabling works and the apron works to reflect what we believe is a realistic allowance for each section. In overall terms the total allowance for preliminaries in this project are very similar to the Dublin Airport provision.

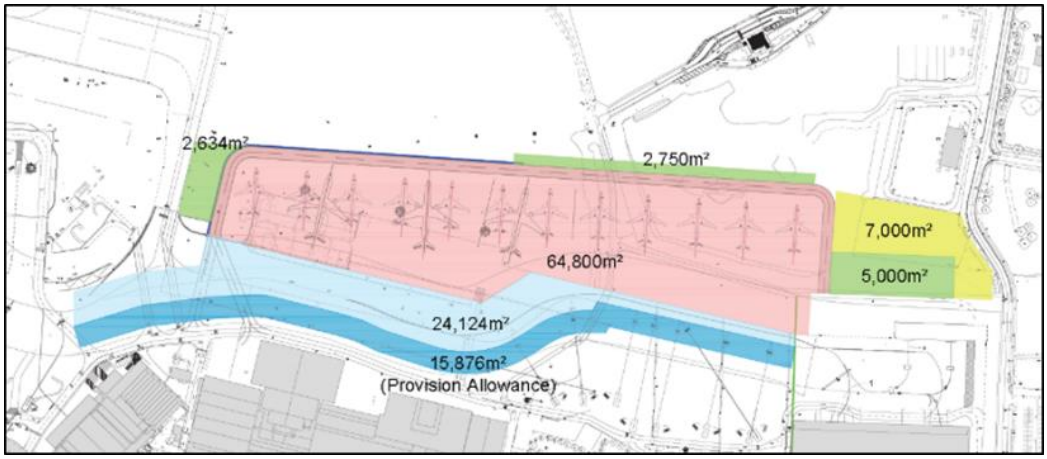
4.47 The drainage works has been assessed at €28.4 per m² in comparison to the Dublin Airport's rate of €36 per m², based on benchmark information for similar projects.

4.48 The installation costs for the HML / AGL and other required electrical installation for the Dublin Airport appears excessive and we have assumed a benchmark rate nearer €40 per m² instead.

7 - Apron 5H and Taxiway Rehabilitation [SCP 17.2.002]

Introduction

Figure 4.7: Apron 5H and Taxiway Rehabilitation



Source: Dublin Airport

4.49 This project provides 12 Code C aircraft parking stands including 3 Wide Body stands in MARS (Multi Aircraft Ramp System) configuration and an open hangar area for business aviation. It also includes the necessary rehabilitation of the North Apron taxiway pavement which is over 60 years old, to facilitate this development.

4.50 Dublin Airport's Summer 2019 forecast stand demand (based on current growth profiles) has identified a stand requirement of 116 NBEs (Narrow Body Equivalent) during the peak demand in the early morning, versus a recent (Q1 2017) stand supply of 105 NBEs. This results in a shortfall of 11 stands and with contingency provision, the shortfall increases to 21 stands, as detailed in the PACE document provided.

4.51 Apron 5H and the associated North Apron Taxiway Rehabilitation is one of the projects required to address this shortfall. Apron 5H is an eastward extension of Apron 5G on the North Apron and encompasses the footprint of the General/Business Aviation parking on Light Aircraft Park 'B' (LAPB). Business aviation parking is being provided as part of this development to compensate for the loss of LAPB.

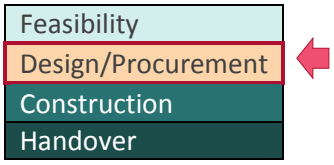
4.52 Apron 5H will be located directly adjacent to the future North Runway access taxiway and this will facilitate greater On Time Performance on completion of the North Runway. The apron also safeguards for a future satellite boarding facility.

Key project metrics

Table 4.31: Apron 5H and Taxiway Rehabilitation – Key project metrics

Metric	Value
Area of Pavement Refurbishment	40,000m²
Net gain in number of NBE stands	12
Project cost estimate (Level 1)	€52,000,058
Cost per stand gained	€4,333,338
Construction cost per stand gained (exc. Refurb)	€2,689,990

Current project status



Specifications review

Table 4.32: Apron 5H and Taxiway Rehabilitation – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code. The project does necessitate the relocation of the General Aviation parking. However, the location of this project being already taxiway served, is considered a sensible solution to meeting the need for more stand space.
Quality of specifications	Given that the project's dimensions are based on a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. The drawings indicate a good level of understanding of existing underground utilities and features.
Procurement efficiency	The project is to be procured on a design and build basis which is sensible in order to achieve further efficiencies in pavement design and construction.
Phasing and synergies with other projects	The phasing appears to have been well planned with the enabling works packages providing timely relocation of GA parking and storage. Furthermore, this project is part of a cluster of projects relating to overall stand capacity improvements, with which it successfully aligns. The feasibility planning has recognised that the construction and commissioning of the new electrical substation is not a short-term project, the relocation of Gate 1A will impact the 5H-project and there will be a need for coordination with the Northern Runway Project. This last point is particularly important to maintain Code F clearances to the future northern runway parallel taxiway. Dublin Airport has satisfactorily indicated how this is to be achieved, including suitable allowances for jet blast protection. The GSE relocation area identified on the drawings received appears to clash with the future PBZ and its airside service roads.
Existing asset conditions	Few existing assets have been retained. The existing pavements have required replacement to permit aircraft weights to be accommodated or to replace life-expired pavements. However, the AECOM pavement study carried out in November 2016 confirms that the taxiway route will not have either the strength nor the residual life for the future operations. Other than the pavements, there is limited scope for the reuse of existing assets.

Subject	Comments
Alternative scopes	The drawings indicate that existing apron pavements are to be demolished and reconstructed. Some efficiencies may be gained through considering overlaying the existing pavements, or re-using elements of pavements that will not be trafficked by aircraft. As this apron will be close to the future runway 28R threshold, with some futureproofing on vertical alignment and additional drainage measures, the new apron could form part of a future de-icing pad strategy, allowing quicker release of aircraft from existing contact stands during periods of aircraft de-icing. The document "Target PCN for PACE Airfield Taxiway and Stands Project" indicates a target PCN value for this project of 80, consistent with Code E aircraft. This is consistent with the targeted use of the stands for Code E remote parking in MARS configuration, as designed on the western half of the new apron. However, as it would appear that the eastern half of the stands will only ever be trafficked by Code C aircraft, some savings in pavement specification may be possible in that location. This is corroborated by the AECOM pavement study carried out in November 2016. Notwithstanding the above, the proposed apron pavements are extremely thick, and in our view, could be reduced.

4.53 In overall terms, while some efficiencies in pavement design could be considered, the overall conclusion is that this project is effective.

Cost estimate review

Table 4.33: Apron 5H and Taxiway Rehabilitation – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€3,563,564	€3,113,010	-€450,554
Construction Costs	€42,716,487	€39,261,061	-€3,455,426
Design Development and Contingency	€5,720,006	€6,779,851	€1,059,845
Total	**€52,000,058**	**€49,105,539**	**-€2,894,519**

Table 4.34: Apron 5H and Taxiway Rehabilitation – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.1%	€509,081	€413,812
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.2%	€1,434,682	€1,244,576
Project Management/Other Costs	n/a	3.8%	3.7%	€1,619,802	€1,454,622
Total				**€3,563,564**	**€3,113,010**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New apron pavement area	65,000 m²	€344	€277	€22,366,272	€18,005,000
Rehabilitation of existing apron (full)	25,000 m²	€329	€287	€8,236,990	€7,175,000
Rehabilitation of existing apron (partial)	15,000 m²	€147	€133	€2,199,610	€1,995,000
New Apron Pavement (Business Aviation)	7,000 m²	€246	€231	€1,723,341	€1,618,050
New GSE parking area (incl potential areas)	10,000 m²	€222	€201	€2,224,446	€2,010,900
Drainage attenuation	65,000 m²	€20	€23	€1,332,205	€1,501,300
Electrical and other lighting	105,000 m²	€31	€20	€3,301,418	€2,126,775
Preliminaries/Phasing/Operational restrictions	1	€1,332,205	€4,829,036	€1,332,205	€4,829,036
Total				**€42,716,487**	**€39,261,061**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	6.7%	0%	€3,120,003	€0
Contingency	n/a	5.6%	10.0%	€2,600,003	€4,237,407
Others	n/a	0%	6.0%	€0	€2,542,444
Total				**€5,720,006**	**€6,779,851**

4.54 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.35: Apron 5H and Taxiway Rehabilitation – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Apron Area	-€2,207,088.0	76.3%	€311.0	€276.9
Escalation Allowance (6%)	-€161,175.1	5.6%	n/a	n/a
Contingency Allowance (10%)	-€268,623.9	9.3%	n/a	n/a
Total	**-€2,636,887.0**	**91.1%**		

4.55 The variance in the costs for the apron area is as a result of Dublin Airport's Construction Costs Level 3 estimate of €311 per m², which is more expensive than we would expect. Our rate of €277 per m² is based on similar pavement construction costs from airfield projects at South-East England airports. The reduced contingency and escalation costs in our estimate are as a result of the lessening in our construction costs due to the pavement rate differential.

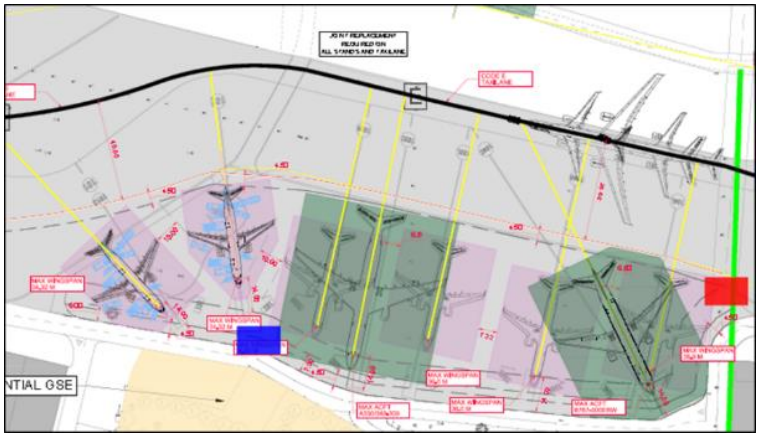
4.56 We have also assumed a slightly lower unit rate for Electrical and other lighting installations at €22.70 against Dublin Airport's €25,00 per m^2. This concerns a significant amount of m^2, thus creating a material absolute difference.

4.57 We have assumed similar contingency and escalation rates, however these were taken over a lower construction costs estimate.

8 - Upgrade and Realignment of Stands 101–104 [SCP 17.2.003]

Introduction

Figure 4.8: Upgrade and Realignment of Stands 101-104



Source: Dublin Airport

4.58 The project comprises the upgrade and realignment of Stands 101–104 to enable full passenger operations. These stands add a net gain of 6 Narrow Body Equivalent (NBEs) passenger operational stands (incl. 2 additional Wide Body (WB) stands).

4.59 The project includes the realignment of the stand layout to maximise the flexibility of the existing stand arrangement, the provision of pollution control infrastructure, high mast lighting infrastructure, and GSE storage areas. The feasibility of this project depends on the Irish Aviation Authority-Safety Regulation Department (IAA SRD) acceptance of the Deviation Acceptance and Action Document (DAAD) for existing parking of maintenance aircraft on this pavement, as part of the EASA transition process.

4.60 Stands 103–104 are currently used to park aircraft being serviced by the hangar tenants. Stands 101-102 are currently used to park large business aviation aircraft. As part of this proposal these activities will be relocated when stands are required for passenger operations.

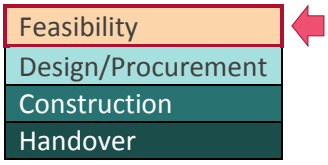
4.61 The Upgrade and Realignment of Stands 101-104 is one of the projects required to address the overall shortfall in passenger aircraft stands for summer 2019 already explained above for the Apron 5H project. These stands also benefit from the Apron 5H and Taxiway Rehabilitation (carried out under SCP 17.2.002) by enabling aircraft access to the respective stands.

Key project metrics

Table 4.36: Upgrade and Realignment of Stands 101–104 – Key project metrics

Metric	Value
New Pavement Construction Area	-
Area of Pavement Refurbishment	3,000m^2
Net gain in number of NBE stands	6
Project cost estimate (Level 1)	€4,998,091
Cost per stand gained	€833,015

Current project status



Specifications review

Table 4.37: Upgrade and Realignment of Stands 101–104 – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code (subject to EASA DAAD approval). The document "Target PCN for PACE Airfield Taxiway and Stands Project" does not indicate a target PCN value for this pavement, declaring 'existing pavement'. The measured PCN contained in the AECOM pavement study carried out in November 2016 shows that while the existing pavements will be suitable for Code C aircraft, we have some doubts as to the capability of these pavements to support Code E aircraft at maximum taxi weight. Without pavement strengthening, the project scope appears to be inconsistent with the targeted use of the stands for Code E remote parking in MARS configuration. The stands are however presently used by lightly loaded Code E aircraft and could potentially continue to be used for this purpose therefore.
Quality of specifications	Given the project's dimensions are based on a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. We cannot determine any details on existing underground utilities and features and this may remain a project risk, albeit a low risk as there is understood to be no pavement reconstruction. There is excavation for drainage works however.
Procurement efficiency	This project is to be procured on a traditional full detailed design basis. Given the limited scope of the project, this is likely to be efficient.
Phasing and synergies with other projects	This project is part of a cluster of projects relating to overall stand capacity improvements, with which this project successfully aligns. The feasibility planning has recognised that there will be a need to plan the interface with the nearby hangar facility tenants.
Existing asset conditions	We believe that the project is broadly consistent with asset condition. However, it is unclear how Code E aircraft will operate from the existing pavements. Other than the pavements, there is limited scope for the reuse of existing assets.
Alternative scopes	As this is a realignment project, in lieu of construction or reconstruction, it represents an efficient method of achieving the stated aims.

4.62 In overall terms the project is efficiently scoped, while some additional pavement strengthening could be considered to provide more assurance of supporting full taxi weight Code E aircraft.

Cost estimate review

Table 4.38: Upgrade and Realignment of Stands 101–104 – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€342,519	€499,001	€156,482
Construction Costs	€4,105,781	€3,426,450	-€679,331
Design Development and Contingency	€549,790	€824,343	€274,553
Total	**€4,998,091**	**€4,749,794**	**-€248,297**

Table 4.39: Upgrade and Realignment of Stands 101–104 – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.1%	€48,931	€37,348
Civil/Airfield/Environmental Engineer	n/a	3.4%	2.7%	€137,897	€91,596
Project Management/Other Costs	n/a	3.8%	10.8%	€155,691	€370,057
Total				**€342,519**	**€499,001**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Rehab Apron Repair Work	3,000 m²	€434	€375	€1,256,963	€1,123,500
High Mast Lighting and Electrical infrastructure (incl Connection to Electrical Substation)	18,000 m²	€62	€39	€1,077,397	€702,000
Pollution Control	3,000 m²	€469	€487	€1,539,139	€1,461,030
New surface water and drainage infrastructure	910 m	€264	€154	€232,281	€139,920
Total				**€4,105,781**	**€3,426,450**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	6.7%	0%	€299,885	€0
Contingency	n/a	5.6%	15.0%	€249,905	€588,817
Others	n/a	0%	6.0%	€0	€235,527
Total				**€549,790**	**€824,343**

4.63 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.40: Upgrade and Realignment of Stands 101–104 – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Apron	-€99,750.0	40.2%	€311.0	€277.8
Electrical and other lighting installations	-€86,400.0	34.8%	€25.0	€20.2
Contingency and escalation	-€39,091.5	15.7%	n/a	n/a
Total	**-€225,241.5**	**90.7%**		

4.64 The variance in the Construction costs for the Upgrade and Realignment of Stands 101–104 is as a result of Dublin Airport's estimated rate of €311 per m² for apron works, which is more

expensive than we would expect. Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

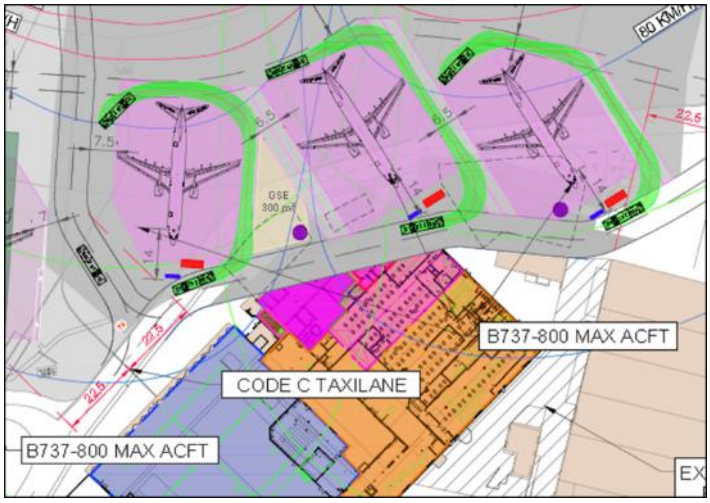
4.65 We have also assumed a slightly lower unit rate for Electrical and other lighting installations at €20.20 against Dublin Airport's €25,00 per m^2. This concerns a significant amount of m^2, thus creating a material absolute difference.

4.66 We have assumed similar contingency and escalation rates, however these were taken over a lower construction costs estimate.

9 - Hangar 1 and Hangar 2 Stands [SCP 17.2.004]

Introduction

Figure 4.9: Hangar 1 and 2 Stands



Source: Dublin Airport

4.67 This project provides for 3 Code C aircraft parking stands adjacent to Hangar 1 and Hangar 2. It includes the rehabilitation of the existing life expired apron pavement under the footprint of the proposed stands and the construction of a new apron pavement. This development will require partial demolition of the old fire station, and partial demolition of the single storey Hangar 1 annex, which will result in relocation of existing tenants.

4.68 Hangar 1 and Hangar 2 Stands is one of the projects required to address the overall shortfall in passenger stands capacity for summer 2019. These stands also benefit from the Apron 5H and Taxiway Rehabilitation (carried out under SCP 17.2.002) by enabling aircraft access to the respective stands.

4.69 The proposed stands are located north of Hanger 1 and 2 and adjacent to the future North Runway Access Taxiway.

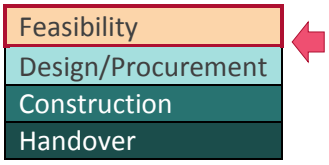
4.70 This development will provide remote NBE stand capacity on the eastern apron to facilitate growing airport demand for stands.

Key project metrics

Table 4.41: Hangar 1 and Hangar 2 Stands – Key project metrics

Metric	Value
New Pavement Construction Area	19,700m^2
Area of Pavement Refurbishment	4,000m^2
Net gain in number of NBE stands	3
Project cost estimate (Level 1)	€14,286,123
Cost per stand gained	€4,762,041

Current project status



Specifications review

Table 4.42: Hangar 1 and Hangar 2 Stands – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code.
Quality of specifications	Given the project's dimensions are based on a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. We cannot determine any details on existing underground utilities and features and given the inclusion of building alterations / demolition, this may remain a project risk, particularly if asbestos is found.
Procurement efficiency	This project is to be procured on a traditional full detailed design basis. Given the need to phase this project carefully (relocations, tenant removals, utilities diversions, taxiway access) Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, and consider enabling works packages to clear the site.
Phasing and synergies with other projects	This project is part of a cluster of projects relating to overall stand capacity improvements, with which this project successfully aligns. The feasibility planning has included an allowance for the upgrade/replacement of parts of the main taxiway route to the new North Apron stands opposite Hangar 1. This is part of the overall rehabilitation and strengthening of this taxiway corridor along which the cluster of apron works exist and upon which they rely.
Existing asset conditions	Few existing assets have been retained as this is a complete change of use of the area. The existing pavements have required replacement to permit aircraft weights to be accommodated. Other than the pavements, there is limited scope for the reuse of existing assets.
Alternative scopes	The document "Target PCN for PACE Airfield Taxiway and Stands Project" indicates a target PCN value for this pavement of 80. However, the measured PCN contained in the AECOM pavement study carried out in November 2016 shows that the existing pavements only have a PCN of between 55 and 60. This PCN value would be suitable for a large number of Code C aircraft (the design requirement). However, it is seen that the residual life of the pavements is expiring and therefore the replacement of the pavements in targeted areas is seen to be consistent with the project requirements. Nonetheless, the design target PCN value of 80 is inconsistent with the intended use (Code C) and therefore some efficiencies could be derived from lowering this PCN target to circa 65. Due to the need for building alterations and taxiway rehabilitation, the costs per stand gained appear high. However, the taxiway rehabilitation is required for projects SCP 17.2.002 and SCP 17.2.003 and therefore some of these distorting costs could be spread across other projects when considering cost efficiencies.

4.71 In overall terms, while the project is effective in developing additional passenger stands, it's pavement design PCN target could potentially be optimised.

Cost estimate review

Table 4.43: Hangar 1 and Hangar 2 Stands – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€979,028	€1,107,006	€127,978
Construction Costs	€11,735,621	€11,070,064	-€665,557
Design Development and Contingency	€1,571,474	€1,400,363	-€171,111
Total	**€14,286,123**	**€13,749,470**	**-€536,653**

Table 4.44: Hangar 1 and Hangar 2 Stands – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	2.0%	€139,861	€221,401
Civil/Airfield/Environmental Engineer	n/a	3.4%	4.0%	€394,154	€442,803
Project Management/Other Costs	n/a	3.8%	4.0%	€445,013	€442,803
Total				**€979,028**	**€1,107,006**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Apron Area	19,700 m²	€352	€338	€6,933,376	€6,659,585
Rehabilitation main taxiway route to new North Apron stands	4,000 m²	€322	€301	€1,288,000	€1,203,680
Electrical Work	23,700 m²	€37	€24	€876,900	€568,800
Demolitions incl making good to building	1,300 m²	€416	€416	€540,301	€540,800
Upgrade to access roads	1	€736,799	€736,799	€736,799	€736,799
Refurbishment of office space to accommodate displaced tenants plus temporary storage and relocation costs	400 m²	€3,401	€3,401	€1,360,245	€1,360,400
Total				**€11,735,621**	**€11,070,064**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	6.7%	9.0%	€857,167	€1,035,051
Contingency	n/a	5.6%	3.0%	€714,306	€365,312
Others	n/a	0%		€0	€0
Total				**€1,571,474**	**€1,400,363**

4.72 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.45: Hangar 1 and Hangar 2 Stands – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	€115,147.9	-21.5%	n/a	n/a
Apron Area	-€157,600.0	29.4%	€311.0	€303.0
Allowance for upgrade/replace parts of main taxiway route	€64,349.0	-12.0%	€284.0	€300.1
Provision of replacement storage	€133,200.0	-24.8%	€3,000.0	€3,333.0
Contingency	-€597,674.4	111.4%	n/a	n/a
Total	**-€442,577.6**	**82.5%**		

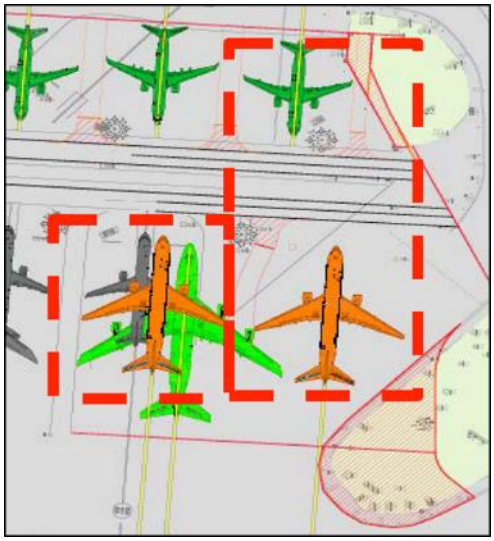
4.73 The variance in the Construction costs for the Hanger 1 and Hanger 2 Stands is as a result of Dublin Airport's estimated apron works rate of €311 per m², which is more expensive than we would expect. Our rate is based on similar pavement construction costs from airfield projects at South-East England airports. We would expect the cost of the storage facility to be higher than the Dublin Airport estimate.

4.74 The Dublin Airport Level 3 estimate allows for a €1.8m contingency, or almost 15%. We have assumed a contingency of 9% over a smaller cost.

10 - West Apron Stands [SCP 17.2.005]

Introduction

Figure 4.10: West Apron Stands



Source: Dublin Airport

4.75 This project creates:

- 1 additional Code D aircraft parking stand (B757, B767, A300 etc.);
- An upgrade of an existing Code C stand to Code D;
- An upgrade of a restricted Code C to a full Code C; and
- An upgrade of an existing Code C stand to a Code E MARS configuration.

4.76 The project entails part infill of grassed area with concrete pavement and conversion of existing West Apron towing route to deliver an additional stand.

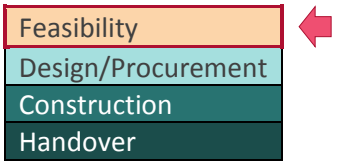
4.77 A key element of Dublin Airport's aircraft stand strategy to 2020 is maximising the use of the West Apron to facilitate cargo operations, business aviation, parking of standby aircraft and transit operations.

Key project metrics

Table 4.46: West Apron Stands – Key project metrics

Metric	Value
New Pavement Construction Area	2,500m^2
Area of Pavement Refurbishment	-
Net gain in number of NBE stands	1
Project cost estimate (Level 1)	€2,495,424
Cost per stand gained	€2,495,424

Current project status



Specifications review

Table 4.47: West Apron Stands – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code.
Quality of specifications	Given the project is at a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope.
Procurement efficiency	This project is at feasibility stage. It is to be procured on a traditional full detailed design basis. Given the need to phase this project carefully to avoid disruption to the nearby stands, Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, especially given the logistical issues associated with this being an island site airside.
Phasing and synergies with other projects	This project is part of a cluster of projects relating to overall stand capacity improvements, with which this project successfully aligns.
Existing asset conditions	Few existing assets are affected by this project, but protection to existing attenuation features and also relocation of existing electrical pits have been identified. There is limited scope for the reuse of any existing assets.
Alternative scopes	None.

4.78 The scope appears effective and efficient.

Cost estimate review

Table 4.48: West Apron Stands – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€161,875	€223,164	€61,289
Construction Costs	€1,974,090	€1,487,763	-€486,328
Design Development and Contingency	€359,459	€522,954	€163,495
Total	**€2,495,424**	**€2,233,880**	**-€261,544**

Table 4.49: West Apron Stands – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.5%	3.0%	€29,611	€44,633
Civil/Airfield/Environmental Engineer	n/a	3.2%	6.0%	€63,171	€89,266
Project Management/Other Costs	n/a	3.5%	6.0%	€69,093	€89,266
Total				**€161,875**	**€223,164**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Apron Area	2,500 m²	€541	€385	€1,353,090	€962,488
Electrical Work	25	€4,140	€3,011	€103,500	€75,275
Temporary Facilities	1	€517,500	€450,000	€517,500	€450,000
Total				**€1,974,090**	**€1,487,763**

Design Development and Contingency	Quantity	% of daa DM-C + C-C	% of SDG costs	daa cost estimate	SDG cost estimate
Design Development	n/a	8.0%	n/a	€170,858	€175,000
Contingency	n/a	8.8%	15.0%	€188,601	€282,889*
Others	n/a	0%	3.0%	€0	€65,064**
Total				**€359,459**	**€522,954**

* estimated as a percentage of the sum of DM-C, C-C and Design Development costs

** estimated as a percentage of the sum of DM-C, C-C, Design Development and Contingency costs

4.79 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.50: West Apron Stands – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Cost	-€150,538.0	57.6%	n/a	n/a
Apron area	€55,750.0	-21.3%	€311.0	€333.3
Temporary measures and blast protection	-€126,885.0	48.5%	n/a	n/a
Total	**-€221,673.0**	**84.8%**		

4.80 Our estimate for design and management costs for this project is based on 15% of the construction cost. This percentage is a recognised benchmark allowance in cost estimates for consultants' fees and project management costs in airport projects. We believe that Dublin Airport's cost estimates for additional temporary blast fences are higher than we would expect based on cost data that we have from similar projects in the UK. Additionally, we have reduced the allowances for temporary measures, but have assumed a higher per m^2 rate for the apron area.

11 - Pier 2 Underpass [SCP 17.2.006]

Introduction

Figure 4.11: Pier 2 Underpass

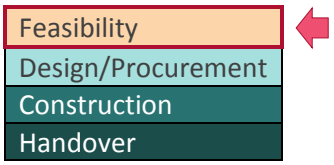
Source: Dublin Airport

4.81 This project comprises the widening of Pier 2 underpass to allow unrestricted access for buses carrying passengers to and from remote stands. Currently these vehicles cannot travel through the Pier 2 Underpass because it is too narrow and these vehicles are forced to route around the back of the Pier 2 stand road, which requires them to travel behind 10 active aircraft stands. This regularly results in bus and fuel bowser journey times increasing. The journey time can range from 3 to 15 minutes.

4.82 As vehicle traffic travelling to/from the North Apron is expected to increase over the coming years, this project is critical in providing a good service for airport customers, predictable journey times, and increased levels of safety on the airfield.

4.83 This solution will also elevate the level of safety around Pier 2. In 2016, there were 7 occurrences of vehicles not giving way to active aircraft on Pier 3 stands.

Current project status



Specifications review

Table 4.51: Pier 2 Underpass – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirement of improving the airside route availability to all airside vehicles and bussing times.
Quality of specifications	Given the project's dimensions are based on a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. The project has been the subject of a detailed feasibility study by Dublin Airport.

Procurement efficiency	This project is to be procured on a traditional full detailed design basis. Given the need to carry out this project carefully through 9 phases to avoid disruption to the primary airside route and nearby stands, Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, especially given the logistical issues associated with this being an island site airside.
Phasing and synergies with other projects	This project does not require specific phasing with other projects other than any works within Pier 2.
Existing asset conditions	It is noted that a detailed Survey of the Services that would be affected by lowering the level of the road needs to be carried out. The need to lower or divert services should be considered a risk to the outturn cost of this project. There is limited scope for the reuse of any existing assets other than the existing tunnel lighting.
Alternative scopes	In order to provide sufficient headroom in the tunnel without impacting on the Pier 2 internal spaces, reducing the level of the roadway should be considered. The scope of works may need further surveys to substantiate appropriate dimensions and alternative solutions.

4.84 In overall terms, the project is considered effective in developing a faster and safer airside vehicular route. Survey work appears to be needed to better define the scheme and the options for changes in road level to minimise the structural impacts on Pier 2.

Cost estimate review

Table 4.52: Pier 2 Underpass – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€298,193	€341,255	€43,062
Construction Costs	€4,259,894	€3,592,156	-€667,738
Design Development and Contingency	€441,484	€590,995	€149,511
Total	**€4,999,571**	**€4,524,406**	**-€475,165**

Table 4.53: Pier 2 Underpass – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.0%	1.5%	€42,599	€53,882
Civil/Airfield/Environmental Engineer	n/a	3.0%	3.0%	€127,797	€107,765
Project Management/Other Costs	n/a	3.0%	5.0%	€127,797	€179,608
Total				**€298,193**	**€341,255**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Alterations and Installation of new Steel work	20 t	€24,433	€14,263	€488,658	€285,250
Demolition work	840 m²	€511	€451	€429,180	€378,840
Construction work	840 m²	€3,133	€2,816	€2,632,074	€2,365,566
Maintaining Passenger Operations	1	€709,982	€562,500	€709,982	€562,500
Total				**€4,259,894**	**€3,592,156**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	4.0%	5.0%	€182,323	€196,671
Contingency	n/a	5.7%	10.0%	€259,161	€394,324
Others	n/a	0%	0%	€0	€0
Total				**€441,484**	**€590,995**

4.85 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.54: Pier 2 Underpass – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	-€195,493.3	41.1%	n/a	n/a
Design Development	-€303,762.3	63.9%	€500,000.0	€196,237.7
Construction costs general	€507,380.0	-106.8%	n/a	n/a
Escalation Allowance	-€247,372.6	52.1%	n/a	n/a
Contingency Allowance	-€224,955.2	47.3%	n/a	n/a
Total	**-€464,203.4**	**97.7%**		

4.86 The allowance for design and management costs included by Dublin Airport is less than would expect, bearing in mind the complexity of the work involved to deliver the project. Our allowance is 9.5%, which while less than the recognised benchmark for most airport projects, is one which we believe is more plausible than Dublin Airport's provision.

4.87 We have increased Dublin Airport's construction cost estimates overall by approximately €500k.

4.88 We have assessed the design development costs at 4.3% of the construction costs and circa €200k which we believe is reasonable considering the structural design required for the works in comparison to 10% proposed by the Dublin Airport at €500K which appears too expensive.

4.89 We have included a 10% contingency allowance which we believe is more realistic than Dublin Airport's allowance, bearing in mind the nature and location of the work required.

12 - Pier 3 Underpass [SCP 17.2.007]

Introduction

Figure 4.12: Pier 3 Underpass

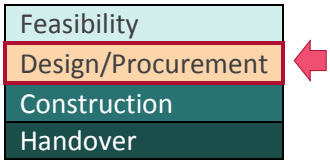
Source: Dublin Airport

4.90 This project comprises the widening of Pier 3 Underpass to allow unrestricted access for fuel bowsers and buses carrying passengers to and from remote aircraft stands. Currently these vehicles cannot travel through the Pier 3 Underpass because it is too narrow. Vehicles are forced to route around the back of Pier 3 stand road, which requires them to travel behind 11 active aircraft stands. The journey time can range from 3 to 15 minutes.

4.91 As vehicle traffic travelling to/from the North Apron is expected to increase over the coming years, this project is critical in providing an efficient service for airport customers, consistent journey times, and elevate levels of safety on the airfield.

4.92 This solution will also elevate the level of safety around Pier 3. In 2016, there were 16 occurrences of vehicles not giving way to active aircraft on Pier 3 stands.

Current project status



Specifications review

Table 4.55: Pier 3 Underpass – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirement of improving the airside route availability to all airside vehicles and bussing times, particularly to the northern apron.
Quality of specifications	The quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. The project has been the subject of a detailed feasibility study by Dublin Airport.

Procurement efficiency	This project is to be procured on a traditional full detailed design basis. Given the need to carry out this project carefully through phases to avoid disruption to the primary airside route and nearby stands, Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, especially given the logistical issues associated with this being an island site airside.
Phasing and synergies with other projects	This project will service the increased level of bus, fuel tanker and GSE traffic associated with the northern apron developments which are expected to significantly increase traffic through this underpass. Therefore, it would be advisable for this project to be completed prior to the northern apron developments. It is understood that this is the case.
Existing asset conditions	Existing assets have been maintained in place wherever possible.
Alternative scopes	We do not believe there are any further alternative methods for improving the underpass widening at Pier 3 than those set out in Dublin Airport's feasibility report.

4.93 In overall terms, the project is considered effective and efficient in developing a faster and safer airside vehicular route.

Cost estimate review

Table 4.56: Pier 3 Underpass – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€13,863	€13,986	€123
Construction Costs	€166,174	€174,825	€8,651
Design Development and Contingency	€19,339	€18,881	-€458
Total	**€199,376**	**€207,692**	**€8,316**

Table 4.57: Pier 3 Underpass – Level 2 Costs

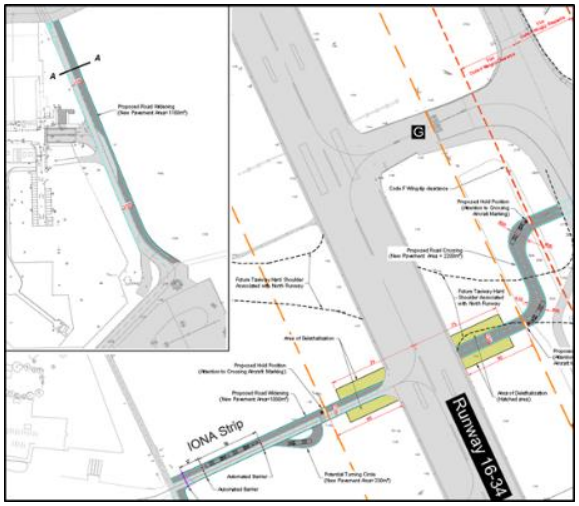
Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	2.0%	€1,980	€3,497
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.0%	€5,581	€5,245
Project Management/Other Costs	n/a	3.8%	3.0%	€6,301	€5,245
Total				**€13,863**	**€13,986**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Alterations to existing underpass configuration	840 m²	€109	€113	€91,396	€94,500
Installation and construction works	840 m²	€89	€96	€74,778	€80,325
Total				**€166,174**	**€174,825**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	4.4%	5.0%	€7,975	€9,441
Contingency	n/a	6.3%	5.0%	€11,364	€9,441
Others	n/a	0%		€0	
Total				**€19,339**	**€18,881**

4.94 There are no significant variances in assumptions between Dublin Airport and Steer Davies Gleave.

13 - West Apron Surface Access [SCP 17.2.008]

Introduction

Figure 4.13: West Apron Surface Access



Source: Dublin Airport's PACE

4.95 This project provides a surface access crossing to the West Apron, across RWY 16/34, to reduce journey time and therefore increase the usability of the West Apron. This surface access will comprise a 10-metre-wide road from Apron 5G to RWY 16/34, linking with existing IONA Taxiway. Dublin Airport currently has 109 operational narrow body equivalent NBE stands, 19 of which are located on the West Apron. The West Apron will be used to accommodate cargo aircraft, transit operations, standby aircraft, and contingency operations. It is currently accessed by the North Perimeter Road which traverses around RWY 16, a distance of circa 4km with an average journey time of circa 10 minutes. To facilitate the North Runway construction, this route will become unavailable in circa 2019, which will result in an increased distance of circa 8km and an average journey time in excess of 20 minutes. The requirement for the project is therefore as a direct consequence of the North Runway construction.

4.96 This surface access route to the West Apron will enable Dublin Airport to utilise existing capacity on the airfield by providing a short (1.5km/approximately 4 minutes journey time) and predictable access route for aircraft servicing vehicles to access the West Apron. This will act as an interim solution until a tunnel or alternative solution is delivered.

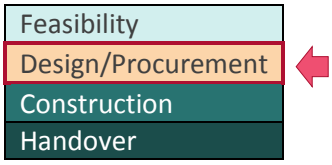
4.97 Access will be available when RWY 16/34 is not in use as an operational runway and the crossing will be managed by a robust set of controls. When RWY 16/34 is the active runway the default access will be the 8km route around the North Runway or the existing access around the perimeter road.

Key project metrics

Table 4.58: West Apron Surface Access – Key project metrics

Metric	Value
Project cost estimate (Level 1)	€3,000,000
Area	4,300 m^2
Cost/m^2	€698/m^2

Current project status



Specifications review

Table 4.59: West Apron Surface Access – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address the functional requirement of improving the airside route availability for all airside vehicles passing between the main terminal aprons and the west apron.
Quality of specifications	Given the project is at a detailed design stage, the quality of specifications and drawing received appears to still be at concept stage. However, while high level, the drawing is sufficiently detailed to describe the proposed works and give a satisfactory indication of scope.
Procurement efficiency	This project is at detailed design stage. It is to be procured on a traditional full detailed design basis. This project could lend itself to a design and build form of procurement to benefit from efficiencies in pavement and alignment design.
Phasing and synergies with other projects	This project is required as a direct consequence of the North Runway construction and therefore needs to be delivered before this to avoid the excessive east to west roadway movements that will otherwise be necessary.
Existing asset conditions	Existing assets have been maintained in place wherever possible. On the western side of runway 16/34 the new road is formed of a widening extension to the existing road. The condition of the existing road is not known and whether its residual life will be similar to the design life of the widening.
Alternative scopes	None

4.98 In overall terms, the project is considered effective and efficient in developing a faster and safer airside vehicular route.

Cost estimate review

Table 4.60: West Apron Surface Access – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€208,593	€211,649	€3,056
Construction Costs	€2,500,407	€2,522,633	€22,226
Design Development and Contingency	€291,000	€292,568	€1,568
Total	**€3,000,000**	**€3,026,849.8**	**€26,849**

Table 4.61: West Apron Surface Access – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.2%	1.2%	€29,799	€30,272
Civil/Airfield/Environmental Engineer	n/a	3.4%	3.4%	€83,979	€85,770
Project Management/Other Costs	n/a	3.8%	3.8%	€94,815	€95,608
Total				**€208,593**	**€211,649**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Construction works	1	€2,050,334	€2,068,559	€2,050,334	€2,068,559
Temporary works to maintain aircraft operations	1	€450,073	€454,074	€450,073	€454,074
Total				**€2,500,407**	**€2,522,633**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	4.4%	4.0%	€120,000	€120,308
Contingency	n/a	6.3%	6.0%	€171,000	€172,260
Others	n/a	0%	0%	€0	€0
Total				**€291,000**	**€292,568**

4.99 Dublin Airport's Level 3 cost breakdown appears to be inconsistent with the Level 1 and Level 2 cost breakdowns provided in the PACE document.

4.100 We have compared our and Dublin Airport's Level 3 cost estimates, which shows a negligible difference in the total cost estimates. On a more detailed level we have found some more significant variances:

- Design and Management Costs: -€143,965.8
- Construction Costs: €153,729.0
- Escalation: €119,259.4
- Contingency: -€175,906.5

4.101 Our assessment of the design and management costs is lower than Dublin Airport's at 7% of the construction costs in comparison to Dublin Airport's assumed 11.6%. Our opinion reflects benchmark allowances for similar works carried out in other airports.

4.102 The construction cost forecast provided by Dublin Airport generally appears reasonable, but our benchmarks show room for small increases on a range of Level 3 line items.

4.103 Dublin Airport excluded escalation costs from their Level 3 estimate. We have included this cost item, in line with other projects.

4.104 We have reduced the contingency allowance from Dublin Airport's 15% to 6%, as this concerns a fairly straightforward project that is in the design and procurement stage.

4.105 In overall terms, these cost estimate variances balance out.

14 - Advanced Visual Docking Guidance System (A-VDGS) [SCP 17.2.009]

Introduction

Figure 4.14: Typical A-VDGS Unit

Source: Dublin Airport's PACE

4.106 Advanced – Visual Docking Guidance Systems (A-VDGS) will enhance capacity through more efficient use of stand infrastructure by displaying critical information. This will lead to improved OTP and support Airport Collaborative Decision Making (A-CDM). This project entails the installation of Advanced Visual Docking Guidance System (A-VDGS) technology to aircraft parking stands on Pier 1, Pier 2, Pier 3, Pier 4, South Apron, Triangle and Apron 5G.

4.107 The A-VDGS technology guides the aircraft to within 10cm of its parking position using invisible infrared lasers to attain the aircraft's type and position. It will also display critical A-CDM operational data (Target Off-Block Time (TOBT), Target Start Up Approval Time (TSAT), etc.) and in turn automatically distribute accurate, real-time data over the IT network.

4.108 The implementation of A-VDGS, along with the introduction of A-CDM at Dublin Airport, will result in a more efficient turnaround operation for users and more efficient use of stand infrastructure. The primary drivers for investing in A-VDGS are:

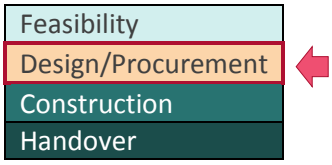
- More efficient use of stand infrastructure;
- Enhanced safety at gates; and
- Environmental objectives.

Key project metrics

Table 4.62: Advanced Visual Docking Guidance System (A-VDGS) – Key project metrics

Metric	Value
Units	117
SESAR funding	€4,650,000
Existing CIP allowance	€750,000

Current project status



Specifications review

Table 4.63: Advanced Visual Docking Guidance System (A-VDGS) – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirement of improving the efficiency and safety of stand operations. The preliminary project specification appears to consider the requirements of Dublin Airport and the need of enhanced ramp safety.
Quality of specifications	Given the project's dimensions are based on a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. The project has been the subject of a detailed feasibility study by Dublin Airport.
Procurement efficiency	The form of procurement is not known. However, we would recommend that such infrastructure should be procured under a direct supply and install contract, based on a detailed specification and set of requirements developed by Dublin Airport. Such infrastructure will need to be specified with a clear understanding of maintenance and training support as it will become a safety critical asset. Given the need to carry out this project carefully through phases to avoid disruption to the nearby stands, Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, especially given the logistical issues associated with each sign location being an island site airside.
Phasing and synergies with other projects	Where relevant, this project should be phased to coincide with the apron stand and FEGP delivery, thereby reducing impacts on operational stands.
Existing asset conditions	New assets.
Alternative scopes	None.

4.109 In overall terms, the project is considered effective and efficient in developing a more efficient and safe ramp operations.

Cost estimate review

Table 4.64: Advanced Visual Docking Guidance System (A-VDGS) – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€632,000	€527,087	-€104,913
Construction Costs	€8,791,980	€8,784,777	-€7,203
Design Development and Contingency	€939,467	€931,057	-€8,410
Total	**€10,363,447***	**€10,242,921***	**-€120,526**

* EUR 5.4m will be covered by other funds.

Table 4.65: Advanced Visual Docking Guidance System (A-VDGS) – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	0.9%	0.9%	€95,000	€79,063
Civil/Airfield/Environmental Engineer	n/a	2.1%	2.1%	€220,000	€184,480
Project Management/Other Costs	n/a	3.0%	3.0%	€317,000	€263,543
Total				**€632,000**	**€527,087**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Pier 1	29	n/a	€91,349	€2,478,078	€2,649,121
Pier 2	13	n/a	€90,805	€1,102,374	€1,180,465
Pier 3	12	n/a	€84,688	€968,260	€1,016,256
Pier 4	26	n/a	€74,345	€1,768,830	€1,932,970
South Apron	9	n/a	€76,041	€604,336	€684,369
Triangle	4	n/a	€161,031	€676,278	€644,124
Apron 5G	4	n/a	€169,368	€1,193,824	€677,472
Total				**€8,791,980**	**€8,784,777**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Contingency	n/a	9.0%	10.0%	€ 942,398	€931,057
Total				**€ 942,398***	**€931,057**

* Value in Level 2 of PACE document does not match Level 1

4.110 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.66: Advanced Visual Docking Guidance System (A-VDGS) – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	-€104,986.7	87.1%	n/a	n/a
Total	**-€104,986.7**	**87.1%**		

4.111 The Level 3 construction costs estimate provided by Dublin Airport for the project appears reasonable. We have included a similar 10% contingency allowance as Dublin Airport, with the only variance being a reduction in the allowance for on-costs which we believe are slightly too expensive.

15 - Fixed Electrical Ground Power [SCP 17.2.010]

Introduction

4.112 This project entails the installation of Fixed Electrical Ground Power (FEGP) infrastructure to 15 aircraft parking stands on Pier 1, and to 8 aircraft parking stands on Pier 3 as listed below.

4.113 Proposed aircraft parking stands to be fitted with FEGP:

Pier 1

- Stands 108 to 111 – 8 units (8 stands)
- Stands 121 to 127 – 7 units (7 stands)

Pier 3

- Stands 318C/R – 2 units (airbridge mounted)
- Stands 317 – 2 units (airbridge mounted)
- Stands 315C – 2 units (airbridge mounted)
- Stands 314 – 2 units (airbridge mounted)
- Stands 313C – 2 units (airbridge mounted)
- Stand 312 – 1 unit (airbridge mounted)
- Stand 311C/R – 1 unit (airbridge mounted)
- Stand 311L – 1 unit (pit and duct system)

4.114 FEGP infrastructure supplies electrical power to the aircraft to power various aircraft systems (flight deck systems, cabin lighting etc.) during the turnaround process whilst parked on stand. The proposed FEGP infrastructure will replace the current practice of providing electrical power to the aircraft on the ground by either:

- Running the aircraft's own Auxiliary Power Unit (APU); or
- Connecting to a mobile diesel-powered Ground Power Unit (GPU).

4.115 Importantly, the proposed FEGP is reported to better meet the requirements of next generation aircraft which have a higher power demand (e.g. B787 Dreamliner and A350 etc), and this high-power demand cannot be reliably supported by the existing ground power units.

4.116 The basis of installation is:

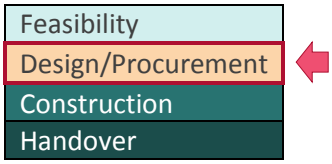
- **Pier 3** - Cost based on airbridge mounted FEGP x 7 stands and pit and duct system for 1 x stand.
- **Pier 1** - Cost based on using existing pit and duct infrastructure on 15 stands.

Key project metrics

Table 4.67: Fixed Electrical Ground Power (FEGP) – Key project metrics

Metric	Value
Units	28

Current project status



Specifications review

Table 4.68: Fixed Electrical Ground Power (FEGP) – Specifications reviews

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirement of improving the environmental aspects of stand operations and safeguards operations for next generation aircraft. The preliminary project specification appears to consider the requirements of Dublin Airport and the need of enhanced ramp safety.
Quality of specifications	Given the project is now moving into the detailed design stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope. The project has been the subject of a detailed feasibility study by Dublin Airport.
Procurement efficiency	The form of procurement is not known. However, we would recommend that such infrastructure should be procured under a direct supply and install contract, based on a detailed specification and set of requirements developed by Dublin Airport. Such infrastructure will need to be specified with a clear understanding of maintenance and training support as it will become a safety critical asset. Given the need to carry out this project carefully through phases to avoid disruption to the nearby stands, Dublin Airport should consider how to gain efficiencies through early contractor involvement where possible, especially given the logistical issues associated with each sign location being an island site airside.
Phasing and synergies with other projects	Where relevant, this project should be phased to coincide with the apron stand and A-VDGS delivery, thereby reducing impacts on operational stands.
Existing asset conditions	New assets.
Alternative scopes	None.

4.117 In overall terms, the project is considered effective and efficient in developing a more efficient, environmentally friendly and safeguarding ramp operations for next generation aircraft.

Cost estimate review

Table 4.69: Fixed Electrical Ground Power (FEGP) – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€432,100	€448,745	€16,645
Construction Costs	€3,556,307	€3,739,826	€183,519
Design Development and Contingency	€638,144	€594,576	-€43,568
Total	**€4,626,551**	**€4,783,148**	**€156,597**

Table 4.70: Fixed Electrical Ground Power (FEGP) – Level 2 Costs

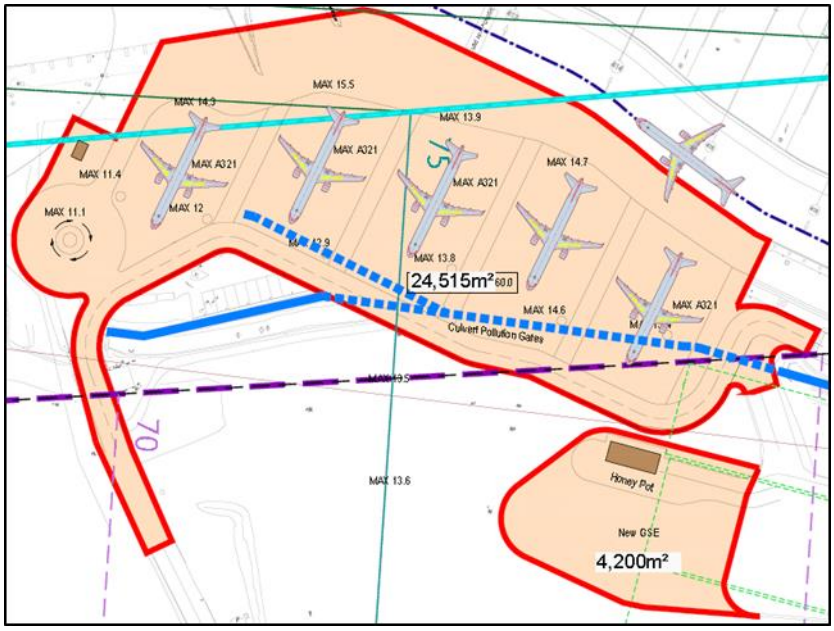
Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	3.0%	3.0%	€100,000	€112,195
Civil/Airfield/Environmental Engineer	n/a	4.0%	4.0%	€160,000	€149,593
Project Management/Other Costs	n/a	5.0%	5.0%	€172,100	€186,958
Total				**€432,100**	**€448,745**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
P1 FEGP Supply and Installation	15	n/a	€103,950	€978,750	€1,559,250
P1 Civils and Prelims	15	n/a	€12,825	€253,727	€192,375
P3 FEGP Supply and Installation	17	n/a	€103,950	€1,877,580	€1,767,150
P3 Civils and Prelims	17	n/a	€13,003	€446,220	€221,051
Total				**€3,556,277**	**€3,739,826**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG C-C**	**daa cost estimate**	**SDG cost estimate**
Contingency	n/a	7.0%	10.0%	€239,304	€373,945
Others	n/a	11.0%	6.0%	€398,840	€220,631
Total				**€638,144**	**€594,576**

4.118 The variances in assumptions between Dublin Airport and Steer Davies Gleave caused by small differences across a range of construction costs estimates at Level 3 and the consequent reductions of contingency and escalation.

16 - South Apron Stands Phase 2 [SCP 17.2.011]

Introduction

Figure 4.15: Overview of South Apron Stands Phase 2



Source: Dublin Airport's PACE

4.119 This project provides 5 Code C aircraft parking stands (NBEs–B737, A320, A321). The project intends to address the shortfall in stands of 11 NBEs. There is currently a shortage of aircraft stands on the eastern side of RWY 16/34. The South Apron Stands phase 1 were commenced to meet the demand and also to respond to customer requests.

4.120 The South Apron Stand phase 2 development delivers 5 NBEs increasing the South Apron capacity to 14 NBEs (after phase 1 is completed). Costs are based on:

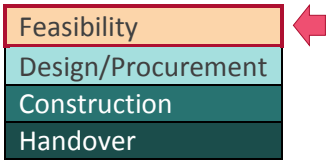
- Replacing existing displaced facilities;
- Providing 5 Code C (NBE) fully operational stands in compliance with EASA requirements;
- Apron parking to be constructed in concrete;
- Apron parking to be provided with high mast lighting, and safeguarded for FEGP and A-VDGS (but not included); and
- Surface water attenuation and pollution control facilities to required standard to be provided.

Key project metrics

Table 4.71: South Apron Stands Phase 2 – Key project metrics

Metric	Value
New Pavement Construction Area (stands)	24,515m^2
Area of Pavement Refurbishment	0m^2
Net gain in number of NBE stands	5
Project cost estimate (Level 1)	€37,873,557
Cost per stand gained	€7,574,711

Current project status



Specifications review

Table 4.72: South Apron Stands Phase 2 – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses (in conjunction with other apron works) the functional requirements of addressing inadequate passenger apron capacity and provides aprons of the correct dimension and aircraft code. The scope of works appears to be consistent with the project need with the exception of the following: The document "Target PCN for PACE Airfield Taxiway and Stands Project" indicates that for this project a target PCN value of 75. Given that only Code C aircraft will access these new stands, the pavement design for this project could potentially be reduced, noting that the maximum ACN value for an A321-200 could be 65.
Quality of specifications	Given the project is at a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope.
Procurement efficiency	The form of procurement is not known.
Phasing and synergies with other projects	This project is part of a cluster of projects relating to overall stand capacity improvements, with which this project successfully aligns, except for the possible over-provision noted above. There will be a need to develop a strategy for any tenants that will require relocation given that there are a number of facilities that need to be demolished in order to make way for the new apron.
Existing asset conditions	Few existing assets have been retained. The existing pavements have required replacement to permit aircraft weights to be accommodated. It is evident that where possible, existing assets, such as high mast lighting, have been re-used where possible.
Alternative scopes	Other than pavement design optimisation, the other areas of rationalisation that may be achieved would be: • to omit the vehicular roundabout from the project by better considering airside traffic circulation around the westernmost stand; and • to consider optimisation of interstand clearway widths with the introduction of A-VDGS, thereby reducing pavement areas.

4.121 In overall terms, while some efficiencies in pavement design and layout could have been considered, the overall conclusion is that this project is efficient.

Cost estimate review

Table 4.73: South Apron Stands Phase 2 – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€3,090,639	€2,990,678	-€99,961
Construction Costs	€26,967,740	€26,177,757	-€789,983
Design Development and Contingency	€7,815,178	€8,083,702	€268,524
Total	**€37,873,557**	**€37,252,136**	**-€621,421**

Table 4.74: South Apron Stands Phase 2 – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.7%	1.8%	€457,473	€460,074
Civil/Airfield/Environmental Engineer	n/a	5.2%	5.2%	€1,423,166	€1,352,605
Project Management/Other Costs	n/a	4.5%	4.5%	€1,210,000	€1,177,999
Total				**€3,090,639**	**€2,990,678**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New Apron/Infill/SW Attenuation	24,500 m²	€488	€446	€11,949,000	€10,922,099
Pollution Control and Control Gate Relocation	24,500 m²	€488	€161	€3,693,000	€3,937,138
Site Clearance and Relocations	1	n/a	€5,013,520	€5,020,740	€5,013,520
New Substations/Electrical/High Mast Lighting	1	n/a	€4,650,000	€4,650,000	€4,650,000
Culvert diversion/Airside Road/Temp Works	1	n/a	€1,650,000	€1,655,000	€1,655,000
Total				**€26,967,740**	**€26,177,757**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	2.0%	2.0%	€500,000	€500,180
Contingency	n/a	20.0%	20.0%	€6,011,675	€5,833,424
Others	n/a	6.0%	6.0%	€1,803,502	€1,750,097
Total				**€7,815,177**	**€8,083,702**

4.122 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.75: South Apron Stands Phase 2 – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	-€101,063.3	16.3%	n/a	n/a
New Apron Pavement	-€196,000.0	31.5%	€311.0	€303.0
Contingency at 20% - Scope definition	-€177,968.6	28.6%	n/a	n/a
Total	**-€475,031.9**	**76.4%**		

4.123 Our construction costs estimates are less than Dublin Airport's. The main driver is that Dublin Airport's new apron pavement rate is slightly higher than our benchmark rate for similar pavement works carried out at South-East England airports.

4.124 Our design and management, contingency and escalation costs are lower than Dublin Airport allowances as a result of the reduction in our construction costs.

17 - Apron Wide CCTV [SCP 17.2.012]

Introduction

Figure 4.16: CCTV example

Source: Dublin Airport's PACE

4.125 This project provides enhanced CCTV coverage to the following Aircraft Parking stands:

- Pier 1
- Pier 2
- Pier 3
- Pier 4
- Triangle
- South Apron

4.126 The project scope includes the provision of one Fixed IP camera per stand (listed from AIP Aircraft Parking / Docking Chart). On contact stands cameras will be mounted, where possible, on building facades, and on remote stands cameras will be pole mounted.

4.127 Data cabling will be provided to all cameras and they will be networked onto the overall Dublin Airport CCTV system. The cameras will be integrated into the Dublin Airport Operation System (AOS).

4.128 The key project drivers are:

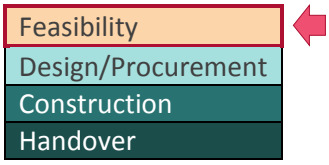
- Greatly enhance safety and governance on the apron area, through the ability to monitor, review and manage all apron activity; and
- Enable operator on the ramp to review key operational issues during the aircraft turnaround process and assist with passenger/ground handling/other issues.

Key project metrics

Table 4.76: Apron Wide CCTV – Key project metrics

Metric	Value
Units	132
Cabling	Category 6

Current project status



Specifications review

Table 4.77: Apron Wide CCTV – Specifications review

Subject	Comments
Effectiveness of scope	The scope addresses the functional requirement of improving the security aspects of stand operations and appears to consider the requirements of Dublin Airport and the need or enhanced ramp security. One CCTV is provided at each stand, and given the potential for shadowing, this provision appears to be sensible.
Quality of specifications	Given the project is at a feasibility stage, the quality of specifications and drawings received, while high level, are sufficiently detailed to describe the proposed works and give a satisfactory indication of scope.
Procurement efficiency	The form of procurement is not known. However, we would recommend that such infrastructure should be procured under a direct supply and install contract, based on a detailed specification and set of requirements developed by Dublin Airport. Such infrastructure will need to be specified with a clear understanding of maintenance and training support as it will become a critical asset to security operations.
Phasing and synergies with other projects	Where relevant, this project should be phased to coincide with the apron stand and A-VDGS delivery, thereby reducing impacts on operational stands. However, the impacts of CCTV installation are less intrusive, and this work may be considered separately from other projects.
Existing asset conditions	New assets. However, we are not clear on the monitoring room infrastructure and any necessary alterations that this new suite of cameras may necessitate.
Alternative scopes	None.

4.129 In overall terms, the project is considered effective and efficient in developing enhanced security on the ramp.

Cost estimate review

Table 4.78: Apron Wide CCTV – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€130,000	€119,909	-€10,091
Construction Costs	€773,050	€666,160	-€106,890
Design Development and Contingency	€189,640	€200,847	€11,207
Total	**€1,092,690**	**€986,916**	**-€105,774**

Table 4.79: Apron Wide CCTV – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Civil/Airfield/Environmental Engineer/Cost Consultant	n/a	8.0%	8.0%	€60,000	€53,293
Project Management/Site Supervision/Security/Specialist	n/a	9.0%	10.0%	€70,000	€66,616
Total				**€130,000**	**€119,909**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
IP Camera/ Cat 6/ Network Switches	110	€1,782	€1,850		€203,500
Licensing and Commissioning	110	€1,000	€906		€99,660
Installation and Electrical Infrastructure	110	€1,196	€1,125		€123,750
Storage and Server Costs	1	€125,000	€115,500		€115,500
Cameras on Tug Release Points	22	€6,744	€5,625		€123,750
Total				**€773,050***	**€666,160**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG C-C**	**daa cost estimate**	**SDG cost estimate**
Contingency	n/a	18.0%	20.0%	€135,457	€133,898
Others	n/a	7.0%	10.0%	€55,183	€66,949
Total				**€190,640**	**€200,847**

*Value based on Level 1 and 3. Level 2 input in PACE document appears incorrect.

4.130 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

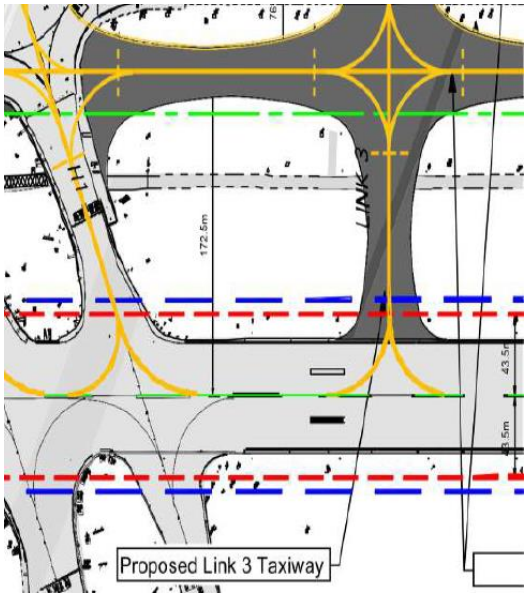
Table 4.80: South Apron Stands Phase 2 – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Fixed IP cameras	-€25,340,0	24.0%	€1,000.0	€808.0
Licensing and commissioning	-€25,340,0	24.0%	€500.0	€404.0
Civils /Ducting etc	-€32,925.0	31.3%	€1,000.0	€1,000.0
Total	**-€83,613.0**	**79.1%**		

18 - Link 3 Extension Taxiway [SCP 17.3.001]

Introduction

Figure 4.17: Link 3 Extension Taxiway



Source: Dublin Airport's PACE

4.131 This project comprises an additional Code E taxiway link from Link 3 to RWY 16/34 and it is aligned to the centreline of the existing Link 3 taxiway adjacent to Pier 3.

4.132 This project is part of a suite of airfield taxiway projects aiming to improve efficiency:

- To provide a more effective taxiway system for the airport;
- To elevate levels of safety; and
- To address the forecast increases in traffic flows by reducing overall arrival and departure delays by between 2 and 5 hours per day.

4.133 Link 3 has the following specific benefits:

- It reduces the number of movements on more complex junctions, Link 4 and Link 2. It was identified as an option to achieve this reduction under the 'Critical Taxiway Review' carried out by Dublin Airport;
- It provides congestion relief from Taxiway Foxtrot Inner and Taxiway Foxtrot Outer routes by enabling an alternative access to departure queue on RWY 16/34 during RWY 28 operations to facilitate queue balancing;
- It provides additional routing options (including towing to West Apron) from Pier 3 and Pier 4;
- It provides another runway exit, thus facilitating reduced Runway Occupancy Time (ROT) in RWY 16 operations; and
- It provides an additional entrance point for short take off for RWY 34 departures and in Dual Runway Operations (DRO) again reducing ROT.

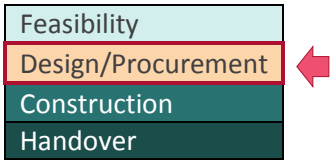
4.134 The project scope and budget are reliant upon the completion of the Dual Taxiway Foxtrot project, without which additional budget is required to complete the Link 3 Taxiway project.

Key project metrics

Table 4.81: Link 3 Extension Taxiway – Key project metrics

Metric	Value
New Pavement Construction Area	4,800m²
Area of Pavement Refurbishment	-
Project cost estimate (Level 1)	€4,957,839
Cost per square metre	€1,033/m²

Current project status



Specifications review

Table 4.82: Link 3 Extension Taxiway – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address in outline the functional requirement of providing greater departure queue balancing potential for RWY 28 and hence alleviates the Link 1/2 bottleneck for improved apron access. It also reportedly facilitates reduced congestion along Apron TWY 4 by serving as an alternative artery to filter traffic onto the main F taxiways. It is noted that Dublin Airport have confirmed this through capacity simulation modelling.
Quality of specifications	At this stage in the project, the details appear to be very high level. However, the need for the project has been determined through very detailed capacity modelling.
Procurement efficiency	This project is understood to be entering detailed design stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • Construction site is within the busiest part of taxiway network; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); and • Difficult construction access / FOD management.
Phasing and synergies with other projects	This project needs to be considered in conjunction with Realignment of Taxiway Alpha and Dual Taxiway Foxtrot projects.
Existing asset conditions	This is a new asset.
Alternative scopes	None at this stage. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.135 In overall terms, the project is considered effective in developing much needed improvements to the taxiway network, reducing hot spots by improving the number of access points to cross runway 16/34. The high-level scope appears logical and efficient, but early contractor involvement on projects 18-21 may provide opportunities for cost savings.

Cost estimate review

Table 4.83: Link 3 Extension Taxiway – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€530,028	€505,569	-€24,459
Construction Costs	€3,567,360	€3,384,810	-€182,550
Design Development and Contingency	€860,451	€814,003	-€46,448
Total	**€4,957,839**	**€4,704,382**	**-€253,457**

Table 4.84: Link 3 Extension Taxiway – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.5%	1.5%	€55,367	€50,772
Civil/Airfield/Environmental Engineer	n/a	10.7%	10.7%	€384,661	€360,817
Project Management/Other Costs	n/a	2.5%	2.8%	€90,000	€93,979
Total				**€530,028**	**€505,569**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Taxiway	4,800 m²	€311	€278	€1,492,800	€1,333,200
Electrical and AGL	4,800 m²	€25	€20	€120,000	€96,960
Drainage	1	€480,000	€100	€480,000	€480,000
Other Elements	1	€1,474,650	€1,474,650	€1,474,560	€1,474,650
Total				**€3,567,360**	**€3,384,810**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Escalation	n/a	6.0%	6.0%	€245,843	€230,447
Contingency	n/a	15.0%	15.0%	€614,608	€583,557
Others	n/a	0%	0%	€0	€0
Total				**€860,451**	**€814,003**

4.136 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.85: Link 3 Extension Taxiway – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Taxiway	-€159,600.0	63.0%	€311.00	€277.8
Escalation 6%	-€13,268.4	5.2%	n/a	n/a
Contingency Allowance	-€33,171.1	13.1%	n/a	n/a
Total	**-€206,039.5**	**81.3%**		

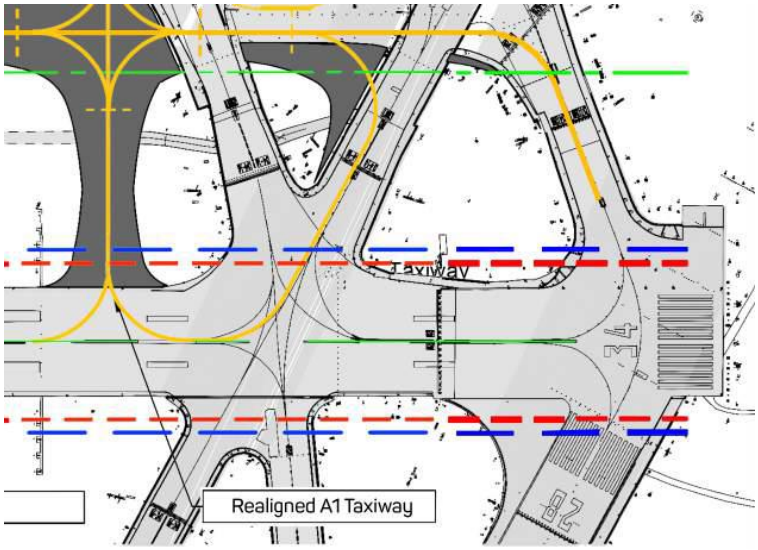
4.137 The variance in the construction costs for the Link 3 Taxiway Extension is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €295 per m² is significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

4.138 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

19 - Realignment of Taxiway A [SCP 17.3.002]

Introduction

Figure 4.18: Realignment of Taxiway A



Source: Dublin Airport's PACE

4.139 This project realigns existing Taxiway A perpendicular to RWY 16/34 providing sufficient clearance from Taxiway B2 such that both taxiways can be operated independently, safeguarded for Code F clearance.

4.140 This project is part of a suite of airfield taxiway projects aiming to improve efficiency:

- To provide a more effective taxiway system for the airport;
- To elevate levels of safety; and
- To address the forecast increases in traffic flows by reducing overall arrival and departure delays by between 2 and 5 hours per day.

4.141 The realignment of Taxiway A has the following specific benefits:

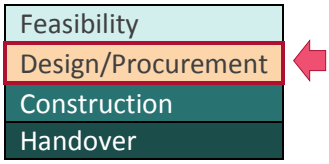
- It allows simultaneous movements on Taxiway B2 and realigned Taxiway A (currently not allowed), and reduces complexity at this Hotspot area;
- It removes a current conflict between two taxiways (A and B2) and can be used as an alternative access to departure queue on RWY 16/34 during RWY 28 operations to facilitate queue balancing;
- It provides a compliant (90 degree) entrance point for short take off on RWY 34 for departures in Dual Runway Operations (DRO) reducing Runway Occupancy Time (ROT); and
- It allows Taxiway A to be used as an exit facilitating reduced runway occupancy time (ROT) in RWY 16 operations.

Key project metrics

Table 4.86: Realignment of Taxiway A – Key project metrics

Metric	Value
New Pavement Construction Area	4,750m^2
Area of Pavement Refurbishment	-
Project cost estimate (Level 1)	€5,582,010
Cost per square metre	€1,175/m^2

Current project status



Specifications review

Table 4.87: Realignment of Taxiway A – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address in outline the functional requirement of enabling simultaneous use of Taxiway A and Taxiway B2 by removing existing wingtip conflict, in addition to reducing complexity around this Hotspot thereby enhancing safety. It is noted that Dublin Airport have confirmed this through capacity simulation modelling.
Quality of specifications	At this stage in the project, the details appear to be very high level. However, the need for the project has been determined through very detailed capacity modelling.
Procurement efficiency	This project is at detailed design stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • Construction site is within the busiest part of taxiway network; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); • Difficult construction access / FOD management.
Phasing and synergies with other projects	This project needs to be considered in conjunction with the Link 3 Extension Taxiway and Dual Taxiway Foxtrot projects.
Existing asset conditions	This is a new asset.
Alternative scopes	None at this stage. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.142 In overall terms, the project is considered effective in developing much needed improvements to the taxiway network, reducing hot spots by improving the number of access points to cross runway 16/34. The high-level scope appears logical and efficient, but early contractor involvement could yield cost benefits through optimisation.

Cost estimate review

Table 4.88: Realignment of Taxiway A – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€628,032	€568,577	-€59,455
Construction Costs	€3,985,200	€3,804,463	-€180,738
Design Development and Contingency	€968,778	€918,310	-€50,468
Total	**€5,582,010**	**€5,291,349**	**-€290,661**

Table 4.89: Realignment of Taxiway A – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.4%	1.4%	€57,465	€51,550
Civil/Airfield/Environmental Engineer	n/a	12.4%	11.8%	€495,567	€448,736
Project Management/Other Costs	n/a	1.8%	1.8%	€75,000	€68,290
Total				**€628,032**	**€568,577**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Taxiway	4,750 m²	€311	€278	€1,477,250	€1,319,313
Electrical and AGL	4,750 m²	€25	€20	€118,750	€95,950
Drainage	1	€475,000	€475,000	€475,000	€475,000
Other Elements	1	n/a	€1,914,200	€1,914,200	€1,914,200
Total				**€3,985,200**	**€3,804,463**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Escalation	n/a	6.0%	6.0%	€276,793	€262,361
Contingency	n/a	15.0%	15.0%	€691,984	€655,950
Others	n/a	0%	0%	€0	€0
Total				**€968,778**	**€918,310**

4.143 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.90: Realignment of Taxiway A – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Taxiway	-€157,937.5	54.3%	€311.00	€277.8
Escalation 6%	-€14,412.1	5.0%	n/a	n/a
Contingency Allowance	-€36,030.3	12.4%	n/a	n/a
Total	**-€208,379.9**	**71.7%**		

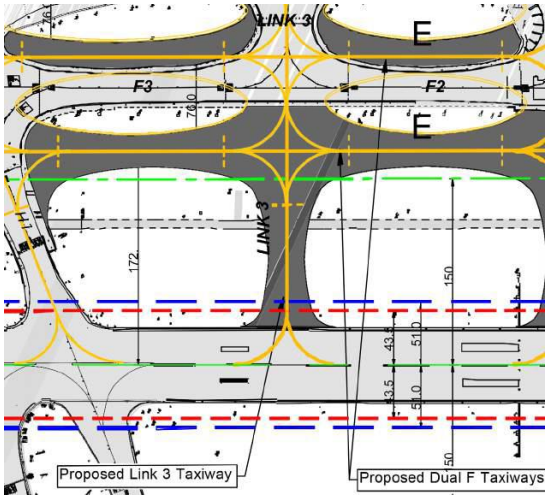
4.144 The variance in the construction costs for the Realignment of Taxiway A is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €311 per m² is significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

4.145 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

20 - Dual Taxiway F [SCP 17.3.003]

Introduction

Figure 4.19: Dual Taxiway F (Option 3)



Source Dublin Airport's PACE

4.146 This project involves the continuation of the Taxiway F-Inner/Taxiway F-Outer axes (Code E–Code E) alignment between Link 4 and Link 1. It removes wide body and narrow body through traffic from Apron Taxiway 4, thereby reducing constraints on Pier 3 push back and manoeuvring.

4.147 This project is part of a suite of airfield taxiway projects aiming to improve efficiency:

- To provide a more effective taxiway system for the airport;
- To elevate levels of safety; and
- To address the forecast increases in traffic flows by reducing overall arrival and departure delays by between 2 and 5 hours per day.

4.148 The dualling of Taxiway F has the following specific benefits:

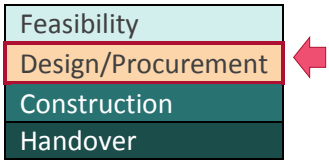
- It provides additional queuing space of 500m;
- It reduces apron access/egress blockage adjacent to Pier 3;
- It provides more opportunity for departure sequencing as wide body and narrow body aircraft form separate queues;
- It offers additional redundancy/resilience and provides an improved junction layout at Link 4;
- It facilitates future North Runway traffic flows; and
- Provides new and improved towing options.

Key project metrics

Table 4.91: Dual Taxiway F – Key project metrics

Metric	Value
New Pavement Construction Area	31,942m^2
Area of Existing Pavement Replacement	20,263m^2
Project cost estimate (Level 1)	€39,534,885
Cost per square metre	€757/m^2

Current project status



Specifications review

Table 4.92: Dual Taxiway F – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address in outline the functional requirement of the continuation of existing Taxiway F-Inner/Outer axes for TWY simplification in addition to allowing Code E - Code E simultaneous movements. It is noted that Dublin Airport have confirmed this through capacity simulation modelling.
Quality of specifications	At this stage in the project, the details appear to be very high level. However, the need for the project has been determined through very detailed capacity modelling.
Procurement efficiency	This project is at detailed design stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • Construction site is within the busiest part of taxiway network; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); and • Difficult construction access and FOD management.
Phasing and synergies with other projects	This project needs to be considered in conjunction with the Link 3 Extension Taxiway and the Realignment of Taxiway Alpha projects.
Existing asset conditions	The new taxiways elements will integrate with the existing taxiway Foxtrot. The documents state a target PCN of 110 for the new taxiway pavements at Foxtrot. We have not seen evidence of the PCN or residual life of the existing pavements in these locations, and therefore there may be additional project costs required in strengthening and/or resurfacing the existing taxiway.
Alternative scopes	It is noted that the stand capacity would be impacted by simultaneous Code E – Code E movements. Recent amendments (December 2017) to EASA runway to taxiway separation criteria may assist in reducing this impact and should be reviewed. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.149 In overall terms, the project at this early stage is considered effective in developing much needed improvements to the taxiway network, reducing hot spots by improving the ability for simultaneous routes along the taxiway Foxtrot corridor. The high-level scope appears logical and efficient, but early contractor involvement on projects 18-21 may provide opportunities for savings.

Cost estimate review

Table 4.93: Dual Taxiway F – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€2,442,348	€2,682,457	€240,109
Construction Costs	€28,934,544	€26,945,823	-€1,988,721
Design Development and Contingency	€8,157,992	€7,703,032	-€454,960
Total	**€39,534,885**	**€37,331,311**	**-€2,203,574**

Table 4.94: Dual Taxiway F – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	0.1%	1.7%	€21,354	€431,133
Civil/Airfield/Environmental Engineer	n/a	7.8%	7.8%	€2,260,994	€2,101,774
Project Management/Other Costs	n/a	0.5%	0.5%	€160,000	€149,549
Total				**€2,442,348**	**€2,682,457**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New Taxiway	31,942 m²	€311	€278	€9,934,183	€8,878,455
Replace Existing Taxiway	20,263 m²	€311	€278	€6,302,042	€5,630,075
Electrical and AGL	52,205 m²	€25	€20	€1,305,125	€1,044,100
Other Elements	1	€11,393,194	€11,393,194	€11,393,194	€11,393,194
Total				**€28,934,544**	**€26,945,823**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Escalation	n/a	6.0%	6.0%	€1,882,613	€1,777,623
Contingency	n/a	20.0%	20.0%	€6,275,378	€5,925,409
Others	n/a	0%	0%	€0	€0
Total				**€8,157,992**	**€7,703,032**

4.150 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.95: Dual Taxiway F – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Cost	€237,018.9	-10.8%	€1,200.0	€151.5
New Pavement	-€1,062,095.1	48.2%	€311.0	€277.8
Replace Existing Pavement	-€673,771.4	30.6%	€311.0	€277.8
Electrical and other lighting installations	-€249,406.5	11.3%	€25.0	€20.2
Escalation at 6%	-€104,920.2	4.8%	n/a	n/a
Contingency at 20%	-€349,734.0	15.9%	n/a	n/a
Total	**-€2,202,908.4**	**100.0%**		

4.151 The variance in the construction costs for the Realignment of Dual Taxiway F is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €311 per m² is significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

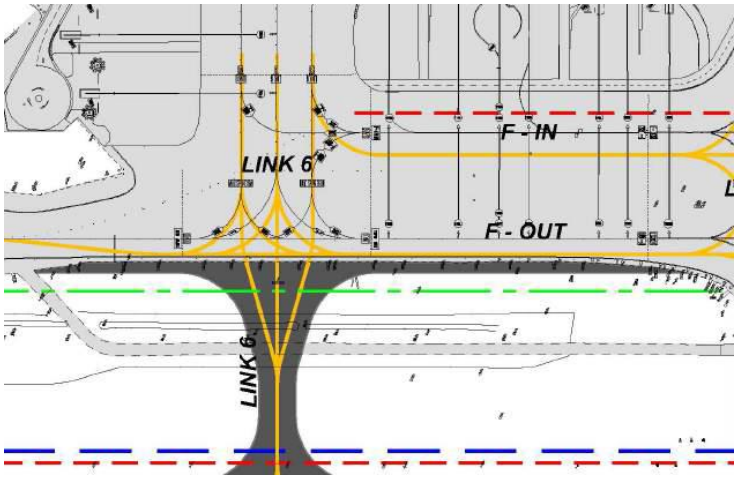
4.152 Our rate for the electrical installation of €20.20 per m^2, based on outturn cost data from airfield projects at various UK airports, is lower than the €25.00 per m^2 assumed by Dublin Airport.

4.153 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

21 - Link 6 Extension Taxiway [SCP 17.3.004]

Introduction

Figure 4.20: Link 6 Extension Taxiway



Source: Dublin Airport's PACE

4.155 This project comprises an additional taxiway from Link 6 to RWY 16/34, aligned to the centreline of the triple taxiway configuration north of Pier 1.

4.156 This project is part of a suite of airfield taxiway projects aiming to improve efficiency:

- To provide a more effective taxiway system for the airport;
- To elevate levels of safety; and
- To address the forecast increases in traffic flows by reducing overall arrival and departure delays by between 2 and 5 hours per day.

4.157 The Link 6 Taxiway provides the following specific benefits:

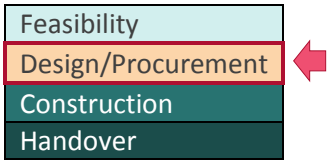
- Reduces the number of movements on more complex junctions, Link 4 and Link 5 and it was identified as an option to achieve this reduction under the 'Critical Taxiway Review' carried out by independent consultants;
- Provides congestion relief from F-Inner and F-Outer by having an alternative access to departure queue on RWY 16/34 during Runway 28 operations.
- Reduces the existing taxiway distance for inbound aircraft via Taxiway M, RW 16/34 and Taxiway G, by some 500m;
- Provides new and improved towing options;
- Provides another exit facilitating reduced runway occupancy time in Runway 34 operations;
- Provides an area between Taxiway G and Taxiway Link 6 to hold aircraft awaiting stands without significant disruption to other operations;
- Provides an additional entrance point for short take off on RWY 16/34 for RWY 16 operations; and
- Facilitates future North Runway traffic flows.

Key project metrics

Table 4.96: Link 6 Extension Taxiway – Key project metrics

Metric	Value
New Pavement Construction Area	5,500m²
Area of Pavement Refurbishment	-
Project cost estimate (Level 1)	€5,806,305
Cost per square metre	€1,056/m²

Current project status



Specifications review

Table 4.97: Link 6 Extension Taxiway – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address in outline the functional requirement of reducing congestion on the existing Taxiway F-Inner/Outer axes and an alternative route for arrivals using taxiway Mike. It is noted that Dublin Airport have confirmed this through capacity simulation modelling.
Quality of specifications	At this stage in the project, the details appear to be very high level. However, the need for the project has been determined through very detailed capacity modelling.
Procurement efficiency	This project is at detailed design stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • This will require work in RWY 16/34 flight strip and on Taxiway F-Outer; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); and • Difficult construction access and FOD management.
Phasing and synergies with other projects	This project does not necessarily need to be phased with other projects; it is a stand-alone taxiway on a 'greenfield' site. However, it will provide a much-improved route for aircraft accessing the northern aprons and it would therefore be beneficial to have this taxiway link extension in place before the north aprons are expanded.
Existing asset conditions	This is a new asset. The proposed PCN value of 110 is consistent with the use of this route by Code E and Code F aircraft.
Alternative scopes	Possible consideration of this link being for Code C aircraft only, reducing costs of pavement and strip grading. However, this would be dependent upon the findings of the capacity simulation. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.158 In overall terms, the project at this early stage is considered effective in developing much needed improvements to the taxiway network, reducing congestion along the taxiway Foxtrot corridor and preparing for increased movements from the northern apron. The high-level scope appears logical and efficient, but early contractor involvement on projects 18-21 may provide opportunities.

Cost estimate review

Table 4.98: Link 6 Extension Taxiway – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€692,098	€613,938	-€78,160
Construction Costs	€4,228,500	€4,092,923	-€135,578
Design Development and Contingency	€885,707	€847,231	-€38,476
Total	**€5,806,305**	**€5,554,092**	**-€252,213**

Table 4.99: Link 6 Extension Taxiway – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.3%	1.3%	€56,932	€53,208
Civil/Airfield/Environmental Engineer	n/a	12.7%	11.2%	€535,166	€458,407
Project Management/Other Costs	n/a	2.5%	2.5%	€100,000	€102,323
Total				**€692,098**	**€613,938**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Taxiway	5,500 m²	€ 298	€275	€1,636,250	€1,512,500
Electrical and AGL	5,500 m²	€ 25	€77	€ 137,500	€425,673
Drainage	1	€ 550,000	€550,000	€ 550,000	€550,000
Other Elements	1	€ 1,904,750	€1,604,750	€ 1,904,750	€1,604,750
Total				**€ 4,228,500**	**€4,092,923**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Escalation	n/a	3.0%	3.0%	€147,617	€141,205
Contingency	n/a	15.0%	15.0%	€738,089	€706,026
Others	n/a	0%	0%	€0	€0
Total				**€885,707**	**€847,231**

4.159 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.100: Link 6 Extension Taxiway – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Cost	-€80,135.5	31.8%	n/a	n/a
Taxiway	-€108,625.0	43.1%	€297.5	€277.8
Total	**-€188,760.5**	**74.9%**		

4.160 Our allowance for design and management costs is 15% of construction costs, which is a recognised benchmark for airport projects.

4.161 The variance in the construction costs for the Link 6 Extension Taxiway is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €311 per m² is

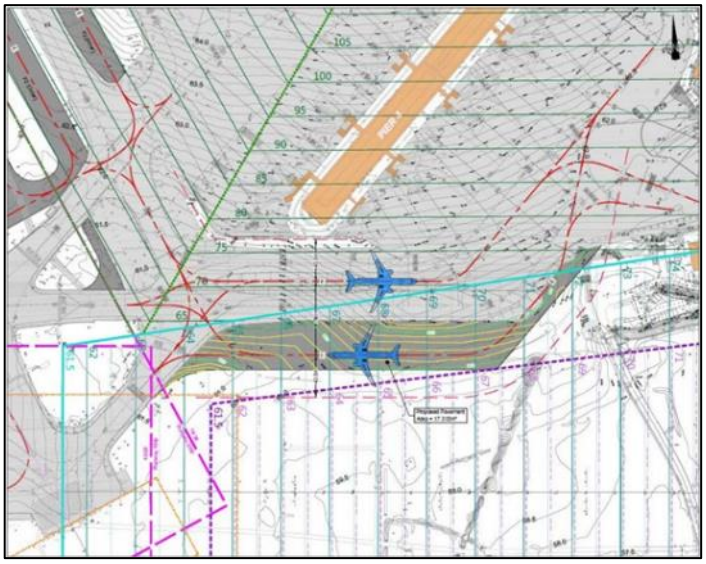
significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

4.162 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

22 - South Apron Taxiway Widening (Dual Code E) [SCP 17.3.005]

Introduction

Figure 4.21: South Apron Dual Taxiway Access Preferred Option



Source: Dublin Airport

4.163 This project comprises the widening of taxiway Bravo 1 in order to permit independent taxiway capability through greater separation between taxiways Bravo 1 and Zulu at the southern end of Pier 4.

4.164 The project is to reduce restrictions on aircraft taxiing to and from the South Apron. It would improve efficiency and safety in operations.

4.165 The South Apron Dual Taxiway Access project provides the following specific benefits:

- Taxiway Z increased to independent Code E taxiway; and
- Taxiway B1 increased to independent Code E taxiway.

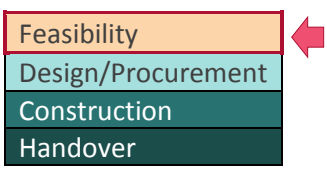
4.166 The project requires IAA SRD approval and mitigation measures for Equivalent Level of Safety as approach surfaces could be compromised.

Key project metrics

Table 4.101: South Apron Taxiway Widening (Dual Code E) – Key project metrics

Metric	Value
New Pavement Construction Area	17,371m^2
Area of Pavement Refurbishment	-
Project cost estimate (Level 1)	€14,652,384
Cost per square metre	€843/m^2

Current project status



Specifications review

Table 4.102: South Apron Taxiway Widening (Dual Code E) – Specifications review

Subject	Comments
Effectiveness of scope	The high-level scope provided appears to address in outline the functional requirement of reducing congestion on the existing Taxiways B1 and Z, subject to EASA agreement on compromising the approach surfaces. It is noted that Dublin Airport have confirmed the taxiway network benefits through capacity simulation modelling during their presentation on 13 November 2017.
Quality of specifications	At this stage in the project, the details appear to be very high level.
Procurement efficiency	This project is at a feasibility stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • This will require work within the narrow taxiway B1/Z corridor; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); and • Difficult construction access and FOD management.
Phasing and synergies with other projects	This project does not need to be phased with other projects; it is a stand-alone taxiway on a 'greenfield' site. However, it will provide a much-improved route for aircraft accessing the southern aprons and it would therefore be beneficial to have this taxiway widening in place before now that the south apron is expanded.
Existing asset conditions	This is a new asset. The proposed PCN is not declared, but should be consistent with the use of this route by the heavier Code E/F aircraft associated with Pier 4.
Alternative scopes	None at this stage. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.167 In overall terms, the project at this early stage is considered effective in developing much needed improvements to the taxiway network, reducing congestion along the taxiway Bravo 1/Zulu corridor and preparing for increased movements from the southern apron and Pier 4. The high-level scope appears logical and efficient, but early contractor involvement may provide opportunities.

Cost estimate review

Table 4.103: South Apron Taxiway Widening (Dual Code E) – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€1,507,766	€1,404,874	-€102,892
Construction Costs	€10,069,510	€9,524,567	-€544,943
Design Development and Contingency	€3,075,104	€2,795,183	-€279,921
Total	**€14,652,384**	**€13,724,623**	**-€927,761**

Table 4.104: South Apron Taxiway Widening (Dual Code E) – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.0%	1.0%	€106,772	€142,869
Civil/Airfield/Environmental Engineer	n/a	4.0%	4.0%	€390,994	€380,983
Project Management/Other Costs	n/a	10.0%	10.0%	€1,010,000	€881,022
Total				**€1,507,776**	**€1,404,874**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
New Taxiway Pavement	17,371 m²	€318	€277	€5,510,155	€4,816,978
Electrical Infrastructure and AGL	17,371 m²	€69	€75	€1,184,275	€1,304,571
Drainage/Attenuation and Specialist Grd Treatment	17,371 m²	€65	€66	€1,118,550	€1,146,486
LVP and Temp Works	1	€2,256,532	€2,256,532	€2,256,532	€2,256,532
Total				**€10,069,512**	**€9,524,567**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Escalation	n/a	3.0%	6.0%	€500,000	€655,766
Contingency	n/a	15.0%	15.0%	€763,513	€1,639,416
Others	n/a	0%	n/a	€1,811,591	€500,000
Total				**€3,075,104**	**€2,795,183**

4.168 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.105: South Apron Taxiway Widening (Dual Code E) – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Site Supervision	-€87,923.4	9.5%	€850,000.0	€762,076.6
Taxiway	-€577,609.3	62.3%	€311.0	€277.8
Escalation at 6%	-€110,394.2	11.9%	n/a	n/a
Contingency at 15%	-€178,793.5	19.3%	n/a	n/a
Total	**-€954,720.4**	**102.9%**		

4.169 Our allowance for design and management costs is 15% of construction costs, which is a recognised benchmark for airport projects.

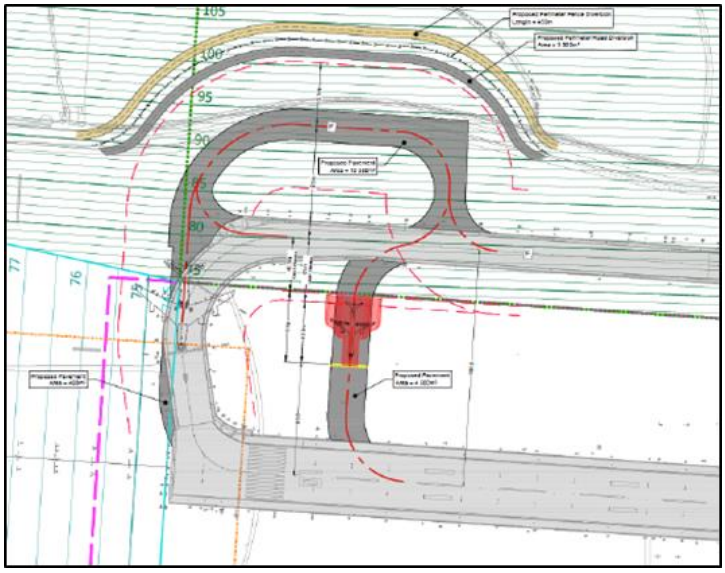
4.170 The variance in the construction costs for the South Apron Taxiway Widening is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €311 per m² is significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

4.171 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

23 - Runway 10 Line-Up Points [SCP 17.3.006]

Introduction

Figure 4.22: Runway 10 Line Up Points (Alternative Proposal)



Source: Dublin Airport

4.172 This project comprises an additional bypass taxiway at the western end of taxiway Bravo, permitting the ability to re-sequence aircraft prior to departing from runway 10.

4.173 It is currently possible to use Taxiway E6 and Taxiway E7. However, there is limited ability to bypass.

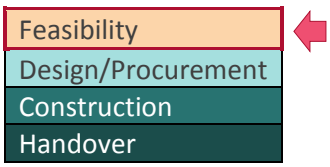
4.174 Current RWY10 may become the primary RWY for DEPs in Parallel Runway operations – Easterly operations.

Key project metrics

Table 4.106: Runway 10 Line-Up Points – Key project metrics

Metric	Value
New Pavement Construction Area	17,480m^2
Area of Pavement Refurbishment	-
Project cost estimate (Level 1)	€16,828,568
Cost per square metre	€963/m^2

Current project status



Specifications review

Table 4.107: Runway 10 Line-Up Points – Specifications review

Subject	Comments
Effectiveness of scope	The high-level drawing provided appears to address in outline the functional requirement of providing for re-sequencing of aircraft at the RWY10 threshold.
Scope efficiency	The outline scope of works appears to be consistent with the project need, however the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.
Quality of specifications	At this stage in the project, the details appear to be very high level.
Procurement efficiency	This project is at feasibility stage. It is to be procured on a traditional full detailed design basis. The project has several complexities where early contractor involvement could yield cost benefits through optimisation of the methodology and construction logistics: • This will require work in RWY 10/28 flight strip and on Taxiway Bravo; • Complex construction phasing to maintain aircraft operations; • Restricted construction window (night time working); and • Difficult construction access and FOD management.
Phasing and synergies with other projects	This project does not need to be phased with other projects; it is a stand-alone taxiway on a 'greenfield' site.
Existing asset conditions	This is a new asset. The proposed PCN value of 110 is consistent with the use of this route by Code E and Code F aircraft.
Alternative scopes	It is noted that a Code F separation and strip width is under consideration as an option. It is not known if this is a likely scenario, and savings might be made by reducing the separation to Code E and managing any Code F to Code E bypass manoeuvres through assessment of wing tip clearance, given that the holding aircraft will be stationary. This may or may not be acceptable to the IAA. Furthermore, it may be possible to produce sufficient re-sequencing capability by construction of the access taxiway component of the project only. We note that the scope is very high level due to the project stage, making it difficult to establish a clear view on the project's efficiency. The proposal, insofar as it is indicated, appears to be logical and efficient.

4.175 In overall terms, the project at this early stage is considered effective in developing the approaching need to optimise the order of departures and provide bypass and re-sequencing capability at this end of the main runway. The high-level scope appears logical and efficient, but early contractor involvement may provide saving opportunities.

Cost estimate review

Table 4.108: Runway 10 Line-Up Points – Level 1 Costs

	daa cost estimate	SDG cost estimate	Cost difference
Design and Management Costs	€1,495,000	€1,691,318	€196,318
Construction Costs	€11,912,906	€11,313,161	-€599,745
Design Development and Contingency	€3,420,660	€3,212,106	-€208,554
Total	**€16,828,568**	**€16,216,585**	**-€611,983**

Table 4.109: Runway 10 Line-Up Points – Level 2 Costs

Design and Management Costs (DM-C)	Quantity	% of daa C-C	% of SDG C-C	daa cost estimate	SDG cost estimate
Planning/Building Control/Cost Consultants	n/a	1.0%	2.5%	€125,000	€282,829
Civil/Airfield/Environmental Engineer	n/a	3.0%	3.5%	€370,000	€390,304
Project Management/Other Costs	n/a	9.0%	9.0%	€1,100,00	€1,018,184
Total				**€1,495,000**	**€1,691,318**
Construction Costs (C-C)	**Quantity**	**daa rate**	**SDG rate**	**daa cost estimate**	**SDG cost estimate**
Taxiway Pavement	17,480 m²	€314	€279	€5,487,689	€4,872,550
Public Road Diversion incl. Fence	3,800 m²	€532	€532	€2,020,400	€2,023,234
Electrical – Incl. AGL, Ducting etc.	25,480 m²	€41	€41	€1,037,000	€1,044,680
Drainage – Incl. Attenuation	17,480 m²	€56	€56	€974,000	€978,880
LVP and Temp Works		n/a	n/a	€2,393,817	€2,393,817
Total				**€11,912,906**	**€11,313,161**
Design Development and Contingency	**Quantity**	**% of daa DM-C + C-C**	**% of SDG DM-C + C-C**	**daa cost estimate**	**SDG cost estimate**
Design Development	n/a	3.7%	4%	€500,000	€481,166
Contingency	n/a	15.5%	15%	€2,086,186	€1,950,672
Others	n/a	2.0%	6.0%	€834,477	€780,269
Total				**€3,420,660**	**€3,212,106**

4.176 The variances in assumptions between Dublin Airport and Steer Davies Gleave are mainly driven by the following Level 3 items:

Table 4.110: Runway 10 Line-Up Points – Main Level 3 variances

Item	Variance	% of total variance	daa rate	SDG rate
Design and Management Costs	€199,762.6	-32.6%	n/a	n/a
Taxiway Pavement	-€576,840.0	94.3%	€311.0	€278.0
Electrical and other lighting installations	-€122,304.0	20.0%	€25.0	€20.2
Drainage	€99,386.8	-16.2%	€50.0	€55.7
Escalation at 6%	-€54,883.6	9.0%	n/a	n/a
Contingency at 15%	-€137,209.2	22.4%	n/a	n/a
Total	**-€592,087.4**	**96.7%**		

4.177 Our allowance for design and management costs is 15% of construction costs, which is a recognised benchmark for airport projects.

4.178 The variance in the construction costs for the Link 6 Extension Taxiway is driven by the difference in unit rate assumptions for the taxiway. Dublin Airport's assumed €311 per m² is significantly more expensive than we would expect at €278 per m². Our rate is based on similar pavement construction costs from airfield projects at South-East England airports.

4.179 Our rate for the electrical installation of €20.20 per m^2, based on outturn cost data from airfield projects at various UK airports, is lower than the €25.00 per m^2 assumed by Dublin Airport.

4.180 The reduced contingency and escalation costs in our estimate are as a result of the reduction in our construction costs due to the pavement rate differential.

CONTROL INFORMATION

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