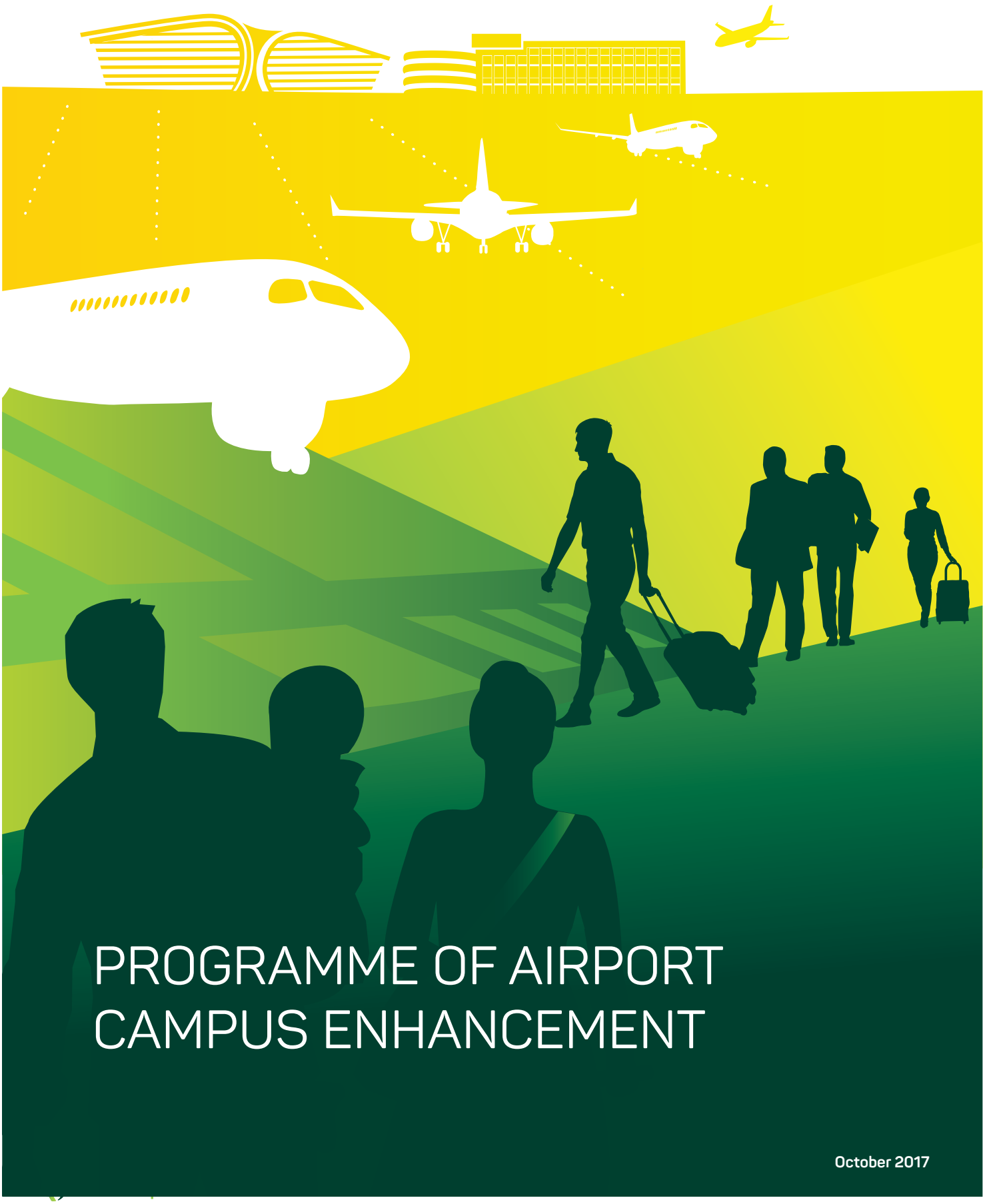
DublinAirport

PACE



PROGRAMME OF AIRPORT CAMPUS ENHANCEMENT

October 2017

PACE: Programme of Airport Campus Enhancement

Annual traffic at Dublin Airport achieved a record level of 27.9 million passengers in 2016. This acceleration from 18.4 million passengers in 2010 was a result of our continued partnerships.

In 2014, the Commission for Aviation Regulation (CAR) provided Dublin Airport with capital investment allowances to support growth in passenger volumes from 21.7 million (2014) to a forecast level of 24.8 million passengers per annum (mppa) in 2019. During 2015 and 2016, passenger volumes at Dublin Airport increased by 15.4% and 11.4% respectively; significantly exceeding the consensus forecasts developed in 2014. Dublin Airport's current demand outlook for 2017-2019 remains positive, with 6% traffic growth recorded in the first half of 2017. The latest near-term forecasts indicate an unconstrained demand opportunity of up to 32 mppa by the end of this decade: this corresponds to an anticipated level of activity circa 7.2 mppa, or 29% greater than originally provided for in 2014. This significant increase in annual activity (both in passenger and aircraft volumes) is clearly placing an elevated strain on existing airport infrastructure, with certain facilities nearing or already operating at maximum capacity throughout 2017. Limited surplus capacity is available to support the unconstrained demand requirements for the period 2018-2020. The capital allowances granted in 2014 have not been sufficient to deliver the appropriate infrastructure required to facilitate current and future customer demand to the end of this regulatory period.

Dublin Airport commenced a review process in late 2016 to assess the current levels of capacity headroom across the campus. We engaged with airport users to understand future customer demand requirements and the supplementary infrastructure required to deliver growth requirements for the remainder of the decade. A programme of accelerated infrastructure projects is now proposed to augment and enhance the delivery of the current Capital Investment Plan (CIP). The drivers for this supplementary investment programme are to facilitate continued sustainable growth for our customers, a targeted alleviation of known capacity constraints, to make improvements to the efficiencies of aircraft and passenger flows, and to further elevate the high levels of service quality currently experienced throughout the airport campus.

The proposed PACE programme is now sufficiently developed for consultation with airport stakeholders. As an important customer and partner of Dublin Airport, we appreciate the key role you play in shaping future airport infrastructure. Given the importance of delivering sufficient infrastructure to accommodate customer growth expectations, and maintaining the high-quality service levels delivered today throughout the airport, Dublin Airport encourages all stakeholders to constructively engage in this consultation process. To inform your assessment of the proposals, the following detailed material has been prepared in accordance with the CAR paper 7/2016, which prescribes guidelines for consultation on supplementary capital expenditure.

2016	PASSENGER VOLUMES	NEAR TERM FORECAST
27.9 ↗	**11.4%**	**32** MPPA
Million passengers Up from 18.4M in 2010	Increase in 2016	Demand opportunity by the end of the decade

The table below outlines the timelines for this consultation process:

Action	Date
Consultation paper issued	5th October 2017
Consultation meetings/presentations:	
1. Initial meeting	25th October 2017
2. Focus on Passenger Processing	25th October 2017
3. Focus on Aircraft Parking/Stands	26th October 2017
4. Focus on Airfield/Taxiways	26th October 2017
CAR to issue Minutes of Consultation Meetings	31st October 2017
Deadline for clarification questions	2nd November 2017
Dublin Airport to issue responses to clarification questions	8th November 2017
Deadline for final written comments from interested parties	13th November 2017

We welcome your feedback and would like to thank you in advance for your submissions.

DublinAirport

Please direct all correspondence relating to this consultation process (including queries and final submissions) to:
pace@dublinairport.com

*All project cost references throughout the document and appendix are based on current approximations.

01 EXECUTIVE SUMMARY

Capital allowances set in the 2014 Determination were based on passenger growth of 3% p.a. to 24.8m by 2019.

01 EXECUTIVE SUMMARY

There is an inextricable link between passenger demand (and by extension airline/airport volumes) and key macroeconomic indicators. Traffic at Dublin Airport declined significantly during the economic recession 2008-2012: the peak to trough saw a reduction of five million in annual passenger numbers.

At the time of drafting the Capital Investment Plan (CIP) for the current pricing/regulatory period, Dublin Airport estimated passengers, under a 'core' forecast would grow gradually by 3% per annum (p.a.) from 21.2m in 2015 to 23.6m in 2019. Based on this traffic forecast, we determined that a non-trigger capital investment of €396m would be required to facilitate the expected level of activity in the period.

This capital allowance acknowledged that the economic environment at the time remained fragile. In the Final 2014 Determination, CAR forecasted passenger volumes to grow by 3% p.a. from 22.1m in 2015 to 24.8m in 2019. However, an allowance of €341m for non-trigger capital expenditure was allowed in contrast to Dublin Airport's submitted investment requirement of €396m. The decision not to allow the full proposed allowance was supported by submissions from key airport stakeholders on the grounds that there was no pressing need for further capacity expansion in the relevant period and that the Dublin Airport plan was larger than necessary for a period that involved no justifiable case for significant capacity expansion.

However, since 2014 both the global and local macroeconomic climates have dramatically improved across a broad range of key indicators, which has fuelled a post-recessionary surge in passenger demand to and from Dublin Airport. Double-digit traffic growth was delivered in the opening two years of the current regulatory period (15.4% in 2015 and 11.4% in 2016). No forecast submitted by any interested party in 2014 anticipated growth profiles of this magnitude. Throughout this period, the level of activity at Dublin Airport crossed 25 mppa (million passengers per annum), with Dublin maturing to the Airports Council International (ACI) Category One airport classification. 'Category One' airports are those with over 25 mppa, and include London Heathrow, London Gatwick, Amsterdam and Paris CDG.

In 2016 alone, 19 new routes were introduced by a diverse group of airlines, and additional capacity was added on 31 existing services. New record levels of passenger volumes were experienced in 2015 and 2016, and a further record will undoubtedly be set again in 2017. Dublin Airport has migrated and matured from a level of 18.4m in 2010 to over 29 mppa expected in 2017. One notable emerging cause for concern is the reduction in British leisure visitors to Ireland (January to July 2017 was -6.2% by comparison with 2016). It is unclear if this has emanated from Brexit uncertainty and is a longer-term issue, or if it is a temporary result of Sterling's depreciation against the Euro (impacted by Brexit). At present, strong Irish originating traffic is managing to offset the decline in British outbound passengers, and Dublin Airport is expecting to experience 1-2% growth on UK routes in 2017.

The forecast for short-term demand is positive, stable and robust. Undoubtedly, a collective opportunity exists to grow airport traffic past 30 mppa by the end of this regulatory period. Dublin Airport has a dual mission to sustain passenger growth while also continually improving the customer experience and service quality. Growth cannot be sustained under deteriorating levels of customer service. As annual passenger numbers migrate into a new 30 million category, significant but smart infrastructural development will be required across the airport campus to sustain the record levels of activity, accommodate future opportunity and more importantly, to continue to enhance the high levels of customer experience and service quality that exist today.

We undertake a comprehensive assessment of capacity across the key processing facilities on an annual basis. This assessment has focused on the core facilities required to process passengers and to park and manoeuvre aircraft across the airfield. Facilities such as the airport road network, kerbside access and the baggage handling system are being assessed as strategic elements of the longer-term Dublin Airport Masterplan.

+29 MPPA

Expected in 2017

The process ultimately identifies and flags operational processors that are currently at, or nearing, maximum capacity. Targeted capacity solutions will then be proposed to alleviate any current or emerging capacity deficits or bottleneck issues in the airport system. When conducting the annual capacity assessment, it is imperative to focus on the composition of demand and traffic across a typical peak day rather than assessing a total demand figure. This is because a high-level total demand may remain the same year-on-year, but if the profile of activity fluctuates across the day, new capacity constraints can emerge at specific times.

The 2017 capacity assessment highlighted these operational processors as requiring immediate capacity enhancements:

- Aircraft parking stands.
- Taxiways.
- Gates and associated bussing routes.
- Terminal 2 check-in.
- US Preclearance.
- Terminal 1 Central Immigration.

The capacity assessment also flagged that these facilities do not have sufficient capacity headroom or an adequate level of service quality to support the forecast growth over the remainder of the regulatory period. Targeted solutions are needed to tactically enhance certain facilities, otherwise growth will be stifled, and service quality will deteriorate for customers.

In the second half of 2016, we undertook a mid-determination review of user requirements. A detailed consultation document was issued to approximately 115 individuals, representing a total 45 organisations operating at Dublin Airport. All airport users were invited to respond to several key questions pertaining to airport infrastructure and their associated requirements as customers/users.

Eleven airport users (representing 84% of passenger traffic in 2016) responded in writing to this request for views and proposals in relation to capacity constraints and potential solutions to address perceived deficits. All eleven had specific concerns in relation to the current and projected levels of airport capacity over the remainder of the current regulatory period.

This process gave us a valuable understanding of user concerns and requests, and the evaluation of user proposals is detailed in Section 6 and Appendix A. In some cases, we received user support for specific infrastructure enhancements which require full consideration. Certain user proposals were categorised as longer-term, strategic masterplanning considerations, and therefore considered outside the scope of this exercise. It is important to note that we do not consider such proposals to be invalid or discounted; certain suggestions will form the basis of the 2020-2024 Capital Investment Plan, or indeed are currently under parallel evaluation through the masterplanning process.

We did not receive a unanimous response to a particular question or item. This is not unusual or unexpected, given the large number of diverse stakeholders represented, and the degree of variation between business models and operating requirements. The detail of the responses varied from outline or general in nature to highly specific individual considerations. In some cases, the responses focused on flagging operational challenges, or made general remarks about the airport. With regard to capacity solutions, the responses received had a strong preference for progressing managed solutions and accelerating capital infrastructure projects. It was assumed that users are unwilling to accept a deterioration in service quality or an inability to grow as preferred solutions for addressing any existing or emerging capacity constraints at the airport.

We are committed to delivering the remainder of the priority CIP projects. It has been necessary to defer several non-essential projects, and to reprioritise all flexibility and savings towards a number of critical 'capacity enabling' projects. These have successfully been delivered within the Business Development allowance. This grouping is now fully exhausted (€66.6m), and no scope or funds remain to accommodate any additional capacity-enhancing or efficiency projects.

As a result, we began a review to identify targeted solutions to address customer requirements and specific capacity deficits across the airport campus. This review focused on the core aeronautical business; specifically passenger processor facilities and airfield efficiency.

A collective opportunity exists to grow airport traffic past 30 mppa by the end of this regulatory period.

A number of solutions were identified and evaluated under a set of key principles:

- Drivers are to support additional demand opportunities, alleviate known capacity constraints, and improve user and customer experience.
- Conceptually, this is a 'Needs-Must' process. There is limited flexibility for opportunistic or 'nice to have' projects.
- Projects must maximise cross-usage, flexibility and interoperability.
- Projects must have an accelerated delivery profile.
- Projects must be cost efficient and effective.
- Projects will require a degree of user support (though not unanimous user support).

PACE is the output of this review. PACE is a set of interdependent projects, designed to enhance the airport experience for all customers.

This report explains the full suite of potential projects identified as part of the twin-track capacity assessment and customer requirements process. PACE projects are divided into three work-streams: Passenger Processing; Aircraft Parking Stands; Airfield/Taxiway System.

We are committed to providing interested parties with appropriate levels of project information so they can undertake parallel evaluations and assessment. Dublin Airport's proposed solutions are developed to concept design level, along with the associated cost estimates and timelines for delivery. Project visuals such as drawings, 3D renders and software modelling outputs are provided. It is important to note that the proposed projects are not refined to detailed design stage; proposals are high-level concepts with scope for improvements and amendments during the detailed design phase.

A total of 28 projects were identified and assessed. The majority of the projects are capital infrastructure solutions. A select number of critical projects emerged during the review process that required immediate delivery under an accelerated construction programme. Timelines for the completion of the projects averaged 20 months and customers declared the projects essential for fulfilling their business objectives in 2017. The projects could not be accommodated through current CIP flexibility (see section 5.8) and required progression in advance of general consultation, to ensure an expedited delivery before the end of 2017. Dublin Airport pre-consulted with stakeholders to obtain their approval for immediate progression and upon this basis, Dublin Airport commenced construction at the earliest opportunity.

This sub-group of key projects are:

- Pier 1 Extension.
- Pre-Boarding Zone (PBZ).
- Common User Self Service (CUSS) Check-in, Phase 1 and Phase 2.
- South Apron Stands Phase 1.
- Immigration e-gates.

The capacity assessment in Section 3 of this paper, identified four passenger processors that will constrain growth during this regulatory period. Airport users identified seven processors that would constrain growth in the near-term. PACE identified 28 projects that could address immediate capacity shortages; one is a managed solution and the remainder are classified as infrastructure projects. The total cost of the proposed projects amounts to €170m. Based on pre-consultation with users and the urgent need for such projects to accommodate 2017 demand, Dublin Airport has proceeded immediately with the sub-group projects mentioned above.

Through engagement with CAR, Dublin Airport has ensured that this consultation document, along with the planned follow-up consultation meetings and presentations, more than adequately satisfies the information sharing and consultation requirements as set-out in CP7/2016.

For reference, Dublin Airport has defined:

- The need and merit for the proposed projects in Section 6.4, 6.5 and 6.6.
- Details on delivery are discussed in Section 6.10.2 and Appendix B.
- Timelines for delivery of projects in Section 6.10.2 and Appendix B and D.
- Update on current CIP in Section 5.
- Detailed business case using CAR's price cap model in Section 6.9.
- Comprehensive cost detail Appendix B.
- Detailed timelines and milestones for projects Appendix B and Appendix D.

PACE is an optimised suite of 16 inter-related projects recommended to deliver the growth envisaged over the coming years.

We are committed to undertaking a comprehensive consultation process with airport users. Interested parties will be encouraged to engage constructively throughout this process and there will be numerous opportunities for users to provide feedback and request clarifications. We will fully analyse and consider all constructive feedback, which will subsequently be discussed fully with users. Ultimately, projects will be updated and refined based on improvements suggested from customer feedback.

On completion of the consultation process with users, we will refine the PACE proposals if appropriate and submit a Supplementary Capital Proposal to CAR for consideration under CP7/2016.

As an important customer and partner of Dublin Airport, we acknowledge the key role you play in shaping future airport infrastructure. The proposed PACE programme is now sufficiently developed for consultation with airport stakeholders.

We hope all stakeholders will constructively engage in this consultation process as delivering sufficient infrastructure to accommodate customer growth expectations and maintaining the high-quality service levels delivered throughout the airport today is vital to us all.

Figure 1: Summary of Proposed Projects

No.	Category	Project	Cost €m
1	Passenger Processing	Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in	5.9
2		Terminal 1 and Terminal 2 Immigration Facilities	11.3
3		Pier 1 Extension	7.6
4		South Apron Pre-Boarding Zone (PBZ)	22.0
5	Stands and Associated Projects	South Apron Stands Phase I	10.5
6		Apron 5H and Taxiway Rehabilitation	52.0
7		Realignment of Stands 101-104	5.0
8		Hangar 1 and Hangar 2 Stands	14.3
9		West Apron Stands	2.5
10		Pier 2 Underpass Widening	5.0
11		Pier 3 Underpass Widening	0.2
12		West Apron Surface Access	3.0
13	Airfield/ Taxiways	Link 3 Taxiway	4.0
14		Realignment of Taxiway A	5.7
15		Dual Taxiway F	15.5
16		Link 6 Taxiway	5.1
		Total – 16 Projects	169.6

02 BACKGROUND

02 BACKGROUND

2.1 2014 Price Determination (2015-2019)

Dublin Airport's Capital Investment Plan (CIP) for the current pricing/regulatory period estimated that passengers, under a 'core' forecast, would grow gradually by 3% p.a. from 21.2m in 2015 to 23.6m in 2019. Based on this traffic forecast, we determined that a non-trigger capital investment of €396m would be required to facilitate the expected level of activity in the period. This capital allowance acknowledged that the economic environment at the time remained fragile. Therefore, proposed capital projects needed to satisfy one or more strict criteria:

- The capital project was a safety or regulatory requirement.
- The current asset required repair or replacement to comply with best asset management principles.
- Where a new asset was required, the current asset had to be fully utilised.
- An attractive commercial opportunity existed that required capital investment for progression.

In determining a CIP for a five-year period, the process must assess:

- Future expected demand.
- The composition/mix of this traffic.
- Composition/mix implications for current and future infrastructure requirements.

The CIP process commences two years prior to the beginning of a five-year regulatory review. This means that traffic forecasts for the latter years of the CIP period have been generated up to seven years in advance. Under these elongated time horizons, accurately predicting user requirements, changes to business models, customer demand profiles, and regulatory or compliance commitments can invariably become a challenging and complex exercise.

In the Final 2014 Determination, CAR forecasted passenger volumes to grow by 3% p.a. from 22.1m in 2015 to 24.8m in 2019. However, an allowance of €341m for non-trigger capital expenditure was allowed; by contrast with the submitted investment requirement of €396m. The decision[1] not to allow the full proposed allowance was supported by key airport stakeholders who reasoned that: There was no pressing need for further capacity expansion in the relevant period and that the Dublin Airport plan was larger than necessary for a period that involved no justifiable case for significant capacity expansion.

€341m

Capital investment allocated to accommodate pax of 24.8 mppa.

€67m

Business Development allowance to accommodate additional pax of 3 mppa.

The €341m allowance granted was mainly for essential airfield, landside, terminal and commercial maintenance and revenue generation projects. The Business Development allowance of €67m represented 20% of the overall capital allowance (€341m), and was the only allowance that can be used for capacity enhancing projects.

CAR granted increased flexibility in the 2014 Determination by allowing greater movement within project 'envelope' allowances. This means that if a project was not defined as a deliverable, we could proceed with an alternative project in order to respond to changing business needs or requirements over the determination period. However, this flexibility was limited because:

[1] See 'Responses to Draft Determination' - https://www.aviationreg.ie/regulation-of-airport-charges-dublin-airport/2014-determination.576.html

- Projects had to be classified in the right envelope - i.e. a new airfield maintenance project could not be remunerated through a saving made in the revenue envelope.
- The maintenance projects put forward for remuneration were essential to ensuring asset lives were prolonged, which meant limited flexibility existed to change these projects.
- CAR did not grant an allowance for a number of key projects which we had identified. Disallowed projects – such as bus lounge facilities, Pier 1 enclosed gates, US Preclearance lounge and a four-floor extension to the Terminal 2 Multi Storey Car Park (MSCP) - required progression due to their respective strong business cases and demand requirements which necessitated alternative funding through CIP flexibility.

These factors limited the 75% flexibility granted in the CIP, and resulted in flexibility being exhausted in some envelopes before the mid-point in the current regulatory period, with little or no further flexibility to progress any additional projects before 2020.

The elevated growth profiles experienced throughout 2015, 2016 and into 2017 are driven and supported by a combination of internal and external factors.

2.2 Recent Growth and Macroeconomic Factors

Double-digit traffic growth was delivered in the opening two years of the current regulatory period (15.4% in 2015 and 11.4% in 2016). No forecast submitted by any interested party in 2014 anticipated growth profiles of this magnitude. Throughout this period, the level of activity at Dublin Airport crossed 25 mppa (million passengers per annum), with Dublin maturing to the Airports Council International (ACI) Category One airport classification. 'Category One' airports are those with over 25 mppa, such as London Heathrow, London Gatwick, Amsterdam and Paris CDG. The elevated growth profiles experienced throughout 2015, 2016 and into 2017 are driven and supported by a successful combination of internal and external factors, such as:

- Macroeconomic conditions:
  - Post-recessionary recovery in core markets of Ireland, UK, Europe and North America has resulted in improved business confidence, higher levels of employment, higher disposable and discretionary income and for a number of years, a relatively weak Euro.
  - Oil Price stability of $50 per barrel and low interest rates strengthen airline business cases for aircraft acquisition and capacity expansion.
  - Tourism Product - Ireland's world-class tourism proposition continues to attract inbound tourists from existing and emerging markets.
- Competitiveness - Dublin Airport charges remain flat, and are highly competitive when benchmarked against other European Category One airports. Dublin Airport also maintains a suite of incentive schemes that are designed to stimulate traffic growth.
- Joint Marketing Investment - Dublin Airport partners with all airlines to actively promote new routes and increase awareness on existing services.
- Continued development of Dublin Airport as a top five gateway for services from Europe to North America: This includes the focus and investment in transfer product, which has successfully grown to a 1.5 mppa business in 2016.

While outside the airport and airlines control, macroeconomic performance directly influences demand for air services. By extension, it is extremely relevant to business performance in the aviation sector. This was demonstrated between 2008-2010 when the global recession correlated with a deterioration in passenger traffic at the airport from a high of 23.5 mppa in 2008 to 18.4 mppa in 2010 (a 28% decline in just two years). Dublin Airport's traffic mix is split 50:50 between Irish and non-Irish residents, which highlights how relevant macroeconomic indicators across a number of key economies are to the specific business performance of Dublin Airport and our partners.

2.2.1 Economic Recovery and growth at Dublin Airport

Gross Domestic Product (GDP) is widely regarded as a key indicator of economic activity and represents the total value of goods produced and services provided in an economy. GDP fluctuations represent movements in the levels of income available within an economy. An increase in GDP generally indicates an improvement in income levels across an economy. Over decades, a strong correlation is evident between GDP movements and passenger demand.

In 2013, when drafting Dublin Airport's Capital Investment Plan for the current period, the Irish economy appeared to be slowly recovering, with GDP growth of 1.1%[2] in 2013, and similar positive growth expected in 2014. However, an unexpected and significantly higher growth rate of 8.4% was recorded in 2014.

Prior to 2013, Irish GDP had declined in most years since 2008 (bar 2010). In core markets such as the UK and US, economic performance had remained stable between 2010-2013, with modest average growth of 2% per annum.

Uncertainty in many Euro economies at the time (such as those of Greece, Spain, Portugal and Italy) resulted in forecasting challenges for the 2015-2019 regulatory period.

Since 2013, Irish GDP has recorded four strong consecutive years of growth. The EU block (excluding Ireland and the UK) experienced average GDP growth of 2% per annum over a similar period, in contrast to the uncertainty (recessionary decline, slight growth and stagnant positions) evident pre-2013. The UK and US economies have sustained GDP growth of 2% per annum over the past four years.

In recent years, strong global macroeconomic growth has contributed to increased traffic results and business performance for both airports and airlines in many markets. This positive dynamic is particularly evident in Ireland - and at Dublin Airport - over the current regulatory period. Traffic growth of 11.4% in 2016 ranked Dublin Airport as the fastest growing large airport in Europe. Dublin Airport grew ahead of major hubs such as, Barcelona, Copenhagen and Madrid at double the EU average growth rate of 5.1%.

Figure 2: Economic Growth in Core Markets*

* GNP has been used for Ireland as it is more reliable than GDP for international comparsion

[2] International Monetary Fund, World Economic Outlook Database, April 2017

2.2.2 Oil Price

Fuel and Labour represent the largest operating costs for any airline (as illustrated by ICAO in Figure 3 below). Fluctuations in the cost of aircraft fuel will directly impact an airline's operating cost profile (both unit and trip), which ultimately affects route contribution and network profitability, unless the market is capable of absorbing a corresponding movement in price (fare).

In 2013, the average cost per barrel of oil[4] was $103, with fuel representing 30% of an airline's cost base. Since 2013, there has been significant downward pressure on oil pricing. This is mainly due to the strong US dollar, a global oversupply, limited capacity cuts, and declining demand. Pricing reduced to $50 per barrel in 2014 and $38 per barrel in 2015; a 63% decrease in unit cost from 2013 to 2015. A low of $29 per barrel was recorded in early 2016, but prices have stabilised in recent months between $40-55 per barrel (a 50-60% reduction in cost since 2013).

Figure 3: ICAO Data on Airline Costs

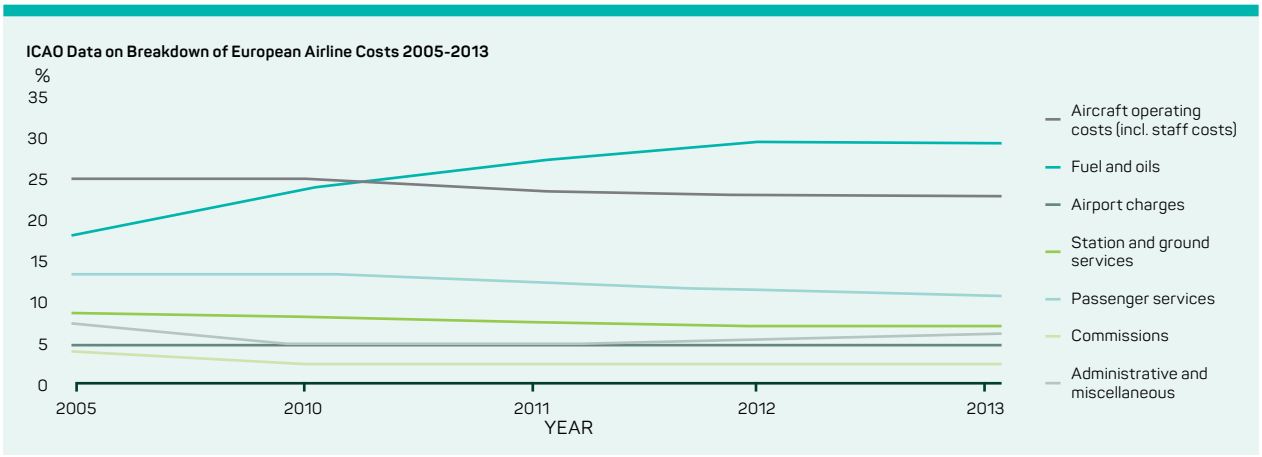
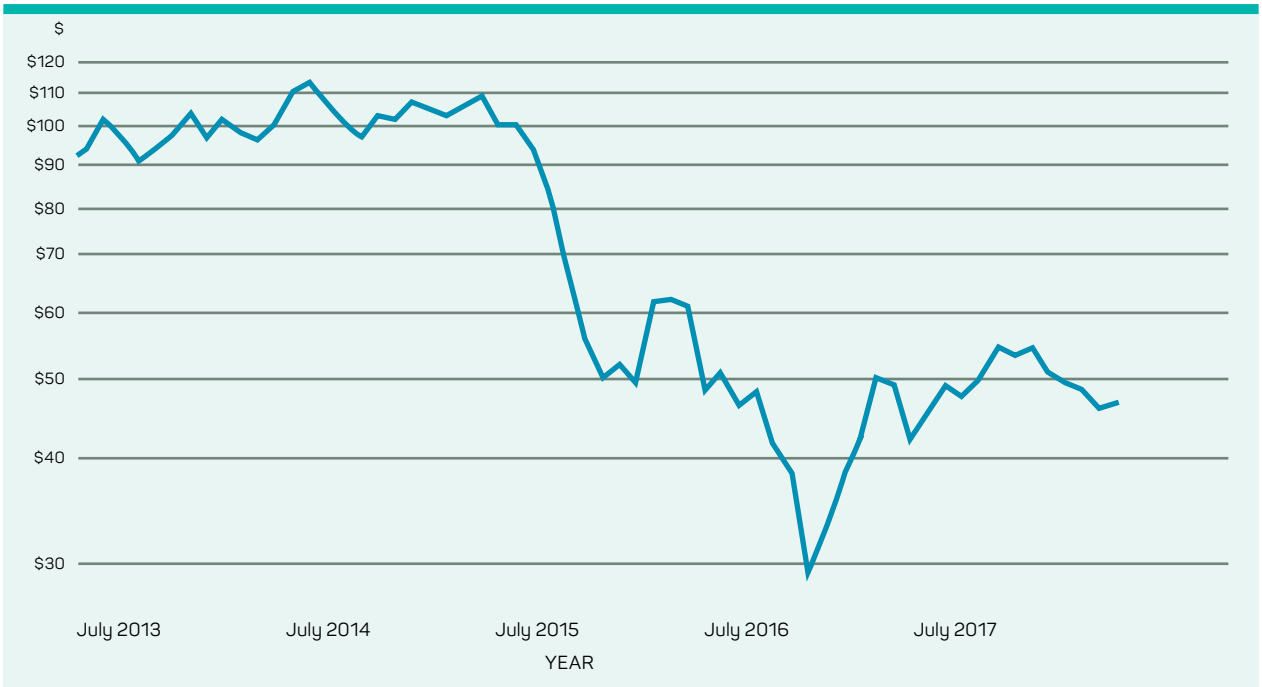
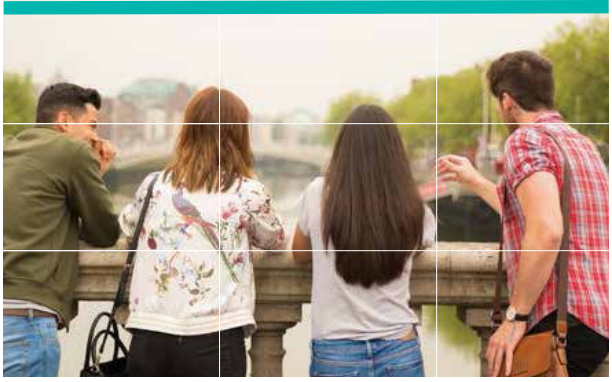


Figure 4: Crude Oil Prices



[3] International Civil Aviation Organisation.
[4] http://www.macrotrends.net/1369/crude-oil-price-history-chart



2.2.3 Tourism

Tourism is a key contributor to GDP, amounting to €7.8[5] billion in value for the Irish economy in 2016. Some key factors directly impacting the tourism industry are:

- Economic: Employment, currency and disposable/ discretionary income.
- Environment: Climatic trends, prevailing conditions and seasonal fluctuations.
- Total Cost of a Holiday: Hotels, food and beverage, transportation and attractions.
- Market Stability: Unforeseen events, terrorist incidents and travel restrictions.

Two distinct categories of tourism directly influence airport passenger volumes at Dublin Airport:

1. Outbound Tourism Market from Ireland

The Central Statistics Office (CSO) reports a surge in demand from Irish residents travelling overseas. Between 2015 and July 2017, the number of outbound trips has risen by 16%. Overseas trips from Ireland are heavily influenced by economic factors such as employment rates, disposable income, consumer price inflation, airfares, resort/destination pricing, and the availability/cost of credit.

2. Inbound Tourism to Ireland

Inbound tourism has grown considerably from 4.05m visits in the first seven months of 2015 to 4.46m visits in 2017 (+14%). Growth markets continue to be North America, Other Europe and Rest of World. Visitors from the UK increased strongly between 2015-2016, but have started to decline in 2017. The associated weakness in Sterling against the Euro means Ireland (and the Eurozone) is now a more expensive destination for UK tourists by comparison with 2015-2016[6].

Figure 5: CSO Statistics – August 2017[7]

Overseas Travel — May-July 2017

Trips to Ireland by Area of Residence

	Irish Resident's Trips Overseas	Trips to Ireland	Great Britain	Other Europe	North America	Other Areas
May-Jul '15	2,171,500	2,589,300	936,100	927,600	561,200	164,400
May-Jul '16	2,252,800	2,843,400	1,016,900	1,020,300	635,600	170,700
May-Jul '17	2,367,500	2,967,600	978,700	1,075,500	713,600	199,900
Jan-Jul '15	4,050,400	4,814,600	1,952,700	1,712,800	857,100	292,100
Jan-Jul '16	4,275,200	5,427,000	2,224,900	1,911,200	990,100	300,800
Jan-Jul '17	4,613,400	5,597,100	2,087,100	1,993,800	1,162,700	353,500

[5] http://www.dttas.ie/tourism
[6] Sterling has recently soared to its highest since the Brexit vote: https://www.rte.ie/news/business/2017/0915/905009-sterling-gains/ (with further gains expected over the course of this Consultation)
[7] CSO Statistical release, 29th August 2017. http://www.cso.ie/en/releasesandpublications/er/ot/overseastravelmay-july2017/

2.2.4 Interest Rates

Interest rates have declined over the period 2011-2016 in line with changes in the financial stability of sovereign debt of individual countries. Yields fell by more than 2 percentage points[8] across the EU Member States between 2011-2016, with the largest declines recorded in Lithuania and Ireland (reductions of more than 4 percentage pointswere recorded).

2.2.5 Currency

Dublin Airport's traffic base is reliant on three core markets; Continental Europe, the UK and North America. The UK (34% of total traffic) and US (12% of total traffic) are currently the two largest source markets for inbound traffic and are exposed to currency exchange risk, which can have a direct impact on passenger demand from those markets. Currency movements over the previous five-year period have exhibited significant fluctuations. Figure 6 illustrates the extent of the Euro depreciation against the British Pound throughout 2015-2016, which resulted in a value-adding purchasing impact for British travellers when in the Eurozone. A similar trend in the US Dollar conversion rate to the Euro also supported significant increases in US visitors to Ireland over the preceding three years. By comparison, in 2017 the Euro strengthened against both the Dollar and Sterling, which may impact inbound leisure and tourist travel demand from both key source markets. Conversely, the escalating strength of the Euro in 2017 may also be fuelling a resurgence in outbound leisure demand from Ireland to both North America and the UK, which acts as a countervailing balance to any decline in inbound demand to Ireland.

Figure 6: EUR and GBP[9]Trend

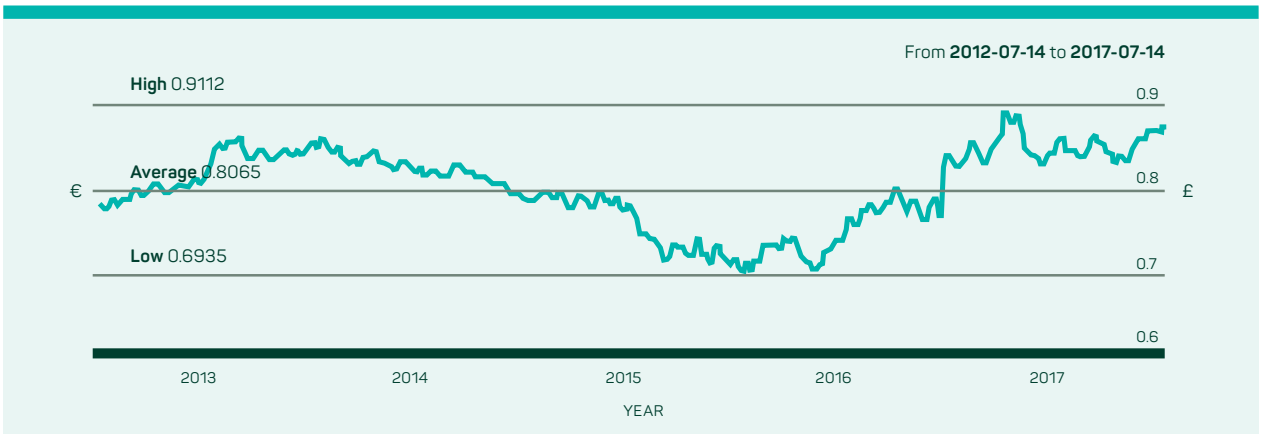
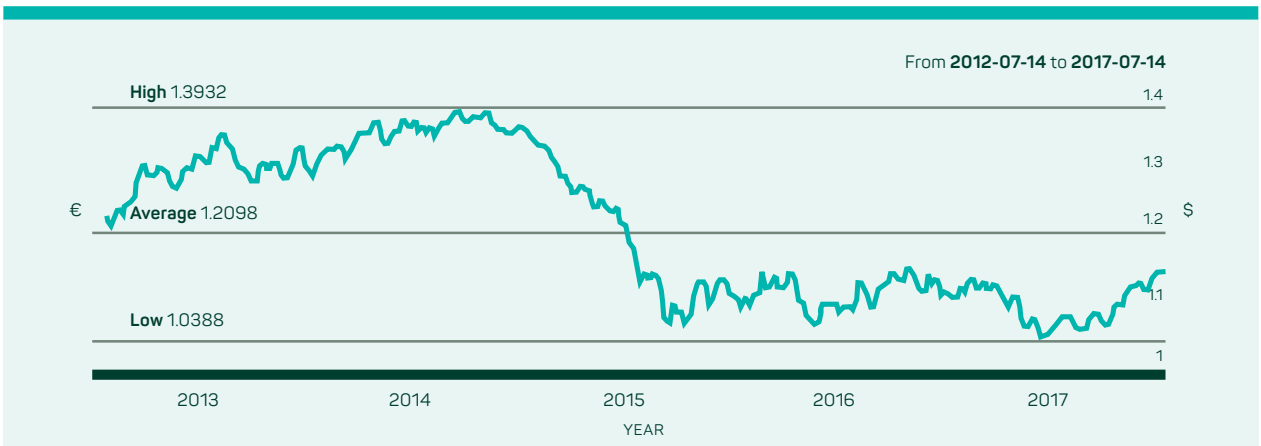
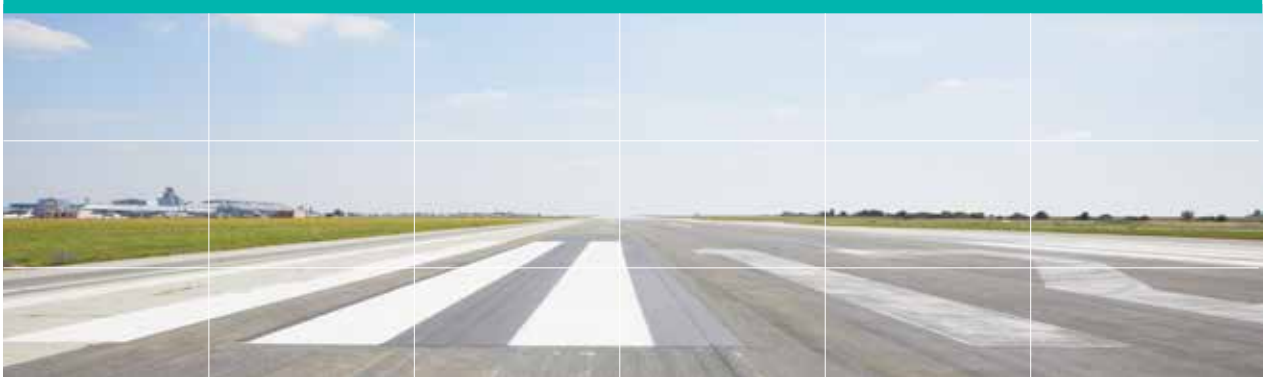


Figure 7: EUR and USD[10] Trend



[8] http://ec.europa.eu/eurostat/statistics-explained/index.php/Exchange_rates_and_interest_rates#Interest_rates
[9] https://fxcentre.aib.ie/i-want-to/view-rates
[10] https://fxcentre.aib.ie/i-want-to/view-rates



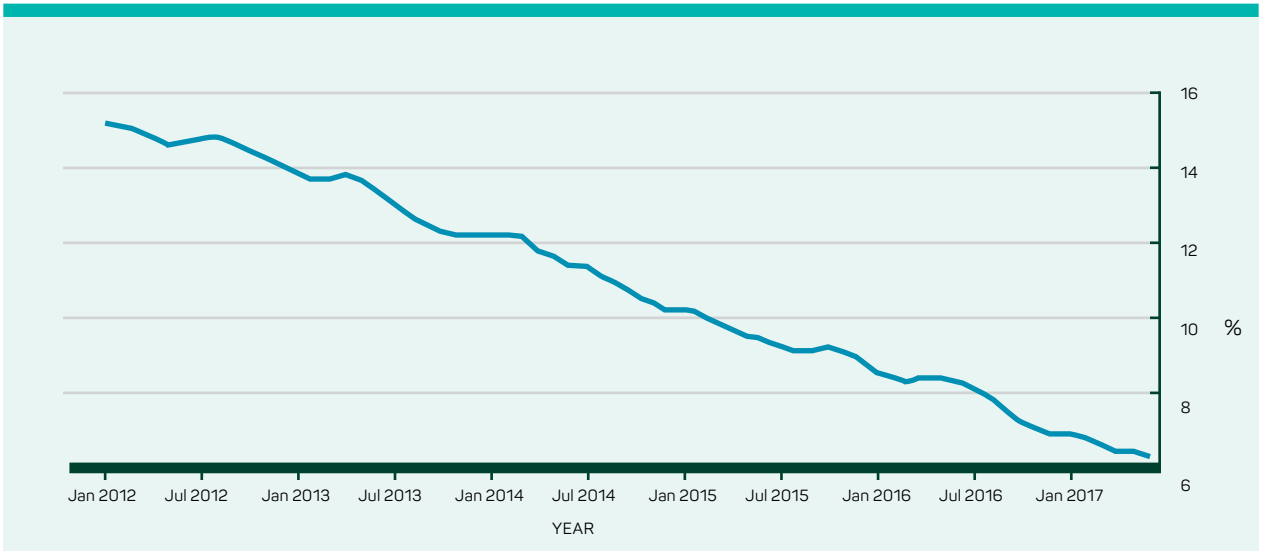
2.2.6 Irish Value Added Tax (VAT)

The Irish Government implemented a 4.5% reduction in Value Added Tax (VAT) on tourism-related goods and services in 2011, designed to stimulate demand and reinvigorate employment in the tourism sector. A report by Deloitte[11] in 2014 concluded that a rise in international traffic and consumer spending directly resulted from the reduction in VAT. This initiative, coupled with economic growth (both domestically and internationally) and relatively suppressed inflation (annual growth in the Consumer Price Index has been less than 1% since 2013) has facilitated a sustained rebound in Irish tourism post-recession.

2.2.7 Irish Unemployment

Unemployment in Ireland has significantly declined over the period 2012-2017, from a high of 15.2% in January 2012 to 6.3% in August 2017. The significant increases in the volume of people employed in Ireland has had a direct impact on consumer purchasing power and discretionary spend; which by extension fuels the consumption components of GDP growth. Naturally high levels of full employment act as a powerful precursor and stimulant, especially for leisure travel and overseas holidays. This continues to propel passenger demand and growth at Dublin Airport throughout 2017.

Figure 8: Irish Unemployment Rate Trend (2012-2017)[12]



[11] http://www.failteireland.ie/FailteIreland/media/WebsiteStructure/Documents/3_Research_Insights/3_General_SurveysReports/FA%C2%A1ilte-Ireland-Tourism-VAT-Study-Report-2014.pdf?ext=.pdf

[12] http://www.cso.ie/indicators/default.aspx?id=2MUM01

2.3 Current Traffic and Evolution of Market Dynamics

In addition to the stark improvements in macroeconomic performance, a number of specific changes to the dynamics and composition of traffic at Dublin Airport have emerged since the final regulatory determination in 2014. The majority of these changes have positively contributed to passenger growth and aircraft movements, but this comes at a price by placing a strain on certain modules of airport infrastructure, during specific times of the day and year.

- Traffic growth at the airport since 2014 has largely been driven by based carriers (78% of the 6.2m incremental passengers in 2016 over 2014), resulting in a higher than anticipated level of demand for overnight aircraft parking stands and an elevated peak first wave of short-haul departures between 06:00-08:00.
- Transfer passenger volumes have increased by 56% in 2016 over 2014. This expanding key segment of business is now a significantly larger share of overall traffic than was anticipated or forecasted in 2013. The transfer model invariably requires aircraft to arrive from North America between 05:00-06:00, which by extension displaces short-haul aircraft from contact pier stands to remote or satellite locations for the first wave departure period. The development of the transfer business is expected to continue throughout this regulatory period, requiring an incremental supply of narrow-body aircraft stands by 2019.
- There has been a significant change to Ryanair's customer service model and the ownership structure of Aer Lingus (the two largest carriers based at Dublin Airport). This will impact on future business plans and/or facilities requirements of both airlines at Dublin Airport.
- The number of scheduled airlines at Dublin Airport in Summer 2017 has increased to over forty carriers (an increase of ten since 2014).
- Scheduled movements have increased by 30% in Summer 2017 by comparison with 2014.
- Long-haul traffic has become a significant component part of Dublin Airport's business in recent years, and will account for 15% of total traffic in 2017. Long-haul traffic has grown by 50% from 2013-2016, with further strong growth predicted for 2017. Growth in long haul traffic has generated a need for additional aircraft parking at peak times of the day.
- There has been an increase of 127% (50 vs. 22) in wide body movements on the peak summer day in 2017, versus 2014.
- The strong resurgence in Irish outbound leisure demand has resulted in a 26% increase in peak summer capacity to Mediterranean resorts by comparison with 2014.
- Three 5 star airlines at Dublin Airport now run ten daily services to and from the Middle East, which amounts to over one million annual seats.
- There have been increases in flight frequency and capacity to core European destinations such as Amsterdam, Hamburg, Paris Orly, Helsinki, Porto, Athens and Berlin, with one million additional passengers in 2017. Airlines contributing to the growth include Ryanair, KLM, Aer Lingus, Transavia, Finnair, Norwegian and SAS.
- Growth in traffic has been driven by 'Other' carriers over the last two years. 2017 traffic forecasts estimate full year passenger traffic of 29.2m. This is a 4.2m increase on 2015. 68% of the growth is driven by 'Other' carriers and 32% by base carriers. This contrasts to the growth seen in 2015 versus 2014, where base carriers drove 77% of the growth.
- UK passenger traffic growth rates have slowed to +1.5% for 2017, and potentially could be flat in 2018. UK passengers accounted for 36% of total traffic in 2016, with 864 flights per week in Summer 2017. This volume of traffic is significant in scale, with a portion at risk due to the uncertainty over Brexit and depreciation of Sterling.

2.4 Expected Future Demand

Top 5 major Airports across Europe experienced growth of +4%[13] in the first half of the year. ACI reported that growth has been "*their [airports] best first-half traffic performance*" in more than a decade, with stronger growth mainly experienced in secondary and/or medium sized airports. Dublin Airport forecasts 5% annual growth for 2017 with annual traffic expected around 29.2m. A slowing growth rate of low-mid single digits is fully consistent with long-range trends experienced at large hub airports.

Global and local macroeconomic trends remain positive and should continue to support increased levels of passenger demand. Current International Monetary Fund (IMF) projections for Ireland's GDP growth remain at 3.5% in 2017 and 3% per annum in both 2018 and 2019. The UK's GDP growth rate is expected to decline from 2% in 2017 to 1.5% and 1.6% in 2018 and 2019 respectively, with the United States sustaining growth of between 2-2.5% p.a. for the remainder of the decade. The Eurozone economy (excluding Ireland) is projected to expand by approximately 2% p.a. in 2017, 2018 and 2019.

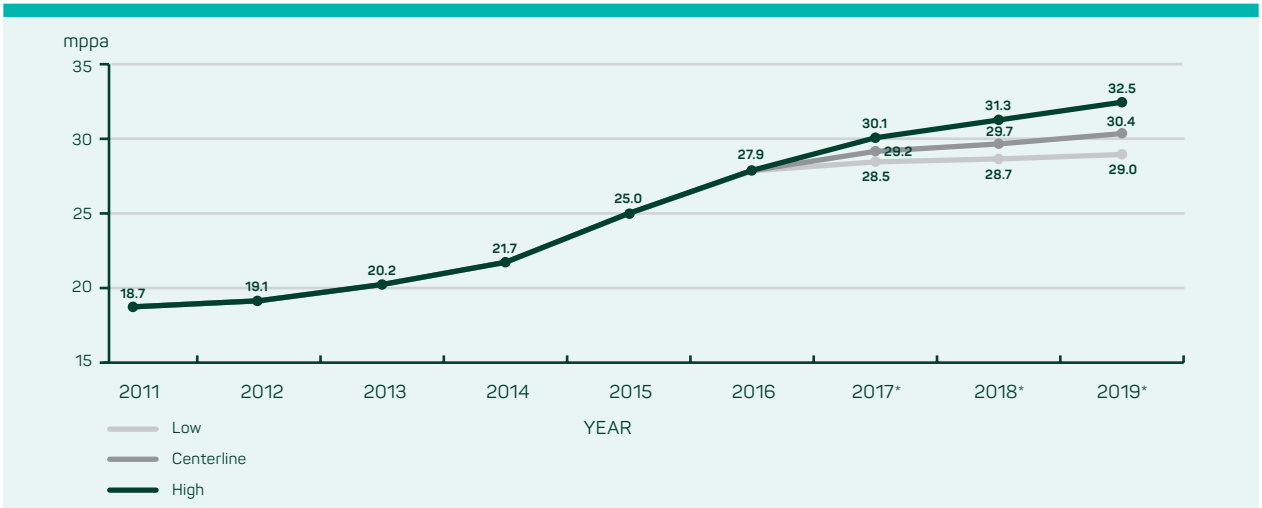
Therefore, the resulting high-level demand environment (with the exception of traffic from UK to Ireland) is considered to remain robust. Airlines are not yet in a position to provide sufficiently detailed guidance on capacity plans for 2018. At a macro level, Dublin Airport forecasts (based off weighted GDP multipliers) indicate a continuation of unconstrained demand growth through 2018 and 2019. The anticipated growth profile is far more stable, mature and predictable than the double-digit surges experienced in 2015-2016.

Outline dynamics of expected growth in 2018-19 are:

- Continuation of double-digit growth in transfer traffic (potentially new transfer business partnerships).
- Continuation of double-digit growth from non-based carriers.
- New long-haul services by new entrant carriers.
- Continuation of expansion on the North Atlantic, through up-gauging of aircraft equipment, additional frequencies (especially in the winter season), and the extension of the operating season.
- No growth expected in UK traffic.
- Increased capacity deployed to core Mediterranean destinations.

Forecast passenger numbers for 2018 and 2019 have been developed across a range of scenarios. Figure 9 outlines the volume range of each scenario (high, low and centreline) for the remaining two years of the current regulatory quinquennium. Each scenario incorporates a range of macroeconomic factors with differing compositions of traffic movements. 2019 traffic numbers are estimated between 29 and 32.5 mppa. Provided we expect to achieve >29 mppa in 2017, the centreline and high growth scenarios would appear most likely at this point in time. By the end of the current regulatory period, annual passenger activity is expected to be in a range of 5.6–7.7 mppa (22-31%) greater than the current regulatory determination and associated capital investment allowances.

Figure 9: Dublin Airport Passenger Numbers[14] (2011–2019)



[13] http://www.luchtzak.be/airports/europes-airports-report-passenger-traffic-growth-9-first-half-2017
[14] *Represents forecasted passenger numbers (produced Q1 2017).

2.5 Strategic Aims/Objectives

The National Aviation Policy (NAP) sets a clear blueprint for the desired future development of the aviation sector, which is expected to provide significant benefits to the state and its citizens on delivery of ambitious, yet achievable goals. There is a responsibility on all stakeholders to focus on achieving NAP goals. Regulatory frameworks should also support and facilitate the envisaged growth. As a key stakeholder within the Irish aviation sector, Dublin Airport is expected to provide a solid platform for the achievement of NAP objectives.

The principal goals of the NAP[15] are as follows:

- To enhance Ireland's connectivity by ensuring safe, secure and competitive access, which is responsive to the needs of business, tourism and consumers.
- To foster the growth of aviation enterprise in Ireland, to support job creation, and to position Ireland as a recognised global leader in aviation.
- To maximise the contribution of the aviation sector to Ireland's economic growth and development.

The Aviation Policy from the Department of Transport, Tourism and Sport (DTTaS) clearly encourages airports to; attract new business, achieve excellence in the delivery of service, provide value for passengers and airlines, and to make a sustainable contribution to their respective local economies and communities.

Dublin Airport's core purpose is to connect Ireland with the world. Our vision is to be an industry leader and grow our business by delivering great service and value for airlines, passengers and business partners. We have a strong commercial focus and expertise, and engage proactively with customers and stakeholders to facilitate their requirements in a dynamic and competitive marketplace.

Our vision is to be an industry leader and grow our business by delivering great service and value for airlines, passengers and business partners.

The Dublin Airport strategy for the period 2014-2017 successfully focused on:

- Growing connectivity.
- Developing a mini-hub.
- Maximising commercial yields.
- Increasing operational and cost efficiency.
- Creating a best in class passenger experience.
- Partnering with business customers to deliver mutual success.

A report published by InterVISTAS in April 2017 highlighted the positive impact Dublin Airport's growth had on local job creation: 20,000 new jobs in the Irish economy over the past four years. The estimated number of jobs supported or facilitated by Dublin Airport has increased from 97,400 in 2013 to 117,300 in 2016. Annual passenger numbers at the airport increased from 20.2 million to 27.9 million during the same period. Dublin Airport's estimated annual value to the Irish economy increased from €6.9 billion per year to €8.3 billion per year, driven by 38% increase in passenger volumes over the past four years. Our new strategic review which began in early 2017 is now well developed and is approaching conclusion. The 2018+ Strategy will draw on the collective achievements over recent years, and provide a refreshed vision for delivering the anticipated growth opportunities over the next five years.

117,300

estimated number of jobs supported or facilitated by Dublin Airport in 2016.

€8.3 billion

estimated annual value p.a. driven by 38% increase in passenger volumes over the past four years.

[15] NAP document from DTTaS

2.6 Summary

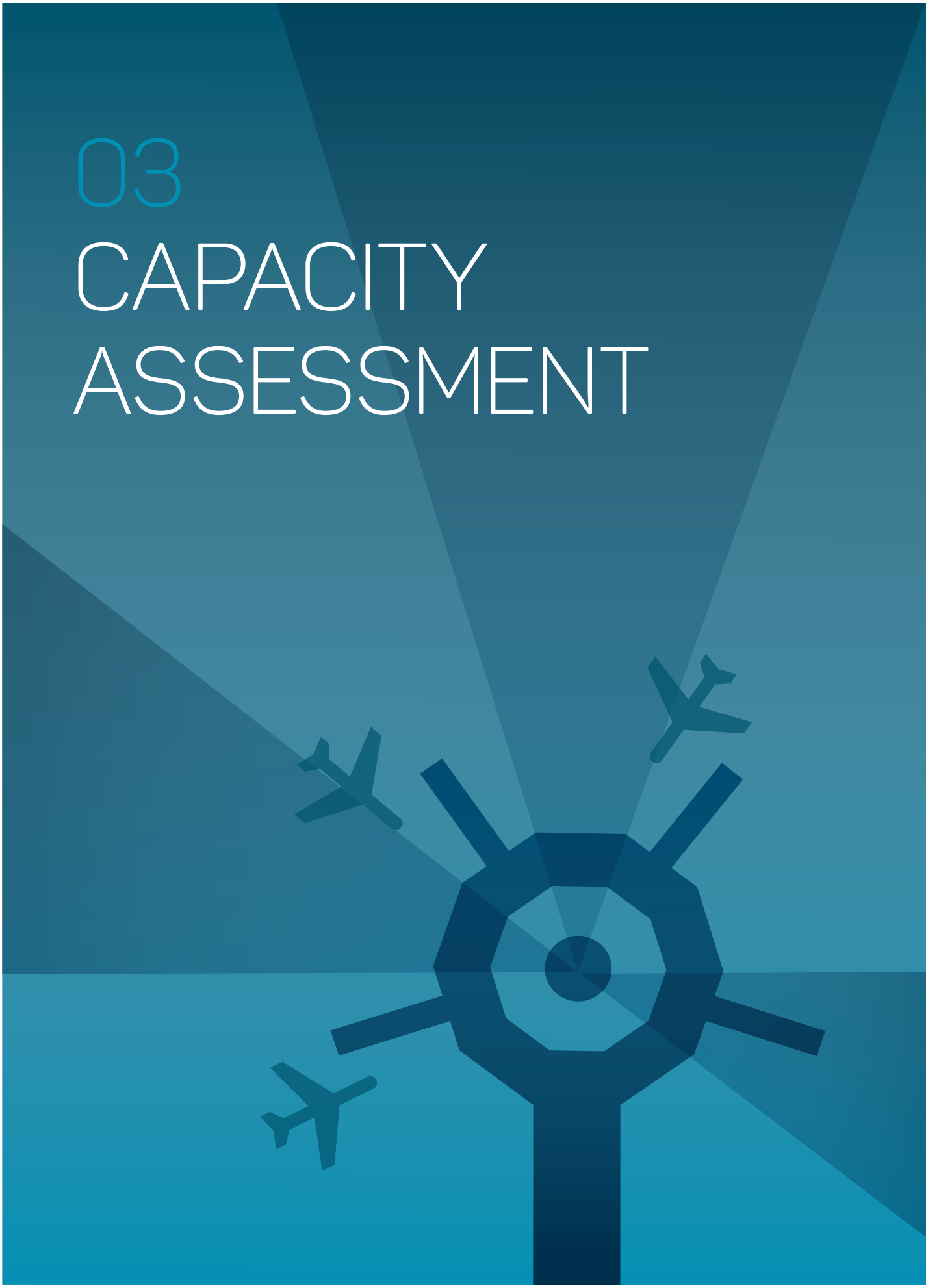
This section clearly demonstrates the inextricable dependency of passenger demand (and by extension airline and airport volumes) on key macroeconomic indicators across a range of markets and economies. Traffic at Dublin Airport declined significantly during the economic recession experienced from 2008-2012 (5 mppa reduction from peak to trough of cycle). However, since 2014 both the global and local macroeconomic climates have dramatically improved across a broad range of key indicators, which has fuelled the post-recessionary surge in passenger demand to and from Dublin Airport.

In 2016 alone, 19 new routes were launched by a diverse range of airlines, and capacity was added-on to 31 existing services. New record levels of passenger volumes were delivered in 2015 and 2016, and a new record will undoubtedly be set again in 2017. Dublin Airport has migrated and matured from a level of 18.4m in 2010 to over 29 mppa in 2017.

The single notable headwind emerging is the reduction in British leisure visitors to Ireland (January to July 2017 was -6.2% by comparison with the same period in 2016). It is unclear if this cause for concern has emanated from Brexit uncertainty and is a longer term trend, or if it is a direct result of Sterling's depreciation against the Euro (impacted by Brexit), and maybe a shorter term trend. At present, strong Irish originating traffic is managing to offset the declines in British outbound passengers and therefore, Dublin Airport will still experience growth on UK routes of 1-2% in 2017.

The forecast for near-term future demand is positive, stable and robust. Undoubtedly, a collective opportunity exists to grow airport traffic past 30 mppa by the end of this regulatory period. Dublin Airport has a dual mission to sustain passenger growth while continually improving the customer experience and service quality. Growth cannot be sustained under deteriorating levels of service quality. As annual passenger numbers migrate into a new 30 million category, significant but smart infrastructural development will be required across the airport campus. This is necessary not only to sustain the new record levels of activity, accommodative future opportunity, and more importantly, to continue to enhance the high levels of customer experience and service quality evident today.

03 CAPACITY ASSESSMENT



03 CAPACITY ASSESSMENT

This section outlines the processes and methodologies routinely used by Dublin Airport to assess passenger and aircraft capacity across the various airport processing modules. The analysis will focus on the current capacity of the various airport facilities and the planned enhancements to the supply of capacity based on the full build out of the current five-year capital plan.

A 'typical busy or peak day' demand profile/schedule has been developed for Summer 2019 and the capacity assessment will highlight the supply needed across the key processing modules to support future customer demands into the next decade.

Associated key metrics are also presented in this section, which highlight how the service quality of the airport system is performing versus prior years. Facilities such as the airport road network, kerbside access, and the baggage handling system are not in scope for this specific assessment, as each processor is being assessed in parallel as strategic elements of the longer-term Airport Masterplan. This assessment will focus on the core facilities required to process passengers and park or manoeuvre aircraft across the airfield.

3.1 Methodology

We undertake a comprehensive assessment of capacity across the key processing facilities on an annual basis. The process ultimately identifies and flags operational processors that are currently at or nearing maximum capacity. Targeted capacity solutions will then be proposed to alleviate any current or emerging capacity deficits or bottleneck issues in the airport system. When conducting the annual capacity assessment, it is imperative that the analysis focuses on the composition of demand and traffic across a typical peak day, rather than assessing a total demand figure: i.e. high-level total demand may remain the same year-on-year, but if the profile of activity fluctuates across the day, new capacity constraints can emerge at specific times.

A number of standard methodologies can be used to assess the typical busy hour or day passenger and aircraft flows across the various airport processors. These methodologies have been developed to accommodate traffic peaks on busy days, and are formulated on the core assumption that demand will exceed supply at peak times of the day, with key facilities thereby flexed to operate at maximum capacity. During these peak periods, queue lengths can rapidly increase, as the number of passengers or aircraft movements can briefly exceed the available capacity of certain facilities.

When designing airport capacity, it is not practical or efficient to scope the infrastructure required to accommodate the absolute peak hour demand on a peak day. This approach would result in unnecessary capital investment and under-utilisation of the assets across the full year, and would require excessive annual operational expenditure to staff and maintain the facilities. As a result, a 'typical busy day' is instead used as the base case foundation for all airport capacity assessments. A typical busy day is a bridge between an average day of operations and the absolute peak day of airport activity. The benefit to applying this metric as the basis for available capacity is to ensure that the cost, scope and specification of the airport's infrastructure is optimised to support high demand periods at an acceptable level of service quality for customers.

The standard methodologies used to determine typical busy days/hours are as follows:

- 95% busy day/hour rate.
- 30th busiest hour.
- Busiest timetable hour.
- International Air Transport Association (IATA) method: second busiest day of an average week, during the peak month.

The typical busy day or hour is calculated on wide range of criteria:

- Total aircraft movements.
- Total passengers.
- Total departing passengers by terminal.
- Transatlantic aircraft movements.
- First wave departure movements.

Differing 'busy days' or 'busy hours' can obviously be derived depending on the criteria used. For example, when specifically focusing on runway infrastructure, a busy day would typically be calculated based on an aircraft movement or flow criterion. Even under this specific runway criterion, a 95% busy day based off daily aircraft movements, could yield a differing profile to the 95% busy day based off a first-wave departures metric.

For capacity planning purposes, we define a 'typical busy day' based off the 95th percentile of passenger and aircraft activity (which is typically between the 14th and 20th busiest days in the year). When establishing the typical busy day for Dublin Airport, the following unique considerations are also relevant:

- Transatlantic movements (especially flights utilising US Preclearance).
- Morning or first-wave departures.
- Late evening arrival bank (short haul aircraft returning to base).
- Transfers versus local passenger volumes.
- The composition of traffic (i.e. Thursday has a higher proportion of business passengers than Saturday).

A second stage evaluation of the 'typical busy day' is required against each of the above criteria, before a final determination is produced for the capacity assessment process.

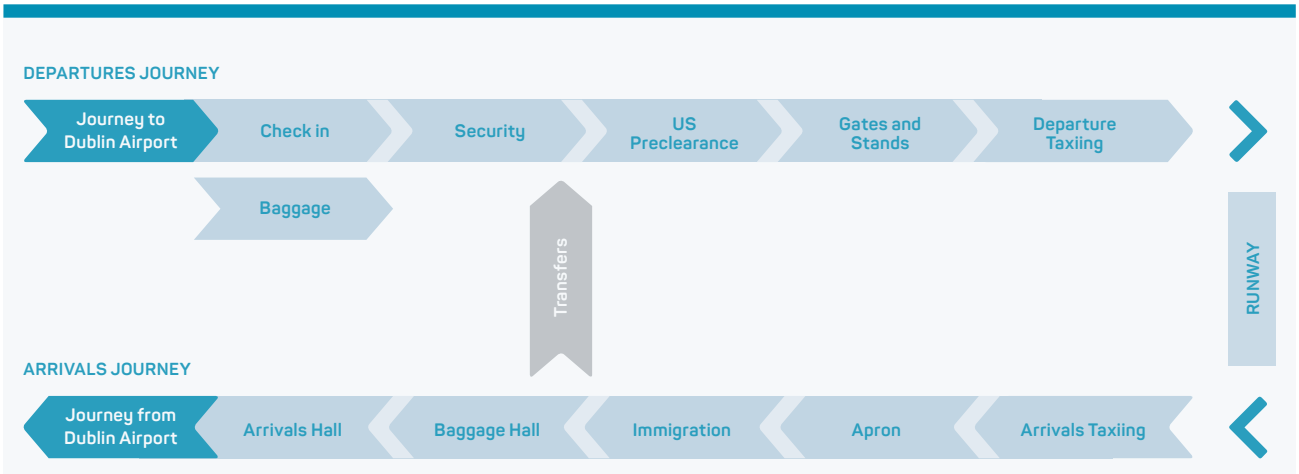
The capacity assessment process examines each of the operational processors under the demand profile of the typical busy day and will determine the relative capacity surplus or deficit through each module in the passenger and aircraft journey. It should be noted that the peak hour for each of the operational modules will vary over the typical busy day, and capacity is therefore assessed against each of the relevant peak hours for each specific processor: the peak hour for passenger presentation at the airport security facility is generally 04:30–05:30, whereas the typical peak hour for passenger presentation at the immigration facilities is generally 22:30–23:30.

The airport journey is a system of inter-connecting operational processors, as illustrated in Figure 10.

Optimisation of the airport's overall capacity is achieved by balancing supply across each of the individual processing modules (for the 95th percentile busy day). The delivery of a standardised or uniform capacity increase across the full pipeline can be challenging (if not impossible) in an airport environment. For example, a new runway can deliver a significant and immediate increase in aircraft movement capacity, whereas a new apron project would most likely be delivered in a phased manner, with aircraft parking capacity increasing moderately on an incremental basis.

Additionally, when constructing large capital intensive projects, significant efficiency gains can be derived from delivering a greater quantum of capacity increase than is immediately required, by comparison with delivering infrastructure that produces solely the exact level of capacity required when operational. Invariably, delivering infrastructure in a just-in-time, incremental-portions fashion can lead to acute capacity constraints in the short-term. When assets are fully utilised immediately upon completion there is considerable cost escalation across the asset base, as each of the subsequent projects will require additional input costs (i.e. design, feasibility, planning and tendering costs). Therefore, in an airport context it is prudent and common practice for capacity across all processors not to be perfectly uniform, and indeed such an alignment may not represent the most efficient approach for delivering capacity across the airport. It is important to re-emphasise that an airport's overall capacity is ultimately defined by the maximum capacity of the 'weakest link' on the peak day; the facility or processor with the lowest level of capacity during the peak demand period.

Figure 10: Operational Processors – Dublin Airport



The routine capacity assessment process will sequentially analyse and address the following queries:

- What is the theoretical capacity of each processor?
- What is the practical capacity of each processor?
- What is the overall capacity of the arrivals and departures journey at the airport?
- Can a future typical busy day demand be accommodated within the current capacity and existing infrastructure?

The theoretical capacity assessment of each processor is based on the relevant factors pertaining to that facility. For example, with regards to Central Security, the applicable factors are:

- The physical number of security lanes.
- The throughput capacity of each lane (based on transaction times per passenger).
- Maximum queue length, based on 15 minute queue times. This 15 minute queue time versus the maximum allowed of 30 minutes (per the 2014 Regulatory Determination) is used for planning purposes. It takes into account any variability between forecast and actual passenger presentation profiles to ensure compliance with the security queuing service quality target.

For other processors, dwell times and maximum queue lengths based on Service Level Agreements (SLAs) or IATA ADRM[16] recommendations were the relevant factors. In assessing space requirements or physical layout of areas e.g. check-in, the optimum Level of Service recommendations in the IATA ADRM were used.

Levels of theoretical capacity are subsequently converted into practical capacity values, using utilisation factors, resourcing requirements, and airport user service preferences etc. Resourcing levels and profiles at certain airport processing facilities (i.e. Immigration, Customs, US Preclearance) is outside the direct management of Dublin Airport. Capacity through an indirectly managed processor is calculated based on the communicated or actual resourcing levels present across the operational day, and managed through engagement with the state authority or service provider. Capacity at a Dublin Airport fully managed processing facility (e.g. Central Security) is calculated based on a fully resourced or maximum staffing level across the operational day.

Once the practical capacity of each processor has been calculated, simulation modelling of passenger presentation and throughput is run against the base case check-in and stand plan (generated by the Airport Operations System) to assess the physical ability of each individual facility to process a forecast level of future demand. The process will ultimately identify a module or facility for which the projected maximum capacity was serving as a limiting factor on the overall capacity of Dublin Airport, to the extent that a forecast level of demand could not be accommodated at a future point in time.

3.2 Current State Capacity Assessment and Expected Future Developments

The following figures (11 and 12) outline the primary departure and arrival processors at Dublin Airport. The colour coding summarises the output metrics from the current state capacity assessment: i.e. green signifies a capacity surplus relative to current demand during the busy day in 2017; yellow signifies that the processor is operating at close to current capacity; and red flags where facilities are operating at capacity for their respective peak hours.

[16] IATA Airport Development Reference Manual

Figure 11: Departure Process – Design Day Capacity Summary

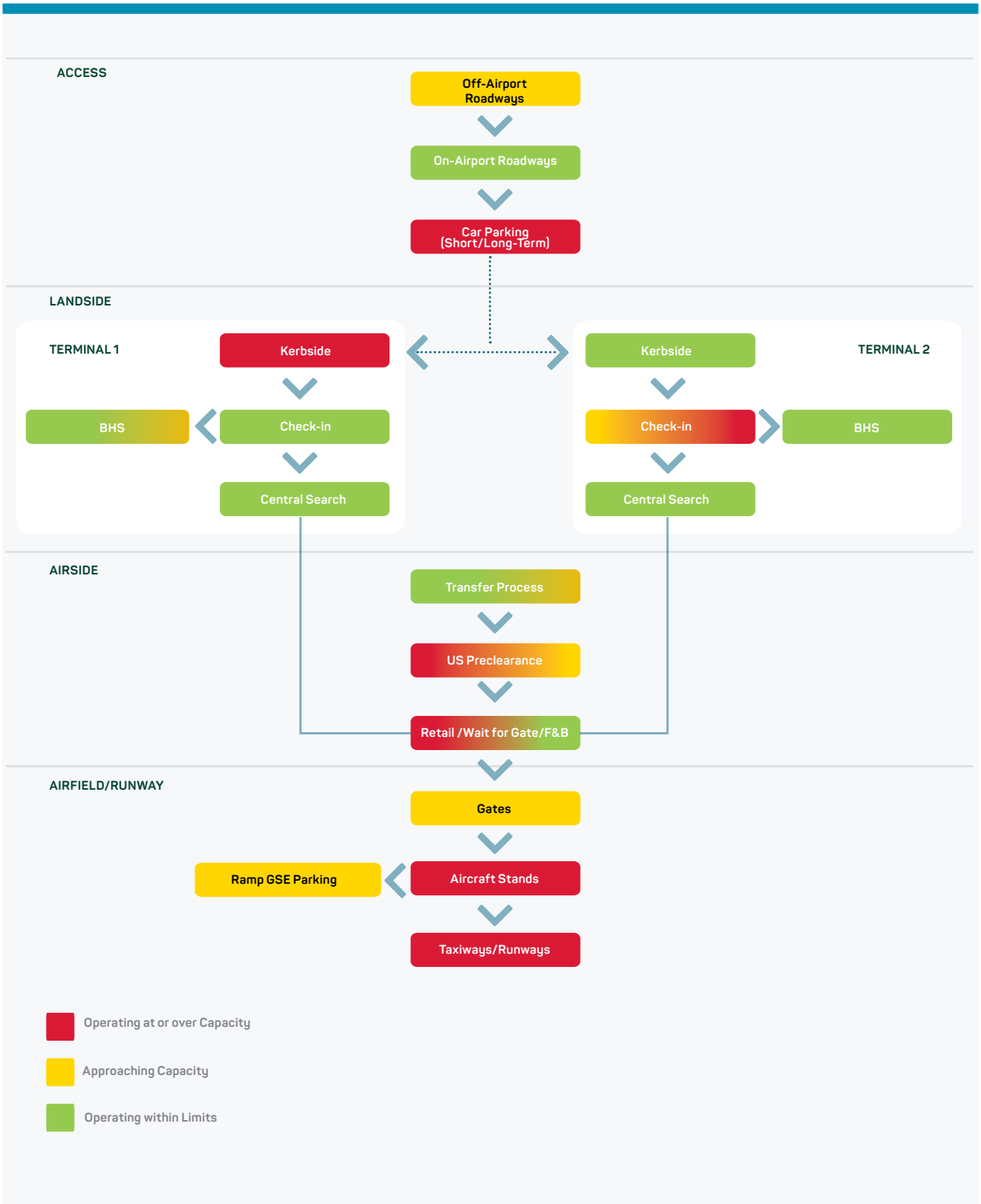


Figure 12: Arrivals Process – Capacity Summary

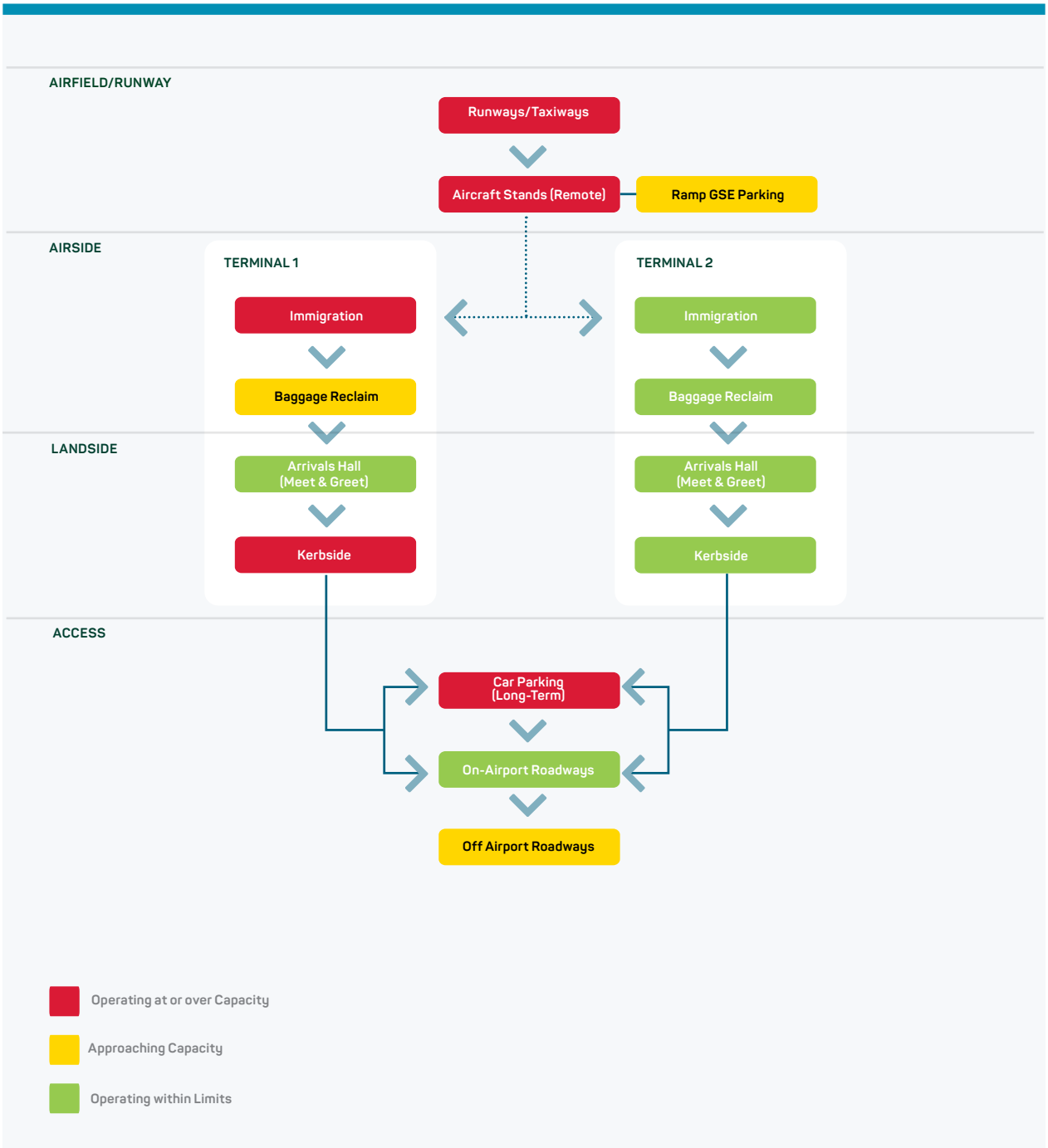


Figure 13: Outline Summary – Current State Capacity Assessment

Current Capacity Assessment Facilities operating at:	Departure Processors	Arrival Processors
Maximum Capacity	· Car Parking · Aircraft Parking Stands · Apron and Taxiway System · Runway	· Runway · Apron and Taxiway System · Aircraft Parking Stands · Immigration (Terminal 1) · Car Parking
Emerging Capacity Constraints	· Airport Access Roadways · Kerbside Parking (Terminal 1) · Check-in (Terminal 2) · Baggage System (Terminal 1) · Transfer Facilities · US Preclearance · Retail/Wait for Gate/Food and Beverage · Departure Gates · Ground Service Equipment Parking	· Airport Access Roadways · Ground Service Equipment Parking · Baggage Reclaim (Terminal 1) · Kerbside Parking (Terminal 1)
Capacity Surplus Exists	· On Airport Roadways · Kerbside (Terminal 2) · Check-in (Terminal 1) · Baggage System (Terminal 2) · Central Security	· Immigration(Terminal 2) · Baggage Reclaim (Terminal 2) · Arrivals Halls · Kerbside (Terminal 2) · On Airport Roadways

Figure 14: Table Heading Explanations

Heading	Capacity Q4 2014	Planned Capacity Changes	Actual Demand 2017	Forecast Demand 2019
Explanation	This capacity number refers to available capacity at the time of setting the 2014 Determination i.e. pre- 2015.	This capacity number reflects (1) additional capacity added to the processor as a result of projects carried out as part of the 2015 to 2019 CIP (which are either in progress or complete); (2) additional capacity as a result of efficiency gains; and (3) loss of capacity due to new regulatory requirements.	This capacity reflects the required amount to satisfy 2017 demand.	This capacity reflects the required amount to satisfy 2019 demand.

In summary, there are six primary airport facilities or processors currently operating at maximum capacity during peak periods:

- Airport Access Roadways.
- Car Parking.
- Aircraft Parking Stands.
- Apron and taxiway System.
- Runway.
- Immigration (Terminal1).

In addition, a number of facilities have emerging capacity constraints during peak periods (as shown).

The capacity deficits currently evident across some of the above processing facilities will constrain the total capacity of the airport campus over the next number of years, and obviously limit the level of growth and demand that can be accommodated within an acceptable level of service quality.

Facilities such as the airport road network, kerbside access, and the baggage handling system are not in scope for this specific assessment. These areas are being assessed as strategic elements of the longer-term Airport Masterplan. This assessment will focus on the core facilities required to process passengers, and park or manoeuvre aircraft across the airfield.

The following sections show the capacity assessment results for each processor. Headings are explained in Figure 14 on the following page.

3.3 Passenger Processing

3.3.1 Check-in Facility

Surplus check-in capacity currently exists throughout the day in Terminal 1, with sufficient headroom to accommodate additional expected demand over the remainder of the regulatory period. (Note: this is unless airlines currently operating in Terminal 1 significantly increase their demand for check-in desks, through either a large increase in activity or significant change in service provision). Queuing space between check-in islands in Terminal 1 is limited, but this constraint can continue to be optimised through managed solutions (tactical operational initiatives).

Enhanced operational efficiencies could be delivered throughout the check-in hall in Terminal 1 through the installation and adoption of Common User Self Service (CUSS) kiosks; similar to the recent equipment and technology introduced for Ryanair, CityJet and Lufthansa. The demand for check-in desks in Terminal 1 is forecast to increase in 2019 due to expected changes in the composition of airline and passenger traffic (i.e. an expected increase in long-haul wide-body operations by premium and full-service carriers).

Check-in capacity in Terminal 2 presents a more challenging situation. Current demand for desks significantly exceeds the available capacity. A cost-effective managed solution was recently introduced to facilitate customer requirements (the provision of two additional check-in desks not directly linked to the baggage system). We contracted with ground-handlers to manually transfer baggage from the check-in desks to the baggage belts. Though effective, this interim solution provided only temporary bridging

Figure 15: Check-in Facility Overview

Area (Unit)	Capacity Q4 2014	Planned Capacity	Actual Demand 2017	Forecast Demand
Terminal 1 Check in Desks (No.)	119	0	65	80
Terminal 2 Check in Desks (No.)	28 East 28 West	+2[1] East	39[2] East 38 West	32[3] East 38 West

[1] +2 reflects the provision of 2 additional check-in desks under a managed solution where the check-in desks are not linked to the baggage belt system

[2] Reflects airline requests. 28 desks allocated based on dynamic opening/closing of desks

[3] 2019 demand based on dynamic opening/closing of check in desks

capacity and unfortunately is not scalable due to limitations on the physical space of the check-in hall. Such a temporary solution is not capable of facilitating check-in for precleared US flights.

For Summer 2017, a non-US bound airline relocated its operation from Terminal 2 to Terminal 1, releasing much needed check-in capacity for the east side of Terminal 2. The available capacity was quickly re-consumed by an increase in activity to North America; and a combination of a new customers, new routes from existing carriers, and the deployment of larger aircraft on existing transatlantic routes.

The profile of passengers presenting at check-in can vary between weekdays and the weekend. Passengers travelling at weekends tend to be more leisure-focussed, and the volume of checked bags increases significantly compared to midweek. Therefore, airline demand for check-in desks is typically higher at weekends than during the week: for example, one operator in Terminal 2 requires ten additional check-in desks between 03:30–05:30 to facilitate demand at weekends. This requirement is currently only facilitated by dispersing operations between both sides of the check-in hall, which is only available for a confined period of time.

In 2016, Dublin Airport and Aer Lingus partnered to increase check-in capacity and efficiency on the West side of Terminal 2. CUSS technology was successfully installed and implemented to facilitate self-service check-in across the full Aer Lingus network. The new technology is now fully operational and delivering significant tangible benefits[17] to customers, including:

- 25% increase in passenger speed.
- 36% reduction in queue time.
- The Self Service Bag Drop can process up to 60 passengers per hour, while 24 passengers are processed by a check-in agent.

There is now a large differential between the passenger-to-check-in desk ratio achieved across Terminal 2. Capacity on the western side of the hall has been enhanced through advanced check-in technology, while conventional technology and processes continue to be deployed on the eastern side of the facility. An opportunity exists to examine if similar efficiencies and capacity enhancements can be delivered through the wider adoption of CUSS technology on the eastern side of the hall.

Findings:

Terminal 1: Current available capacity is sufficient to support expected future growth.

Terminal 2: Demand currently exceeds supply. Additional check-in capacity is required to support future growth.

Further enhanced operational efficiencies could be delivered through the wider adoption of CUSS technology.

[17] SITA Industry trends report.

3.3.2 Central Security Facility

In recent years, the capacity of the security screening facilities in both terminals has significantly fluctuated.

In Terminal 1, security processing capacity temporarily reduced following the introduction of Explosive Trace Detection (ETD) screening of passengers in March 2015, and of hand-baggage in September 2015. The introduction of the Automatic Tray Return System (ATRS) on all fifteen lanes in Terminal 1 later enhanced capacity beyond previous levels. There is potential to seek further additional efficiencies from the ATRS system, such as the optimal configuration for passengers parallel loading, the optimal resourcing levels for each lane/bank of lanes and (subject to approval from the security regulator), the introduction of remote screening of images.

In Terminal 2, capacity also temporarily reduced after the mandatory introduction of ETD. In response, we installed four additional security screening lanes, bringing the total number of lanes from 14 to 18.

This much needed supplementary project (a specific allowance was not awarded in the 2015-2019 capital approval plan) was therefore only delivered by redirecting allowances initially assigned to other projects. All lanes in Terminal 2 are currently manual lanes (no ATRS has been installed, primarily due to the space requirement for the additional length of ATRS lanes). Sufficient capacity is currently available in Terminal 2 Security to process expected passenger demand to the end of the current regulatory period.

LAGS Phase II

At this point in time, there has been no mandate for airports to implement Liquids, Aerosols and Gels (LAGs) Phase II by a certain date. It is anticipated that at least one year's notice would be provided to airport operators and security providers following the publication or mandating of such a requirement. On this basis, we do not anticipate a requirement to implement LAGs Phase II in the current regulatory period.

Figure 16: Security Facility Overview (excluding Liquids and Gels Phase II)

Facility	Capacity Q4 2014[1]	Planned Capacity Changes[2]	Actual Demand 2017	Forecast Demand 2019
Terminal 1 Security (pax[18]/hr)	3,090	4,155	2,914	3,140
Terminal 2 Security (pax/hr)	2,530	2,650[3]	2,119	2,293

Figure 17: Security Facility Overview (including Liquids and Gels Phase II)

Facility	Capacity Q4 2014[1]	Planned Capacity Changes[4]	Actual Demand 2017	Forecast Demand 2019
Terminal 1 Security (pax/hr)	3,090[1]	3,525	2,914	3,140
Terminal 2 Security (pax/hr)	2,530	2,305[3]	2,119	2,293

[1] Reflects introduction of Explosive Trace Detection (ETD), 1st March 2015 and 1st September 2015 – prior to implementation of Automatic Tray Return System (ATRS).
[2] Reflects estimated full extraction of ATRS efficiency gains
[3] Reflects 14 x-ray machines in 2014 vs. 18 in 2016.
[4] Pax = Passengers

[18] Pax = Passengers

However, it must be flagged as a risk, that under LAGS Phase II, the existing capacities of the central security processors would again temporarily reduce (similar to ETD implementation). Figure 18 summarises the revised capacity to expected demand position for Summer 2019.

Terminal 1 security capacity post the implementation of LAGS II is sufficient to meet the expected short-term future demand. However, post Phase II peak hour security capacity in Terminal 2 would reduce to what is expected in the busy hour demand profile in Summer 2019. Excess capacity is less than could accommodate a single short-haul flight in the peak security demand time period. The capacity head-room would be insufficient to accommodate an incremental flight in the busy hour.

Findings:

Current capacity (enhanced by full ATRS efficiencies) is sufficient to accommodate expected short-term demand. However, if LAGs Phase II is implemented in the current regulatory period, insufficient capacity headroom will be available to facilitate an increase in activity during peak operating hours for Terminal 2.

3.3.3 Departure Gates and Bus Lounges

Gate space is a function of aircraft parking stand demand: a departing aircraft (irrespective of where it is parked) will require a discrete departure gate for processing the passengers prior to boarding. An aircraft parked on a contact stand must be served by an associated gate with sufficient capacity to accommodate the required number of passengers to match the stand and aircraft classification (i.e. Code C/Code D etc.[19]). Gate space can also be used to temporarily hold passengers before they are bussed to remote stands or satellite facilities.

A gate may be airbridge-served or have stairs, escalators or elevators which allow passengers to exit from the terminal to the apron, and either board an aircraft directly on a contact stand or board a bus for transit to an aircraft parked on a remote stand. As the number of remote stands has increased at Dublin Airport in recent years, the gate-to-stands ratio has decreased[20]. Passengers bound for different flights cannot be inter-mixed through a single gate (due to the elevated risk of passengers boarding an incorrect aircraft), and therefore, a delicate staggering of flights is required from a single gate. In specific instances, short-haul flights are staggered over 20 minutes. This is to mitigate against the constraints posed by the reduced gate-to-stands ratio, following the introduction of additional remote stands.

Gate capacity has emerged in Summer 2017 as a constraining issue for stand planning (especially when processing concurrent flights during peak periods). As highlighted in Figure 18, there is currently insufficient gate and lounge capacity to facilitate 2017 demand. Additional gate capacity may be required to support concurrent remote departures under the expected Summer 2019 demand profile.

Findings:

The assessment highlighted a gate shortage of seven for 2017. An additional four gates are required (on 2017) to accommodate 2019 demand levels.

Figure 18: Departure Gates and Bus Lounge Overview

Facility	Capacity Q4 2014	Planned Capacity Changes	Actual Demand 2017	Forecast Demand 2019
Gate (No.)	57	61	68	72

Gates are the number of routes (stairs and elevators or airbridges) for the exit of passengers from the Terminal to the aircraft.
Reflects the total number of gates which can be used for short-haul departures in first wave (19 gates on departures level of Terminal 2, and two gates in Customs and Border Protection (US Preclearance)). Gates on US Preclearance level can no longer be used for bussing.

[19] https://www.skybrary.aero/index.php/ICAO_Aerodrome_Reference_Code
[20] 94 stands: 57 gates vs. 109 stands:61 gates = 61% vs 56%

3.3.4 Immigration Facility

Several variables impact on the capacity processing of the Immigration facilities across the airport, such as: the profile of passengers, queue presentation; state resources available; and the transaction times of EU versus non-EU passport holders. Typically, during a transatlantic arrival bank in Terminal 2, up to 60% of the arriving passengers are non-EU citizens. During peak periods, where demand can temporarily exceed capacity, arriving passengers are required to queue for longer periods of time compared to the IATA's Optimum level of service of ten minutes (as cited in the tenth edition of IATA Airport Development Reference Manual).

Immigration capacity/throughput has recently been impacted by changes in procedures due to the increased threats to civil aviation throughout Europe. Resourcing levels at Irish Naturalisation and Immigration Service (INIS), the state authority responsible for immigration service provision have increased in line with passenger growth, but the per-passenger transaction time has also increased significantly due to changes in immigration and passport inspection procedures. INIS officers manage the Terminal 1 facility, whereas the Terminal 2 facility is currently transitioning from the Garda National Immigration Bureau (GNIB) to INIS.

Demand during peak hours is currently at maximum processing capacity Summer 2017. If a number of flights are operating off-schedule in a given hour, it can invariably result in queues and delays.

An acute issue is emerging each night in Terminal 1, which is exacerbated when a number of aircraft arrive off-schedule in close proximity to each other. Higher processing times combined with a concentrated influx of arriving aircraft can quickly maximise the limited physical queuing space within the Immigration facility. This can result in large volumes of passengers queuing on approach to the Immigration facility, which backs on to the pier linked Skybridge. We deploy Customer Service Agents (CSAs) to manage the passenger queues, which can also require the temporary closure of the travelator and escalators into the Immigration facility. These long queues are impacting on customer service quality, and we have received a high volume of complaints and negative attention this year.

The current Terminal 1 Immigration capability is not sufficient to support the expected future growth and changing passenger composition over the coming years. While peak hour demand expected in Summer 2019 is forecast to be accommodated within the available capacity (when current enhancement projects are complete), the physical square footage of the floor space within the facility restricts the efficient presentation of passengers to feed the Immigration desks and gates. This means that the planned throughput enhancements expected to be delivered from technology projects such as electronic gates will be under-utilised by the suboptimal and inefficient presentation of passengers.

Findings:

Terminal 1: The physical capacity of the Immigration facility serving Piers 1 and 2 is inadequate to meet the current and forecast demand to 2019.

Terminal 2: The capacity of the primary Terminal 2 Immigration facility is currently sufficient to meet forecast demand out to 2019. Note: during banks of long-haul arrivals, passenger demand can exceed throughput capacity. However, the physical size of the floor space within the facility is adequate to accommodate a build-up of queuing passengers.

Figure 19: Immigration Overview

Area (Unit)	Capacity Q4 2014	Planned Capacity Changes	Actual Demand 2017	Forecast Demand 2019
Terminal 1 Primary Immigration (pax/hr)	2,897 (Pier 1/2)	4,300 using e-gates in Pier 1/2	2,481	3,664
Terminal 2 Immigration (pax/hr)	3,200[1] 1,489 Short Haul (SH)[2] 1,000 Long Haul (LH)[3]	3,400 using e-gates	1,446 SH 1,251 LH	2,057 SH 1,524 LH

[1] Based on 16 manned booths.

[2] Based on typical resource levels during Short Haul arrivals peak in T2.

[3] Based on typical resource levels during Long Haul arrivals wave in T2.

3.3.5 US Preclearance and Transfer Facilities

Future demand for US Preclearance is expected to continue to grow across the day. In Summer 2017, departing demand is approaching maximum capacity between 09:00-12:30. Physical capacity remains available between 12:30-16:30 (which is the current closing time of the facility).

A mandatory segment of the US Preclearance process is passenger screening by the Transportation Security Agency (TSA). Six x-ray machines are provided in the recently expanded US Preclearance area to facilitate the TSA screening. There is limited scope to increase the physical footprint of the facility any further due to adjacent constraints within the pier. The throughput capability of the TSA facility is currently constraining the overall capacity of the US Preclearance processor.

Automated Passport Control (APC) kiosks were introduced in 2015 in the US Preclearance area and on the upper level of Pier 4 in 2016. The APC kiosks have successfully improved the flow and efficiency of passenger presentation during peak periods and facilitated the record volume of passengers through the facility this summer.[21] The full efficiency gains from the provision of the APC kiosks is reflected in the US Preclearance capacity. However, because the negotiation of additional US Preclearance resources is an inter-governmental process, considerable challenges continue to exist with regards to both the physical infrastructure and the resourcing of the facility.

The maximum number of flights that the US Preclearance facility can currently simultaneously process is ten. This is a function of the number of aircraft parked on adjoining Pier 4 stands, and increased by one additional aircraft versus Summer 2016. The incremental flight was delivered under an initiative to relocate a non-US bound airline from Terminal 2 to Terminal 1 and by providing a new piece of infrastructure (an additional swing gate) on the departures level of Pier 4.

The options to further increase the number of stands which can be utilised for US Precleared departures is limited, as Pier 4 aircraft parking is fully utilised during the peak morning demand period. Short-term capacity growth in US Preclearance activity will focus on: maximising spare capacity in the afternoon; the upgauging of existing flights during peak periods; and exploring the feasibility of conducting future remote operations with all stakeholders.

The new transfer facility currently under construction in Pier 4 is expected to be operational during Quarter 3 2018. This facility will have a capacity of 1,600 passengers per hour, more than doubling the existing transfer capacity.

Findings:

US Preclearance: Capacity constraints currently exist during peak periods, primarily resulting from a shortage in TSA processing capacity and a limitation in the number of contact stands adjoining the facility.

Transfer facilities: The new transfer facility currently under construction will have the capacity to facilitate the expected growth throughout the current regulatory period.

Figure 20: US Preclearance and Transfers Overview

Area (Unit)	Capacity Q4 2014	Planned Capacity Changes	Actual Demand 2017	Forecast Demand 2019
US Preclearance (pax/hr)	850	1,100	1,007	1,215
Transfer Facility (pax/hr)	650	1,600	874	1,151

[21] In general, US citizens and Visa Waiver Programme countries' citizens can use the APC kiosks, thus allowing for an expedited engagement with the US Preclearance officer. The 22 kiosks have provided efficiencies in the US Preclearance processing of between 40%-50%.

3.4 Aircraft Parking Stands

In late 2014, Dublin Airport had an available capacity of 76 aircraft parking stands on the eastern campus (to the east of Runway 16/34). The composition was 63 contact stands and 13 remote stands, with a further 19 remote stands available on the West Apron. In 2015, 10 net additional remote stands were delivered through the Apron 5G project. In addition, an incremental narrow-body stand was constructed on Pier 3 in 2016, through a stand optimisation and realignment project and finally, a stand was withdrawn from service on Pier 2 to facilitate the new bussing lounge. The various developments increased the physical stand capacity from 95 to 105 stands.

On a typical busy day, the peak demand period for stand occupancy is between 05:00-08:00. Up to 12 contact stands (NBE) are occupied by early transatlantic aircraft, and the remaining airport stands are fully occupied by overnighting aircraft (predominantly short-haul aircraft based at Dublin). The peak hourly demand requirement in Summer 2017 is 101 aircraft parking stands. This means that technical transit flights, ad-hoc flights and freighter aircraft are required to operate from the West Apron during peak periods (due to a shortage of suitable stand capacity available on the eastern campus).

Airlines operating at Dublin Airport during the first wave of departures continue to express a strong business preference for the allocation and usage of contact stands. Dublin Airport's policy is to maximise the use of contact stands, aircraft are only allocated to remote stands when all contact stands are fully utilised. Aircraft operating with turn-arounds of greater than two hours may be requested to tow off/back on to a contact stand if the stand is required for use by another appropriate aircraft. The volume of aircraft flight movements is expected to increase by 4.5% in 2017 over 2016. By extension, an increase in the towing of aircraft is also now essential to facilitate demand requirements and maximise the efficiency and occupancy of the contact stand portfolio.

Figure 22 highlights the year-on-year increase in towing movements by month during the peak period 05:00–08:00.

Figure 21: Aircraft Parking Stands Overview

Area (Unit)	Capacity Q4 2014	Planned Capacity Changes	Actual Demand 2017	Forecast Demand 2019
Stands NBE (Narrow Body Equivalent)	95 19 West Apron 76 East Campus	105 +10 Net (Apron 5G completed)	101	116

Figure 22: Towing Movements from 05:00-08:00

Month Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016	214	270	367	319	287	360	347	327	376	372	316	349	3,904
2017	340	308	411	353	382	429	472	427					
% Change	+58%	+14%	+12%	+11%	+33%	+19%	+36%	+31%					

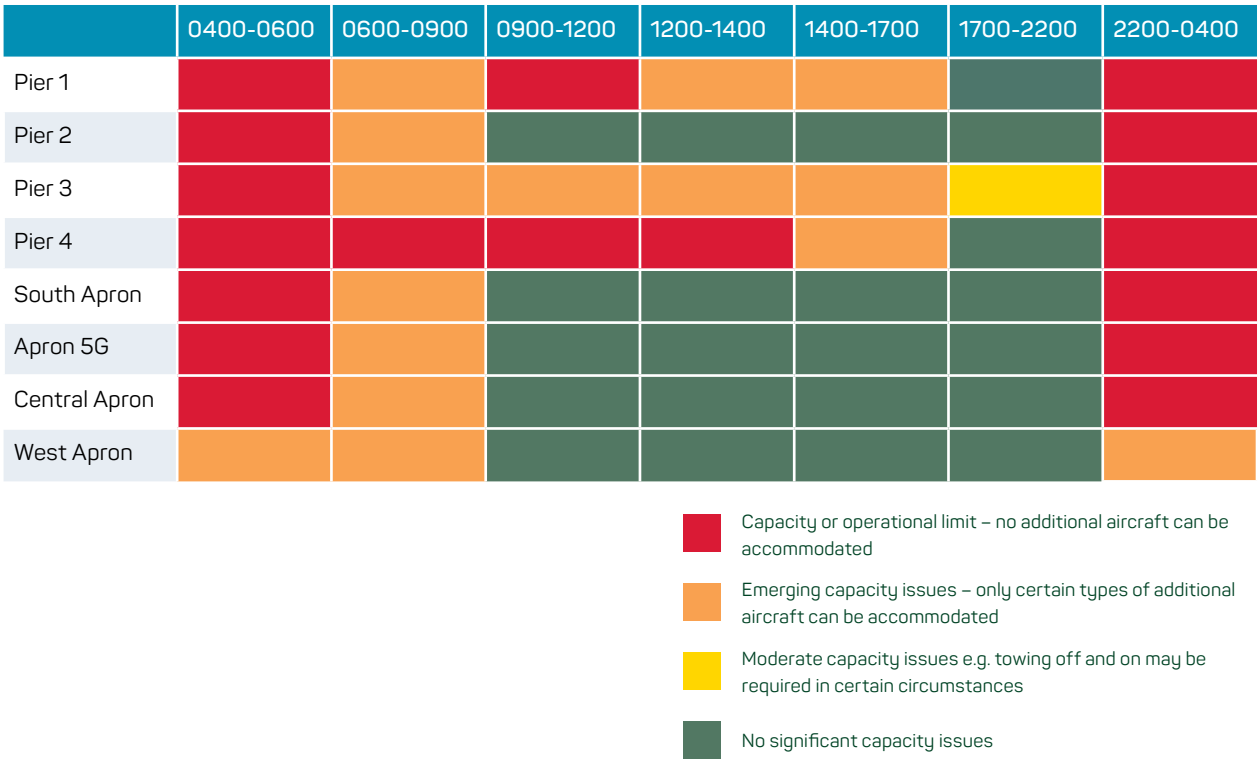
Comparing May and June 2016 with the same period in 2017 shows a daily increase of three towing movements between 05:00–08:00 on average. Towing aircraft (particularly wide-body) during this period requires active collaboration between operations and ATC at all times, and towing movements are often opposing the busy first-wave departure flow. This can result in delays to clearance for the tow and in some cases, additional congestion to the apron and taxiways.

The stand demand referred to above excludes the requirement for adequate contingency: i.e. the removal of stands from use for rehabilitation or maintenance; ad-hoc events (such as diversions, sporting events, weather, or state visits); unexpected stand demand due to external factors such as air traffic control (ATC) disruption; or aircraft experiencing technical issues. Currently, Aircraft Park Charlie (APC) provides up to 13 contingency (parking only) NBE stands. However, this apron is scheduled to close in late 2019 to facilitate the construction of the North Runway. Standard operating practice in the majority of mid-to-large UK airports is to provide a minimum of 10% contingency stand capacity (approximately 11 NBE stands). Dublin Airport maximises the use of all stands and has a limited number available for contingency[22] and the issue of stand availability will become even more critical in 2019 when APC is decommissioned.

In 2017, stand availability issues have emerged across the operational day. There is an acute shortage of pier-served contact stands across several hours.Figure 23 highlights the emerging and existing capacity shortages.

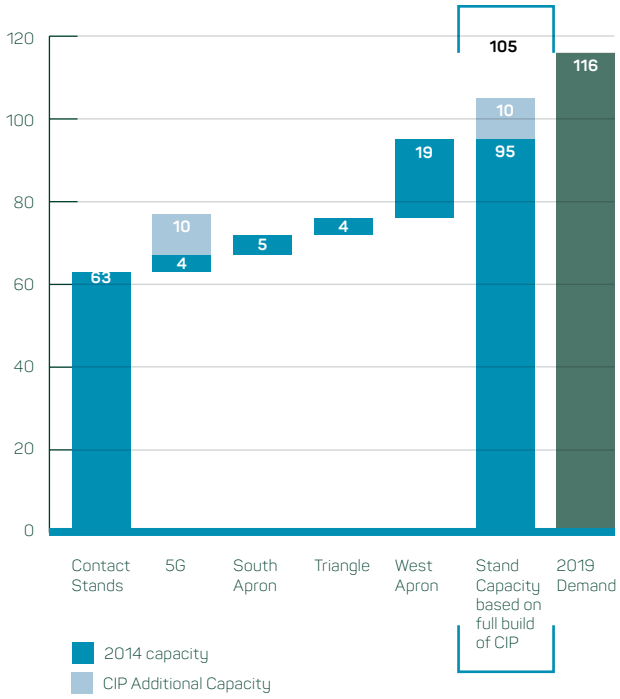
Wide-body pier-served stand availability is limited from 04:00 until after midday. There will undoubtedly be a strategic requirement to focus on providing additional wide-body contact stand capacity in the next five-year capital plan (2020–2024). Our priority for the remainder of the currently regulatory period is to provide additional stand capacity to support growth requirements, and to replace a portion of the decommissioned contingency stands when APC closes.

Figure 23: Assessment of Stand Availability – Typical Busy Day 2017



[22] Dublin Airport assessment of contingency requirement: four NBE stands to cover rolling-stand closures for maintenance and repair and six NBE stands to cover unscheduled aircraft parking requirements.

Figure 24: Shortfall of Stands



Findings:

- There is an expected shortfall of 11 NBE stands to accommodate baseline 2019 demand (four stands accelerated to achieve 2017 delivery and will form part of consultation).
- The delivery of four stands will be expedited for full operations later this year.
- An additional seven NBE stands are required to facilitate the Summer 2019 operation.
- The above capacity will only accommodate baseline demand and does not provide additional contingency.
- Dublin Airport stand contingency is expected to remain at levels well below 10% for the remainder of the current regulatory period.
- A further eight-to-ten NBE stands would be required to achieve the standard contingency ratio of 10% for medium-to-large airports.
- There is a shortage of wide-body stands for transatlantic flights.

To accommodate based carrier demand in 2017, Dublin Airport was requested to immediately progress a project to maximise the capability of the South Apron and expedite the construction of four additional NBE stands. After agreement on the required capability and customer needs, the project progressed. We will deliver four essential NBE stands for full usage in Winter 2017/18. The additional South Apron stands, when fully complete and operational, increase the total number of available stands at the airport to 109.

A shortfall of seven NBE stands is forecast for Summer 2019 (to support aircraft demand). Adequate contingency provisions are not included in this deficit and subject to an additional requirement. Additional capacity is immediately required to facilitate the expected demand activity throughout the remainder of the currently regulatory period.

A shortfall of seven NBE stands is forecast for Summer 2019 (to support aircraft demand).

3.5 Airfield/Taxiway (TWY) System

Delivering aircraft in a sequential and timely fashion to the Runway (RWY) is a crucial success factor for the productivity and performance of the runway. An airport's runway system must be supported by an efficient taxiway network to deliver aircraft to the runway for take-off and provide efficient routings for arrivals to their parking stands.

The primary metrics for assessing taxiway efficiencies are average taxi-in and taxi-out times, i.e. runway-to-stand/stand-to-runway durations. Excessive taxiing/holding times caused by congestion during pushback, departure queuing or arrival routings can lead to on-time performance issues, and a requirement for airlines to increase the duration of certain flight times. This in turn has implications for the operational efficiency and safety of the airspace and ground operations (towing, bussing, refuelling etc.)

Despite traffic growth, average taxi times for Summer 2017 have not increased by comparison with Summer 2016 (May-July). This can be attributed to several initiatives, namely the change in tailwind preferences favouring the use of RWY 28 over RWY 10 (which is generally associated with higher taxi-out times) and a greater drive to maximise the number of aircraft departing from RWY 34 in Dual Operations. Taxiway Zulu reopened on 5th July 2016, following the completion of a safety case. The re-opening of

this taxiway has provided flow improvements to/from the South Apron.

There is an ongoing initiative to further reduce the departure-departure separations on the runway, which is expected to deliver a positive impact on departure delays during first-wave. However, the current taxiway system is constrained at peak times and it will be challenging to maintain average taxi-times at current levels over the remainder of the regulatory period.

Figures (25 and 26) illustrate the various taxi-in[23] and out[24] times recorded at Dublin Airport for Summer 2016 versus Summer 2017 (April–June).

Perhaps the truest indicator of congestion is taxi-out additional time for departures. This metric is collected centrally by EUROCONTROL within the Pan-European ANS Performance data repository.

Taxi-out additional time is defined as the 'average departure runway queuing time on the outbound traffic flow, during congestion periods at airports'; i.e. total taxi-time minus the unimpeded taxi-time. Trends in available data show that additional taxi-out minutes increased significantly with traffic growth between 2014-2015. Despite Dublin Airport's better relative performance over a number of other major European airports, it is becoming increasingly challenging to sustain or reduce this level of congestion-related delay.

Figure 25: RWY 28 Average Taxi-in times by Apron/Pier for Summer 2016–2017 (April-June)

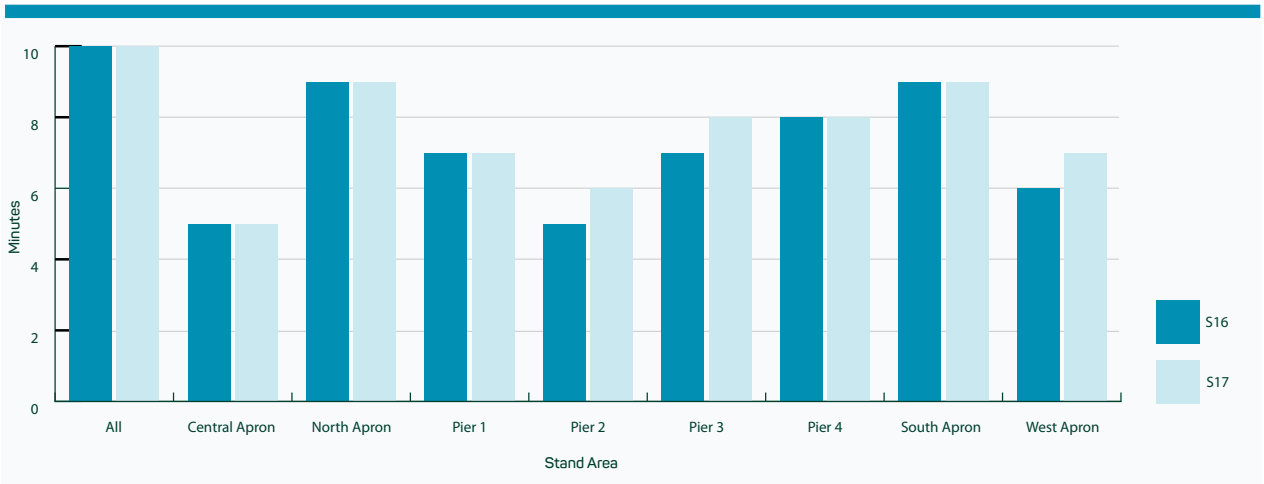
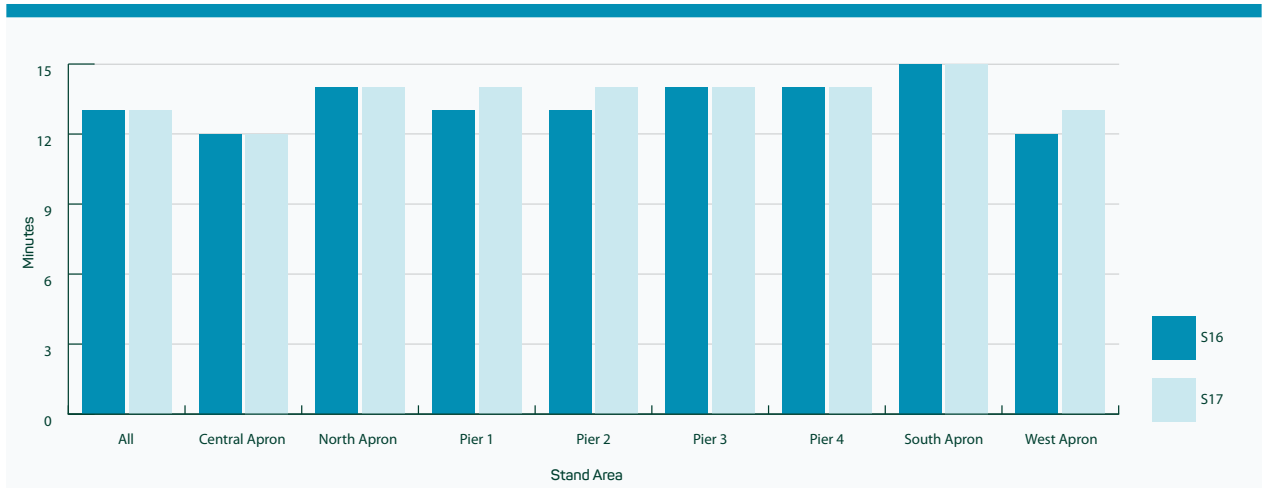


Figure 26: RWY 28 Average Taxi-out times by Apron/Pier for Summer 2016–2017 (April-June)



[23] Taxi-in times are defined here as the time elapsed between vacating the runway and on-block time.
[24] Taxi-out times are defined here as the time elapsed between off-block time and wheels-up time.

Figure 27: Taxi-out Additional Minutes (EUROCONTROL)

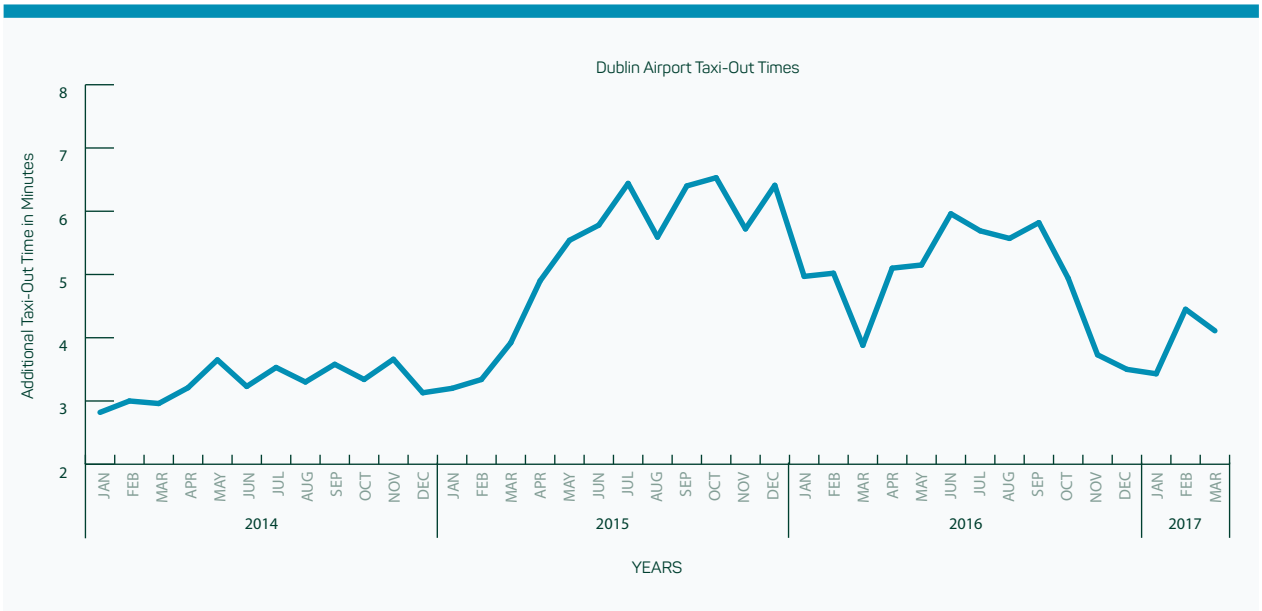


Figure 28: Punctuality Report (April-June) – Passenger Flights

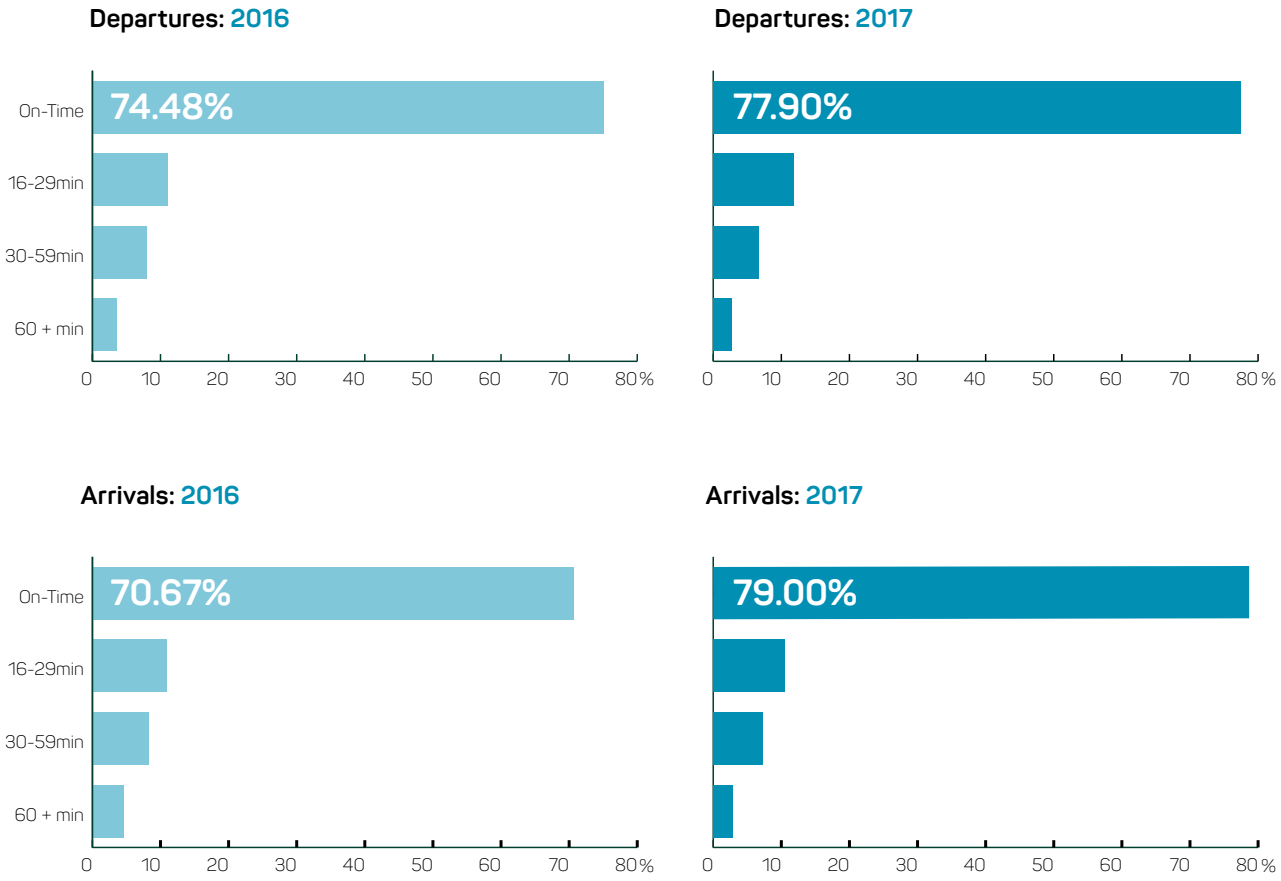


Figure 29: Top 10 Reasons for Departure Delays Summer 2016–Summer 2017

	Delay Reason	S16 (Full)	W16 (Full)	S17 (To date)
1	Airline - rotation	19.5%	15.7%	15.6%
2	Air traffic control	17.1%	15.1%	15.6%
3	Airport facilities	3.9%	5.9%	8.6%
4	Passenger convenience	6.2%	5.0%	7.2%
5	Aircraft defects	6.5%	7.5%	7.0%
6	Airport of origin	13.1%	9.0%	5.8%
7	Ground handling - fuel	2.9%	1.3%	5.6%
8	Persons with Reduced Mobility (PRM)	4.3%	3.2%	4.2%
9	Loading/unloading issues	2.3%	1.7%	3.6%
10	Unknown	1.4%	1.6%	3.4%

Note: Delay criteria are self-assessed by handlers and their usage can be inconsistent across categories. Both 'Airport Facilities' and 'Airport of Origin' fall under the airport's remit, and must be looked at combined.

A number of expert independent airfield studies were completed in 2016-17, including: the assessment of RWY 28 additional line-up points; evaluations of airfield capacity through modelling; and a Critical Taxiway Review in response to the Air Accident Investigation Unit (AAIU) recommendation. The common objective was to assess if the current system and capacity can adequately manage forecast traffic up to 2019 and also to make recommendations (based on user feedback) for potential efficiencies (e.g. reduced taxi-times) safety enhancements, simplification or removal of restrictions, and any other improvement opportunities. The key findings of these studies can be categorised under airfield efficiency and airfield safety (mainly with reference to existing taxiway system complexity).

3.5.1 Airfield Efficiency

A combination of airfield flow modelling, user feedback and data analysis has highlighted certain limitations and pinch points across the taxiway system. Although there are several runway demand peaks throughout the day, the first wave is the most challenging period - primarily because the accumulating departure queue contributes to congestion at key junctions and along primary taxiways. This has a knock-on impact on a significant number of arrivals at this time (particularly in RWY 28 operations) that are required to join the departure queue. A number of constraints affect the use of existing taxiways, which in turn impact on the ability to efficiently manoeuvre high volumes of departing aircraft at peak times. Some of these constraints are related to the proximity of aprons and the interaction between pushbacks and taxi-flows. Other constraints relate to taxiway geometry, lack of holding and queuing space, or operating restrictions.

The most recent taxi-time data shows that taxi-in times have remained reasonably consistent throughout the day with the exception of first-wave arrivals. In that period, times spike predominantly due to interactions with departing traffic; i.e. southbound arrivals conflicting with the RWY 28 departure queue, with no alternative routing for accessing the apron.

Peak taxi-in times are also impacted by aircraft not vacating their allocated parking stands when necessary, which results in arriving aircraft holding out on the airfield for the stand to clear. In other cases, an arriving aircraft can land more than 45 minutes early and must hold out on the airfield until a suitable stand is available.

In summary, peak arrival taxi-times are caused by a combination of: stand availability issues; arrival punctuality; and a number of arrivals having to join the peak departure queue (further evidenced by the fact that, where the departure queue does not hinder taxi-in flows, RWY 10 taxi-in times are typically much lower).

Figure 30: Taxi-In times for June 2017

Figure 31: Taxi-Out times for June 2017

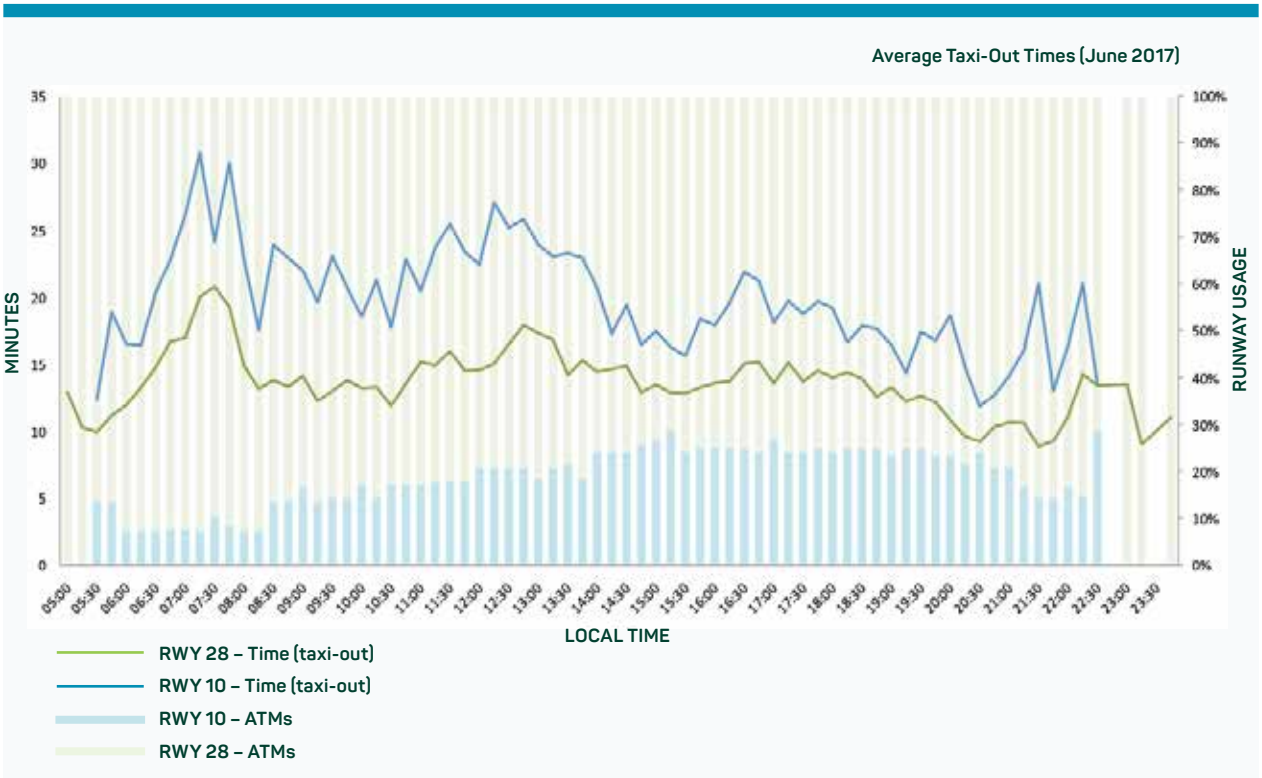


Figure 31 illustrates that the average taxi-out times for RWY 10/28 in June 2017 are consistently higher for RWY 10 than out to RWY 28. This is primarily due to the additional taxiing distance required to the runway holding position. However, RWY 10 movements account for less than 20% of all RWY 10/28 movements. Flow simulations have confirmed that the runway is the primary constraint, and the majority of the taxi delay is attributable to the runway-holding area. The runway-holding area delay can be reduced through safely reducing airspace minimum separations and by reducing runway occupancy time to optimise the runway throughput.

Despite the runway being the primary contributor to airfield congestion during peak periods, the taxiway configuration is not optimised for reducing routing delays, mainly as a result of; the busy junctions (e.g. Links 1, 2 and 4), taxiway restrictions, multi-directional flows; arrivals conflicting with the departure queue (especially along the Foxtrot taxiways in RWY 28 operations), lack of opportunities to balance departure queues (leading to a greater demand for holding on taxiway (TWY) E1, hindering apron access) and delays relating to pushbacks. With safety as key and a core principle, we do have opportunities to optimise the taxiway network to address these issues and improve taxiway flows to minimise congestion and routing delays.

3.5.2 Airfield Safety/Complexity

Dublin Airport currently operates with 27 airfield and taxiway restrictions (Section 1.3 of the AIP), all of which are fully approved and safety compliant.

There is a need to simplify and design out restrictions on the taxiway system. Key Steering Groups – including the Dublin Airport Operations Planning Group (DAOPG), the Runway Process Improvement Group (RPIG) and the Local Runway Safety Team (LRST) - continue to progress initiatives in this regard.

Following a runway incursion in 2011, the AAIU issued two safety recommendations concerning the alignment of TWY F1 (completed 18th August 2015) and a revision of taxiway designation in order to simplify pilot instructions. A sequence of wingtip collision incidents on Link 2 (October 2014 and April 2015) led to additional safety measures, the prevention of simultaneous opening of TWYs A and B2, and the consolidation of multiple hotspots into a single, larger hotspot zone.

A critical review of the taxiway system, supported by user consultation, was completed by independent experts in early 2017. The report was accepted and closed by the AAIU in February 2017. The study identified the most complex aspects of the airfield and provided recommendations for addressing the complexity.

Figure 32: Critical Taxiway Review Summary (Taxiway Infrastructure)

Category	Finding
TWY Designation Logic	Re-designation is the most important aspect to reducing the complexity of the current TWY system.
Link 4 Complexity	Evaluated as a "complex layout" which scored "poor" (2/6). The main contributor is the diagonal connection with seven lead-in TWYs identified and its high traffic load.
Link 1 Bottleneck	Due to heavy traffic load and being of "medium complex" geometry, although it has been simplified by realigning F1. The area scored 'good' (4/6).
Link 2 Bottleneck	Due to heavy traffic load and being the location of recent wingtip collision incidents, yet scored as 'very good' (4/5) with F1 realignment.
Hotspot Complexity	High taxiway density and close proximity to runways. Scored 'fair' (3/6), as TWY A and B2 are used dependently.
Routing complexity (RWY 28/Dual Ops)	Dual RWY 28/34 operations rated lowest (most complex routings), followed by RWY 28. Recommendations were aimed at reducing bottlenecks around F1/Links 1, 2 and 4 and to shorten long taxi routes.
West Apron Access	The challenge of enabling safe and efficient access to the West Apron was addressed, stating that a tunnel is clearly the optimal long-term solution.

Findings:

The current taxiway system contains complexities and poses operational challenges. The existing infrastructure is suboptimal in places and will increasingly struggle to facilitate future increases in activity. It will also be challenging to maintain the current levels of service quality, specifically with regards to acceptable average taxi-times as traffic continues to grow. There is a requirement to improve the taxiway routing options (aircraft and tows); migrate traffic off the aprons, provide north-south two-way flows, design out taxiway restrictions and elevate operational safety.

3.6 Runway (RWY)

Our primary objective is to maximise the usage and efficiency of the existing runway infrastructure. In recent years, overall aircraft movements have increased from 170,000 (2013) to 215,000 (2016) and are forecasted to be 223,000 in 2017, with peak hour departures increasing from 31 in 2013 to 35 in 2017.

Runway capacity is defined by the physical configuration and associated airspace management. Capacity is further affected by aircraft size, mix, flow to the runway and the need for resilience/recovery. Separation requirements also have a major impact on the capacity and efficiency of the runway.

A number of performance metrics are used to assess runway capacity. These metrics include:

- Runway utilisation.
- Wake turbulence mix.
- Aircraft type mix.
- Engine type mix.
- Arrival-Arrival (AA) separations.
- Arrival-Departure-Arrival (ADA) separations.
- Departure-Departure (DD) separations.
- Arrival runway occupancy time and exit point usage.
- Departure runway occupancy time and pilot reaction time.

Values for each of these performance metrics are updated based on operational data supplied by Dublin Airport and the Irish Aviation Authority (IAA). The capacity of Runway 10/28 is independently assessed by National Air Traffic Services (NATS).

The Runway Process Improvement Group (RPIG) has agreed a four-phase programme to deliver an increase in capacity on R10/28. The initiatives are focused on increasing the declared capacity from 31 peak hour departures in 2013, to a future level of 39.

Phase 1 of this programme was completed in 2014, with 33 departures declared in the peak departures hour for Summer 2015. Agreement was reached between all stakeholders to declare a further capacity increase in 2016, of 35 departures in the peak hour (06:00–07:00 local time), which successfully completed Phase 2 of the project. Dublin Airport proposed increasing to 37 movements for Summer 2017, based on observed reductions in Departure-Departure separations. However, this proposal was not supported by the airline members of the Coordination Committee and ultimately, the Commission for Aviation Regulation ruled not to increase the peak hour departure rate for Summer 2017.

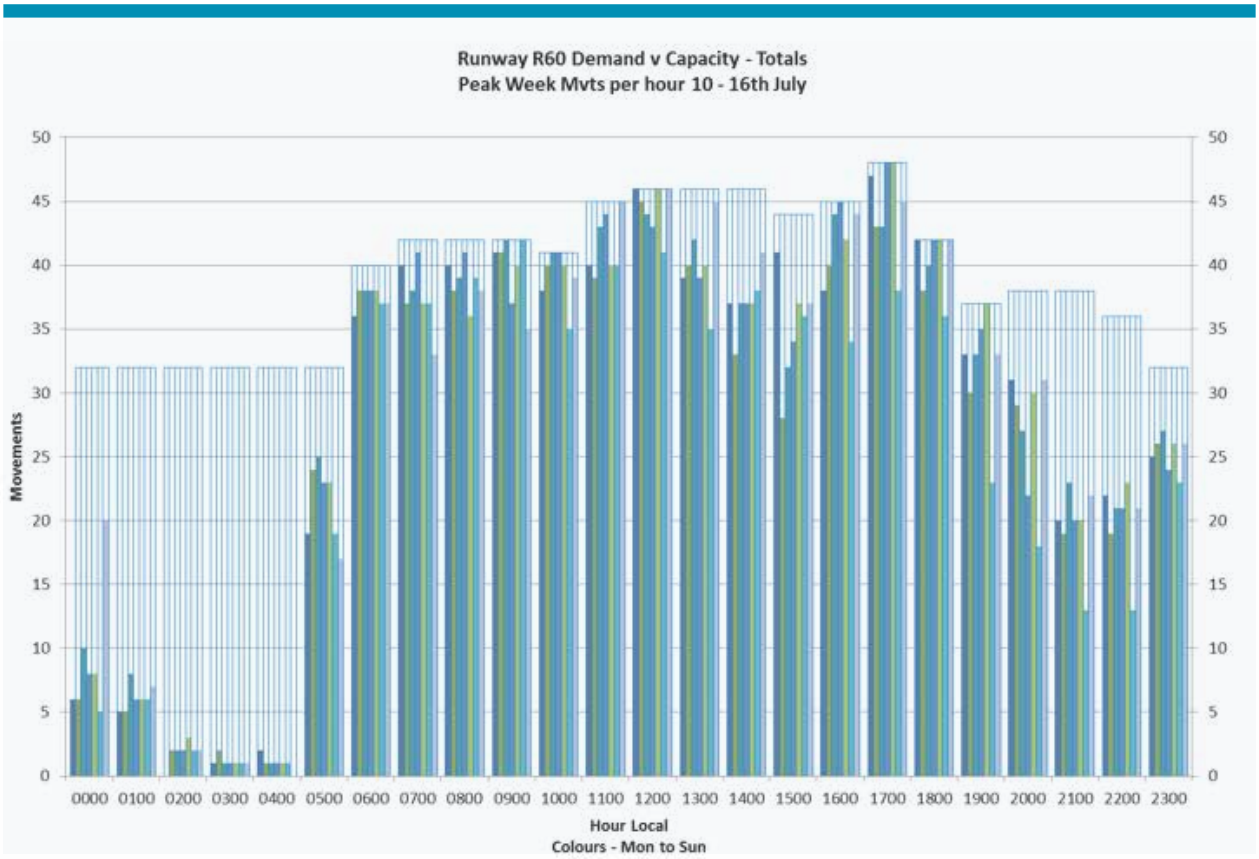
Raw demand exceeds capacity in Summer 2017 for departures/arrivals/total movements in 06:00, 09:00, 12:00 and 17:00 hours (local times). The over-subscription for available capacity was managed through independent slot allocation, which is expected to continue for future seasons. It is evident in Summer 2017 that the runway is operating at the maximum capacity allowed for multiple hours across the day. Excess demand, if possible, is co-ordinated into adjoining hours (as illustrated).

Figure 33: Runway Overview Peak Hour Departures

Area (Unit)	Capacity Q4 2014	Capacity based on additional projects/efficiency in CIP	Demand 2017	Demand at 2019
Runway (Departures 06:00-07:00)	33	39	45	49

Raw demand for 06:00 local hour is 45 departures. Excess demand co-ordinated to other hours.

Figure 34: Total Movements Runway Demand vs Capacity (Summer 2017)



Further runway capacity increases are required to support growth over the remainder of the regulatory term (from both new and existing customers). The North Runway is expected to deliver sufficient capacity to accommodate the medium to longer range demand requirements.

In the short-term, further runway capacity increases can be enabled through non-infrastructural improvements.

Findings:

The existing runway has the capability to immediately support 37 departures and potentially up to 39 departures (an increase from 35 departures currently declared) in the peak hour through non-infrastructural improvements, without impacting the ten-minute delay criteria. The slot coordination process will continue to manage demand until the North Runway is operational.

3.7 Summary

The 2017 capacity assessment study highlights the below operational processors, as critically requiring immediate capacity enhancements:

- Aircraft parking stands.
- Taxiways.
- Gates and associated bussing routes.
- Terminal 2 check-in.
- US Preclearance.
- Terminal 1 Central Immigration.

The capacity assessment has also flagged that the above facilities are operating close to or at capacity. Targeted solutions are required to tactically enhance these facilities to maintain service quality levels and accommodate growth.

The assessment has considered the probability of future changes to security regulations and the potential for these mandatory changes to impact on the capacity available. At this time, security capacity is deemed sufficient to support the expected future growth and there is no immediate requirement to provide additional infrastructure (assuming LAGs II implementation is not required in the current regulatory period).

No immediate infrastructure solution is required to address runway capacity. Capacity will continue to be optimised through the slot co-ordination proccess and through enhanced operational procedures with longer-term needs addressed by the introduction of the North Runway.

This assessment has focussed on the core facilities required to process passengers, and park and manoeuvre aircraft across the airfield. Facilities such as the airport road network, kerbside access and the baggage handling system are being assessed as strategic elements of the longer-term Airport Masterplan.

04 CUSTOMER/ USER REQUIREMENTS

04 CUSTOMER/USER REQUIREMENTS

In the second half of 2016, Dublin Airport undertook a mid-determination review of user requirements. A detailed consultation document was issued to approximately 115 individuals, representing a total 45 organisations operating at Dublin Airport. All airport users were invited to respond to several key questions pertaining to airport infrastructure and their associated requirements as customers/users. We encouraged detailed responses to the following key items:

- Do you consider that Dublin Airport has sufficient infrastructure and/or capacity to deliver your operational and service requirements for the period 2016-2019?
- Do you have any proposals regarding how the management of existing infrastructure at Dublin Airport could be improved?

We listed four potential tracks for addressing and alleviating any existing or emerging capacity constraints:

1. **Managed Solutions:** solutions that avoid the requirement to expand or create new infrastructure; i.e. investing in additional operating costs or technology expenditure to manage the constraint.
2. **Expand Infrastructure:** solutions which require an expansion to existing infrastructure or new infrastructure.
3. **Reduce Service Levels:** accepting a lower quality of service, as facilities would not be improved to accommodate higher volumes of activity.
4. **Constrain Demand:** an agreed acceptance not to expand infrastructure or increase capacity, which will constrain demand and limit growth.

We received eight written responses to the consultation (which represented a total of 11 individual organisations who operate at Dublin Airport). These organisations represented 84% of Dublin Airports traffic mix in 2016.

We did not receive a unanimous response to a particular question or item. This is not unusual or unexpected, given the large number of diverse stakeholders represented, and the degree of variation between business models and operating requirements. The detail of the responses varied from outline or general in nature to highly specific individual considerations. In some cases, the responses focused on flagging operational challenges, or made general remarks about the airport. With regard to capacity solutions, the responses received had a strong preference for progressing managed solutions and accelerating capital infrastructure projects. Based on this, it is assumed that user is unwilling to accept a deterioration in service quality or an inability to grow as preferred solutions for addressing any existing or emerging capacity constraints at the airport.

4.1 High Level User Responses

The table on the following page summarises the airport facilities that users specifically flagged as either currently operating with capacity constraints or there is a view that capacity constraints will emerge over the remainder of the current regulatory period.

> Customer responses had a strong preference for progressing managed solutions and accelerating capital infrastructure projects.

Figure 35: User Identified Capacity Constraints

Airport User	1	2	3	4	5	6	7	8
Facility/Processor:								
Terminal 1 Check-in Desks								
Terminal 1 Security								
Terminal 1 Gates and Bus Lounges		•				•		
Terminal 1 Immigration	•							
Terminal 2 Check in Desks	•			•	•	•		
Terminal 2 Security	•							
Terminal 2 Gates and Bus Lounges	•		•	•	•			
Terminal 2 Immigration				•	•			
US Preclearance	•			•	•			
Transfer Facility	•		•					
Aircraft Parking Stands	•		•	•			•	•
Taxiway System	•			•				
Ground Equipment Parking	•		•			•	•	•
Baggage Hall						•		

As previously mentioned, airport users expressed differing views with regards to airport capacity constraints. The spectrum of opinion may be driven by a number of factors:

- The specific location or zone of operation for one airport user may be more constrained than another location and therefore, there is a higher impact to the user's operation/customer experience, relative to other customers.
- A given user's business model and operating requirements will inform their respective priorities with regards to infrastructure capability and levels of service.
- A given user's projected growth profile will drive a specific set of capacity and infrastructure requirements.

The next section provides a detailed summary of user feedback and requirements by primary airport processor.

4.2 User Responses by Airport Processor

4.2.1 Check-in Facilities

A total of four responses were received specifically in relation to the Check-in facility. All four responses focused on the Terminal 2 facility. Users expressed dissatisfaction with the current capacity and availability of check-in desks, which is creating congestion issues, delays in the processing of customers and in general, a poor level of customer experience. Users also expect the situation to worsen in the coming years, if an enhancement solution is not immediately implemented.

Users also proposed the implementation of targeted managed solutions to address the capacity issues, as opposed to investing in terminal infrastructure projects. The primary suggestion was the adoption of enhanced technology to facilitate self-service check-in and automated bag drop (implementation in the current physical location, and also the provision of additional off-site capabilities).

In parallel to this consultation process, a Shared Services Committee was set up to discuss Common User Passenger Processing (CUPP) and Commom User Self-Service (CUSS) requirements. Eight airlines participated and continue to be involved in this process and have expressed an interest in adopting the latest technology, which is designed to improve passenger processing times, maximise the efficiency of the terminal floor-space and ultimately, enhance the customer experience.

4.2.2 Passenger Security Facilities

Dublin Airport received one response in relation to security screening in Terminal 2. Dublin Airport had requested feedback from users on the capability of the screening processors to facilitate the unexpected introduction of the additional ETD tasks . The user responded that there is insufficient capacity in Terminal 2 to manage the current level of activity (the user also flagged that the implementation of LAGS Phase II is expected to decrease passenger processing times 'by as much as 15%').

Dublin Airport also requested feedback on how an airline's operation would be impacted if security screening capacity was reduced at peak times. The user responded that On Time Performance (OTP) would deteriorate due to late passengers arriving at the gate, which ultimately results in a poor passenger experience and customer proposition. Outside of this consultation process, a separate user requested that Dublin Airport improve passenger processing rates in Terminal 1 through an improved usage of the existing resources.

Based on the feedback received, only one operator considered there to be an existing or emerging capacity constraint at the passenger screening processor in Terminal 2.

4.2.3 Departure Gates and Bus Lounges

Six responses were received in relation to departure gates and bus lounges. All responses expressed a requirement for additional capacity across the airside campus. The proposals focused on managed solutions and additional infrastructure. In relation to piers, there was a specific request to extend Pier 1, another to re-use the lower gates on Pier 3 for bussing operations and a third request for the introduction of additional swing gates on Pier 4. There was also a specific request for the development of a pre-boarding zone (PBZ) in the South Apron and finally, a satellite building/pier on the West Apron (to better utilise the facility for passenger operations).

4.2.4 Immigration Facilities

Three responses were received in relation to the primary Immigration processing facilities in both terminals. One user commented that in the short-term, they did not have an objection to passengers queuing along the Skybridge (Terminal 1), provided the queues were managed by either Dublin Airport or a handling agent. However, in the long-term, the user also noted that this situation would not be satisfactory or sustainable. One response was received in relation to Terminal 2, which stated that congestion in Immigration was associated with passenger growth, and is a concern. A final response stated that additional e-gates should be installed at the Immigration facilities.

4.2.5 US Preclearance Facility/Customs and Border Protection (CBP)

Three responses were received in relation to US Preclearance. All responses flagged that current capacity is an issue and options need to be considered to address this constraint. Users commented that they are not prepared to reschedule flights or consider remote stand operations as alternative mitigations.

The solutions suggested were mainly procedural, but specific requests focused on introducing additional global entry kiosks, additional human resources and as a longer-term solution, expanded infrastructure to deliver a larger capacity facility.

4.2.6 Transfer Facilities

Two responses were received in relation to transfer facilities. One user requested the provision of dedicated bussing services for transfer passengers direct from the aircraft to the Transfer Facility on Pier 4. A second user requested that additional resources be introduced on the Dublin Airport Transfer Host Team, to facilitate increased interactions with connecting passengers.

4.2.7 Aircraft Parking Stands

A total of four responses were received in relation to aircraft parking. The feedback is summarised as:

- Lack of contingency stands.
- Additional infrastructure is required.
- Lack of available stands in certain piers is causing delays.
- Two respondents stated that any stands decommissioned must be replaced by an equivalent number of new stands. A further two respondents stated that the South Apron should be expanded, equivalent in size to the recently constructed apron 5G (which has the capacity to simultaneously accommodate 12 narrow-body aircraft).
- No user specifically requested a requirement for contact stands. However, one user did allude to the fact that Dublin Airport should strive to find suitable infrastructure to support the long-haul transatlantic product which includes US Preclearance facility and contact stand operations.

4.2.8 Taxiway System

Two responses were received in relation to the airport taxiway system. The responses stated that on-time performance is critical for an airport and that Dublin Airport's average taxiing time was unacceptable. Users suggested that solutions should focus on a mix of efficiency initiatives and also enhanced physical infrastructure projects. One user specifically provided a very detailed response with numerous managed solution and infrastructure projects suggestions which cross over between taxiway and runway solutions. Examples of suggestions included:

- Build more effective Rapid Exit Taxiways (RETs) and Rapid Access Taxiways (RATs); and
- Visual-docking guidance system and stand guidance systems could improve OTP and taxing times.

Detailed responses to the user's suggestions are contained in Appendix A.

4.2.9 Runway/Air Traffic Management

The scope of this consultation focused on the existing primary Runway 10/28, as the new northern runway will deliver the longer-term capacity solution from 2021. A number of initiatives to increase the capacity on the existing runway are outlined in Section 3.6. The majority of airlines did not support specific proposals to increase the capacity of the existing runway for Summer 2017, with CAR ultimately deciding that runway capacity for Summer 2017 should remain at Summer 2016 levels.

Through the consultation process, one specific user provided feedback in relation to the runway system and air traffic management. A number of managed solutions were proposed, which predominantly relate to the provision of air traffic navigation. As the service provider, the IAA is ultimately responsible for the evaluation of the proposed initiatives. We have engaged with the IAA to provide feedback on each proposal in Appendix A of this document.

4.2.10 Other Facilities

A number of users flagged issues with the availability of parking capacity for ground handling equipment on specific aprons.

Finally, one user raised an issue in relation to the capacity of the Terminal 1 baggage hall.

A full listing of the various user requests and Dublin Airport responses can be found in Appendix A to this document. We provided a response to each specific item. Where a user comment or request related to the provision of services not directly managed by the airport authority, the feedback from the relevant service provider is also included in the response.

4.3 Summary

Eleven airport users (representing 84% of passenger traffic in 2016) responded in writing to this request for views and proposals in relation to capacity constraints and potential solutions to address perceived deficits. All 11 had specific concerns in relation to the current and projected levels of airport capacity over the remainder of the current regulatory period.

Through this dialogue process, we gained an understanding of the totality of user concerns and requests. In some cases, we received user support for specific infrastructure enhancements, which requires full consideration (the evaluation of user proposals is detailed in Section 6 and Appendix A of this document).

Certain user proposals were categorised as longer-term, strategic masterplanning considerations, and outside this exercise (such projects were not capable of an accelerated delivery profile, and so could not begin during this regulatory period). It is important to note that we do not consider such proposals to be invalid or discounted; certain suggestions will form the basis of the 2020-2024 Capital Investment Plan, or indeed are currently under parallel evaluation through the masterplanning process.

Figure 36 summarises the user support for projects by category of solution.

Figure 36: User Support Summary (by Processor and Preferred Solution)

Processor	Managed Solution	Infrastructure Project	Not Stated
Terminal 1 Check-in	•		
Terminal 2 Check-in	•		
Terminal 1 Security	•		
Terminal 2 Security			•
US Preclearance	•	•	
Departure Gates	•	•	
Transfer facility	•		
Aircraft Parking	•	•	
Taxiways/Runway	•	•	
Terminal 1 Immigration	•		
Terminal 2 Immigration	•		

Users identified a range of capacity constraints - no overall consensus.

05 UPDATE ON CURRENT CAPITAL INVESTMENT PROGRAMME

05 UPDATE ON CURRENT CAPITAL INVESTMENT PROGRAMME (CIP)

This section outlines the current status of CIP 2015-2019. It demonstrates that the current CIP is fully committed i.e. cost allowances are fully allocated to projects under construction, with no surplus available to fund additional projects.

5.1 Background

In the 2014 Determination, a total non-trigger capital allowance of €341m was granted by CAR[25]. This allowance is sub-divided into a number of capital envelopes and groupings. Within each category, there are specific 'deliverables' which must be achieved to sanction the specific project allowance.

Within each category, there is some flexibility to deliver additional projects through overall savings or project changes, or to balance over-runs and underspends within the overall allowance. Trigger projects also included in the current determination are illustrated in the table below.

Figure 37: 2014 Determination - Capital Allowances

Grouping	Capital Allowance (€ m)	Deliverables
Airfield Maintenance	125	(a) Runway 10/28 overlay. (b) Runway 16/34 overlay. (c) Pollution control.
Landside and Terminal Maintenance	39	None
Business Development	67	(a) Cargo gate redevelopment.
Revenue	56	(a) Completion of Terminal 2 multi-storey carpark.
Information Technology	41	None
Other	14	None
Sub Total	341	
North Runway (trigger)	247	Initial trigger achieved in 2015.
Additional Runway 28/10 line-up points (trigger)	30	Not yet triggered.
Terminal 2 Hold Baggage System Standard 3 (trigger)	13	Not yet triggered.
Pier 2 segregation (trigger)	18	Trigger to be achieved in 2017.
Total Trigger	308	
Overall Total	**649**	

The CIP flexibility is currently constrained to each specific grouping; i.e. a saving on an Information Technology project cannot be reinvested towards an additional Business Development (capacity) enabling project. Therefore, insufficient allowances are available or transferrable to fund the incremental projects required to accommodate the forecast level of demand to the end of the current regulatory period.

Sections 5.2-5.8 outline the status of each capital grouping, and provide an update on the specific projects within each envelope.

5.2 Airfield Maintenance

In the Airfield Maintenance grouping, €125m was allowed, representing 37% of the total capital expenditure (capex). A number of key runway, taxiway and apron rehabilitation projects are required to ensure that the critical airfield infrastructure remains fully serviceable to support operations. All key projects are currently in progress (the differing phases of construction are listed in Figure 38 on the following page).

[25] Dublin Airport had sought a total non-trigger capital allowance of €396m in accordance with its anticipated growth and associated requirements.

a. **Runway 10/28 Overlay Rehabilitation, Airfield Lighting and Taxiway Aeronautical Ground Lighting (AGL) Upgrade:** these projects are currently on site. To minimise the overall impact on operations, these will be delivered as one single project. The package is expected to complete in Quarter 2 2018. The working hours for this project are limited to 23:00-05:00 each night, in order to minimise the impact on operations and to provide a reasonable working window for the project to be delivered in line with expectations. Alternative phasing options were discussed with airport users at the Dublin Airport Operations Planning Group, but discounted based on the level of impact to operations.

b. **Runway 16/34 Pavement Rehabilitation:** the first phase of this project was completed in early 2015, with the rehabilitation of the 'Runway 16/34 and Taxiway A' junction. The next phase of the project is currently at design stage. This phase is expected to be complete in early 2019.

c. **Airfield Pollution Control:** the feasibility study is currently underway and discussions are ongoing with Fingal County Council and the Environmental Protection Agency (EPA), specifically in relation to the discharge limits allowed to adjacent watercourses (in particular the Cuckoo Stream). The allowable limits will have a direct impact on the quantum of storage and associated infrastructure to be provided. It is expected that works will commence in Summer 2018, for completion in late 2019.

d. **Apron, Taxiway and Road Rehabilitation:** projects are underway and a number of phases are complete, with over 30,000sqm of airfield pavement rehabilitated to date. This includes two phases between Piers 3 and Pier 4 (circa 20,000sqm) completed in March 2016 and April 2017 respectively. The rehabilitation of Taxiways B7 and E3 were recently completed as part of the Runway 10/28 overlay project. It is expected that this work will continue to the end of 2019. The ability to carry out essential apron and taxiway rehabilitation is becoming increasingly challenging, as the windows for construction are reduced to primarily the winter season; i.e. November to mid-March. This is due to the lack of contingency parking stands in summer, which are required to facilitate relocated operations due to the apron works around the piers.

e. **Airfield Vehicle Provision:** a programme of airfield vehicle provision and replacement is ongoing and this will continue throughout the current regulatory period. Vehicles replaced to date include glycol recovery vehicles, runway towed jet sweepers, pavement de-icing vehicles, ambulance, sweeper vehicles, tractors and other essential maintenance and operations vehicles.

Figure 38: Summary of Airfield Maintenance Projects

Airfield Maintenance Projects	CIP No.	Project Status	Capital Allowance
Runway 16/34 Pavement Rehabilitation	6.001	Ongoing	€24.5m
Runway 10/28 Overlay Rehabilitation	6.017	On Site	€22.5m
Apron Rehabilitation	6.002	Ongoing	€21.1m
Airfield Taxiway Rehabilitation	6.055	On Site	€16.1m
Airfield Lighting Upgrade (RWY 10/28)	6.004	On Site	€9.2m
Airfield and Apron Road	6.006	Ongoing	€1.7m
Taxiway AGL Upgrade	6.009	On Site	€3.9m
Airfield Vehicles and Equipment	4.001	Ongoing	€5.7m
Airfield Pollution Control	9.022	Feasibility	€20.1m
Sub Total			€124.8m
New Projects			
Airport Masterplan Development			€0m
Total			**€124.8m**

5.3 Terminal and Landside Maintenance

In the Terminal and Landside Maintenance category, €39m was allowed across a range of campus and Terminal (T1) projects. Figure 39 lists the status of key projects.

a. **Terminal 1 Roof Repairs/Upgrades:** Phase 1 (T1 6-Bay) andPhase 2 (T1 8-Bay) are complete. Phase 3 is currently under design and expected to commence in Quarter 3 2017, for completion in late 2018.

b. **Terminal 1 Critical Equipment Upgrades:**

   i. Life Safety Systems Upgrade Phase 1 is complete. Phase 2 is currently on site. Phase 3 is at design stage.

   ii. Phase 1 of smoke dampers in Terminal 1 have been completed, with Phase 2 due to commence in Quarter 3 2017.

   iii. Baggage system upgrades, including baggage reconciliation (Phase 1) completed in Terminal 1, with additional phases ongoing into 2019.

c. **Pier 2 Heating Ventilation Air Conditioning** (HVAC) works are on site and will be complete in Quarter 3 2017. Some savings will be made on this project to accommodate additional projects required that were not covered in the CIP such as Terminal 1 Departures Road and the Airport Masterplan.

d. **Medium Temperature Hot Water:** the first phase of the Medium Temperature Hot Water (MTHW) upgrade in Terminal 1 has been completed and design is underway for future phases.

e. **Energy Conservation Pojects:** a number of energy conservation projects (i.e. LED lighting, heating upgrade and boiler upgrades) are now delivering €200k in annual energy.

Figure 39: Summary of Terminal and Landside Maintenance Projects

Terminal and Landside Maintenance Projects	CIP No.	Project Status	Capital Allowance
Light Vehicle Fleet	4.002	Ongoing	€2.2m
Carpark Maintenance	3.004	Ongoing	€4.5m
Landside Infrastructure Utilities	3.001	Ongoing	€4.6m
Terminal 1 Roof Upgrades	7.102	Phase 1 and Phase 2	€8.0m
Terminal 1 Baggage Reconciliation System	4.005	Phase 1 Complete	€1.1m
Terminal 1 Critical Equipment Upgrades	4.006	Ongoing	€6.0m
Heating Ventilation Air Conditioning and Baggage	7.104	Ongoing	€7.5m
Central Search Equipment (Capital Maintenance)	4.007	Ongoing	€2.7m
External Roads	3.035	Phase 1 Complete	€2.0m
Sub Total			€38.6m
New Projects:			
Repairs to Departures Road		Complete	€0m
Departures Floor Rehabilitation		On Site	€0m
Masterplan Development		Ongoing	€0m
Total			**€38.6m**

5.4 Revenue

In the Revenue grouping, €56m was allowed to deliver the approved projects. The status of the key projects is listed in Figure 40 below.

a. **Terminal 2 MSCP Upgrade:** this project was completed in early 2016 and delivered four more levels, providing an extra 1,400 carpark spaces. The specific allowance covered two new levels, but flexibility within this grouping was utilised to provide a further two levels (total of four constructed). This project provided much needed additional short-term car parking capacity and is also delivering increased commercial revenues.

b. **Long-Term Carpark** - Surface Upgrade: this project was completed in Summer 2016, with circa 5,000 long-term spaces in the Red Zone carpark upgraded to a porous surface course (delivering a superior quality product to competitors). Parking rates were subsequently increased in 2016, with higher volumes of customers now using the carpark (which is delivering incremental revenue).

c. **Commercial Property Refurbishments:** key projects delivered to date include Skybridge House refurbishment and the development of the Preclearance Lounge. This programme will continue into 2019, and is required to provide facilities for a number of new airlines commencing operations at Dublin Airport.

d. **Digital Advertising:** the digital advertising project completed in early 2016 delivered multiple new advertising screens across both terminals, which are now generating commercial revenue in line with projected targets.

e. **Retail Refurbishments:** certain projects are ongoing in both terminals, with future phases planned for completion in 2018 and 2019.

Figure 40: Summary of Revenue Projects

Revenue Projects	CIP No.	Project Status	Capital Allowance
Terminal 2 Multi-storey Carpark Phase 2	2.006	Complete	€12.4m
Digital Advertising Point of Display	2.010	Complete	€1.0m
Long-term Car Park Resurfacing	3.006	Complete	€6.8m
Commercial Property Refurbishments	2.031	Ongoing	€10.6m
Retail Refurbishments	5.001	Ongoing	€12.2m
Commercial Hangars Infrastructure	2.005	Design Stage	€0.6m
Cargo Terminal Development	2.007	Project Deferred	€2.2m
Consolidated Car Rental Centre	7.116	Project Deferred	€10.1m
Sub Total			€55.9m
New Projects			
Preclearance Lounge		Complete	€0m
Pier 3 Link Upgrade		Complete	€0m
M50 Garage Roof Replacement		Complete	€0m
VIP Refurbishment and General Aviation		Complete	€0m
Terminal 1 Executive Lounge Expansion		Ongoing	€0m
Miscellaneous Minor Projects		Complete	€0m
Total			**€55.9m**

The Consolidated Car Rental Centre has been deferred by the business (requirements and associated benefits not crystallising at this juncture). The allowance has been transferred to fund additional revenue projects; e.g. Terminal 2 MSCP additional levels and the Preclearance Lounge (both identified above).

5.5 Information Technology (IT)

In the IT grouping, CAR allowed €41.3m to cover the necessary infrastructure and technology improvements. These support the ongoing business demands, which are increasingly more technology focussed and evolving towards automated, self-service solutions.

IT projects are smaller in scale than large infrastructure projects and so it is not practical to provide a status update on each specific project.

a. **IT Technology and Lifecycle Management:** this grouping encapsulates Infrastructure and Devices, Operating Platforms and Integrations, Licensing and Networks. At the end of 2017, 50% of the total allowance will be invested. This expenditure ensures we have robust hardware and networks in place to support the current business, and also future growth to meet airline and passenger demands. Examples of expenditure to date include an enterprise re-platform project that moved all applications from older AIX technology onto a more secure and future proofed Linux platform. There are lifecycle programs in place to replace hardware and network components to guarantee service levels to the airport. Dublin Airport has also invested significantly in WiFi to deliver best in class passenger service. Hardware, Software and Database Licenses are purchased on an ongoing basis to allow us use the current technology as well as supporting growth in line with our technology footprint and user base.

b. **IT Business Systems:** this category is expected to be 30% over the original allowance by the end of the period and will utilise savings made in Retail IT and Business Innovation Investment. At the end of 2017, 60% of the expected total spend will be incurred. To date, significant new projects have been completed, in addition to continuous investment in the existing systems, to ensure they meet the business needs. The key areas of investment are: Access Control, CCTV, Airport Operating System, FIDS, Baggage Systems, Mobile Applications, Energy Management, Commercial System upgrades and Support services (e.g. Oracle, Business Intelligence and Forecasting). The projects include a mix of 'Run' and 'Transform' initiatives. Run projects include upgrades of existing applications e.g. Baggage Software upgrade in Terminal 2. Typically, these are required when the current solution is running on out of support platforms. Transform projects include rollout of new applications to the airport e.g. Energy Management system to better manage our Utilities and Billing, extension of CCTV solution across both terminals, mobile responsive B2C websites and Mobile Apps. Ongoing investment in Data and Analytics through leveraging our data assets supports real-time operational reporting and decision making. Advanced Analytics developments allow us to plan more accurately around resources both human and physical to ensure the smooth operation of the airport.

c. **Retail IT:** an allowance for miscellaneous items of €1.6m was granted. 40% of this has been spent to date on projects such as BI enhancements, upgrade of the ARI ERP, Navision investment in till hardware. The remaining allowance will be used to fund the additional IT Business System investments not assigned an allowance as part of the original CIP.

d. **Business Innovation Investment:** to date, 60% of this allowance has been invested. This category provides a level of flexibility to invest in general innovation projects such as ACDM, visual docking guidance, IT platforms and

Figure 41: Summary of IT Projects

IT Projects	CIP No.	Project Status	Capital Allowance
IT Technology and Lifecycle Management	8.008	Ongoing	€15.9m
IT Business Systems Investment	8.009	Ongoing	€15.7m
Retail IT	5.002	Ongoing	€1.6m
Business Innovation Investment	8.009c	Ongoing	€8.1m
Total			**€41.3m**

Applications. There have been significant investments in passenger handling including a new CUPPS (Common Use Passenger Processing) solution across all check-in and boarding gates, and CUSS (Common Use Self-Service). There are plans to rollout CUSS fully across both terminals to meet the airlines' future needs. Dublin Airport is also investing heavily in A-CDM to ensure that the systems and processes can integrate with all aviation stakeholders to maximize Infrastructure resources (e.g. stands and gates), and deliver cost savings to airlines (e.g. reduced taxi times, fuel etc). We have begun a feasibility study for an Advanced Docking Guidance System. This is required to address certain compliance issues in addition to providing key operational data to pilots on stand. The total spend is forecast to be 29% under the CAR allowance and will be used to fund other IT Business System investment projects (not assigned an allowance as part of the original CIP).

e. **Common User Self Service (CUSS)** was allocated €1m as part of original CIP. To date, Dublin Airport has invested €2.2m on a number of installations to support customer needs across both terminals. Operators have requested CUSS Phase II to commence, which will involve Terminal 1 users moving to a two-step layout, CUSS clusters in Terminal 1 and configuration changes in Terminal 2, costing €1.7m. This additional €2.9m (€3.9m less €1.0m allowance) cannot be accommodated as part of the original CIP flexibility, as the allowance will be exhausted by other pressing IT projects.

5.6 Other Category

In the Other grouping, €14m was allowed to cover the minor projects and the full CIP programme management. The status of the key projects in this group are listed in Figure 42 below.

a. **Minor Projects:** ongoing status and will continue to 2019. Key initiatives are airfield paint markings, Terminal 1 chiller upgrade, and repairs to Hangar One doors. Over 100 minor projects have been completed to date across the campus.

b. **Programme Management:** on-going and in-line with the project delivery profile. Will continue to the end of 2019 and is required to manage the interdependencies between projects and provide consistent governance and protocols for the delivery of all projects.

Figure 42: Summary of Other Projects

Other Projects	CIP No.	Project Status	Capital Allowance
Minor Projects	8.001	Ongoing	€10.1m
Programme Management	8.200	Ongoing	€3.5m
Total			**€13.6m**

5.7 Trigger Projects

A number of 'triggers' were included in the 2014 Determination. The status of each trigger project is outlined in Figure 43 below.

Figure 43: Summary of Trigger Projects

Trigger Projects	CIP No.	Project Status	Capital Allowance
Pier 2 Segregation	7.111	Trigger to be achieved in 2017	€18.1m
North Runway	6.051	Initial trigger achieved in 2015	€247.0m
Additional 28/10 line-up points	6.013	Not Triggered	€30.2m
Terminal 2 Hold Baggage Standard 3	4.003	Not Triggered	€13.1m
Total			**€308.4m**

a. **Pier 2 Segregation:** the trigger of segregation being mandated by a regulating authority has been reached and the project commenced construction in 2016. All works are due for completion by the end of 2017. In this regard, Customs and Immigration have confirmed in writing that the current project, once completed, will meet the requirements in relation to passenger segregation from all destinations. Currently, the pier primarily only serves UK destinations. This project will provide flexibility to support operations to and from all destinations throughout the day. In addition, this project will allow segregation of bussed passengers from non-bussed departing passengers. The allowance will be fully utilised on this project.

b. **Northern Runway:** the trigger of 25 mppa in a 12-month period was achieved in 2015 and this project commenced construction in 2016. The runway construction is expected to be completed in 2020.

c. **Additional Runway 28/10 Line-up Points:** the trigger of capacity in the peak hour (06.00-07.00 local) being declared at 37 departures has not been achieved to date. This project is on hold, pending the activation of the trigger. Section 6.5 will cover this project in detail. It has been determined that Runway 28 additional line-up points will not deliver the capacity enhancement originally envisaged. The Airsight Critical Review of Taxiway Systems report recommends not developing additional infrastructure in this already complex and operationally challenging hotspot. The report suggests de-constructing taxiways and intersections in this location. For both these compelling reasons, if the trigger is achieved in the current regulatory period, we strongly recommend refocusing development attention to Runway 10, as it is expected to be the future primary departure runway in an easterly flow, and the line-up infrastructure for this runway is currently not sufficiently developed to support the expected increases in activity under the future parallel runway system.

d. **Terminal 2 Hold Baggage System Standard 3:** this project is mandated through legislation and the timeline for EDS (Explosive Detection System) technology is set out in *'Commission Implementation Regulation (EU) No. 1087/2011 of 27 October 2011'*, which states that (12.4.2.7) *'Standard 2 shall expire on 1 September 2020.'* and (12.4.2.11) *'All EDs shall meet standard 3 by 1 September 2020 at the latest, unless point 12.4.2.8 applies.'* (12.4.2.8) *'The appropriate authority may permit standard 2 EDS, installed between 1 January 2011 and 1 September 2014, to continue to be used until 1 September 2022, at the latest.'* As EDS became operational in Terminal 2 in late 2010, it is outside this derogation period and therefore must be operational by 1st September 2020. This project is currently at design phase, however the trigger for remuneration will not be achieved until the next regulatory period.

5.8 Business Development

In the Business Development grouping, €66.6m was awarded to support a three million increase in annual passenger traffic by the end of the current regulatory period. The planned scope of the Business Development grouping is:

- Provide capacity to enable the core traffic forecast to 2019 (24.8 mppa).
- Facilitate the safe operation of large aircraft (e.g. B777).
- Safeguard the continued operational life of Terminal 1 and facilitate a rebalancing of activity across terminals.
- Provide additional efficiencies in airport operations and for customers.

Following the accelerated growth experienced in 2015, it was clear that the Business Development allowances awarded in the CIP would be insufficient to meet the capacity demands over the remainder of the current regulatory period. A revised strategy was developed to reallocate the allowed capex across the most efficient and beneficial projects. This revised strategy included:

- Enable the relocation of non-passenger services (e.g. cargo) to the west of Runway 16/34, which would free-up capacity on the eastern campus to support additional passenger services.
- Accommodate increased gauge and larger capacity aircraft on Piers 2 and 3.
- Develop an improved transfer solution, with a streamlined passenger experience.
- Increase the number of available US Preclearance stands on Pier 4.
- Increase the availability of walk-out stands on Pier 1.
- Defer non-essential projects that do not elevate safety or increase capacity.

The revised strategy deferred some less urgent projects and reprioritised other projects to directly support the accelerated passenger growth profile. The existing Business Development allowance is now fully exhausted. Details of the projects are highlighted in the table below (Figure 44).

Figure 44: Summary of Business Development Projects

Business Development Projects	CIP No.	Project Status	Capital Allowance
Cargo Gate Redevelopment	6.021	Complete	€1.8m
Central Search Area – New Technologies	4.004	Phase 1 Complete	€13.2m
Terminal 1 Arrivals	7.121	Complete	€8.9m
Terminal 1 Façade	7.119	On Site	€0.7m
Terminal 2 Transfer Facility	7.117	On Site	€21.6m
Airfield Infrastructure for large[26] aircraft	6.007	On Site	€1.5m
Consolidated Staff Car Park	2.017	Design Stage	€1.5m
Pier 3 Flexibility	7.116	Project Deferred*	€15.1m
Fixed Electrical Ground Power Terminal 1	7.103	Project Deferred	€1.5m
Airport Screening Centre	6.022	Project Deferred	€0.8m
Total			**€66.6m**

*While the Pier 3 flexibility project is currently on hold, an element of the project has been delivered through the Pier 3 Realignment project, whereby additional provision has been made for B777 x 3 aircraft and A350 x 3 aircraft. While a solution for code F aircraft has yet to be delivered, alternatives are currently being examined.

[26] Includes modifications to existing taxiways to accommodate Code E, B777 also as some existing taxiways not designed to accommodate B777 and B747

Figure 45: Summary of Additional Priority Projects

Project	Project Status	Capital Allowance
Extension of CPSRA to Airfield	Complete	€0m
Terminal 2 Level 10 Bussing Gates x 2 - Phase 1	Complete	€0m
Terminal 2 Stand 400C conversion for CBP	Complete	€0m
Pier 1 Ground Floor Boarding Gates	Complete	€0m
Pier 3 Link Upgrade	Complete	€0m
Pier 3 Realignment and Additional stand	Complete	€0m
Terminal 2 BHS Transfer Dock	Complete	€0m
Pier 2 Realignment	Complete	€0m
Realignment of Taxiway Zulu	Complete	€0m
Miscellaneous Capacity Projects	Complete	€0m
Total		**€0m**

The above additional projects, which received no allowance in the 2014 Final Determination, have been prioritised to deliver essential capacity and have been completed or are currently under construction. These projects will be funded through allowances from deferred projects.

Such projects are necessary to facilitate the current and expected growth profile, and focus on a number of requirements; an increase in the number of stands available on the eastern campus, an increase in bussing facilities to service remote stands, an increase in baggage transfer capacity and the provision of enhanced operational flexibility. The outline projects to facilitate these requirements are:

a. **Extension of the 'Critical Part of the Security Restricted Area'** CPSRA airfield project allowed for the relocation of cargo services to a more accessible West Apron. Cargo operators fully support the initiative. To date, FedEx have relocated its full operation to the West Apron and DHL have relocated its evening operation (with full operations expected to be relocated in Quarter 4 2017). Other cargo operators are also requesting relocation to this area and additional facilities will be required to support the next phase of relocated operations. This maximizes the ability to accommodate passenger services on the the eastern campus.

b. **Provision of an additional stand and increased flexibility on Pier 3** through the Pier 3 Realignment project increases aircraft gauge from A330 to B777/A350 on three stands. It also provides an additional 'walk out' Code C contact stand, thereby increasing the capacity of Pier 3 from 10 NBEs to 11 NBEs. This initiative was progressed by leveraging the recent changes to aircraft clearances published by the European Aviation Safety Agency (EASA).

c. **Provision of an additional US Preclearance gate** on Pier 4 through conversion of gate 412 to a sterile US Preclearance gate provides the ability to park additional US Preclearance aircraft on Pier 4, while also maintaining the ability to accommodate short-haul operations and safeguard the Terminal 2 transfer facility (currently under construction).

d. **Provision of two extra bussing gates** on Level 10 Terminal 2 (gates 336 and 337). This project provides extra capacity to bus passengers from Terminal 2 to remote stands (generally to aircraft parked on the central apron or northern aprons) for first wave departures.

e. **Provision of additional boarding facilities** on the existing ground floor of Pier 1, thereby allowing 'walk-out' access to two existing aircraft parking stands (119 and 120). This greatly improves efficiency and removes the need to bus passengers to these stands.

f. **Installation of an incremental transfer dock** in Terminal 2 was required to meet the growth in transfer passengers in the peak hour and enable transfer baggage capacity to increase from 540 (in 2015) to 810 (forecast for 2019).

g. **Realignment of the stands on Pier 2** has provided increased flexibility by providing a new Code E Multi Aircraft Ramp System (MARS) stand, an increase from Code D to Code E x 1 stand and an increase in aircraft gauge on five Code C stands. This project will provide additional parking capacity for long-haul aircraft and reduce the number of tows from Piers 3 and 4 to the west and northern aprons.

h. **Realignment of Taxiway Zulu** has increased the capacity of Code C aircraft to/from the South Apron and Pier 4 South, by allowing simultaneous Code C movements on Taxiway B1 and Taxiway Z.

5.9 Summary

Dublin Airport is committed to optimising the full suite of capital allowances awarded under the current regulatory determination. We are currently focused on delivering the reminder of the priority CIP projects. However, it was necessary to defer a number of non-essential projects and to reprioritise all flexibility and savings towards a number of critical 'capacity enabling' projects. These have successfully been delivered within the Business Development allowance. This grouping is now fully exhausted (€66.6m), and there is no scope or funding remaining to accommodate any additional capacity-enhancing or efficiency projects.

06 PROGRAMME OF AIRPORT CAMPUS ENHANCEMENT

06 PACE – PROGRAMME OF AIRPORT CAMPUS ENHANCEMENT

6.1 Overview

Sections 3 and 4 of this document outline the key requirements of customers (as provided to Dublin Airport), and highlighted a number of emerging capacity constraints across specific modules of airport infrastructure. As a result, we commenced a review to identify targeted solutions for addressing customer requirements and the specific capacity deficits across the airport campus. The scope of the review was focused on the core aeronautical business; specifically, passenger processor facilities and airfield efficiency.

A number of solutions were identified and evaluated under a set of key principles:

- Drivers are to support additional demand opportunities, alleviate known capacity constraints and improve user and customer experience.
- Conceptually a 'Needs-Must' process. Limited flexibility for opportunistic or 'nice to have' projects.
- Maximise cross-usage, flexibility and interoperability.
- Projects must have an accelerated delivery profile.
- Cost efficiency and effective.
- Requires a degree of user support (but not unanimous user support).

PACE is the output of this review. PACE is a set of interdependent projects, designed to enhance the airport experience for all customers.

6.2 Proposed PACE Projects

This section outlines the full suite of potential projects identified as part of the twin track process; i.e. capacity assessment and customer requirements. The PACE projects are presented under three work-streams: Passenger Processing; Aircraft Parking Stands; and Airfield/ Taxiway System.

We are committed to providing interested parties with appropriate levels of project information, so they can undertake parallel evaluations and assessment. That is why Dublin Airport's proposed solutions are developed to concept design level, along with the associated cost estimates and timelines for delivery. Project visuals such as drawings, 3D renders and details of software modelling are provided. It is important to note that the proposed projects are not refined to detailed design stage; proposals are high-level concepts with scope for improvements and amendments during the detailed design phase.

A total of 28 projects were identified and assessed. The majority of the projects are capital infrastructure solutions.

Figure 46: Summary of Projects by Category

	Projects Assessed			Projects Proposed		
Category	Total Projects	Managed Solutions	Capital Infrastructure	Proposed Projects	Managed Solutions	Capital Infrastructure
Passenger Processing	9	1	8	4	1	3
Aircraft Parking/Stands	13	0	13	8	0	8
Airfield/Taxiways	6	0	6	4	0	4
Total	**28**	**1**	**27**	**16**	**1**	**15**

Each category will cover:

- Findings from the capacity assessment.
- High level customer requirements.
- Full suite of solutions identified and assessed as part of PACE.
- Capital projects proposed by Dublin Airport and associated benefits.
- Capital projects deferred or not proposed by Dublin Airport.
- Cost relating to each project .

6.3 Accelerated Projects

A select number of critical projects emerged during the review process that required immediate delivery under an accelerated construction programme. Customers declared the projects essential for fulfilling their business objectives in 2017. Timelines for the completion of the projects averaged 20 months. The projects could not be accommodated through current CIP flexibility (see Section 5.8) and required progression in advance of general consultation to ensure an expedited delivery before the end of 2017. We pre-consulted with stakeholders to obtain their approval for immediate progression and then commenced construction at the earliest opportunity.

This sub-group of key projects are; Pier 1 Extension, Pre-Boarding Zone (PBZ), Common User Self Service (CUSS) - Phase 1 and Phase 2, South Apron Stands and Immigration e-gates. Detailed information is provided in the following sections.

6.4 Passenger Processing

The capacity assessment in Section 3 of this paper identified four passenger processors that will constrain growth during this regulatory period. Airport users identified eight processors that would constrain growth in the near-term (summarised in Figure 47). PACE identified nine projects that could address immediate capacity shortages: one is a managed solution, and eight are categorised as capital projects. The total cost of these projects amounts to €78m.

6.4.1 Check-in (Terminal 1 and Terminal 2)

The capacity assessment identified Terminal 2 check-in as a capacity constraint. Four users also identified Terminal 2 check-in as a limiting factor. No specific constraints were flagged in Terminal 1, although there is a strong requirement from many customers for the airport to implement enhanced check-in technology. While this solution is not necessarily required to address immediate capacity issues in Terminal 1, users are requesting the technology to enhance the efficiency of the check-in process, and to ultimately provide passengers with a self-service option. CUSS is also driving operational efficiencies for the airlines through improved ground resourcing.

Figure 47: Summary of Passenger Processors

Processor	Capacity Assessment	Users
Check-in Terminal 1	No Constraint	Constraint
Check-in Terminal 2	Constraint	Constraint
Central Search Terminal 1	No Constraint – Subject to LAGS	Constraint
Central Search Terminal 2	No Constraint – Subject to LAGS	Constraint
US Preclearance	Constraint	Constraint
Gate Lounges/Bussing	Constraint	Constraint
Immigration – Terminal 1	Constraint	Constraint
Immigration – Terminal 2	No Constraint	Constraint

The review identified a number of possible solutions for addressing the current check-in constraints: CUSS implementation, and a check-in hall expansion project in Terminal 2.

CUSS Implementation – Phased Approach

The CUSS investment to date has been implemented in two phases. The request from users for Phase 1 CUSS arose during the planning and design stage of the replacement (Common User Passenger Processing) CUPPS project, whereby airlines and handlers requested increased functionality through the introduction of CUSS passenger processing technologies. The airline and user business rationale for CUSS was:

- Reduced passenger processing time at the check in area and provision of enhanced customer experience.
- Accelerated airline and user efficiencies in the delivery of passenger services.

Prior to introducing CUSS in Terminal 2 west, the check-in queues regularly spanned the length of the terminal and at peak times, spilled out onto the kerbside. The need to address such queues was one of the key CUSS investment drivers. In addition, Terminal 1 airlines required CUSS to deliver efficiencies and increased processing rates. The technology has been extremely well received by customers and operators, with the self-service features providing an enhanced level of customer experience.

1. **CUSS Phase 1 - Terminal 1 Check-in (Area 12 and13) Terminal 2 west side (€2.2m)**
   CUSS Phase 1 entailed the installation of ten self-service kiosks and nine bag drop units across Terminal 1 and Terminal 2 during Quarter 4 2015/Quarter 1 2016. The final outturn project cost for Phase 1 was €2.2m. A detailed project sheet is included in Appendix B.
2. **CUSS Phase 2 - Terminal 1 Check-in; 2 Step process and Terminal 2 west side (€1.7m).**
   Following the successful implementation and operation of CUSS Phase 1 and in response to user requests for further investment and enhancement, Dublin Airport initiated CUSS Phase 2. The scope of CUSS Phase 2 included:
   - Terminal 1 carriers move to a 2-step CUSS process.
   - CUSS clusters in Terminal 1 – additional users.
   - CUSS configuration changes in Terminal 2 (west side).
3. **Proposed CUSS Phase 3 - Terminal 2 Check-in east side (€3.0m)**
   As described in Section 3.3.1 of this paper, the demand for check-in desks on the east side of Terminal 2 is oversubscribed. By 2019 there is expected to be a shortfall of between 6-8 check-in desks to meet Summer 2019 demand.

The total cost of the three phases is estimated at €6.9m. The CIP contained an allowance of €1m.

Alternative Solution - Capital Infrastructure

A capital infrastructure solution was assessed, which would extend the Terminal 2 check-in building on the east side, to accommodate the additional check-in desks. The indicative cost associated with the extension is €20m. The project would take three years to complete (Appendix C).

Proposal

It would clearly not be practical nor efficient to progress a €20m terminal expansion project, when a cost effective and accelerated solution already exists in the form of CUSS technology. The CUSS €3m investment can be delivered over a six month period. We therefore recommend the progression of this initiative, which can be delivered in time to meet the required Terminal 2 east side check-in 2019 demand.

Regarding Phases 1 and 2, we are seeking approval for the €2.9m CUSS investment incurred to date (over the CIP allowance of €1m), as the projects required commencement immediately in order to facilitate user requirements in 2017. We deducted the €1m allowance granted as part of the original CIP, determining the total cost of the combined CUSS investment.

Figure 48: CUSS Investment

CUSS	€'m
CIP Allowance	(1.0)
Phase 1	2.2
Phase 2	1.7
Phase 3	3.0
Net Investment	**5.9**

6.4.2 Central Search (Security)

The capacity assessment in Section 3 identified Security in both Terminal 1 and Terminal 2 as potential constraints to growth, especially under a requirement to implement LAGs Phase II/III. A specific user also raised concerns on Terminal 2 security capacity. Additional processing lanes were provided in Terminal 2 in 2015 and 2016, increasing the total capacity from 16 to 18 lanes. This project was funded through CIP flexibility and was not originally included in the 2014 CIP allowance.

Implementation of LAGs Phase II/III will increase processing times at security and invariably reduce capacity. At time of writing, it is unclear as to when this regulation will be mandated - it is not expected in this regulatory period. Section 3 flagged that security capacity in both locations could accommodate the implementation of LAGS, but any capacity headroom would be greatly diminished, rendering security operating at close to maximum capacity.

The review identified two minor projects that could expand the Central Search floor-space to accommodate additional security lanes. Details on the projects are as follows:

- **Terminal 1 Central Search Expansion costing €2m.** This project requires the relocation of the existing Staff and Fast Track security area to accommodate two additional ATRS security lanes.
- **Terminal 2 Central Search Expansion costing €1m.** This project requires installing an extra security lane as well as realignment of the existing security lanes to increase efficiency.

Proposal

We recommend deferring both projects on the basis that LAGs Phase II/III will not be implemented in the current period and therefore, sufficient capacity exists to accommodate demand. Refer to Appendix C for project details.

6.4.3 US Preclearance

The capacity assessment in Section 3 identified the US Preclearance facility as a potential constraint to growth in the near-term. Three users also flagged the capacity of the facility and suggested the following improvements:

- Increase TSA resources.
- Increase processing booths.
- A larger facility to support long-term growth.

Infrastructure solutions were assessed, which could extend the US Preclearance facility to accommodate the additional security lane required and provide additional queuing space to meet the 2019 demand. However, this solution would result in the loss of adjacent critical infrastructure on Pier 4; i.e. a much-needed contact stand and a reduction in size of the Pier 4 underpass. For this purpose, this project was not considered a viable option.

An alternative solution was developed, which required the construction of additional floor space on the Departures level of Pier 4 to create a corralled queue space for additional APC (Automated Passport Control) processing kiosks. This would regulate passenger flow into the TSA screening, as additional processing would be completed on the Departures level. The proposal was modelled using CAST simulation with 2019 schedules and the assumptions were validated. The estimated capital cost to extend the building at Departures level is €3m. This option provided temporary capacity relief to accommodate the demand up to 2019, and would become constrained again. In addition, the feasibility, design, planning and construction of this new facility would take circa 18 months and would therefore be complete in 2019, at which point the facility would be constrained. This solution does not provide for expansion and so a more sustainable longer term solution is required. The ultimate solution is an expansion to the TSA and US Preclearance processing facility. This is being considered as part of the masterplan, to provide more long term capacity. For these reasons, and to avoid nugatory expenditure, we recommend that this option is deferred until a more permanent solution is developed as part of the masterplan process. In the interim, managed solutions are being progressed to coordinate demand.

Proposal

In the absence of a suitable infrastructure solution, Dublin Airport will maximise the efficiency of the existing facility by implementing a number of managed solutions. As solutions materialise, agreement will be required with users regarding incremental operating costs.

Dublin Airport are currently progressing the below short-term solutions:

- Negotiating with US authorities for additional Customs and Border Protection Officers to be deployed during peak periods.
- Obtaining greater flexibility regarding the deployment of existing APC technology – e.g. alternative locations.
- Negotiating with authorities for wider use technology solutions e.g. development of a mobile app.
- Deployment of additional Dublin Airport resources to manage queues on the Departures level.

6.4.4 Gate and Lounge Facilities

Both the capacity assessment and user consultation responses identified the immediate need for additional Gate and Lounge facilities. The capacity assessment identified a shortage of four departure gates in Terminal 1 from 2017 and a shortage of three gates in Terminal 2 from 2017, with a further four gates required to accommodate 2019 demand. A total of six users raised concerns regarding insufficient gate capacity to meet demand; two users in relation to Terminal 1, and four users in relation to Terminal 2. As discussed in Section 6.3, we were requested to progress a number of critical projects immediately in order to ensure completion before the end of 2017. Two such projects support the delivery of the 2017/18 demand requirements and received customer support in advance of construction.

Project 1 – Pier 1 Extension €7.6m

In order to accommodate the shortfall of departure gates in Terminal 1, Pier 1 Extension is being progressed. This will provide four new boarding gates, and will increase the number of contact stands on Pier 1 from 21 to 23. This extension provides additional floor space of circa 900sqm. The project also delivers toilets on the ground floor of Pier 1 and a coffee shop to serve the four additional boarding gates. The additional boarding gates will enable an increase in pier-served aircraft to be simultaneously boarded than is currently possible, through stands 118R, 119, 119R and 120L. There are currently ten Code C contact stands (110-122) around the end of Pier 1 which are served by only six boarding gates; four on the departures level and two on ground floor level. Gate capacity is currently a constraining factor in maximising the use of stands at Pier 1. Delivering additional gate lounge capacity will; enable the two remote stands (119R and 120L) to become contact stands, thereby delivering 23 contact stands around Pier 1 without the necessity to bus to these aircraft; and will relieve current congestion by providing a more favourable 'gate to stand' ratio. The 'gate to stand' ratio is detailed in Figure 49.

Figure 49: Stand to Gate Ratio

Year	Stands	Gates	Stands per gate
Summer 2015	8.0	4.0	2.0
Summer 2016	10.0	6.0	1.7
Summer 2017	12.0	8.0	1.5

The Pier 1 extension currently accommodates circa 20 flights on average per day and has a throughput capacity in excess of 1m passengers per year.

The cost of this project is €7.6m and this includes safeguarding the roof structure and associated steelwork for a future upper floor extension should the need arise.

Project 2 – Pre-Boarding Zone (PBZ) €22m

In order to accommodate the shortfall in departure gates in Terminal 2, the South Apron PBZ is being progressed as the preferred option. This is a satellite boarding gate facility comprising five boarding gates to service nine aircraft stands on the South Apron. The PBZ is a single-storey modular building circa 117m long x 19.5m wide, with a gross internal floor area of circa 2,200sqm. This project includes the installation of toilet facilities and a coffee dock within the PBZ, and the refurbishment of the Pier C bus gates to enable shuttle bus departures to the PBZ.

This project is being carried out in lieu of a previous option to develop four additional bus gates in Terminal 2 Level 15 (Departures Level), which would require bussing directly to the aircraft.

The pre-boarding zone on the South Apron will have additional benefits:

- It will reduce the number of buses required to service nine narrow body remote stands on the South Apron for first wave departures and throughout the day.
- It will improve the On-Time Performance (OTP) of these aircraft stands, by achieving greater predictability of embarking and disembarking passengers from aircraft.
- It will provide a better passenger experience by having contact stands where passengers can walk directly from a gate facility to the aircraft in lieu of the original proposal, bussing directly from Level 15 bus gates.

It is expected that the PBZ will accommodate circa 30 flights on average per day and has a throughput capacity in excess of 2m passengers per year.

The cost of this project is €22m and this includes the refurbishment of Pier C bus gates.

Proposal

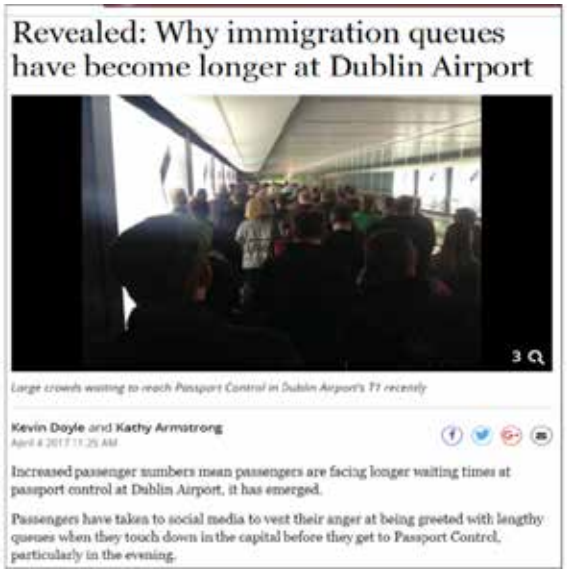
Dublin Airport has progressed both projects based on strong user support through pre-consultation and is seeking a combined project approval of €29.6m. Please see Appendix B for further project details.

6.4.5 Immigration Facilities

In the capacity consultation, one user described the Terminal 1 facility as constrained, and two users identified the Terminal 2 facility as an emerging constraint.

The capacity assessment in Section 3, identified the primary Terminal 1 Immigration facility as a significant constraint in 2017 and the capacity of the facility is not sufficient to support the expected increase in future volumes, both in terms of throughput and the physical queuing space required before presentation to Immigration. Significant service quality issues are arising daily at Terminal 1 Immigration, with unacceptably long queues backing up escalators and onto the Skybridge. The current situation is requiring significant resources to manage queues, and to ensure passenger safety when queues back onto the Skybridge. The situation is attracting frequent negative media attention and complaints from passengers (January - April 2017: 250 complaints).

Figure 50: Media Clipping on Immigration Queue Times



Revealed: Why immigration queues have become longer at Dublin Airport

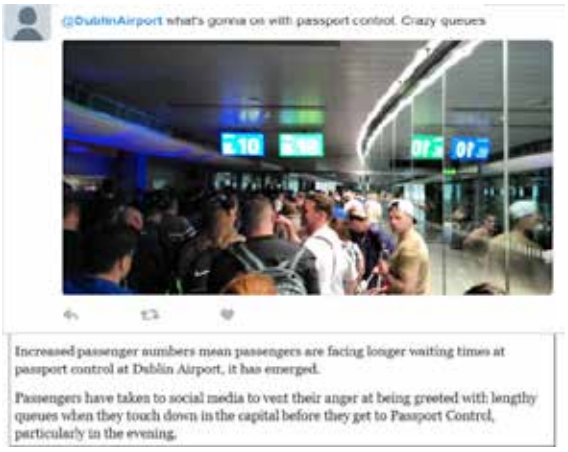
Large crowds waiting to reach Passport Control in Dublin Airport's T1 recently

Kevin Doyle and Kathy Armstrong

Increased passenger numbers mean passengers are facing longer waiting times at passport control at Dublin Airport, it has emerged.

Passengers have taken to social media to vent their anger at being greeted with lengthy queues when they touch down in the capital before they get to Passport Control, particularly in the evening.

Figure 51: Twitter Complaint on Immigration Queue Times - 2 April 2016



@DublinAirport what's gonna on with passport control. Crazy queues

Increased passenger numbers mean passengers are facing longer waiting times at passport control at Dublin Airport, it has emerged.

Passengers have taken to social media to vent their anger at being greeted with lengthy queues when they touch down in the capital before they get to Passport Control, particularly in the evening.

The current situation is not sustainable in Terminal 1 and necessitates an immediate infrastructure enhancement. There is an initial opportunity to increase throughput in both facilities by installing e-gates. This would increase the hourly processing capacity by 200 additional passengers per hour in Terminal 2, and 1,000 additional passengers per hour can be achieved in Terminal 1. The e-gates will be funded by the Department of Justice and Equality, however enabling works are required to reposition and remodel the manned booths and to provide power and data infrastructure to support the e-gates. The estimated project cost is €1.7m.

The installation of e-gates will increase throughput in both facilities. However, a significant issue still present in Terminal 1 is a severe shortage of adequate queuing space to efficiently feed the processors. Dynamic modelling highlights that in Summer 2019 the throughput increases delivered by the e-gates are not fully utilised, as the existing queuing space is significantly undersized to manage the demand within the facility. The consequence of this is further queuing on the Skybridge.

The project team have developed two solutions to address both capacity issues:

1. Extend the existing Immigration hall in Terminal 1 out into the landside carpark: €9.6m.
2. Develop new Immigration facility on the ground floor of Pier 1: €6.5m.

Proposal

Dublin Airport is committed to investing €1.7m to facilitate the installation of the e-gates. Additionally, Dublin Airport proposes to extend the existing Immigration hall costing €9.6m. This option is preferred over the construction of a new facility on the ground floor of Pier 1, for several reasons:

- Pier 1 option requires a split operation for INIS, and is not resource efficient.
- The Pier 1 option has a lower capacity than the extension project and would be at capacity before the end of 2019.
- The cost of the project is inefficient, as the capacity delivered will only satisfy demand for another two years. The extension to the current facility provides adequate capacity out to 2024/2025.

The combined cost of the proposed projects amounts to €11.3m. Further details on all projects can be found in Appendices B and C respectively.

6.4.6 Proposed Terminal Projects

Nine projects were evaluated in detail to resolve issues and enhance capacity across the terminal facilities. The projects are primarily infrastructure solutions, with one additional managed solution. (US Preclearance managed solutions will be progressed by Dublin Airport Operations and communicated outside of this process.) The total cost of the terminal improvement options amounted to €78m. Dublin Airport is proposing the immediate progression of four of the targeted projects, at a combined cost of €46.8m.

Figure 52: Proposed Terminal Infrastructure Project

No	PACE Proposed Terminal Infrastructure Projects	Cost
1	Terminal 1 and Terminal 2 Common User Self Service (CUSS)	€5.9m
2	Pier 1 Extension	€7.6m
3	South Apron PBZ	€22.0m
4	Terminal 1 and Terminal 2 Immigration Facilities	€11.3m
	Total	**€46.8m**

6.5 Aircraft Stand Capacity

We estimate a shortage of 17 aircraft parking stands under Summer 2019 baseline demand projections. Additionally, five users expressed significant concerns in relation to aircraft parking capacity. Stand capacity is the most pressing constraint at Dublin Airport today. It poses significant operational challenges and inefficiencies for all stakeholders on a daily basis. A significant focus was placed on identifying capacity solutions because the expected demand opportunity cannot be supported by the existing infrastructure.

Dublin Airport's stand infrastructure is a heterogeneous mix. Many characteristics differentiate a stand's capability and utility, such as:

- Stand proximity to Terminal 1 and Terminal 2.
- The stand location east or west of the Runway 16/34.
- Contact stands (air bridge serviced).
- Contact stands (walk out).
- Remote stands.
- Satellite stands.
- Stand capability to park narrow-body or wide-body aircraft.
- US Preclearance enabled stands.
- General Aviation and Hangar stands.
- Long-term parking stands.
- Contingency stands.

The objective of the review was to formulate a stand development plan that is robust and flexible and more importantly, will support the planned growth through to the 2019 schedule. To this end, two approaches were considered to deliver the required solutions. The first was to identify new stand development options that could add supply to the existing inventory. The second was to consider managed solutions to optimise the utilisation of the existing remote stand infrastructure (bussing routes and associated infrastructure).

Furthermore, the development of options focused on identifying combinations and alternatives capable of delivering the required capacity over the planning horizon, in a safe and efficient manner, while preserving flexibility to accommodate changes in the nature and scale of demand over time.

Stand development objectives were drafted to be congruent with the PACE key principles; i.e.

- Provide the capacity required to accommodate forecast demand.
- Respond to customer requirements.
- Maximise usage and cross-flexibility.
- Prioritise cost effective and value enhancing solutions.
- Optimise the utilisation of existing facilities, infrastructure, and other resources.
- Provide MARS stands where possible to build a degree of flexibility for wide-body demand.
- Comply with EASA, IAA and Dublin Airport standards.
- Consider long-range flexibility and expandability beyond the current planning horizon.
- Reflect the long-range development framework.

6.5.1 Stand Development Options Approach

The review focused on stand infrastructure deficits primarily occurring during two peak periods of the day. The first period is during the early morning peak, typically at 05:45. The second period is during the US Preclearance peak for Pier 4 contact stands, which occurs between 09:00-12:00. The primary driver for additional stand capacity in future seasons is the significant shortfall overnight and through the early morning peak period.

6.5.2 Stand Supply Options

There is a clear requirement to develop additional contact stands at Dublin Airport. The two largest carriers at Dublin have expressed a strong preference for utilising contact stands. Contact stands are pier-served, and new contact stands would require the development of additional pier infrastructure. The development of pier infrastructure is a significant civil engineering undertaking and is currently being developed under the Dublin Airport Masterplan. Additional contact stands and pier facilities cannot be delivered within the current regulatory period and therefore, such solutions are not capable of proving the much-needed short-term capacity. PACE focused on stand solutions that can deliver an accelerated benefit to customers, so the evaluation focused on primarily remote and satellite stand solutions options across the campus.

Several locations and options have been evaluated in detail. A decision support and optimisation matrix was used to assess the relative value of each potential solution, and all projects were assessed against common set of weighted criteria.

The following Figures highlight the potential locations, costs and evaluation for additional aircraft parking stands.The benefits and challenges of each potential project is outlined. Full details are contained in Appendix B and C.

South Apron Stands Phase 1 €10.5m

This project delivers four narrow body stands on the South Apron and increases South Apron capacity from five to nine stands. At an early stage in the evaluation, it was apparent that this project was scoring highly on the top three priority criteria and customer support was expressed to progress the project immediately, so that 2017/18 demand could be satisfied. The stands complied with the strategic criteria, i.e. the project had an expedited delivery profile: provided significant customer benefits and deliverability was not complex. In summary, the project was considered optimal to progress; it could be delivered within the timeline with minimal impact on operations during construction, be used for passenger operations, and can support the development of the South Apron PBZ by providing sufficient capacity to maximise the use of the facility.

North Apron Stand Package - includes North Apron 5H, Stands 101 -104 and Hangars 1 and 2 €71.3m

This project delivers 21 new Code C (Net 15) stands for operational use on the North Apron and is the only remaining area east of Runway 16/34 where a significant quantum of stands can be delivered. The proposed stands are optimal to progress for the following reasons:

- The project can be delivered under phases within the required timeline.
- It will provide a significant increase in zonal stand capacity.
- There will be sufficient space for additional services and ground support.
- Multi-usage stands, with MARS capability.
- There will be a minimal impact on passenger operations during construction.
- It can be used for passenger operations.
- It is future-proofed for a PBZ operation.

Figure 53: Potential Stand Development Locations

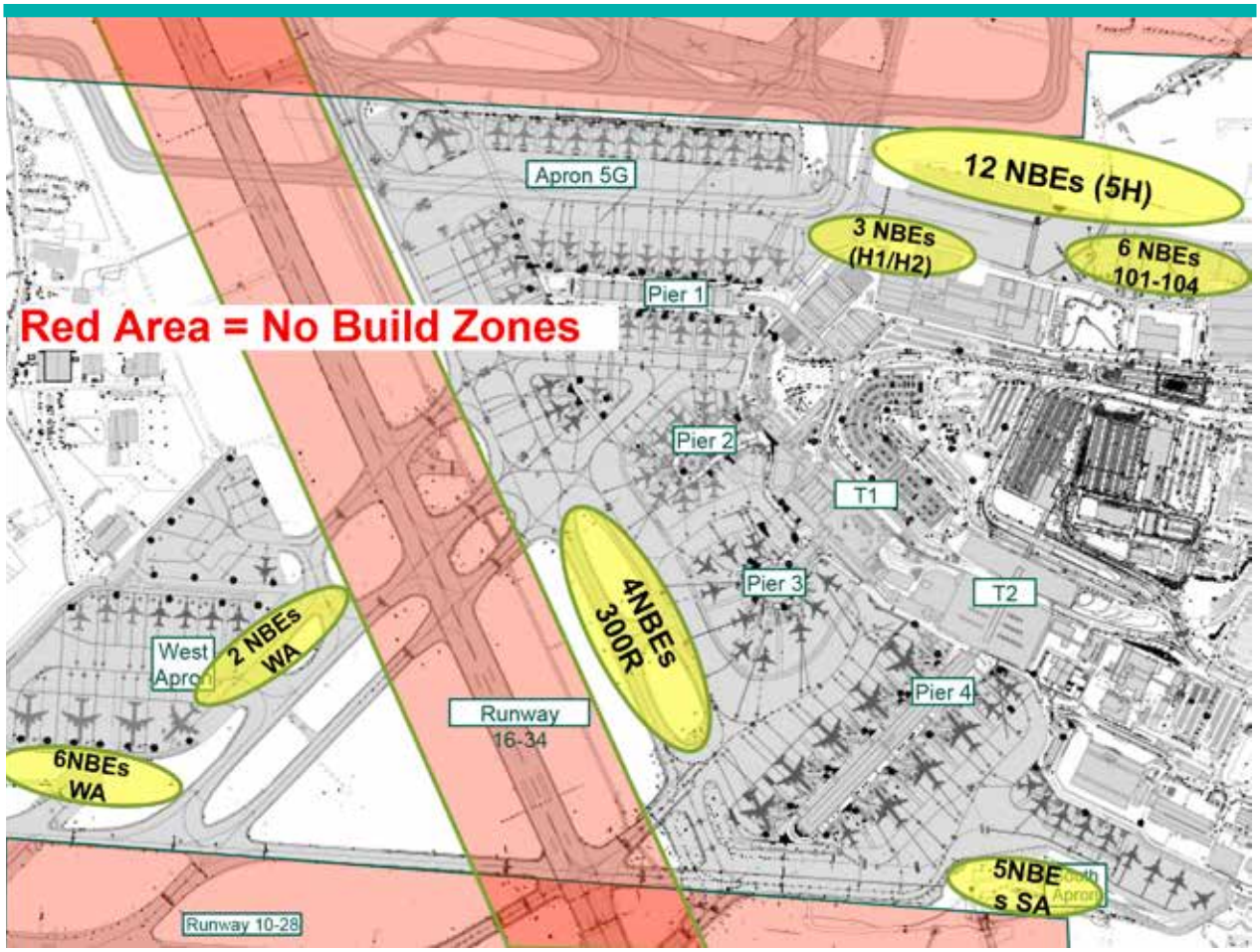


Figure 54: Stand Development Options

No.	Stand Development Option	Apron	NBE Stands	Cost in €m
1	Apron 5H and Taxiway Rehabilitation	North Apron	12	52.0
2	Hangar 1 and 2 Stands	North Apron	3	14.3
3	Stands 101-104	North Apron	6	5.0
4	Pier 3 Remote	Central Apron	4	18.0
5	South Apron Stands Phase 1	South Apron	4	10.5
6	South Apron Stands Phase 2	South Apron	5	30.0
7	Extension to West Apron Stands (6 NBE)	West Apron	6	15.0
8	West Apron Stands (2 NBE)	West Apron	2	2.5

Figure 55: Evaluation of Stand Development Options

Priority	Stand Development Option	North Apron 5H	Hangar 1 and 2	Stands 101-104	Pier 3 Remote	South Apron Phase 1	South Apron Phase 2	West Apron (6 x NBE)	West Apron (2 x NBE)
1	Improve Safety								
2	Deliverability								
3	Serviceability (Easy Pax Operations)								
4	Benefit Congestion/ Improve Operations								
5	Planning/Compliance with Regulations								
6	Multiple User Flexibility								
7	Cost/Stand	€4.3m	€4.8m	€0.9m	€4.5m	€2.6m	€6.0m	€2.5m	€1.3m
8	Master Plan Compatible								

Does Not meet Objective Risk Exists Meets Objective

West Apron Stands (2 NBE) €2.5m

This project delivers:

- One Code D stand.
- One upgrade from Code C to Code D.
- One Code E stand in MARS (Multiple Apron Ramp System) configuration.
- One upgrade from reduced Code C to full Code C.

This project should be progressed on the basis that additional stand capacity is required on the West Apron to facilitate the relocation of operations (maximise East Apron stand availability). The proposed stands can be constructed relatively quickly, with minimal disruption. They are extremely cost effective and highly flexible for cross usage.

Pier 3 Remote €18m

This project would deliver four remote Code C stands adjacent to Pier 3. Following airside risk assessments, it was concluded that the apron cannot safely be used for passenger operations. It is adjacent to busy taxiways on four sides coupled with aircraft pushing back from Pier 3, and there would be significant risks associated with jet blast. It could therefore only be used for towing or parking aircraft, which is a lower priority usage and does not resolve the capacity deficit for live operations in Summer 2019. It has a negative impact on safety due to the requirement to cross primary taxiway routes for access and the cost is inefficient for the limited benefits derived. In addition, we believe that more benefit can be derived from using this location for taxiway development, as detailed in Section 6.6.2 - Dual Foxtrot Taxiways.

West Apron Stands (6 NBE) €15m

This project would deliver six Code C stands on the West Apron. However, the solution is incomplete, as it does not provide efficient passenger access to stands, and can only be used for alternative activity e.g. parking, maintenance, repair and overhaul (MRO) and cargo. Based on the 2019 schedule, the West Apron (with the addition of the West Apron Stands 2 NBE project above) is sufficient to manage

the non-passenger activity. The essential requirement is for efficient passenger operational stands. Without a more sustainable access to the West Apron, passenger activity at the level required is not practical. While this project represents a good solution for remote stands, it can only be progressed in conjunction with more sustainable access.

For these reasons and to avoid unnecessary expenditure, our recommendation is to defer this option until a more permanent solution is developed as part of the masterplan process. It may be proposed as part of the next CIP.

South Apron Stands – Phase 2 €30m

The South Apron is constrained and is a challenging location for delivering additional stand capacity. There are numerous complexities and risks when considering additional stands in this location.

- Any project would require the relocation of numerous existing facilities (12 in total), such as the Department of Agriculture animal inspection facility, aircraft lavatory disposal facility, aircraft waste compactors, the Foreign Object Debris (FOD) control unit, an existing power substation, ULD/GSE storage etc. The relocation of each facility will need:
  - Agreement with key stakeholders; preparation of planning applications.
  - Planning permissions.
  - New facilities to be constructed.
  - Existing facilities to be demolished.
  - Significant land infill before any new stands can be constructed.
- The project is not deliverable within the proposed timeline and has an estimated delivery date of 2021/2022. Also, due to the numerous planning permissions required and the environmental risk associated with the Cuckoo Stream diversion, the timeline is high-risk.
- Additional aircraft on the South Apron may also negatively impact OTP and exacerbate congestion and manoeuvring limitations.
- The stands would have limited flexibility and cross usage.
- Extremely limited ground space for equipment.
- There are obstacle clearance sensitivities with proximity to Runway 10/28 that may impact the final design and impose limitations (e.g. lighting compliance).

In conjunction with specialist airport planning consultants, we have conducted numerous detailed assessments of development options in the South Apron. It is important to note that a potentially compliant design may exist which would allow a further five stands to be constructed in the South Apron. However, for all the inherent challenges above and most importantly, as the project cannot deliver the much-needed additional capacity in this decade, we recommend progressing less complex, more efficient alternative solutions. Additional stands in the South Apron may have value for customers and should continue to be evaluated as development options for potential consideration - either under the next five-year plan or through the masterplanning process.

6.5.3 Associated Stand Projects

Two airport users requested consideration be given to enhancing bussing routings, improving the consistency of journey times to remote stands and a more efficient access routing to the West Apron, for both passenger and general operations. A significant operational challenge exists today, when conducting bussing operations to the northern aprons; unpredictable and long journey times are a frequent occurrence, as passenger buses and large aircraft servicing vehicles are subject to indirect routings around the back of aircraft stands on numerous piers.

Creating consistent bussing routes to the northern aprons

Passenger buses travelling between Terminal 2 bus gates and remote stands north of Piers 2 and 3 currently must travel around the Pier 2 and Pier 3 back-of-stand road, as pier underpasses are not sufficiently wide to accommodate passenger buses and large ground vehicles. Buses travelling the back-of-stand road pass behind 21 active aircraft stands and traverse the taxi lane at the Pier 2 and Pier 3 cul-de-sac (as illustrated by the red route). Buses obviously have to yield to moving aircraft, which can compromise on-time departures.

Additional remote stands require efficient and consistent bussing routes. Two projects have been identified to significantly improve the quality of customer experience and journey times for bussing operations to the northern aprons. The widening of the Pier 2 (€5m) and Pier 3 (€0.2m) underpasses deliver reduced and predictable bus routes for Terminal 2 carriers, to all stands north of Pier 2 (max. five minutes). For illustrative purposes, journey times have been calculated to Apron 5G stands and the proposed Apron 5H stands. The current route to the existing south apron remote stands shown in blue has been provided for comparative purposes.

Access to the West Apron

Several operators are experiencing real challenges running a sustainable operation from the West Apron. The journey times for slow-moving equipment are unworkable. The North Runway will exacerbate the issue as it will become an eight kilometer journey from the eastern campus to the West Apron. All stakeholders have a strategic objective to maximise stand capacity on the eastern campus and therefore, relocations to the west are releasing valuable capacity back into the contact stand areas. The current perimeter road solution is not scalable and not future-proofed. It is imperative to unlock the West Apron by proving direct surface access, in an efficient and reliable manner.

Two contrasting solutions have been explored by the project team:

1. Surface access
2. Vehicle Tunnel

Surface Access €3m

A surface access to the West Apron, across Runway 16/34, will reduce journey time and therefore increase its usability

This surface access will comprise a ten-metre wide road, from Apron 5G to Runway 16/34 linking with the existing IONA Taxiway. The West Apron is currently accessed by the North Perimeter Road, which traverses Runway 16, a distance of four kilometres and an average journey time of ten minutes. To facilitate the North Runway construction, this route will become unavailable in circa 2019. This will result in an increased distance of eight kilometres and an average journey time of over 20 minutes. This surface access route to the West Apron will enable Dublin Airport to utilise existing capacity on the airfield by providing a short and predictable access route for aircraft servicing vehicles accessing the West Apron, one and a half kilometres, approximately four minutes journey time. This temporary solution will be effective in the short-term, until a long-term vehicular tunnel can be delivered under the masterplan.

Tunnel Access €100m–€150m

One option studied was a vehicle tunnel to connect the eastern campus with the West Apron. The tunnel would facilitate aircraft servicing vehicles and passenger bussed operations. Four tunnel locations were identified and have been outlined in Figure 58.

Figure 56: Existing and Proposed Bus Routes to North Apron Stands

Bus journey times from T2 bus gate to 5G/5H

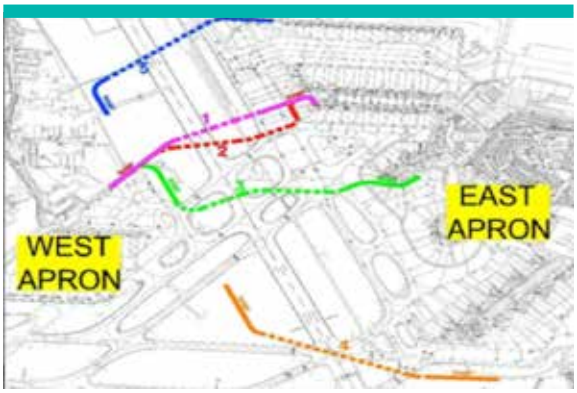
	T2 – 5H/5G	
	0 Delays	1 Delay
Back of Stand Rd	6.5/5 min	11.5/10 min
	T2 – 5H/5G	
P2 Underpass	5/3.5 min	

Bus Journey time from T2 bus gate – South Apron stand option

	T2 – SA
	0 Delays
Stand Road	2 mins

Figure 57: Potential West Apron Surface Access

Figure 58: Potential West Apron Tunnel Options



The cost of delivering a tunnel is estimated between €100m-€150m. It would take four to five years to complete the design, statutory planning permission, construction and commissioning. The cost and timeline is dependent on the method of tunnel construction used, such as 'cut and cover' or 'boring'. Both methods would need to be considered in any feasibility study to determine impact on operations and deliverability.

Proposal

On evaluation, the tunnel option does not provide the immediate solution required and should be deferred to the next five-year planning process. We recommend proceeding with the Piers 2 and 3 underpass widening projects and the West Apron surface access projects, as significant benefits and value can be delivered in a cost-efficient manner and in a relatively short time. A more permanent solution for access to the West Apron will be developed as part of the masterplan process and may be proposed as part of the next CIP.

6.5.4 Wide-body peak on Pier 4 US Preclearance Stand Options

The detailed capacity analysis highlighted that Pier 4 stand demand is exceeding supply by three wide-body stands in summer 2019. The review identified two solutions for developing additional US Preclearance stand capacity.

Capital Solution	Impact	Cost
Construct first phase of Pier 3 extension	US Precleared passengers are bussed to Pier 3 to a pre-boarding zone	€70m-€120m

Managed Solution	Impact	Cost
Passengers bussed directly to remote aircraft from Pier 4 gates	No Capital Investment required, however additional opex required to manage bus operation. Challenges with US Preclearance operating procedures and	Requires negotiation with stakeholders

Proposal

On evaluation of the options above, we propose deferring the capital solution, due to the scale of investment required and the elongated delivery time of more than four years. This solution would require masterplan compliance and is not appropriate for progressing at this time. The preferred short-term solution is to explore the practicalities for introducing remote US Preclearance operations.

6.5.5 Stand Development Plan Summary

In summary, a significant investment in stand capacity is urgently required at Dublin Airport, if demand is to be facilitated in the 2018-2020 timeframe. Airport users are urgently requesting the progression of capacity-enhancing projects to accommodate their needs over the coming years. There is a real risk that the airport infrastructure will be unable to accommodate airport user needs at the current growth rates, unless additional stand capacity can be delivered in an expedited manner. We have assessed numerous options for stand development across several locations, and evaluated each against robust, consistent principles. Eight inter-related projects are within the scope

of the supplementary process and have satisfied the delivery requirements. We recommend progressing eight projects and the necessary €92.5m investment in stand capacity, which will underwrite the combined customer growth plans for the next number of years. Further details on each project can be found in Appendix B.

Figure 59: Stand Development and Associated Projects

No.	Projects	Cost
1	South Apron Stands	€10.5m
2	Apron 5H stands and taxiway	€52.0m
3	Stands 101-104	€5.0m
4	Hangar 1 and 2 stands	€14.3m
5	West Apron x 2 Stands	€2.5m
6	Pier 2 Underpass Widening	€5.0m
7	Pier 3 Underpass Widening	€0.2m
8	West Apron Access	€3.0m
	Total	**€92.5m**

6.6 Airfield/Taxiway Projects

The airfield assessment highlighted a number of operational challenges, which can be summarised as follows:

- Infrastructural challenges: cul-de-sacs, hotspots, restricted use taxiways and the convergence of Runway 28 and 34 thresholds.
- Major taxi-lanes through push-back aprons.
- Shortage of links from the eastern aprons out to the airfield.
- Suboptimal north/south parallel flow infrastructure; this is especially challenging for towing aircraft from southern locations to northern and western aprons.
- Maintaining satisfactory on-time performance and taxi-in/out times in peak season.

Enhancements to the airfield system are required to support the capacity increases that will be delivered under the new runway and stand infrastructure, but also to ensure that maximum efficiencies can be extracted from the taxiway infrastructure, to the benefit of all customers. Airport operators have provided detailed feedback on the current operational issues and challenges experienced on the airfield. A key point submitted during the consultation was that, *'On Time Performance (OTP) is critical for a hub airport to be successful and future infrastructure development has to prioritise a positive impact on OTP'*. Another piece of feedback was that Dublin Airport's peak taxi times were higher than what the operator deemed acceptable. Furthermore, users highlighted concerns over ramp congestion, push-back delays, taxiway congestion, increased towing movements and inefficient convergence between arriving and departing aircraft flows.

We have undertaken a comprehensive evaluation of the airfield system (supported by expert airfield consultants, and informed by the recommendations from parallel studies). Several potential improvements and enhancements could be made to the existing airfield infrastructure, which would deliver tangible efficiency benefits for operators and customers into the coming years. A number of projects and concepts have been evaluated with the ultimate objectives of:

- Improving OTP.
- Flow efficiency.
- Reducing congestion.
- And optimising taxi-times (in acknowledgement of the key messages conveyed by operators through consultation).

Priority will be assigned to projects that specifically address the following issues:

- Efficiently feed the runway during times of peak demand (i.e. minimise en-route delays).
- Address existing bottlenecks identified in the Critical Taxiway Review (e.g. offloading traffic at busy intersections on Links 1,2 and 4).
- Manage traffic access/egress of cul-de-sacs to minimise delay.
- Segregate arrivals and departures or opposing traffic flows where possible.
- Facilitate efficient towing movements and minimise disruption to airfield flow.
- Remove existing AIP restrictions by reducing safety risks.
- Simplify airfield (taxiway) layout for intuitive navigation.

- Reduce nominal taxi times by decreasing distance travelled to/from stand to runway (as recommended in the Critical Taxiway Review).
- Facilitate on-time pushbacks by diverting through traffic away from apron taxiways (Apron Taxiway 4).

User suggestions recommended both additional infrastructure and targeted managed solutions, which primarily relate to operating procedures; standard taxi routings, pushbacks or runway modes of operation and air traffic management or airspace procedural changes.

6.6.1 Managed Solutions

The following managed solutions are planned for implementation within the current CIP period, to maximise the efficiency of the existing assets without the requirement for additional capital infrastructure.

- **Reduced minimum Departure-Departure separation:** Potential to reduce the minimum departure-departure separation from 1.0 nautical mile (NM) to 0.7NM. This initiative will require regulatory approval following a successful period of live trials.
- **Introduction of Airport-Collaborative Decision Making (A-CDM):** A-CDM is planned to 'go live' during the Winter 2017/18 season. Implementing A-CDM is expected to deliver improvements in OTP, predictability in operations, optimise existing resources, reduce apron and Taxiway congestion, as well as improving air traffic flow management/slot usage.
- **Taxiway Re-designation:** The Critical Taxiway Review concluded that "*The current taxiway nomenclature at Dublin Airport has been identified as a main contributor to the complexity of the airport layout. Hence, a taxiway re-designation at Dublin Airport is an important measure to improve pilot orientation, situational awareness and overall safety*". Feedback from the user survey (in which all airlines and ATC were invited to participate) also highlighted the need to simplify and standardise taxiway naming conventions and adopt a more logical structure. An improved scheme has been agreed through consultation and will be submitted to the IAA Safety Regulation Division (IAA-SRD). If approved, the revised scheme will be implemented on a phased basis; as part of the Runway 10/28 overlay project, in parallel with the introduction of the Northern Runway/additional taxiway infrastructure and finally, for all remaining taxiways. This is expected to ease pilot navigation, reduce potential for error and avoid long ATC verbal instructions/pilot read-backs.
- **Advanced Visual Docking Guidance System (A-VDGS):** A-VDGS was recommended as a managed solution by operators. The benefits associated with A-VDGS include faster and more efficient turnaround times, improved OTP, display of critical A-CDM operational data (Target Off-Block Time (TOBT), Target Start Approval Time (TSAT), etc.), and display of accurate, real-time data, using IT integration. A feasibility study is in progress to determine the most suitable locations for the next phase of A-VDGS implementation. Four units have already been installed in Pier 3, with an additional unit planned for Pier 4 in early 2018.

In addition to the solutions identified, we have engaged with ATC and a number of operators through the Runway Process Improvement Group (RPIG) to consider the benefits of the following initiatives:

- Reduced Departure-Departure separations.
- Alleviating UK Airspace constraints.
- Revision of Preferential Noise Routes (PNR) and Standard Instrument Departure (SID) routes.
- Review of Noise Abatement Procedures (NAP).
- High Intensity Runway Operations (HIRO).

A significant collaborative effort is in progress to fully maximise the efficiency of the airfield system through a suite of managed solutions. Despite many of the initiatives already delivering efficiency benefits, the review process identified a requirement for additional airfield infrastructure that would provide permanent and tangible improvements to the physical layout of the airfield system. The review flagged that specific projects should be immediately progressed, so that the infrastructure could provide the required benefits as quickly as possible. Deferring the construction of the recommended projects until 2020 (as submissions to next CIP) would likely result in no significant improvements to the airfield infrastructure in advance of the new Northern Runway.

6.6.2 Proposed Airfield Projects

A total of eight taxiway concepts were evaluated for feasibility. We recommend progressing four inter-related projects to deliver optimal efficiency improvements. Again, it is important to flag that certain additional projects may have the potential to deliver efficiency benefits for customers and should continue to be evaluated either through the masterplanning or CIP 2020 processes.

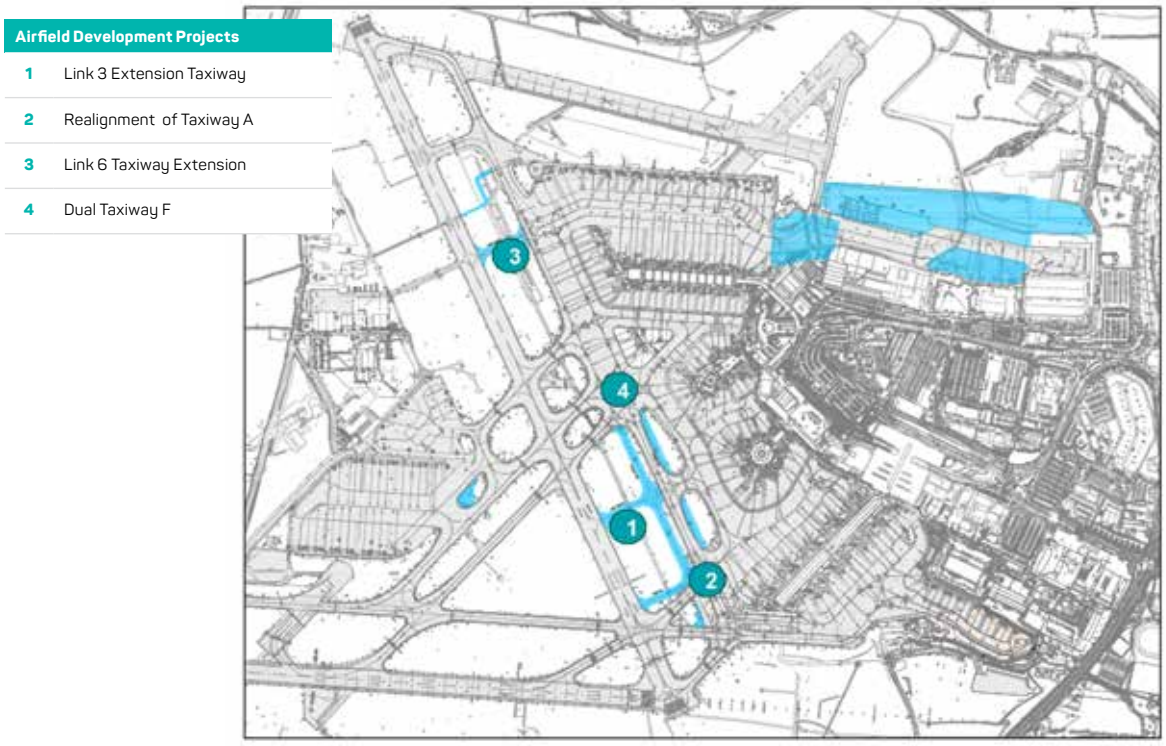
The projects in Figure 60 fulfill the objectives of the PACE programme. The three responses from our user consultation which recommended new taxiway infrastructure builds have been considered. The suite of recommended projects specifically relates to improving the eastern Taxiway infrastructure (highest activity and requires structural improvements).

PACE recommends progressing the four inter-related projects at a total investment of €30.3m. Several additional projects have also undergone detailed analysis and should be considered under trigger processes or under the next CIP.

Figure 60: PACE Airfield Projects

No.	PACE Proposed Taxiway Infrastructure Projects	Cost
1	Link 3 Extension Taxiway	€4.0m
2	Realignment of Taxiway A	€5.7m
3	Dual Taxiway F	€15.5m
4	Link 6 Extension Taxiway	€5.1m
	Total	€30.3m

Figure 61: PACE Proposed Taxiway Infrastructure Projects



Critical Taxiway Review of PACE Proposals

The independent Critical Taxiway Review evaluated several proposals for the taxiway system (including the RWY 28 additional runway holding points and the Link 3 Extension). It concluded that the planned Link 3 Extension Taxiway is a valuable infrastructural addition to improve efficiency and reduce traffic flows on Links 1, 2 and 4. The justification is that the extension of Link 3 enables a connection to RWY 16/34 and relieves the bottleneck around Links 1 and 2 without adding significant complexity to the hotspot area.

Independent consultants originally proposed and designed the Link 6 Extension taxiway as an additional improvement recommendation, on the basis that this project would; reduce congestion on Link 4/5 and F-Outer, reduce taxi times to Apron Taxiway 6 and simplify taxi clearances.

Another independent recommendation was to re-open Dual F taxiways to improve traffic flows to and from the South Apron, but in conjunction with a full straight axis of the Dual F taxiways in parallel. The displaced axis of TWYs F3 and F2 at intersections Link 4 and Link 3 has been identified as a contributor to intersection complexity.

Therefore, it was deemed desirable to simplify the area by taxiway pavement and centreline displacement, leading to the Dual Taxiway F proposal. There are a number of possible options to address the continuation of the Dual Taxiway F alignment.

Dublin Airport is committed to designing out taxiway restrictions and complexities, especially under new infrastructure proposals. Holistically, dual Code E taxiways should be the baseline requirement for the specification of this project, especially as the proposed taxiway provides direct service to Piers 3 and 4, which both primarily facilitate wide-body operations. Dublin Airport recommends detailed design evaluation for this project to explore the ability to deliver dual Code E capability, without a corresponding loss of contact stands. If this cannot be achieved, Option 1 would also provide much needed short-term efficiency benefits. Extension of the current arrangement with Code E on outer taxiway and Code C on inner Taxiway is the option included in the project sheet (Option 1), as the baseline option.

The realignment of TWY A was not evaluated at the time of the Critical Taxiway Review and emerged as a later concept. However, the review observed that TWY A (in its current configuration) contributes to the complexity of the Hotspot area and that the permanent closure should be considered as a safety improvement and to prevent the reoccurrence of wingtip incidents. The benefits of TWY A during RWY 34 Dual Operations and the potential flexibility it offers in a parallel runway routing scenario have been considered. Its realignment aims to preserve its functionality, while reducing the likelihood of a wingtip clearance issue. The project would also provide improved runway visibility when used as an entry taxiway onto RWY 34, due to its perpendicular alignment

In summary, the PACE proposals are designed to adhere to the Critical Taxiway Review guiding principles i.e. enhance safety and reduce complexity or confusion across the taxiway network.

Airfield Simulation of PACE Taxiway Proposals

A recommendation received from the user consultation was to, "model and simulate airport operations to identify pinch points" and hence propose solutions to resolve. Airfield modelling is a critical part of any feasibility study,

Figure 62: Dual Taxiway F Options

Scheme	Capacity	Comments	Stand Capacity Impact	Cost
Option 1	Code E-C	Extend F-Inner and F-Outer (current arrangement extended)	Nil	€15.5m
Option 2	Code E-E	Current EASA Dimensions	· Loss of 5 Narrow and 5 Widebody Stands	€18.0m
Option 3	Code E-E	Revised EASA Dimensions*	· Loss of 1 narrow and 1 widebody stand	€30.0m
Option 4	Code E	Removal of F-Inner	Nil	€15.0m

*There is an EASA proposal to reduce the runway to taxiway centreline clearance from 182.5m to 172.5m and if this is approved, this option would be viable (decision expected in Quarter 4 2017).

especially with regards to new taxiway infrastructure. Arup were commissioned to undertake an independent airfield simulation study to determine the operational impact of the potential projects on the overall airfield efficiency.

A reduction in peak arrival and departure delays was determined, resulting from the additional infrastructure. Rolling hour delays were also reduced throughout the day. Additionally, a separate set of simulations were undertaken for a 2022 schedule i.e. with the full parallel runway system in operation. The findings of the study confirmed that the benefits of the proposed schemes continued to be sustained under the future parallel runway operation, especially in terms of reducing peak departure and arrival taxi delays.

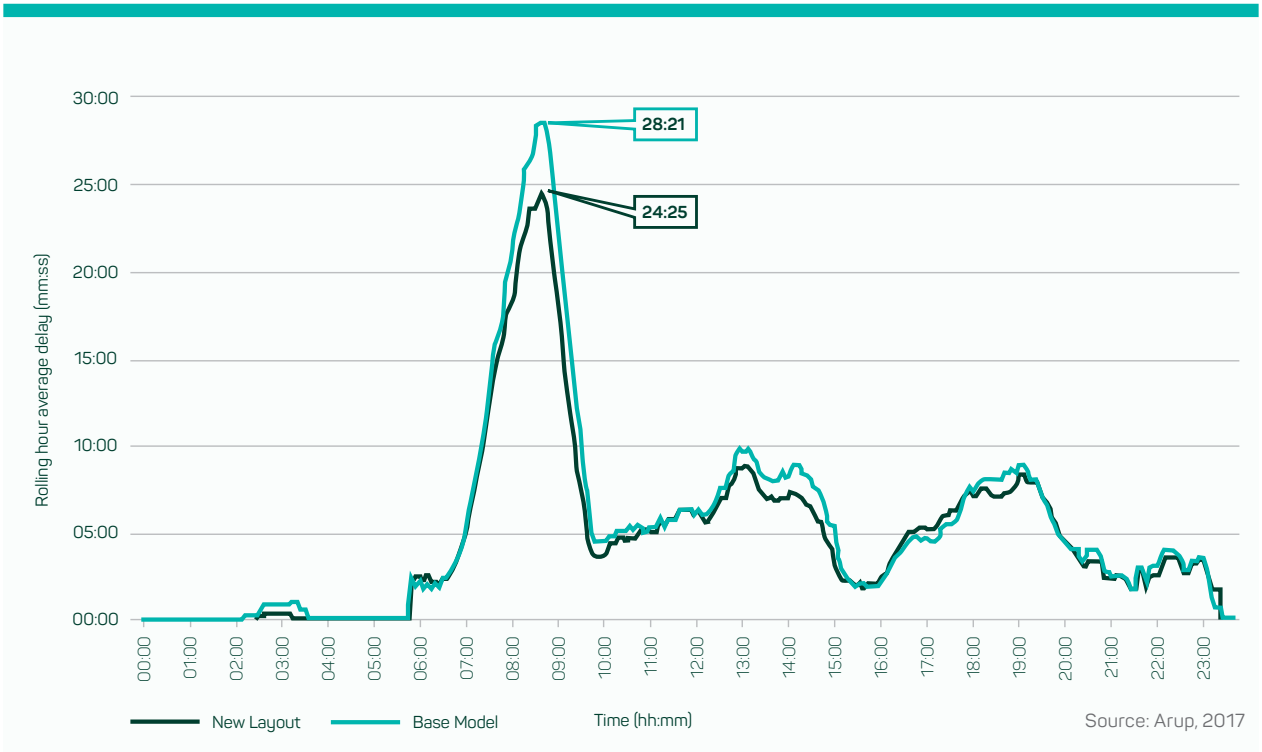
Single Runway Analysis (RWY 28 in 2019)

A 2019 coordinated schedule was simulated using CAST software, which included 39 departures in the peak hour (06.00 local time). Two models were used to compare results; a baseline model with existing taxiway infrastructure, and a 'New Layout' model with the proposed PACE taxiway schemes.

Runway throughout was consistent in both models, though Arup noted improvements relating to departure and arrival delays, increased flexibility and improved traffic flows, with no negative impacts on performance for aircraft parked in specific locations of the airfield. Towing movements were significantly improved, due to the additional routing flexibility, particularly in contraflow to primary taxiing routes. Maximum rolling hour delays (all delays combined including pushback delays, taxi-out delays and departure holding delays) for the 'New Layout' were approximately

Figure 63: 2019 Airfield Layout including Proposed PACE Projects

Figure 64: 2019 Rolling Hour Average Departure Delays (combined for gate, taxi-out and runway holding delays)*

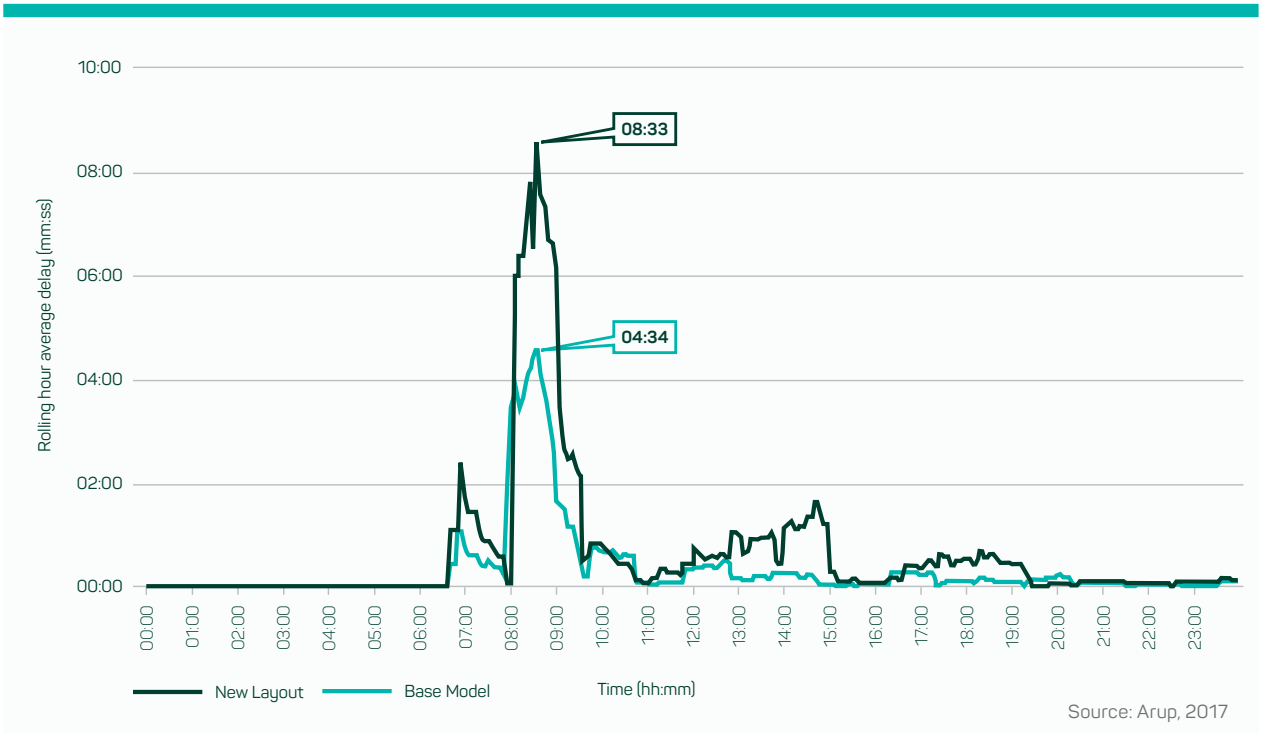


Source: Arup, 2017

four minutes (15%) lower at peak times, than the current infrastructure,refer to Figure 64, and are also generally lower throughout the operating day.

Maximum rolling hour delays (all taxi-in associated delays) under the 'New Layout' were approximately halved at peak times (four minutes, or 46% lower), as shown in Figure 65, than under the current infrastructure and are also significantly reduced throughout the operating day, especially during the busy midday and evening periods.

Figure 65: 2019 Rolling Hour Average Arrival Delays (taxi-in delays from runway to gate)*



Source: Arup, 2017

*Based off 2019 forecast schedule.

Figure 66: Average Daily Delays

	Output Parameter	Base Model (hh:mm:ss)	New Model (hh:mm:ss)	% Difference
DEPARTURES	Average maximum rolling hour delay	00:28:21	00:24:25	-14%
	Average delay per operation	00:07:46	00:07:01	-10%
	Overall delay	51:38:54	46:32:38	-10%
ARRIVALS	Average maximum rolling	00:08:33	00:04:34	-47%
	Average delay per operation	00:00:41	00:00:20	-51%
	Overall delay	04:14:39	02:02:54	-52%
TOW	Average delay	00:00:59	00:00:26	-56€€

Source: Arup, 2017

Parallel Runway Analysis (RWYS 28L/R 2022)

A 2022 coordinated forecast schedule was simulated using CAST software, with a peak demand of 55 departures, distributed between the parallel runways by compass departure direction. Although the planned modes of parallel runway operations have yet to be determined, demand was processed in segregated mode throughout the remainder of the operating day. Two variations were used to compare results; with and without the PACE Taxiway projects (except for the Link 6 Extension, which was included in both assessments).

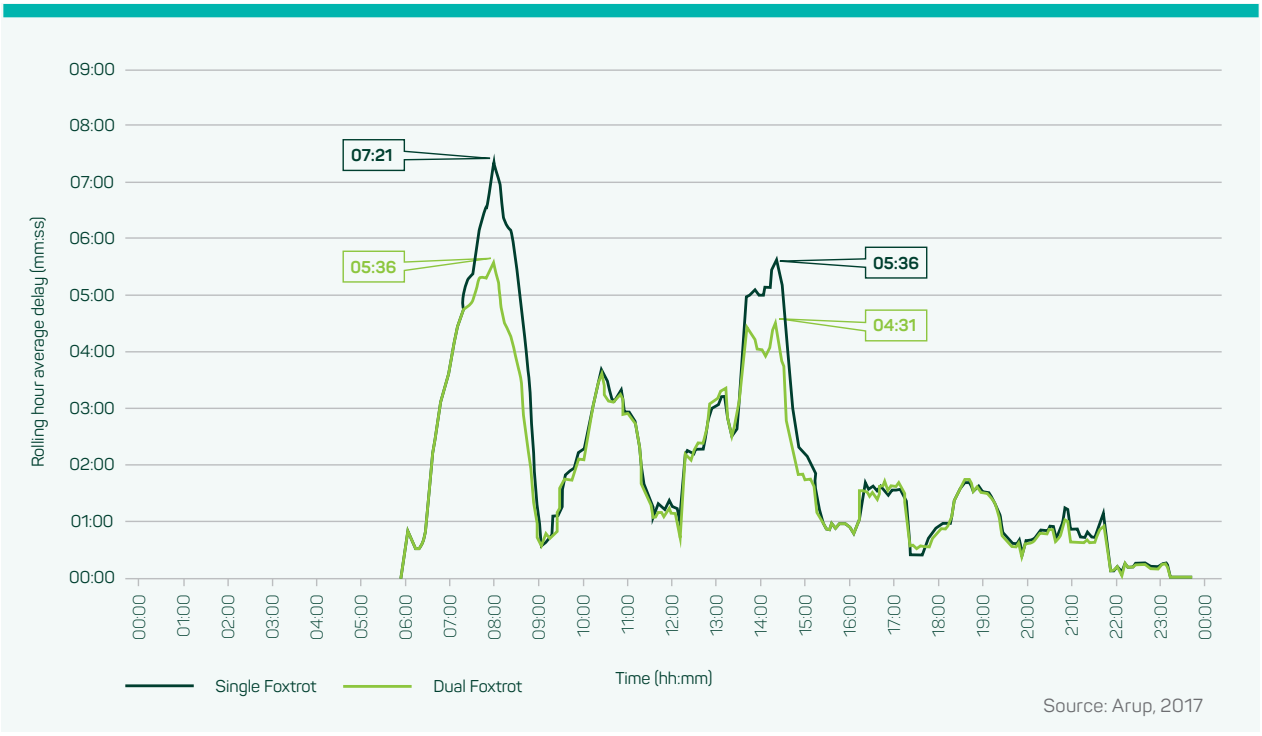
Runway throughput was consistent in both models, but Arup observed improvements to departure and arrival delays, with no negative impacts on performance for aircraft parked in specific locations. Maximum rolling hour delays (all delays combined including pushback delays, taxi-out delays and departure holding delays) under the PACE layout (referred to in the chart as "Dual Foxtrot" but also includes Link extension taxiways) were approximately 01:40 minutes (24%) lower at peak than under the existing infrastructure and are also significantly lower at the 1400-hour peak period, refer to Figure 66.

Maximum rolling hour arrival delays (all taxi-in associated delays) for both scenarios were minimal in general. However, the PACE scheme demonstrated a significant reduction in arrival delays for specific individual aircraft that experienced high arrival delays under the current infrastructure. Higher delays in the model without the PACE infrastructure were primarily caused by inbound aircraft that were required to join the departure queue at the TWY E1 hold, for which the full-length Dual Foxtrot Taxiways will alleviate a material portion of the taxi delay.

Figure 67: 2022 Airfield Layout including Proposed PACE Projects

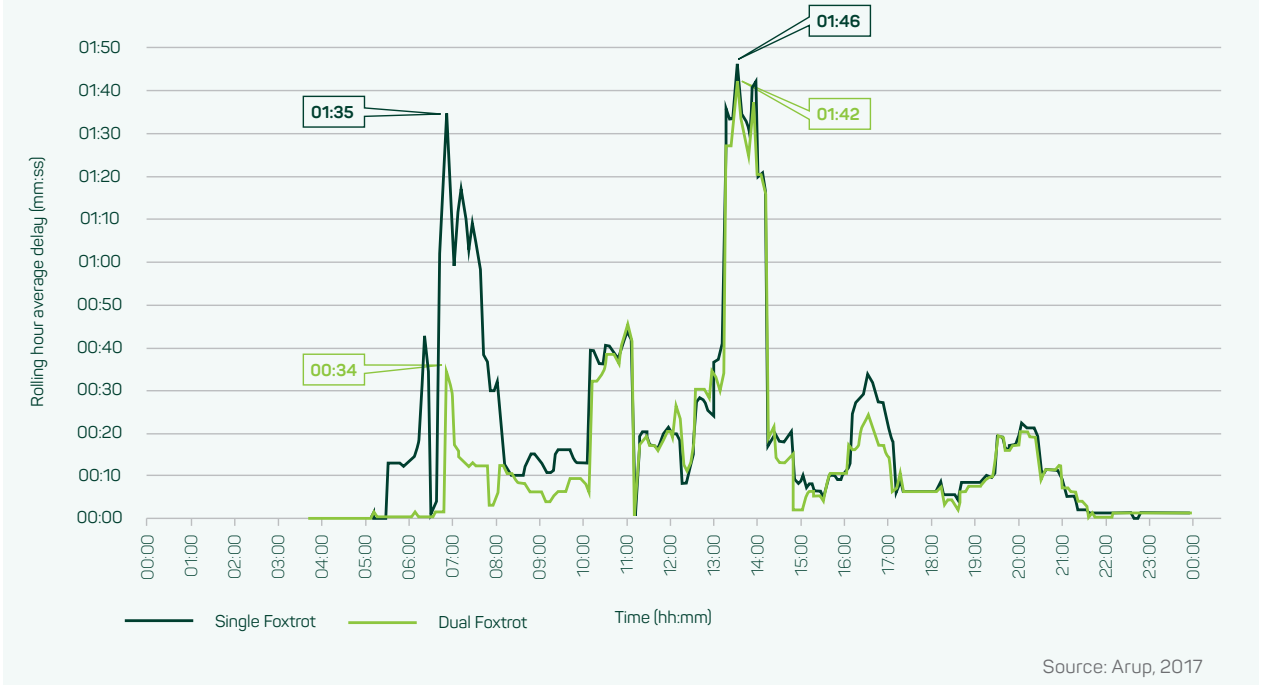
Source: Arup, 2017

Figure 68: 2022 Parallel Runway Rolling Hour Average Departure Delays (combined for gate, taxi-out and runway holding delays)*



Source: Arup, 2017

Figure 69: 2022 Parallel Runway Rolling Hour Average Arrival Delays (taxi-in delays from runway to gate)*



Source: Arup, 2017

*Based off 2022 forecast schedule.

Figure 70: Average Daily Delays (2022)

	Output Parameter	Current taxiway infrastructure	NEW taxiways included	% Difference
DEPARTURES	Maximum average rolling hour delay	00:07:21	00:05:36	-24%
	Average delay per operation	00:02:38	00:02:21	-11%
	Sum of daily delay	20:13:58	18:03:21	-11%
ARRIVALS	Maximum average rolling hour delay	00:01:46	00:01:42	-4%
	Average delay per operation	00:00:20	00:00:16	-20%
	Sum of daily delay	02:16:20	01:49:04	-20%

Source: Arup, 2017

Proposal

The proposed PACE projects have demonstrated qualitative, intuitive and quantitative benefits to overall single runway airfield performance with continued benefits in parallel operations. The hard benefits focus on reducing taxiing delays and providing flexibility and routing alternatives. The benefits for each inter-related project are:

- **Link 3 Extension Taxiway:** provides greater departure queue balancing potential for RWY 28 and hence alleviates the Link 1/2 bottleneck for improved apron access. It also facilitates reduced congestion along Apron TWY 4 by serving as an alternative artery to filter traffic onto the main F taxiways.
- **Realignment of Taxiway A:** enabler for the simultaneous reopening/use of TWY B2 with the 'new' TWY A with no convergence, thus removing existing AIP restriction and reducing complexity. The project would permit increased runway visibility during line-up for RWY 34 through improved alignment.
- **Full-length Dual F Taxiways:** continuation of Taxiways F-Inner and F-Outer can improve traffic segregation, facilitate towing movements, improve apron access, and reduce the unnecessary traffic flow (congestion) via Apron Taxiway 4 that can currently delay pushbacks and increase taxi times due to stand manoeuvring interactions with departure traffic.
- **Link 6 Extension Taxiway:** alleviates congestion around Links 4 and 5 and busy intersections at M1/H1 that are subject to multi-directional traffic flows, and thus facilitates manoeuvring around the Triangle during peak. It also reduces existing arrival taxi distances for the north airfield (Apron TWY 6) via TWY G and will provide an important function in linking the North Runway to current taxiway infrastructure.

We propose this suite of inter-related projects to significantly enhance the operational efficiency and functionality of the airfield. Detailed feasibility is required to inform the potential design options and user feedback is essential for maximising the value that can be delivered from the completed project. Subject to final approval, construction phasing and interdependencies shall be coordinated to minimise the severity and duration of overall airfield disruption.

6.6.3 Deferred Taxiway Infrastructure Projects

Figure 71: Deferred Taxiway Projects

No.	PACE Deferred/Discounted Taxiway Infrastructure Projects	Cost
1	RWY 10-28 Rapid Exit Taxiways (RETs)	€9.0m
2	RWY 28 End-around Taxiway (South Apron Access)	€50.0m
	Total	€59.0m

We recommend deferring these projects for the following reasons:

1. **RWY 10-28 Rapid Exit Taxiways (RETs) €9m**
   Independent airfield modelling did not show any significant benefits in increasing runway throughput with the addition of RETs, despite a slight reduction in arrival runway occupancy times. Projects thus deferred for consideration as part of 2020-2024 CIP period.

2. **RWY 28 End-around Taxiway (South Apron Access) +€50m**
   This project was assessed by Ricondo as part of the Dublin Airport Masterplan Update (2017). The major challenges involved with design options include EASA non-compliance due to infringement of the Obstacle Limitation Surface (usage limited to aircraft with a tail height of 8.6m max) when aircraft are on final approach to RWY 28, and the expected capital expenditure; estimated in excess of €50m due to relocating adjacent roads and the runway approach lights, localizer, glide slope, fences and perimeter roadways (and subject to land acquisition). The project cannot deliver immediate efficient value and so is not in scope for the supplementary review.

6.6.4 Current CIP Deferred Taxiway Infrastructure Project

Figure 72: 2014 Determination Deferred Projects

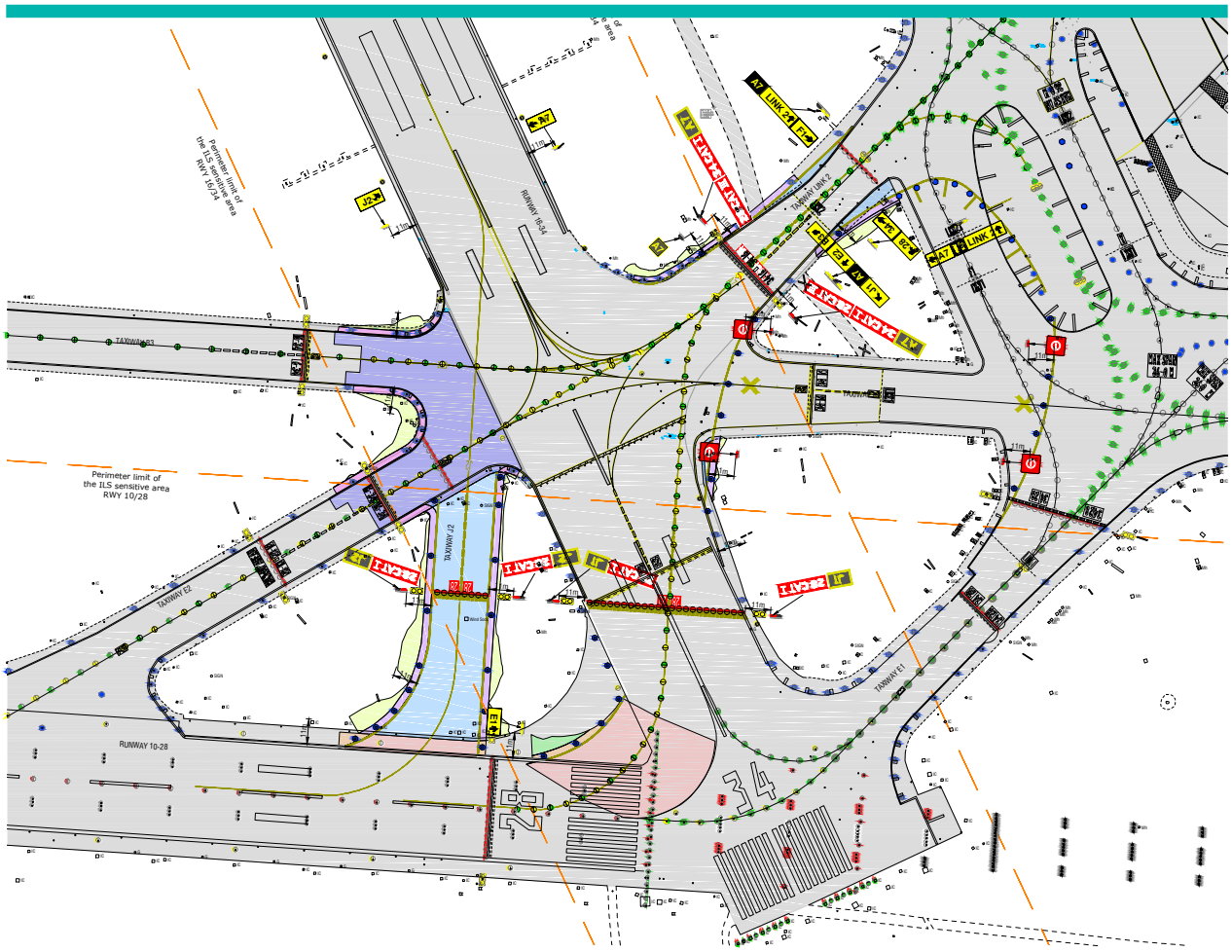
No.	PACE Deferred/Discounted Taxiway Infrastructure Projects	Cost
1	RWY 28 Additional Holding Points	€14.0m
2	RWY 10 Additional Holding Points	€16.0m
	Total	€30.0m

1. RWY 28 Additional Holding Points

Following a detailed feasibility study, a recommendation was communicated to stakeholders in November 2016 not to progress additional runway holding positions (RHPs) (or line-up points) for RWY 28. These had been initially considered an enabler to increase peak departure capacity from 37 to 39 movements. Independent assessments yielded several important findings and have formed the basis for the design and selection criteria of appropriate taxiway infrastructure projects.

- Independent airfield simulations have concluded that the main airfield constraint is the single runway and although there were some improvements seen in arrival times during first-wave (due to more flexible departure queue balancing with an additional RWY 28 RHP), taxi times/delay are only significantly improved by increased runway throughput from reduced departure-departure separations. Improved queue balancing can be achieved via alternative taxiway infrastructure (e.g. the Link 3 Extension Taxiway to feed RWY 16-34).
- Independent Critical Taxiway Review (2016) recommended that we do not proceed with plans to construct an additional RHP for RWY 28, as it adds significant complexity to the existing hotspot. The hotspot area, including the draft for additional Line-up points for RWY 28, was consequently evaluated as 1/6 ('very poor') in terms of complexity. Furthermore, following risk assessment, it was proposed that full or partial taxiway closures would be recommended to reduce this complexity and enhance the safety of the design. The recommended closure of TWY B2 was largely viewed as unfavourable by users, who currently utilise the route as a more efficient taxi option when available.

Figure 73: Runway 28 Additional Holding Point Design Option



- IAA Air Navigation Service Providers (IAA-ANSP) have confirmed that 39 departures may be achieved without the additional RHPs (subject to confirmation in a seasonal runway capacity study). There is minimal foreseeable benefit in having a third, when two are available at present (when Dual Operations not in use).
- There is uncertainty over the use of (the existing) RWY 28L as a departure runway in parallel runway operations (current runway could predominantly be used for arrivals in segregated mode), which would render additional infrastructure to facilitate departures on this runway primarily redundant (inefficient and potentially not fully utilised).
- Trigger of 37 departures has not yet been achieved (S17 declared capacity is 35 peak hour departures) and so the capital allowance to commence the project is currently suspended.

Therefore, whilst IAA efforts are ongoing to safely reduce departure-departure separations for more efficient single runway operations, Dublin Airport recommends focusing on the managed solutions and additional infrastructure projects to enhance the efficiency and functionality of the airfield system.

2. RWY 10 Additional Holding Points

We recommend detailed evaluation of this project for consideration in the 2020-2024 CIP submission (provided the continued scope is made available to deliver under the current trigger mechanism).

6.7 Interdependent Projects

The purpose of this Section is to highlight that the proposed projects are fundamentally interdependent. The progression of a single project in isolation will result in suboptimal efficiency benefits, and in fact may only shift a known constraint to another location. For example, as a general principle, the delivery of remote aircraft parking stands without the necessary access improvements does not achieve the overall project objective. In this case, approval of the remote stands without a complementary project to improve bussing efficiency will not provide the much-needed additional capacity, as the solution would prove unsatisfactory for passenger operations.

As illustrated in Section 2.4, passenger numbers to the end of the current regulatory period have the potential to reach +32 mppa. We evaluated 28 solutions to enhance the airport's functionality and customer experience over this period. PACE, an optimised suite of 16 inter-related projects, is recommended to deliver the growth envisaged over the coming years and to fulfil customer requirements.

Our recommendation is to progress PACE projects in two core Groups. Group 1 will accommodate annual passengers in 2017. Group 2 will accommodate residual passenger growth up to the end of the current regulatory period.

Group 1

These projects must be completed and in operation to alleviate known constraints in several processors.

The cost of the above projects, in Figure 74, amounts to €44.7m. Adequate capacity will be provided to accommodate in excess of 1mppa over 2016. The expected 1.3m increase in passenger numbers in 2017 (29.2m expected in 2017 vs. 27.9m in 2016) will be 90% driven by additional frequencies (77%) and through larger aircraft (11%), which both required an expansion of facilities to accommodate the demand. Key projects were fast-tracked to deliver customer requirements and ensure demand was not constrained by the existing facilities. The key processors at capacity for 2017 were check-in, gate and stand availability and Immigration.

Figure 74: Interdependent Project Groupings

Group 1 (+1 mppa)
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in Phase 1 and 2
Terminal 1 and 2 Immigration E-gates
Pier 1 Extension
South Apron PBZ
South Apron Stands Phase 1

Group 2 (+2/3 mppa)
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Phase 3
Immigration Extension
5H stand package North Apron taxiway rehab
Stands 101-104
Stands Hangar 1 and Hangar 2
West Apron +2 Code C stands
Pier 2 underpass
Pier 3 underpass
West Apron surface access
New Link 3 taxiway
New Link 6 taxiway
Realignment of Taxiway Alpha

Figure 75: Group 1 Projects

Processor	Project	Status
Enhanced check-in efficiency Terminal 1 and 2	CUSS Phase 1 and 2	Complete
Additional gate capacity in Terminal 1	Pier 1 Extension	Delivered for peak Summer 2017
Increase in Immigration capacity in Terminal 1 and 2	Installation of e-gates	Complete in Q4 2017
Additional aircraft parking stands to serve Terminal	South Apron Stands	Will be fully operational in late 2017
Additional gate capacity in Terminal 2	South Apron PBZ	In construction

Group 2

To facilitate an increase in airport activity beyond expected 2017 levels (c29.2m) and to the end of the current regulatory period, the remaining proposed projects which are estimated to cost €124.9m must be complete. These projects will provide the necessary facility enhancements and alleviate several emerging processing constraints.

1. Passenger Processing

Projects for CUSS Phase 3 and an expansion to the Pier 1/2 Immigration facility are required to support the expected 2019 passenger demand and ensure service quality levels do not deteriorate.

2. Stands

The stand development strategy to 2019 comprises:

- Maximising the sustainable use of the West Apron.
- Relocating non-passenger operations to the West Apron, such as dedicated cargo and other activities (long-term parking for MRO, standby aircraft, GA etc).
- Providing efficient access to the West Apron.
- Developing stands on the West Apron to further accommodate relocated activity from the eastern campus.
- The provision of additional stand infrastructure on the northern aprons.

Stand capacity is urgently required to facilitate the passenger growth forecast. Section 6.6 explains in detail why the preferred optimal solution to deliver the required infrastructure, under the urgent timelines, are the North Apron Stand Development (21 NBEs) and West Apron Stand Development (2 NBEs). This development of new remote stands, along with the increased usage of the existing remote stands (Apron 5G and Triangle etc.) requires efficient and predictable bussing routes and hence, the widening of the underpasses at Pier 2 and Pier 3 is urgently required to support an increase in bussing and remote operations. Improved access to the West Apron is proposed through the West Apron Surface Access project, which is also integral to the core stand development strategy.

3. Taxiways

Increasing the current stand provision from 109 NBEs (excluding APC; 13NBE non-operational stands) to 126 NBEs will require associated taxiway improvements. We assessed the potential taxiway options to accommodate this increase under these criteria:

- Capacity to accommodate the additional movements associated with the existing stand provision.
- Capacity to accommodate the additional movements associated with the new stand provision.
- Ability to maintain On Time Performance (OTP).
- Improve flow and circulation on the apron and taxiways.
- Reduce average taxi-times to/from all runways.

Four inter-related taxiway improvement projects are proposed to address and improve the above operational challenges. Taxiway development must run in parallel, or ideally in advance, of any future runway or stand provision, otherwise the growth potential generated by certain infrastructure projects could be stranded by constraints up or down stream in the airport processing flow.

6.8 Masterplan Integration

In late 2016, Dublin Airport commenced the periodic review of its Masterplan. An airport masterplan is a physical infrastructure blueprint for delivering potential future growth. The primary purpose of a masterplan is to consider and outline in advance the logical facilities and infrastructure required to support various long-range growth profiles. At the concept stage of this review, a theoretical planning capacity of 55 mppa was agreed for the project scope. This level of activity represents both an approximate doubling of current airport traffic and is also the 30-year forecast horizon for growth (when rounded to five mppa increments).

The Dublin Airport Masterplan process is expected to be complete in October 2017. In June 2017, the project had progressed to an appropriate stage for consultation. An initial Masterplan briefing was conducted with airport users, customers and stakeholders on 7th June 2017. The purpose of this briefing was to:

- Outline the masterplan process.
- Explain how the Masterplan fits in the capital allocation process.
- Discuss key issues facing Dublin Airport that the Masterplan is seeing to address.
- Present the options considered to date.
- Understand user/stakeholder requirements from the Masterplan process.
- Request written feedback from airport users on a range of business development options and seek informed views on changes in market dynamics.

A key deliverable from the masterplanning process is to integrate, inform and steer future infrastructure development. The Masterplan Compliance Process (MCP) was developed in 2016 to ensure that all future capital infrastructure projects are assessed and subsequently deemed compatible with the emerging strands of the Dublin Airport Masterplan.

Masterplan Compliance Process (MCP)

- Mandatory process with formal oversight through the Masterplan Coordination Committee (MCC) and facilitated through the biweekly internal Capital Clearance Process (CCH).
- Underpinned by Compliance Register.
- Aims to ensure future-proof certainty, to minimise unnecessary spend.
- Mechanism to ensure the Masterplan is constantly refreshed.
- Promotes collaborative engagement and negates abortive development effort.
- Internal Service Level Agreement to ensure capital projects are compatible with the Airport Masterplan.
- Forms part of the quality management procedure (QM08).
- Approved audit process.

55 mppa

PLANNING CAPACITY FOR MASTERPLAN SCOPE

30 year

MASTERPLAN FORECAST HORIZON

Figure 76: Initial Screening Process Flow (all projects require a Masterplan Compliance Determination)

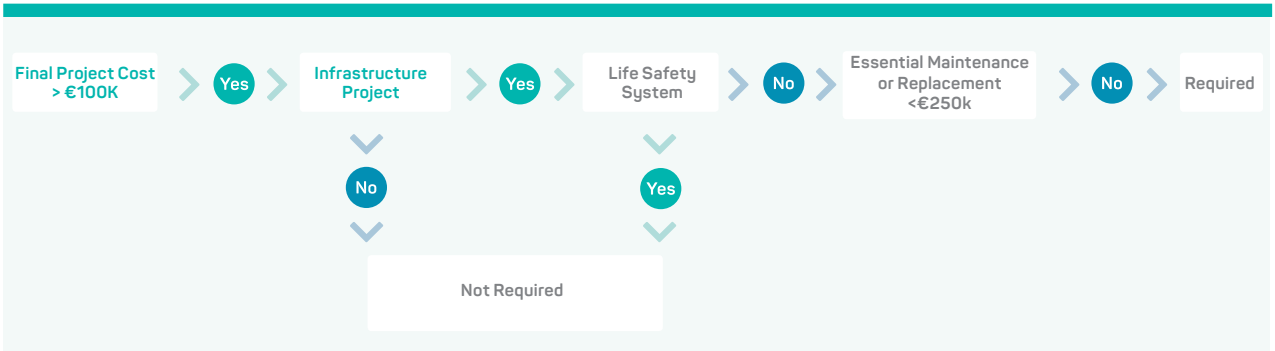


Figure 77: General Masterplan Compliance Determination Process Flow

The key outputs from the Masterplan Compliance Process (MCP) are as follows:

- Masterplan compliance determination Compliant, Non-Compliant or N/A);
- Approval conditions (if any);
- Masterplan asset life determination;
- Mandatory additional internal consultation required;
- MCP final comments.

The proposed development projects detailed in Sections 6.4/6.5/6.6 at this document have all fully completed the Masterplan Compliance Process, based on the emerging Masterplan streams. The resulting determinations, conditions, asset life amendments and supporting comments are incorporated into each of the outline project designs and financial business cases (see Appendix E for Masterplan compliance determinations for each project).

6.9 Financial Impact/Business Case for Investment

A requirement of the supplementary capex process is for Dublin Airport to demonstrate the financial impact to users of the proposed projects. Future price cap levels are unknown at this point in time so CAR have developed a price cap model to assist users make assumptions in assessing the future price cap impact of the proposed projects. This model firstly calculates, on a simplistic basis, the direct impact on the price cap for additional investments (if approved). The price impact represents the capital expenditure entering the Regulated Asset Base (RAB), with all other items remaining constant (i.e. no incremental passengers). Secondly, the model considers the impact of both the capital component and the estimated incremental passengers which would be delivered by the additional projects. The incremental volume will drive increased commercial revenues and operating costs, but in general, should dilute the price cap applicable at the future point in time.

Dublin Airport have quantified the impact of PACE on the price cap by using constant variables (i.e. 2019 price cap, WACC and elasticities as per the 2014 Determination). The business case for the entire suite of proposed projects is presented based on the information provided in Sections 6.4/6.5/6.6. The projects are required to accommodate the expected traffic demand for 2019/2020.

Using CAR's model, the direct financial impact of the €170m capital expenditure (if passengers were to remain as is, i.e. 27.9m in 2016), would be an increase of €0.51 per passenger on the price cap. However, these projects will deliver additional passenger volumes of 3.6 mppa on 2016 and therefore, this calculation does not represent the overall financial benefit for stakeholders. The incremental 3.6 mppa, based on 2014 determination elasticities, would increase commercial revenues by €14.6 m p.a. and opex by €4.3m. When the annual capex, opex and commercial revenue components are assessed, the 2019 base price cap, under the increased annual passenger volumes, will have a dilutive impact on the price cap of €0.87 per passenger.

Additionally, any projects approved through this process will not attract price cap remuneration until 2020 at the earliest, as the allowed investment will only enter the RAB from the start of the next regulatory period. This dilutive impact on the price cap would be immediate for users, as the incremental passenger volumes will be delivered before the next regulatory period. The business case or financial impact is further assessed on the inter-dependent project categories.

Projects to achieve 2017 demand levels require an investment of €44.7m. The direct financial impact of the expenditure, assuming all other items remain constant, is a corresponding increase of €0.15 per passenger. When the associated metrics are factored into the equation, there is a dilutive impact on the price cap of €0.37 per passenger.

Projects to achieve 2019 demand levels will require an investment of €124.9m. The direct financial impact of the expenditure, assuming all other items remain constant, is a corresponding increase of €0.34 per passenger. When the associated metrics are factored into the equation, there is a dilutive impact on the price cap of €0.52 per passenger.

The summary output of the CAR price cap model is in Appendix F.

6.10 Programme Management

Programme Management is defined as the process of: managing the multiple interdependent projects; ensuring a standardised approach to managing cost, time, quality, safety, and risk; and ensuring adequate control and monitoring is in place to safeguard the efficient delivery and overall regulatory compliance. In addition, Programme Management manages the collective impact of the project construction on day-to-day airport operations, and examines options to minimise any negative impact, ensuring minimum disruption to customers. The programme management principles for delivery of these projects, are:

- Expedite projects to alleviate the most significant capacity constraints.
- Expedite projects that can be delivered at an early stage.
- Group projects together, so that impact on operations is minimised.
- Group projects together that deliver the greatest economies of scale and efficiency in construction delivery.
- Deliver individual projects in phases so that capacity can be released in stages aligned to the forecast demand.
- Group projects together to ensure 'downtime' of infrastructure is minimised.
- Expedite planning and regulatory/environmental processes to remove risks early in the project timeline.
- Assess the availability of construction resources (contractors) and the quantum of activity that can be managed in a live operational environment (i.e. assess deliverability).

6.10.1 Stakeholder Engagement

In the delivery of any potential project, it will be essential that every avenue is explored to maintain operations with minimum disruption. It should however be recognised that it is impossible to construct large-scale projects in a live operational environment without some minor impact on operations or requiring some level of temporary relocations of services.

We always aim to determine the optimum solution for each project. We will engage with affected stakeholders to solicit views to determine the potential impact of each project on their specific operation. This will be done through the normal operational channels, such as bilateral discussions, where a project has a direct impact on a single user or group of users. Any disruption will be quantified and communicated directly to users, along with the mitigation plan and managed solutions if applicable. General impacts, which affect the totality of airport operations, are best managed through the existing channels; i.e. The Dublin Airport Operations Committee (AOC), the Dublin Airport Operations Planning Group (DAOPG), and the Dublin Airport Coordination Committee.

6.10.2 Project Delivery

On the following page is an outline, of the high-level project timelines for the delivery of the PACE programme.

See Appendix D for the detailed project plan.

Airfield Projects

Txiway Link 3, Realigned Taxiway A and Dual Taxiway F are grouped together and delivered on the same timeline. This is because all three projects interface physically on the ground and their design - including, vertical and horizontal geometry, drainage, lighting, signage, pavement structure etc. - is interdependent. Delivering these projects uniquely would be inefficient and require multiple taxiway closures or restrictions for each individual project. Taxiway Link 6 can be delivered in advance of the other airfield projects, and is proposed to progress early to provide additional flexibility while the other projects are under construction. This is a mitigation to minimise operational disruption.

The delivery of Taxiway Link 6 will provide options for routing traffic during the construction of other airfield projects. West Apron Access will also progress in advance, as this is a key component of commencing the overall stand strategy, where non-passenger operations are relocated to the West Apron. A more efficient access route must be provided to ensure its sustainability. Currently cargo operations have been relocated to West Apron, providing stand capacity on the East Apron for passenger operations. The programme plans to relocate other dedicated cargo operators by 2019.

Stand Projects

The primary capacity constraint is currently stand provision (this was also identified by multiple users in the consultation) and the construction of stands in the South Apron has been accelerated, with full operation expected in late 2017. Stands 101-104 are currently not available for passenger operations and are only used for tow-on and tow-off operations. These stands could possibly be re-designated as passenger operational stands to provide additional stand capacity on the East Apron. There is a risk to the delivery, as these stands require regulatory approval and a DAAD (Deviation Acceptance and Action Document). If approved, these stands could be operational for Summer 2018. West Apron stands (two NBEs) can be delivered by early 2019 and this will provide additional capacity for relocated non-passenger activity to the West Apron.

West Apron stands are essential to facilitate the growth on the East Apron and to provide contingency while the majority of stands are being constructed on the northern aprons. Apron 5H, Hangar 1 and 2 and 101-104 Stands can also be delivered by Summer 2019 and will provide capacity for passenger operations on the East Apron to meet expected demand. These projects require relocation of facilities, stores etc, and will be co-ordinated to minimise the impact on customers. Apron 5H provides the maximum benefit in terms of stand capacity. This project will be phased to provide 6 NBEs by Summer 2019 and full project completion by 2020. This project also includes the rehabilitation of sixty-year-old pavement, and will be phased to ensure access to hangars is maintained at all times. The option of constructing as a landside or airside site will be reviewed as part of the design process, to determine the most efficient construction approach. The complexity of such a project is demonstrated here to show the interfaces required to complete the design, tender, planning, environmental compliance and construction.

Figure 78: Project Delivery Timeframes

ID	SCP Ref	Project Name
1	17.1.001	Terminal 1 and Terminal 2 Common User Self Service (CUSS)
2	17.1.002	Pier 1 Extension
3	17.1.003	South Apron PBZ
4	17.1.004	Terminal 1 and Terminal 2 Immigration Facilities
5	17.2.001	South Apron Stands
6	17.2.002	Apron 5H and Taxiway Rehab
7	17.2.003	Stands 101-104
8	17.2.004	Hangar 1 and Hangar 2
9	17.2.005	West Apron Stands
10	17.2.006	Pier 2 Underpass
11	17.2.007	Pier 3 Underpass
12	17.2.008	West Apron Access
13	17.3.001	Link 3 Taxiway
14	17.3.002	Realignment of Taxiway A
15	17.3.003	Dual Taxiway F
16	17.3.004	Link 6 taxiway

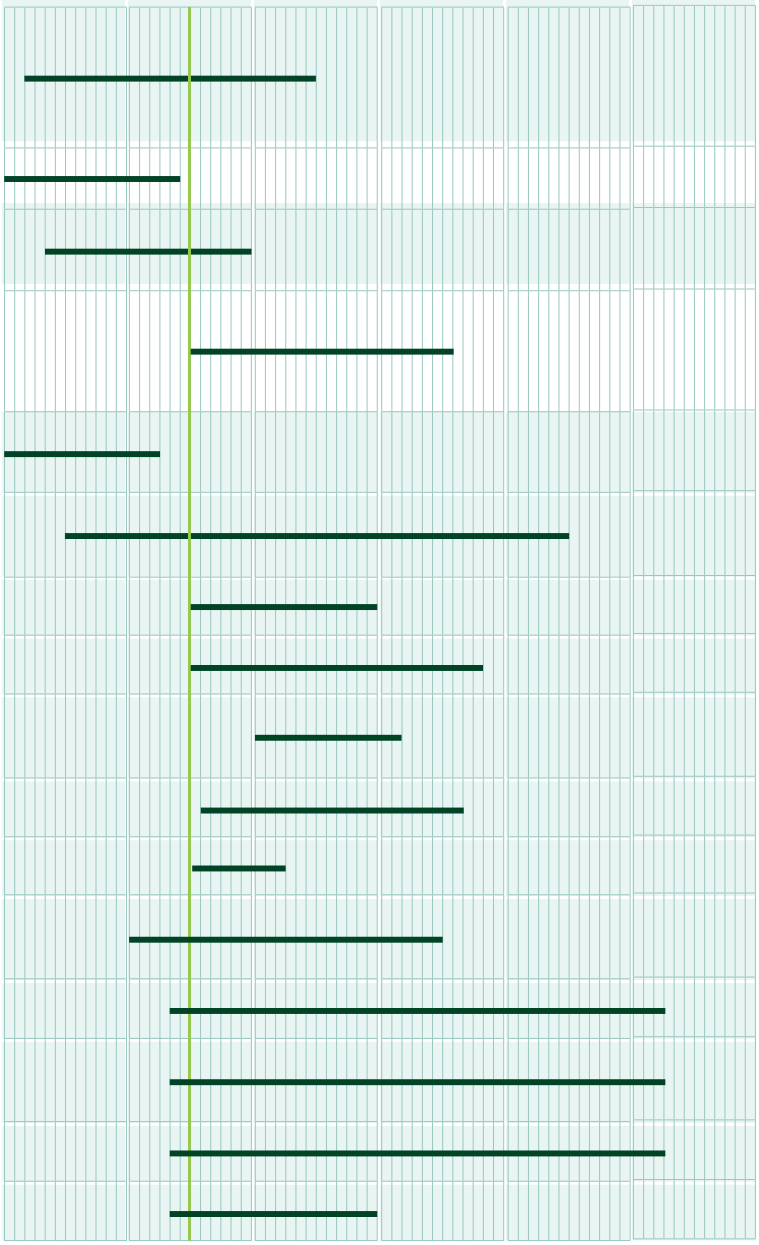


Figure 79: Typical Work Breakdown Structure - Apron 5H

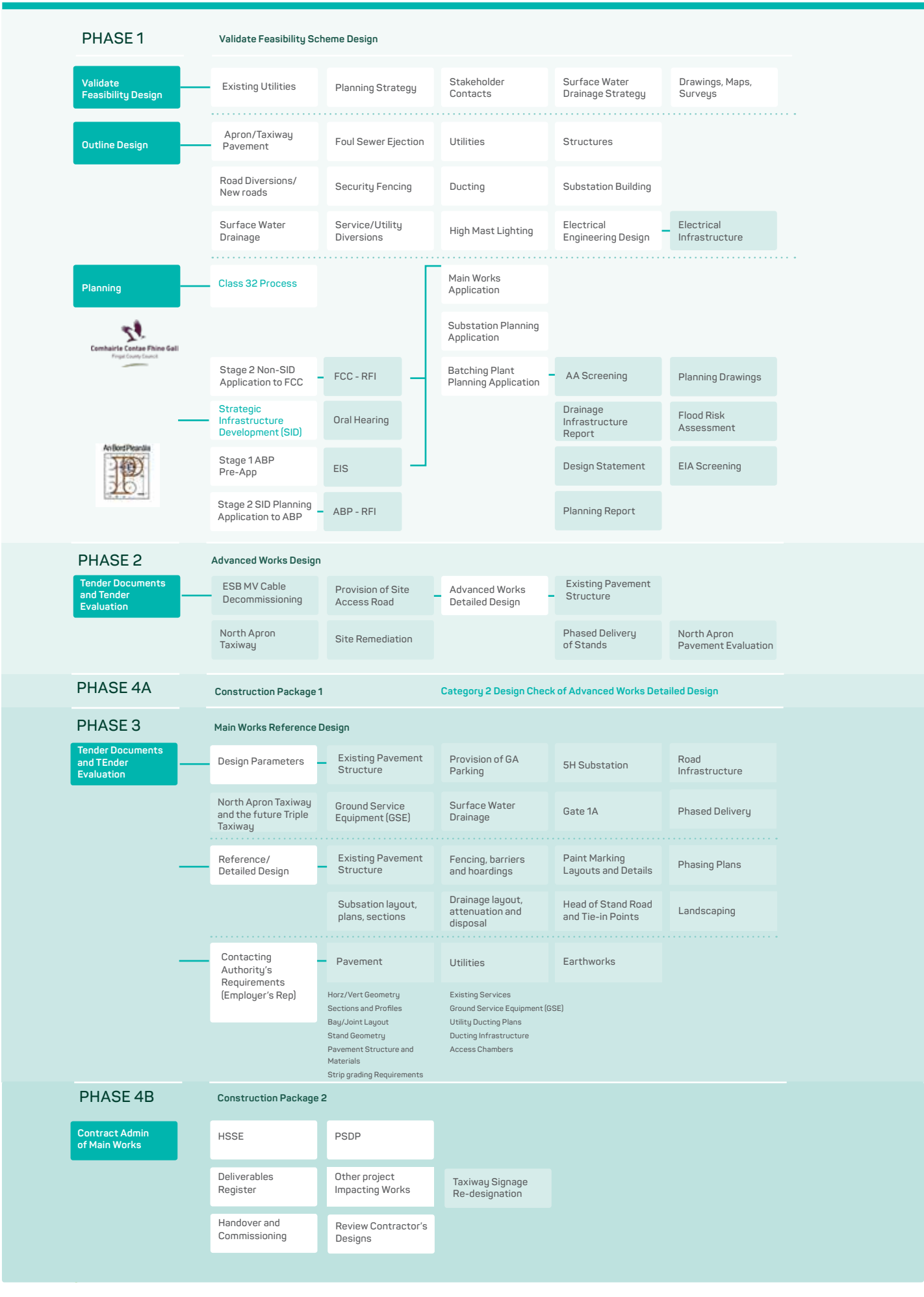
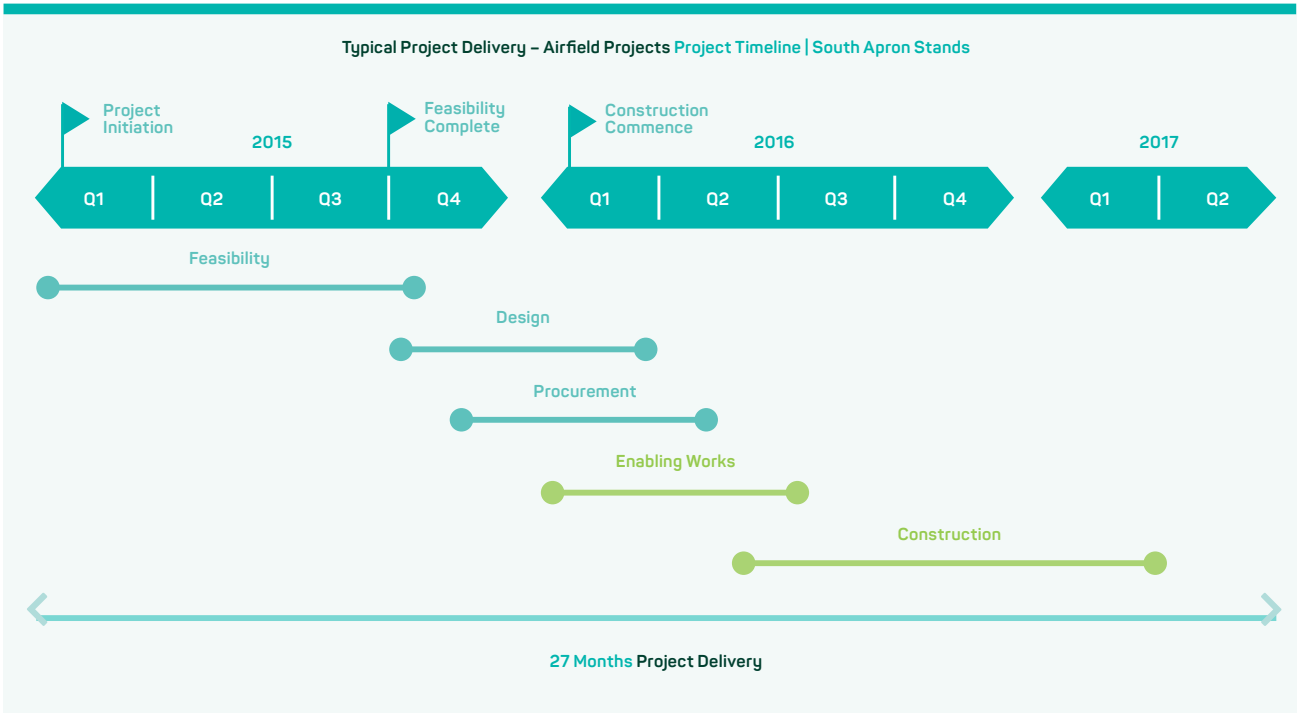


Figure 80: Project Timelines-South Apron Stands



Delivery challenges associated with airfield projects:

- Access restrictions
- Phasing
- Live operations/Low visibility
- Integration with other projects
- IAA approvals
- Complex design and feasibilty

The timelines associated with typical airfield project delivery are highlighted in the chart above. It shows critical milestones and activities that must be achieved in order to hand over the operational infrastructure. A relatively straightforward and non-complex project, such as the South Apron Stands, required a delivery profile of 27 months for completion and handover to flight operations.

The Pier 2 and 3 Underpass Widening can be delivered for Summer 2019. Remote stand provision will change from 50% in 2017 to 60% in 2019, so bussing will require a more predictable and resilient solution. The Pier 3 Underpass Widening project requires minor works only and can be completed in early 2018. Pier 2 widening is significantly more complex and will not be complete until Summer 2019. Both projects will be designed and phased to ensure minimal disruption within the pier and externally, on the apron roads.

Passenger Processing Projects

The Pier 1 Extension project was required for peak Summer 2017 and prioritised for delivery on that basis. This project provides an additional 860 sqm of gate lounge space and four new boarding gates. The South Apron PBZ is also required for 2017. It is currently under construction for delivery in late 2017. Both projects underpin the primary demand requirements for 2017/18. The PBZ project is being constructed as a landside site to expedite delivery and control unnecessary cost. During construction the removal of two stands is essential to provide the necessary working space, as the site is constrained. Terminal 1 Immigration expansion can be delivered for Summer 2019. This project requires full planning permission, as it is a physical extension to the terminal processor and will be phased during construction to minimise disruption. The first phase of this project (installation of e-gates) will be complete in late 2017. This project will be coordinated with the multiple stakeholders involved. Terminal 2 Immigration improvements can be completed in Quarter 4 2017, with the installation of e-gates. This project will be phased to minimise disruption and maintain the maximum level of throughput at the facility. This project will also be coordinated with the multiple stakeholders affected. Terminal 1 CUSS Phase 1 was installed in Quarter 1 2016 at the request of, and in conjunction with, users in Terminal 1. Phase 2 CUSS is currently progressing. It is expected that CUSS Phase 2 will be completed in Quarter 3 2017. Terminal 2 CUSS Phase 1 (east side) was completed in Quarter 1 2016 and Terminal 2 CUSS Phase 2 (west side) is proposed

for completion in Summer 2018. This project will require significant stakeholder engagement and early consultation has commenced with the relevant operators.

6.10.3 Environmental Considerations

Our commitment to sustainability and specifically to carbon management is evident through a number of policy decisions in recent years, including:

- Dublin Airport was one of the first members of the Airports Carbon Accreditation programme, a voluntary carbon management initiative launched by the airport industry. It is now implemented by 190 airports worldwide and recognised by the United Nations Framework Convention on Climate Change (UNFCCC).
- Dublin Airport was the first airport to obtain ISO 50001 accreditation for its energy management system.

Both Dublin and Cork Airports have entered an agreement with SEAI to actively manage energy consumption and have set a target of a reduction of 33% in energy consumption by 2020. The 33% reduction target was set for the public sector. We are on course to achieve this target.

In the development of projects, we always consider the impact on the environment in relation to material selection, construction methods, asset life etc.

In addition, there is a positive benefit from the airfield specific projects in relation to aircraft taxi time and associated fuel burn. Stimulation modeling demonstrates the PACE Taxiway projects delivers the following efficiency improvements for operators:

- An average reduction in departure delay per movement of between 10%-14%.
- An average reduction in arrival delay per movement of 47%-56%.
- An overall reduction in departure delay of five hours per day.
- An overall reduction in arrival delay of two hours per day.

These delays would equate to an annual saving of circa 2,500 hours. At a fuel burn rate for taxiing aircraft at 700kg/hour, this would equate to a fuel burn saving of 1,750 tonnes or 5,512 tonnes of CO^2.

New and more onerous energy standards will apply for CIP 2020–2024. For example, the enactment of the Near Zero Energy Buildings regulations will necessitate significant changes to traditional construction methods. After 31st December 2018, new buildings occupied and owned by public authorities must be Near Zero-Energy Buildings (NZEB). As part of this supplementary capex process, we will consider these requirements in the design of the proposed facilities. We must comply with energy performance requirements in the design and construction of all new buildings. We must also comply if there is a material alteration or extension of an existing building, in terms of energy demand and CO2 emissions.

Progress towards energy efficiency targets, at a national level, has been slower than anticipated. After 2020 such national targets will become more onerous, as EU Member States seek to decouple economic growth from energy consumption. An EU energy consumption reduction target of 40% was announced during the Paris Climate Conference (COP 21).

10-14%

AVERAGE REDUCTION
IN DEPARTURE DELAY PER MOVEMENT

47-56%

AVERAGE REDUCTION
IN ARRIVAL DELAY PER MOVEMENT

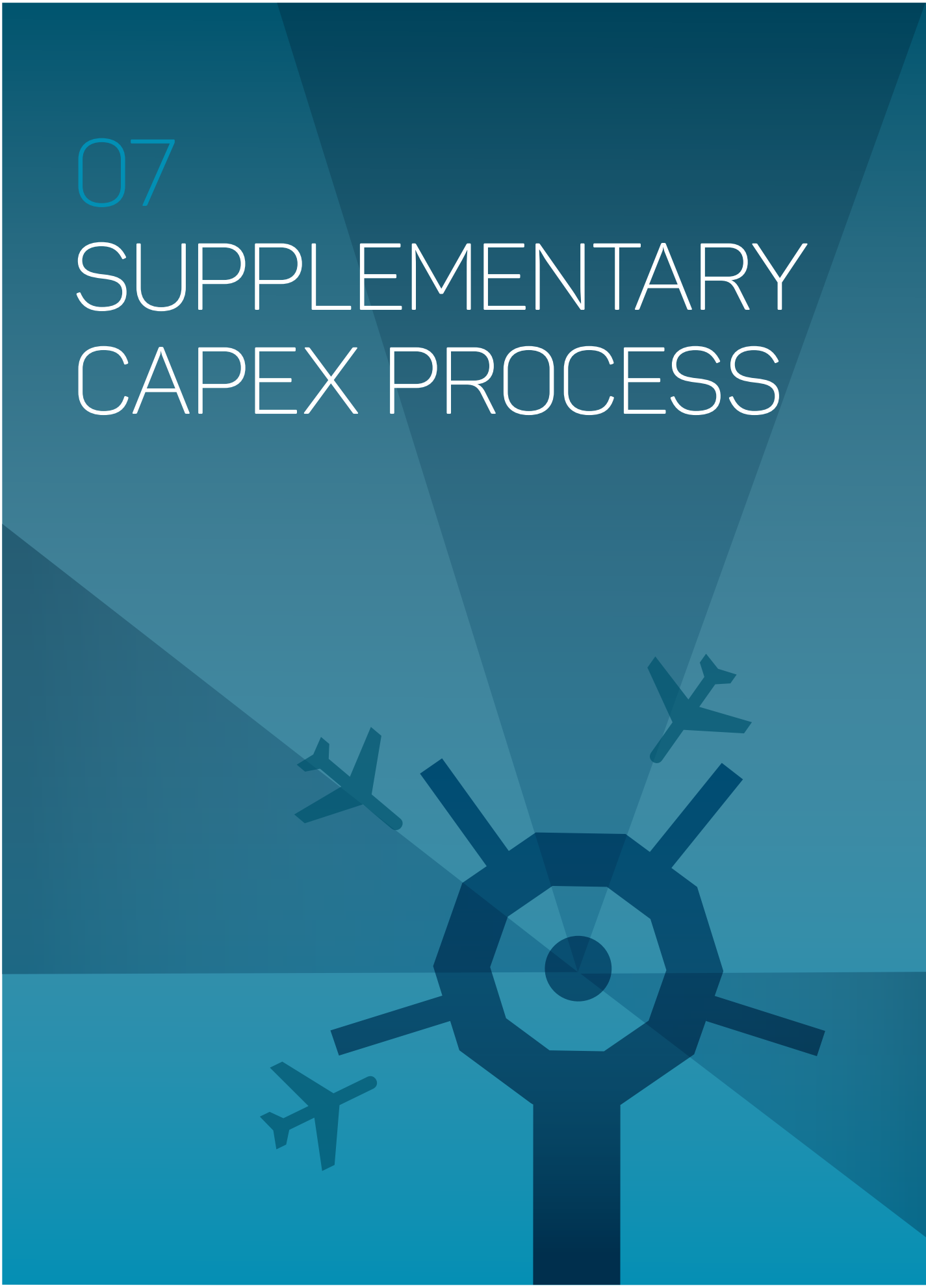
5 hours per day

OVERALL REDUCTION IN
DEPARTURE DELAY

2 hours per day

OVERALL REDUCTION IN ARRIVAL DELAY

07 SUPPLEMENTARY CAPEX PROCESS



07 SUPPLEMENTARY CAPEX PROCESS

On 9th December 2016, CAR published a policy document on, *'Process for Consideration of a Supplementary Capex Allowance'*. This process was developed and finalised after public consultation to improve flexibility in the regulatory process, and to ensure that the airport can respond to changing conditions within a determination period. The increased flexibility provides scope for the airport to develop and accommodate unexpected traffic demand, which achieves the regulatory objective, *'To facilitate the efficient and economic development and operation of Dublin Airport which meet the requirements of current and prospective users of Dublin Airport'*.

CAR defined the process as follows:

- *'When making a submission, Dublin Airport must demonstrate that the additional capital investment is driven by a change in circumstances from the time the prevailing determination was made.*
- *Prior to making a submission, Dublin Airport must consult with users on a range of issues as set out in Section 3 of CP7/2016, including the need for project timelines for delivery and detailed cost information. Dublin Airport will also provide updates on the delivery of the current Capital Investment Programme.*
- *Once a submission is made, the Commission will review the level of consultation carried out by Dublin Airport to ensure that full information sharing has taken place. The Commission will then publish a draft decision, which would be subject to consultation, in advance of publishing a final decision. The scope of the review will be confined to the supplementary capital expenditure allowance.*
- *Dublin Airport will provide updates on the delivery of all approved projects to the Commission and other interested parties.'*

In Section 3 of CP7/2016, CAR stated Dublin Airport must consult with users on the following in advance of making a submission to the Commission:

- *'The need/merit of the project.*
- *Details on delivery of proposed project.*
- *Timelines for the delivery of the proposed project.*
- *Details on delivery of current Capital Investment Programme including which projects have been prioritised, added or dropped, together with a timeline for delivery of the Programme.*
- *Proposed projects to deliver additional capacity must be underpinned by a capacity assessment showing that existing infrastructure is being maximised. This assessment can be conducted by Dublin Airport or a third party.*
- *Detailed business cases and cost information must be provided to users. Costs must be worked up comprehensively to allow an assessment by users of the costs and benefits of projects. Where appropriate, Dublin Airport should present the costs and benefits of a number of options for addressing a need.*
- *Detailed timelines and milestones for projects should be consulted on.'*

Through engagement with CAR, Dublin Airport has ensured that this consultation document, along with the planned follow-up consultation meetings and presentations, more than adequately satisfies the information sharing and consultation requirements set-out in CP7/2016.

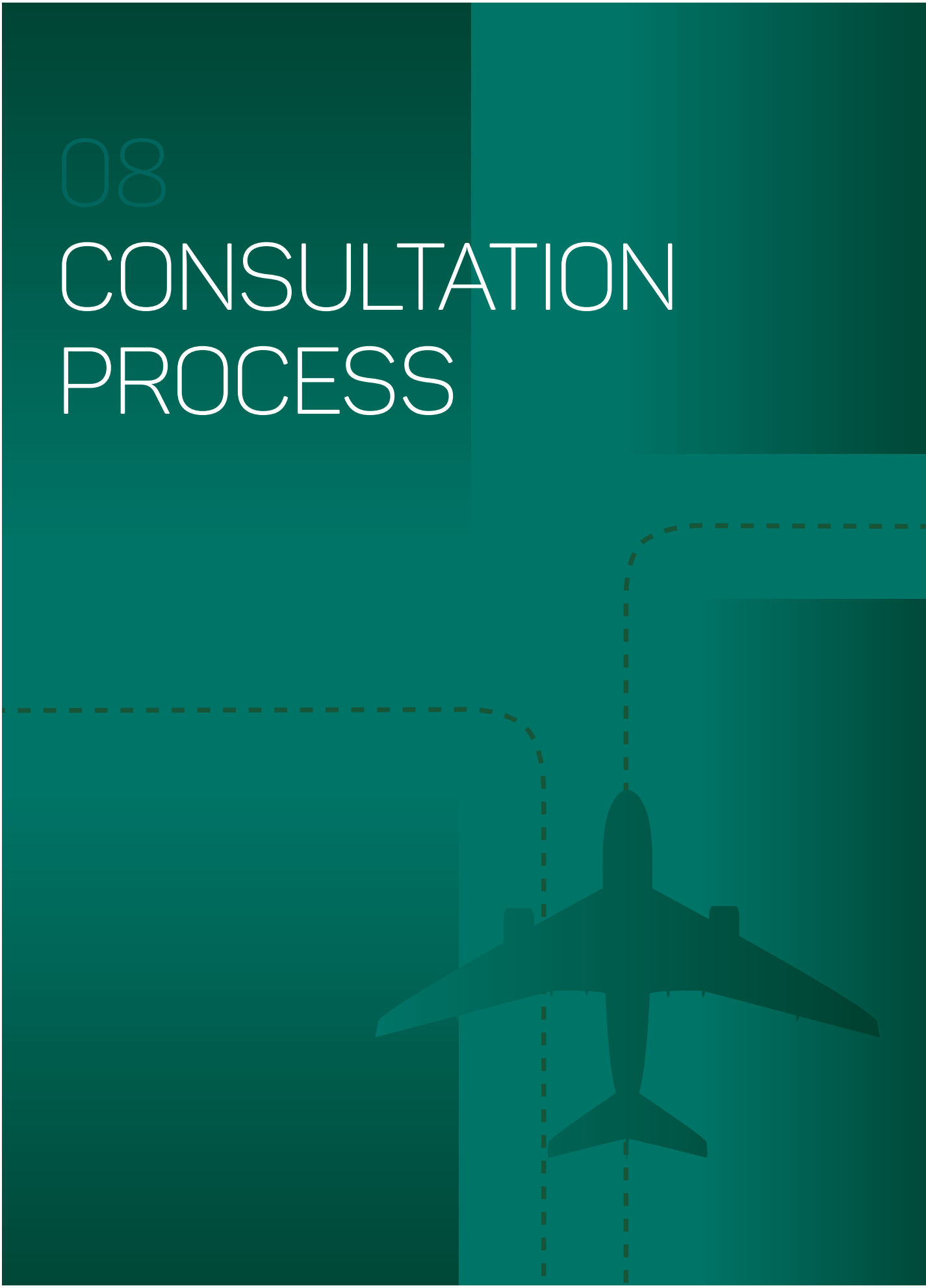
For reference, Dublin Airport has defined:

- The need and merit for the proposed projects in Section 6.4/6.5/6.6 and Appendix B.
- Details on delivery are discussed in Section 6.10.2 and Appendix B.
- Timelines for delivery of projects in Section 6.10.2 and Appendix B and D.
- Update on current CIP in Section 5.
- Detailed business case using CAR's price cap model in Section 6.9.
- Comprehensive cost detail Appendix B.

We are committed to undertaking a comprehensive consultation process with airport users. Interested parties will be encouraged to engage constructively throughout this process, and we will facilitate many opportunities for users to provide feedback and request clarifications. Our intention is to fully analyse and consider all constructive feedback, which will subsequently be discussed fully with users. Ultimately, projects will be updated and refined based on improvements suggested from customer feedback.

When we have completed this consultation process, we intend to refine the PACE proposals and subsequently, submit a Supplementary Capital Proposal to CAR for consideration.

08 CONSULTATION PROCESS



08 CONSULTATION PROCESS

As an important customer and partner of Dublin Airport, we appreciate the key role you play in shaping future airport infrastructure. The proposed PACE programme is now sufficiently developed for consultation with airport stakeholders. Given the importance of delivering sufficient infrastructure to accommodate customer growth expectations, and maintaining the high-quality service levels currently delivered throughout the airport, we encourage all stakeholders to constructively engage in this consultation process.

We would like to invite all users to attend consultation meetings and provide a written response to the PACE proposal.

Dublin Airport would like to thank you in advance for all comments, repsonses and submissions. Please direct all correspondance on PACE to **pace@dublinairport.com**

APPENDICES

APPENDIX A

Capacity Consultation Feedback and Airport Response

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
1	User 1	**Airfield**	Airfield	Use capacity management tool to simulate operations and ease capacity choke points.	Dublin Airport actively uses CAST software for airfield planning purposes and also outsources modelling work to external subject matter experts as required. Simulations are carried out to inform seasonal capacity declaration, to assess the impact of major airfield works and to quantify the benefits of future proposed infrastructure (as will be detailed for PACE proposals).
2	User 1	**Airfield**	Airfield	Build more effective Rapid Exit Taxiways (RETs) and Rapid Access Taxiways (RATs).	Rapid Exit Taxiways (RETs) and Rapid Access Taxiways (RATs) were considered as part of the project evaluation and the modelling showed that while RETs reduce Runway Occupancy Times (ROT), there was not an overall benefit to runway capacity due to arrival / departure profile at Dublin Airport - See justification for project deferral in Appendix C.
3	User 1	**Airfield**	Airfield	Visual-docking guidance system - stand guidance systems could improve OTP and taxiing times.	A feasibility study is underway to assess the business requirement for providing A-VDGS on contact stands at Dublin Airport to maintain safety and realise the full benefits of A-CDM.
4	User 1	**Airfield**	Airfield	Increase infrastructural access (passengers and GSE) from East Apron to West Apron to support any potential future use of the West Apron for passenger flights.	The strategy for stand development at Dublin Airport to 2020 is to maximise the sustainable use of the West Apron for non-passenger operations thereby freeing up capacity on East Apron for passenger operations. PACE includes a project to provide more sustainable Surface Access to the West Apron in the short / medium term.
5	User 1 User 1 User 5	**Air Traffic Management** **Airfield**	Airfield	Devise logical taxi routings and push aircraft to closest terminal position where possible. Avoid cul-de-sac encounters through ATC tactics. Long taxiway times stemming from airfield capacity constraints causing delays, which in turn causes problems for connecting passengers. Also causes reduced OTP. Need to reduce taxi-in and taxi-out times to acceptable levels.	In order to improve taxiway efficiency and OTP a suite of taxiway infrastructure projects are proposed as part of PACE (see Section 6) which will: • Improve taxi time and reduce delay. • Reduce taxiing complexity. • Provide resilience. • Design out operating restrictions. • Improve current junction hotspots. • Ease apron access-related congestion. • Facilitate towing requirements. These projects will assist ATC in managing airfield taxiing and will provide additional flexibility in taxi routings at Dublin Airport.
6	User 1	**Air Traffic Management**	Airfield	RWY 10 and RWY 34, simultaneous departures.	IAA ANSP have advised that the safety issues associated with RWY 34 and RWY 10 simultaneous departures (e.g. ensuring the sterility of the runways and the go-around protection) do not make this option feasible.

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
7	User 1	**Air Traffic Management**	Airfield	Queuing system for RWY 10 using 3 line up points.	IAA ANSP have advised that both Taxiway E7 and Taxiway E6 for intermediate line-ups on a tactical basis and/or when the pilot requests it, are currently available. The tower controller will try to maximise the throughput where possible by offering Taxiway E7 when it is considered that an intermediate departure will allow an aircraft to depart before an aircraft on approach lands. Turbo-props are more disposed to Taxiway E6 departures while the Cat C aircraft tend to prefer the longer TORA from Taxiway E7.
8	User 1	**Air Traffic Management**	Airfield	All day simultaneous runway availability for 16/34 and 10/28.	IAA ANSP have advised that Dual Runway Operations only works when there are few arrivals because of the need to ensure that an arrival is not affected by an aircraft positioning for a RWY 34 departure or using take-off thrust in the area of the RWY 28 landing threshold. They are actively using approach spacing strategies (e.g. Arrival-Departure-Departure-Departure-Arrival (ADDDA) to optimise the morning departure wave runway throughput. Once they move into the core of the day where the number of arrivals and departures are broadly equal, it would be extremely inefficient to delay arrivals (and hence turnarounds) to allow the use of RWY 28 and RWY 34.
9	User 1	**Air Traffic Management**	Airfield	Tactical use of direct B routing to RWY 10 - critical to keep Taxiway B2 open.	IAA ANSP have advised that they currently do not allow it because the preferred exit taxiway from RWY 10 is E3 and aircraft outbound from B2 along B3 potentially would block an arrival and reduce runway throughput. In addition, from a human factors performance point-of-view, it is best practice to standardise operations to the extent possible and allowing outbound aircraft to taxi B2-B3 would be an anomaly. However, they have advised that they would be prepared to re-assess this (for example, by the strictly limited tactical use of B2-B3 when there are no arrivals to RWY 10 or none within a certain distance/flying time from the runway).
10	User 1	**Air Traffic Management**	Airfield	Implementing tighter pilot procedures.	The principles of implementing tighter pilot procedures are contained in the Aeronautical Information Publication (AIP) at EIDW, 2.20 Section 3 - High Intensity Runway Operations (HIRO). These principles are fully supported by Dublin Airport to maximise runway efficiency.
11	User 1	**Air Traffic Management**	Airfield	Introducing Time-Based Separation (TBS) for landing in windy conditions.	IAA ANSP have advised that they see the benefits of TBS and are actively assessing with EUROCONTROL how TBS could help at Dublin Airport, including identifying methods of improving repeatability of spacing. They expect that TBS will be implemented at Dublin Airport within the next 2/3 years.
12	User 3	**Airfield**	Airfield	Redesign of road system to provide uninterrupted bussing from Terminal 2 to Central Apron.	PACE includes projects to widen underpasses at Pier 2 and Pier 3 to facilitate quicker, more predictable and safer bussing routes to remote stands. See Projects in Appendix B.

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
13	User 1 User 3	**Airfield**	Airfield	Infill South Apron area and build new taxiways and access/holding points into runway. Constructing South Apron runway access taxiways for PBZ and South Apron operations. Infill/Extension of South Apron Area.	Dublin Airport has evaluated options to infill South Apron stands and provide additional access points and holding points onto RWY 28. Please refer to Section 6.5.2 South Apron Phase 2 which details the reasons for not progressing with this project at this point in time.
14	User 1	**Air Traffic Management**	Airfield	Pair-wise separation taking into account the types of aircraft (rather than size per ICAO) and the weight of the aircraft to calculate TBS.	IAA ANSP have advised that they have investigated this with EUROCONTROL already. The initiative is called RECAT-EU and is of limited value to Dublin Airport at present because of the overwhelming predominance of Cat C aircraft (outside the transatlantic movement period). They also believe that at the Embraer end of the jet categories this could actually give a disbenefit because the recategorisation puts an extra spacing requirement on this category of aircraft.
15	User 1	**Air Traffic Management**	Airfield	Introduce cross-border arrivals management (XMAN) system which allows for better management of stacking system at Point Merge.	IAA ANSP have advised that the XMAN system is currently only employed by Heathrow and requires control input from Shannon, Maastricht and Reims. This needs significant IT infrastructure and has a wide-ranging area of operations. Consequently it would not be a solution suited to Dublin Airport at the moment. Even at the levels of traffic now being experienced at Dublin Airport, the Point Merge System normally handles the traffic without significant holding. In order to optimise operations further, IAA ANSP need a Dublin-focused 'local' AMAN which feeds accurately to the Point Merge System and this is being provided as part of a COOPANS upgrade in 2019.
16	User 1	**Air Traffic Management**	Airfield	Introducing Continuous Descent Approach (CDA) procedures – for environmental and fuel usage efficiency.	IAA ANSP have advised that this is fully in operation since December 2012 and has shown substantial benefit both in fuel reductions and emissions.
17	User 1	**Air Traffic Management**	Airfield	Introduce Performance Based Navigation (PBN) and Automatic Dependent Surveillance-Broadcast (ADS-B).	IAA ANSP have advised that all of their procedures are already PBN. They also advised that it is not the navigation capability of individual aircraft which assists airspace utilisation, but the efficient Air Traffic Management of all aircraft in the airspace and this is achieved through robust and safe ATC procedures. They also use ADS-B Mode S enhanced surveillance in their advanced ATM systems to enhance situational awareness of controllers regarding actual and planned flight profiles and pilots' input to aircraft systems.
18	User 6	**Baggage**	Terminal 1	Baggage Hall.	This does not form part of PACE as it is being reviewed as part of the HBS Upgrade to Standard 3 compliance project and will be consulted with users separately in due course.
19	User 1 User 4 User 5	**US Preclearance**	Terminal 2	Increase US Preclearance capacity to account for expected passenger growth through more APCs and global entry kiosks.	The proposal to address capacity constraint in US Preclearance is a managed solution, with multiple options being considered and is detailed in Section 6.4.

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
20	User 5	**US Preclearance**	Terminal 2	Consider US Preclearance proposal to allow pre-cleared and non-pre-cleared passengers to mingle.	Under current US Preclearance requirements, there is no provision to mingle pre-cleared and non pre-cleared passengers.
21	User 5	**US Preclearance**	Terminal 2	Consolidate security screening for pre-clearance departures to a single EU and US standard checkpoint.	This proposal would require significant investment in additional resources and some capital expenditure and as such, was not deemed a necessary requirement.
22	User 1	**US Preclearance**	Terminal 2	Higher US Preclearance service level. Prepared to share costs on a fair basis through cost sharing mechanism.	The Department of Transport, Tourism and Sport has recently engaged with US Customs and Border Protection around a new reimbursement model. Our understanding is that this process is currently underway.
23	User 1 User 4 User 5 User 6	**Check-in Desks**	Terminal 1 Terminal 2	More investment in common use check-in kiosks and online check-in methods at off-terminal sites. Invest in self-service technologies similar to Bag Tag and Drop.	A project for Common User Self Service (CUSS) is proposed as part of PACE to address check-in efficiency and capacity. See Section 6.4.1 and Appendix B.
24	User 1	**Check-in Desks**	Terminal 1 Terminal 2	Upgrade CUTE system to allow GHA and enable swifter switch between airline DCS applications. Enable merged queuing for airline customers at same check in desk.	CUTE system has been superseded by CUPPS (Common User Passenger Processing) in December 2015. CUPPS has facilitated a faster transition between Airline DCS applications. Regarding merged queues: this is not practical. Agents have to sign into each individual airline's DCS to check-in a flight. Switching between airlines DCS takes time and will delay the process at the desk for passengers.
25	User 2	**Gates and Bus Lounges**	Terminal 1	Pier 1 extension.	A project for Pier 1 Extension is proposed as part of PACE. See Section 6.4.4 and Appendix B.
26	User 4	**Gates and Bus Lounges**	Terminal 2	Lack of ramp with gate availability is causing congestion and delays outbound.	Two projects for additional gate capacity are being proposed as part of PACE: 1. Four gate extension to Pier 1. 2. Five gate pre-boarding zone on the South Apron. In addition, a suite of taxiway infrastructure projects are proposed as part of PACE (see Section 6) which will: • Improve taxi time and reduce delay. • Reduce taxiing complexity. • Provide resilience. • Design out operating restrictions. • Improve current junction hotspots. • Ease apron access-related congestion. • Facilitate towing requirements.
27	User 3	**Gates and Bus Lounges**	Terminal 2	Satellite Bussing Gates to service South Apron Regional feeder services from Terminal 2.	Included in this proposal is a Pre-Boarding Zone facility on the South Apron. See Section 6.4.4 for details. South Apron constrained at peak times and stand rules will determine allocated carriers for stands.

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
28	User 5	**Gates and Bus Lounges**	Terminal 2	Create more swing gate operations.	This was addressed by Dublin Airport in May 2017 (as part of the current CIP allowance) when a new swing gate was installed in Terminal 2, which facilitated the use of stand 400C for pre-cleared flights. Further options may be available to provide extra US Preclearance stands which require further evaluation.
29	User 1 User 6	**Gates and Bus Lounges**	Airfield	Satellite terminal on West Apron for passenger operations.	The strategy for stand development at Dublin Airport to 2020 is to maximise the sustainable use of the West Apron for non-passenger operations thereby freeing up capacity on East Apron for passenger operations. PACE includes a project to provide more sustainable Surface Access to the West Apron in the short/medium term. A satellite terminal on the West Apron is outside the scope of PACE and is currently being evaluated as part of the Masterplan process.
30	User 1	**Gates and Bus Lounges**	Terminal 2	Pier 4 - possibility of passengers boarding incorrect flight when there is a tight window between gate usage combined with an unexpected tail number change. Relocation of bussing gate for remote aircraft in these circumstances should be adopted as standard practice.	Stand and Gate allocation rules take these concerns into account. Monitoring takes place through Terminal Operations Centre on daily basis to ensure efficient operation.
31	User 1	**Gates and Bus Lounges**	Terminal 1	Insufficient space/ seating for passengers at Gate 301. Risk of passengers boarding incorrect flight during first wave.	This gate feeds 2 stands during first wave to increase the number of contact stands as a request from our airlines. An alternative would be to reallocate one flight to a remote stand and bus passengers.
32	User 1	**Gates and Bus Lounges**	Terminal 1	Use lower level Pier 3 gates for bussing operation. Refurbishment also required.	This option is not possible as these stands are used as walk out gates rather than for bussing operations.
33	User 1	**Gates and Bus Lounges**	Terminal 2	Self-service e-gates (boarding) in PBZ.	This was considered previously but not requested by Airport Operators Committee. Dublin Airport is continuing to evaluate the technical feasibility of self-service functionality in the PBZ.
34	User 4	**Gates and Bus Lounges**	Terminal 2	Retain existing gates of operation; 402 to 408.	Noted. Gates will be retained.
35	User 1	**Gates and Bus Lounges**	Terminal 1 Terminal 2	Dedicated inbound passenger injection point rather than at a gate that happens to be available upon landing.	The new transfer facility currently under construction will provide an injection point for Terminal 2 remote arriving aircraft.
36	User 5	**Immigration**	Terminal 2	E-gates in Immigration.	Project proposed as part of PACE, Section 6.4.5. Refer to Appendix B for further details.

Feedback and Airport Response

	User	Category	Location	Condensed User Feedback	Response
37	User 1	**Immigration**	Terminal 1	Get staff member to manage Skybridge queues such that passengers en route to Pier 3 via the "outer lane" on Skybridge are not impeded or delayed. No queuing on the Skybridge in the longer term.	Stand allocation rules will plan to avoid any mixing between Terminal 1 and Terminal 2 arrivals on Pier 3. Resources are also in situ to manage cross flows in conjunction with handlers.
38	User 1	**Immigration**	Terminal 1 Terminal 2	Review the requirement for all transfer passengers to be inspected by INIS.	This requirement is controlled and implemented by Irish Naturalisation and Immigration Service (INIS).
39	User 1 User 6	**Other**	Terminal 1	Increase parking/storage allotment for Ground Service Equipment (GSE) and Unit Loading Devices (ULD).	All new stand development projects as part of PACE will provide adequate GSE parking capacity. Existing stands will continue to be evaluated to identify optimised solutions.
40	User 1	**Security**	Terminal 2	Increase capacity headroom for Terminal 2 Security to account for LAGS Phase II.	The capacity assessment has identified there is sufficient security capacity in Terminal 1 and Terminal 2 for the duration of this regulatory period. In the event of LAGS Phase II/III being implemented, this position would need to be reevaluated.
41	User 7 User 8	**Stands**	Airfield	Provide sufficient replacement General/ Business Aviation parking space on east side of airport.	GA stand provision is included as part of the North Apron Stand Development project.
42	User 1	**Stands**	Airfield	Requirement for stand contingencies and dedicated location to park standby aircraft.	As part of PACE, Dublin Airport is recommending stand development projects including contingency provision. Refer to Section 6.5 for details.
43	User 1	**Stands**	Airfield	Minimise late stand changes.	Dublin Airport's policy is to minimise unplanned stand changes. The Stand Allocation Unit will engage with airlines and handlers to avoid late stand changes. However, sometimes this is unavoidable when aircraft have experienced technical issues and/or operate off schedule.
44	User 6	**Stands**	Terminal 1	Reduce constraints on stand availability on Pier 3. Pre-empt further deterioration of the situation following stand re-alignment.	As part of PACE Dublin Airport is recommending stand development projects. Refer to Section 6.5 for details. Stand rules will determine allocated carriers for stands.
45	User 3	**Transfer Facility**	Terminal 2	Bussing services for Transatlantic transfers direct to Pier 4 Transfer Facility.	The new transfer facility currently under construction will provide an injection point for Terminal 2 remote arriving aircraft.
46	User 1	**Transfer Facility**	Terminal 2	Increase transfer host team to allow higher numbers of interventions with connecting passengers.	Transfer host team recently increased from 5 to 7 full time staff. We will continue to monitor staffing levels as passenger numbers increase.

APPENDIX B

PACE Project Sheets

PACE Projects Sheet

SCP Reference	Project Title	Estimated Cost €'m
Passenger Processing		
SCP 17.1.001	Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in	5.9
SCP 17.1.002	Pier 1 Extension	7.6
SCP 17.1.003	South Apron PBZ	22.0
SCP 17.1.004	Terminal 1 and Terminal 2 Immigration Facilities	11.3
Stands and Associated Projects		
SCP 17.2.001	South Apron Stands	10.5
SCP 17.2.002	Apron 5H and Taxiway Rehabilitation	52.0
SCP 17.2.003	Upgrade and Realignment of Stands 101–104	5.0
SCP 17.2.004	Hangar 1 and Hangar 2 Stands	14.3
SCP 17.2.005	West Apron Stands	2.5
SCP 17.2.006	Pier 2 Underpass	5.0
SCP 17.2.007	Pier 3 Underpass	0.2
SCP 17.2.008	West Apron Surface Access	3.0
Airfield/Taxiway		
SCP 17.3.001	Link 3 Extension Taxiway	4.0
SCP 17.3.002	Realignment of Taxiway A	5.7
SCP 17.3.003	Dual Taxiway F	15.5
SCP 17.3.004	Link 6 Extension Taxiway	5.1
	Cumulative Total	**169.6**

SCP 17.1.001
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in

Project Summary

This project provides for additional and more efficient check-in capacity in Terminal 1 and Terminal 2 through the use of Common Use Self Service (CUSS) technology. CUSS technology reduces passenger processing time at the check-in area and provides an enhanced customer experience. Airports Council International (ACI) predicts that 80% of global passengers will be offered a complete self-service experience based on industry standards by 2020. This project is being carried out in 3 phases:

CUSS Phase 1 (Proof of Concept) - €2.2m

- Terminal 1 users - 1 step kiosk fit out.
- Terminal 2 users - 2 step fit out.

As part of the CUPPS replacement project (Common User Passenger Processing System – previously known as CUTE Common User Terminal Equipment), Dublin Airport implemented increased functionality for our airline and handling agent customers through the introduction of CUSS passenger processing technologies. CUSS extends to check-in, bag drop and boarding. It is expected that CUSS will significantly enhance the passenger experience at the airport and will drive efficiencies in the delivery of passenger services. CUSS for check-in and bag drop will only be in scope for this initiative. As part of the CUPPS/CUSS project, Dublin Airport undertook trials and a number of airlines have indicated their preference for CUSS products.

CUSS Phase I was implemented in Q2 2016. In this phase, Dublin Airport purchased 10 Self Service Kiosks and 9 bag drop units and installed 7 in Terminal 1 and 12 in Terminal 2.

CUSS Phase 2 - €1.7m

- Terminal 1 users - move to a 2 step CUSS layout .
- Sky Handling Partner and Swissport CUSS clusters in Terminal 1.
- Terminal 2 users - CUSS configuration changes.

Following the successful deployment of CUSS Kiosks and Bag Drops in Terminal 1 and Terminal 2 in 2016 (Phase 1), other airlines would like to leverage the benefits of CUSS. This supports our strategy of enabling growth by increasing the number of CUSS kiosks around the airport. The installation of 65 CUSS units at a cost of €2.2m in 2016 has been transformative, in particular for Aer Lingus check-in, where CUSS has alleviated a critical poor service pinch point. The 2016 investment has seen the following benefits:

- A reduction of queue times by up to 75%, particularly in Terminal 2 where Aer Lingus have a 2-step check-in process. On average, 8,000 bags processed daily.
- There has been very positive feedback from both airlines and passengers.
- It has negated the need to extend Terminal 2 check-in at an estimated in the region of €30m.
- There is now a standard seamless passenger experience across both terminals with equipment that can move between terminals.

Since the introduction of CUSS, it has become apparent that the 2 step process brings the most benefit.

Step 1 Passengers can check –in, weigh bags, process payments and print boarding passes and bag tags away from the check-in desk.

Step 2 Passengers drop the tagged and weighed bags onto the belt at a touchless bag drop.

SCP 17.1.001
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in

Project Summary

Phase 3 2018/19 - €3.0m

Phase 3 includes the installation of CUSS Technology on the east side of Terminal 2 check-in. The east side of the Terminal 2 Check-in hall is mainly used for US based airlines and is at capacity during the transatlantic peak. To meet the 2018 and 2019 requirement for the US carriers, an eastern check in hall extension was explored. This extension would cost in the region of €20m. By investing in CUSS on the east side of Terminal 2, we are innovating through technology to deliver efficient capital spend to increase capacity. This investment will greatly improve the check in experience at Dublin Airport and will also defer the need for large building extensions.

Full cost of 3 phases (2016-2019) - €6.9m	
Phase 1 cost (2016)	€2.2m
Phase 2 cost (2017)	€1.7m
Phase 3 cost (2018/19)	€3.0m

CUSS implementation

CUSS implementation

SCP 17.1.001
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in

Project Details Summary		
Category Passenger Processing	Terminal (Business Development)	
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Request (Operational Efficiency)	**Total Capex Requirement** €5.9m (€6.9m less €1m allowance)
Underpinning Assumptions and Cost Benchmarks	• Optimises use of critical infrastructure. • Supports airline growth and efficiency . • Meets user requirements. • Provides multiple user flexibility. • Cost based on tender returns for similar works in 2016 (CUSS Phase 1) and adjusted for inflation.	
Opex Impacts	• IT support costs. • Energy costs.	
Stakeholder Evaluation and Consultation Status	Phase 1 and Phase 2 of this project have been requested by airlines and users. This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Output	Terminal 1 and Terminal 2 CUSS implementation.	
Asset life	5 years.	

Project Delivery Key Milestones	
Phase 1 Complete	Q3 2016
Phase 2 Complete	Q2 2017
Phase 3 Feasibility/Outline Design Complete	Q3 2017
Phase 3 Detail Design Complete	Q3 2017
Phase 3 Construction Commence	Q2 2018
Phase 3 Project Handover	Q2 2018

SCP 17.1.001
Terminal 1 and Terminal 2 Common User Self Service (CUSS) Check-in

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€506,827
Construction Costs	88%	€6,075,336
Design Development and Contingency	5%	€317,838
Total	**100%**	**€6,900,000**

Key Assumptions

- Optimises use of critical infrastructure.
- Supports airline growth and efficiency.
- Meets user requirements.
- Provides multiple user flexibility.
- Cost based on tender returns for similar works in 2016 (CUSS Phase 1) and adjusted for inflation.
- Design Development and Contingency is not applicable for Phase 1 and 2.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€6,075,336	1.2	€72,404	€72,404
Civil/Airfield/Environmental Engineer	€6,075,336	3.4	€204,047	€204,047
Project Management/Other Costs	€6,075,336	3.8	€230,376	€230,376
Total - to summary				**€506,827**

Construction Costs	Quantity	Unit	Rate	Total
Preliminaries	1	Sum	€1,152,110	€1,152,110
Building works	170	m^2	€1,852	€314,784
Equipment; SSK Units incl elec works	98	nr	€31,693	€3,119,560
Equipment; BDK Units incl elec works	41	nr	€35,925	€1,488,881
Total - to summary				**€6,075,336**

Design Development and Contingency	Value	%	Total	Total
Design Development (Phase 3 only)	€2,889,432	6.0	€173,366	€173,366
Contingency (Phase 3 only)	€2,889,432	5.0	€144,472	€144,472
Others	€0	0	€0	€0
Total - to summary				**€317,838**

SCP 17.1.002
Pier 1 Extension

Project Summary

This project comprises a single storey extension to Pier 1 including:

- circa 860sqm ground floor extension to Pier 1 with the provision of 4 boarding gates.
- Associated civil works and ramp alterations.
- Relocation of existing battery chargers and fuel tank.
- Relocation of existing GSE parking.
- Safeguarding structural works for future first floor extension.
- Toilet block on ground floor of Pier 1.

This project will enable more pier-served aircraft to be simultaneously boarded than currently possible (by having two additional boarding gates), through stands 118R, 119, 119R and 120L. In addition, the proposed gates will convert stands 119R and 120, from remote, to walk out contact stands. It will remove the current need to bus to these stands from Terminal 1 bus gates.

This project will increase the total number of walk-out contact stands at Pier 1 from 21 to 23, and it will relieve current congestion by providing a more favourable 'gate to stand' ratio.

This in turn, delivers better and more efficient usage of contact stands, and has the ability to facilitate an increase in departures from Pier 1.

SCP 17.1.002
Pier 1 Extension

Project Details Summary		
Category Passenger Processing		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €7.6m
Underpinning Assumptions and Cost Benchmarks	• Cost based on tender return.	
Opex Impacts	• Additional Opex includes heat and light.	
Stakeholder Evaluation and Consultation Status	• This project was specifically requested by users. • This proposal is being presented as part of the Supplementary Capex Process in Q3 2017, in consultation with users.	
Project Deliverable	• Ground Floor Extension to Pier 1. • 2 contact (previously remote) Code C NBEs. • Extra lounge/queuing space in Pier 1 (circa 860sqm).	
Asset Life	40 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q2 2016
Planning Complete	Q2 2016
Detail Design Complete	Q4 2016
Construction Commence	Q4 2016 (6 months)
Project Handover	Q2 2017

SCP 17.1.002
Pier 1 Extension

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	8%	€585,200
Construction Costs	92%	€7,014,800
Design Development and Contigency	NA	NA
Total	**100%**	**€7,600,000**

Key Assumptions

- Cost based on construction within existing apron.
- No demolitions of existing buildings.
- Works carried out airside.
- Standard steel structure cladded building.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€7,014,800	1.2	€83,600	€83,600
Civil/Airfield/Environmental Engineer	€7,014,800	3.4	€235,600	€235,600
Project Management/Other Costs	€7,014,800	3.8	€266,000	€266,000
Total - to summary				**€585,200**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
Enabling Works	860	m^2	€838	€720,605
Construction Cost	860	m^2	€5,562	€4,783,588
Mechanical Costs	860	m^2	€1,159	€997,000
Electrical Costs	860	m^2	€597	€513,606
Total - to summary				**€7,014,800**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	-	-	-	NA
Contingency	-	-	-	NA
Others	-	-	-	NA
Total - to summary				**€0**

SCP 17.1.003
South Apron Pre-Boarding Zone (PBZ)

Project Summary

The South Apron Pre-Boarding Zone (PBZ) is a satellite boarding gate facility comprising of five boarding gates to service nine Code C stands. The PBZ is a single storey building circa 6.95m in height and 117m long x 19.5m wide, and has a gross internal area of 2,205sqm. The South Apron Pre-Boarding Zone investment includes:

- PBZ modular building with associated enabling works.
- External covered walkways to stands 416–418.
- Food and beverage offering.
- Welfare facilities.
- Swing gate for mixed mode operation (separate arrivals and departures)
- Remodelled Pier C Bus lounge.
- Widening head of stand road to facilitate shuttle operation.

Passengers will access PBZ via the Pier C bus lounge (Gate 335) where a shuttle bus service will be operating to the PBZ.

This project is required to service 9 Code C stands on the South Apron to meet the current and forecast demand.

A pre boarding zone on the South Apron will also have the following additional benefits:

- It will reduce the number of busses required to service 9 NBE remote stands on the South Apron for first wave departures and throughout the day.
- It will improve the On-Time Performance (OTP) of these aircraft stands, by achieving greater predictability of embarking and disembarking passengers from aircraft.
- It will provide a better passenger experience by having stands where passengers can walk directly from a gate facility to the aircraft.

SCP 17.1.003
South Apron Pre-Boarding Zone (PBZ)

Project Details Summary		
Category Passenger Processing		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €22m
Underpinning Assumptions and Cost Benchmarks	• Costs based on contract award price.	
Opex Impacts	• Heat and light, maintenance, cleaning etc. • Shuttling bus operation.	
Stakeholder Evaluation and Consultation Status	• This project was specifically requested by users. • This proposal in being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• 5 Boarding Gates to serve nine walk out stands. • Enabling works to facilitate boarding gate facility (realigned bus gate etc.). • Relocation of Security Access Gate. • Widening head of stand road. • Remodelled Pier C Bus lounge to facilitate shuttle service.	
Asset Life	15 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q2 2016
Planning Complete	Q3 2016
Detail Design Complete	Q3 2016
Construction Commence	Q1 2017 (9 months)
Project Handover	Q4 2017

SCP 17.1.003
South Apron Pre-Boarding Zone (PBZ)

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	8%	€1,689,603
Construction Costs	92%	€20,253,298
Design Development and Contigency	NA	NA
Total	**100%**	**€21,942,901**

Key Assumptions

- Cost based on construction within existing aprons.
- Works carried out landside.
- Modular steel structure cladded building.
- Construction costs are based on tender returns.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€20,253,298	1.2	€241,372	€241,372
Civil/Airfield/Environmental Engineer	€20,253,298	3.4	€680,230	€680,230
Project Management/Other Costs	€20,253,298	3.8	€768,002	€768,002
Total - to summary				**€1,689,603**

Construction Costs	Quantity	Unit	Rate	Total
Enabling Works	2,200	m^2	€3,104	€6,828,083
Terminal 2 Alterations	1	Item	€1,592,337	€1,592,337
Construction Cost	2,200	m^2	€4,702	€10,345,307
Mechanical Costs	2,200	m^2	€448	€985,265
Electrical Costs	2,200	m^2	€228	€502,307
Total - to summary				**€20,253,298**

Design Development and Contingency	Value	%	Total	Total
Design Development	-	-	-	NA
Contingency	-	-	-	NA
Others	-	-	-	NA
Total - to summary				**€0**

SCP 17.2.004
Terminal 1 and Terminal 2 Immigration Facilities

Project Summary

The Terminal 1 and Terminal 2 Immigration Facilities projects include the installation of e-gates and an extension to the Immigration hall in Terminal 1 (Pier 1 and Pier 2).

Terminal 1 e-gates and Extension to Immigration Hall (Pier 1 and Pier 2)

This project comprises:

- The installation of 10 e-gates in the existing Immigration hall.
- The extension of the existing Immigration hall to facilitate additional processing and queuing to meet the forecast demand profile.

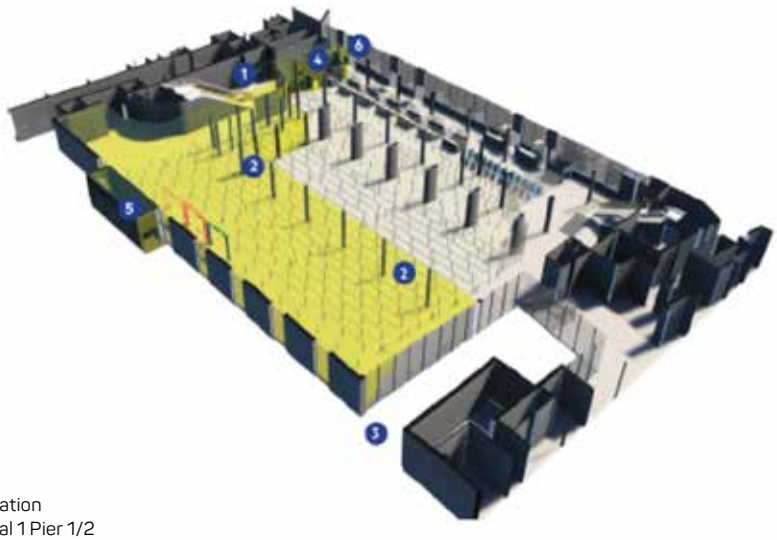
Passengers arriving in Pier 1 are regularly forced to queue on the Pier 1 Skybridge before entering the Immigration area. It is necessary at peak times to restrict usage of the travellator and the escalators, and to deploy customer service agents (CSAs) to manage queues in this area. This does not provide an acceptable level of customer service or safety for passengers. An extension to the Immigration hall is required to meet the increase in processing capacity provided by the e-gates and to eliminate queuing on the Skybridge

Terminal 2 e-gates

This project comprises the installation of 10 e-gates in the existing Immigration hall and modifications to the existing booths to facilitate additional processing and queuing to meet the forecast demand profile. The processing capacity will increase from 3,200 pax/hr to 3,400 pax/hr.

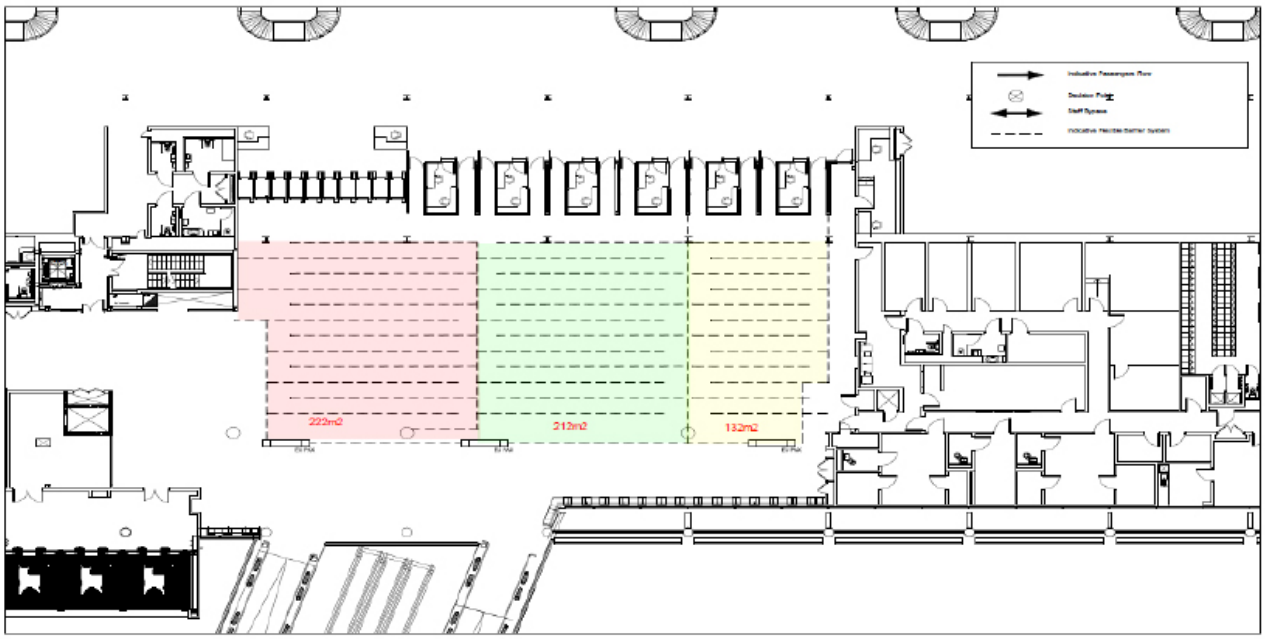
Terminal 1	Processing Capacity (pax/hr)	Queue Space	mppa	Comments
Current Layout Q2 2017 **12 Desks**	2,897	422m²	25 mppa	1. Queue times exceed 40mins. 2. Constant queuing on Skybridge .
+10 e-gates	4,300*	422m²	28 mppa	Queuing on Skybridge will still be an issue.
2019 Schedule	4,300	1,200m²	32 mppa	Facility is sufficient for 32mppa.

*Capacity not achievable without Pier 1/Pier 2 extension as not possible to meet the presentation demand to e-gates or booths due to queuing on Skybridge, which extension will remove.



Immigration
Terminal 1 Pier 1/2

SCP 17.2.004
Terminal 1 and Terminal 2 Immigration Facilities



Terminal 2

Project Details Summary		
Category Passenger Processing		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Business Development	**Total Capex Requirement** €11.3m
Underpinning Assumptions and Cost Benchmarks	• Cost based on rate of €5,500/sqm for Terminal building projects. • Cost based on tender returns for similar works in 2016 (Terminal 2 Transfers, Pier 1 Extension) and adjusted for inflation. • No allowance for refurbishment of existing area included.	
Opex Impacts	• Additional energy costs.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017, with users.	
Project Deliverable	• Increase processing capability from 2,897 pax/hr to 4,300 pax/hr. • Extension of Pier 1/Pier 2 Immigration Hall. • Installation of 10 e-gates in Terminal 1 (Pier 1 and 2) and 10 e-gates in Terminal 2 Immigration halls (supply of e-gates by others). • Improved level of service.	
Asset Life	• 10 years for installation of e-gates. • 15 years for extension to hall.	

SCP 17.2.004
Terminal 1 and Terminal 2 Immigration Facilities

Project Summary (Cont.)

Project Delivery Key Milestones (e-gates Terminal 1 and Terminal 2)	
Feasibility/Outline Design complete	Q1 2017
Planning Complete	Q1 2017
Detail Design Complete	Q2 2017
Construction Commence	Q3 2017 (3 months)
Project Handover	Q4 2017

Project Delivery Key Milestones (Extension to Pier 1 / Pier 2 Immigration Hall)	
Feasibility/Outline Design Complete	Q4 2017
Planning Complete	Q4 2017
Detail Design Complete	Q1 2018
Construction Commence	Q2 2018 (12 months)
Project Handover	Q2 2019

SCP 17.2.004
Terminal 1 and Terminal 2 Immigration Facilities

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€774,885
Construction Costs	82%	€9,288,561
Design Development and Contigency	11%	€1,243,797
Total	**100%**	**€11,307,243**

Key Assumptions

- Cost based on €5,500/sq. m for terminal building projects.
- Cost based on tender returns for similar work in 2016 (T2 transfers and adjusted for inflation).
- Works carried out airside.
- Estimated for inflation.
- Refurbishment of existing Immigration area is excluded.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€9,288,561	1.2	€110,698	€110,698
Civil/Airfield/Environmental Engineer	€9,288,561	3.4	€311,967	€311,967
Project Management/Other Costs	€9,288,561	3.8	€352,221	€352,221
Total - to summary				**€774,885**

Construction Costs	Quantity	Unit	Rate	Total
New build extension with improved specification	870	m^2	€5,500	€4,785,000
Immigration e-gates T1 and T2	1	Sum	€1,067,911	€1,067,911
Mechanical works	1	Sum	€825,000	€993,524
Electrical works	1	Sum	€650,000	€702,512
Ext Bldg wrks caldding etc incl car parking, paving	700	m^2	€2,370	€1,739,614
Total - to summary				**€9,288,561**

Design Development and Contingency	Value	%	Total	Total
Design Development	€10,063,447	6.7	€678,435	€678,435
Contingency	€10,063,447	5.6	€565,362	€565,362
Others	€0	0	€0	€0
Total - to summary				**€1,243,797**

SCP 17.2.001
South Apron Stands

Project Summary

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.

This project is necessary to address the shortfall in stands of 11 NBEs as detailed in Section 3. It was necessary to commence this project in advance of the Supplementary Capex Process and expand the number of stands on the South Apron by 4 NBEs, in order to accommodate the 2017 demand.

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.

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

SCP 17.2.001
South Apron Stands

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €10.5m
Underpinning Assumptions and Cost Benchmarks	• Costs based on providing 4 Code C fully operational stands in compliance with EASA. • Apron parking constructed in concrete. • Apron parking providing AGL and floodlighting. • Costs based on tender returns. • Safeguarding of Fixed Electrical Ground Power (FEGP)	
Opex Impacts	• This project was specifically requested by users. • Additional opex costs include floodlighting, AGL and snow clearing.	
Stakeholder Evaluation and Consultation Status	• This proposal in being presented as part of the Supplementary Capex Process in Q3 2017, with users.	
Project Deliverable	• 4 NBE Code C stands. • 8,000 sqm of GSE parking area.	
Asset Life	40 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q1 2015
Planning Complete	Q2 2015
Detail Design Complete	Q4 2015
Construction Commence	Q1 2016 (13 months)
Project Handover	Q4 2017

SCP 17.2.001
South Apron Stands

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	8%	€807,315
Construction Costs	92%	€9,677,289
Design Development and Contigency	NA	NA
Total	**100%**	**€10,484,604**

Key Assumptions

- Approx. 17,000m² of concrete apron and head of stand road pavement.
- Provision of new Airfield Ground Lighting systems (AGLs).
- Airfield signage including stand designators; electrical works including modifications to substation, provision of external distribution boards, MV and LV cabling and associated ducting; provision of new high mast lights and upgrades and modifications to existing high mast lighting.
- Construction of approx. 185m of earth retaining structures.
- Accommodation works for Swissport including realignment of Bond Road, including the relocation of weighbridge and provision of additional equipment parking area.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€9,677,289	1.2	€115,331	€115,331
Civil/Airfield/Environmental Engineer	€9,677,289	3.4	€325,023	€325,023
Project Management/Other Costs	€9,677,289	3.8	€366,961	€366,961
Total - to summary				**€807,315**

Construction Costs	Quantity	Unit	Rate	Total
New Pavement	17,000	m²	€290	€4,935,418
Electrical Work	17,000	m²	€74	€1,258,048
Drainage	17,000	m²	€154	€2,612,868
Temporary works to maintain aircraft operations	1	Sum	€870,956	€870,956
Total - to summary				**€9,677,289**

Design Development and Contingency	Value	%	Total	Total
Design Development	-	-	-	NA
Contingency	-	-	-	NA
Others	-	-	-	NA
Total - to summary				**€0**

SCP 17.2.002
Apron 5H and North Apron Taxiway Rehabilitation

Project Summary

This project provides 12 Code C aircraft parking stands (NBEs – B737, A320 etc.) including 3 Wide Body stands (A330, B777 etc.) in MARS (Multi Apron Ramp System) configuration and an open hangar area for business aviation. It also includes the necessary rehabilitation of North Apron taxiway pavement which is over 60 years old, to facilitate this development.

Dublin Airport Summer 2019 forecast stand demand (based on current growth profiles) has identified a stand requirement of 116 NBEs (Narrow Body Equivalent) during the peak stand demand in the early morning, with a current (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 Section 3.

Apron 5H and the associated North Apron Taxiway Rehabilitation project 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.

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.

SCP 17.2.002
Apron 5H and North Apron Taxiway Rehabilitation

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €52m (incl. €15m Apron Reconstruction)
Underpinning Assumptions and Cost Benchmarks	• Costs based on providing fully operational stands in compliance with EASA requirements. • Apron parking to be constructed in concrete. • Apron parking to be provided with AGL, high mast lighting and safeguarded for FEGP (not included). • Adequate Ground Service Equipment (GSE) parking also to be provided – area 5,000sqm. • Provision of surface water attenuation and pollution control facilities to required standard. • Costs based on tender returns for similar works in 2014 (Apron 5G, South Apron and Apron Reconstruction), adjusted for inflation.	
Opex Impacts	• Additional opex costs include energy costs associated with floodlighting and AGL and de-icing as required.	
Stakeholder Evaluation and Consultation Status	• This proposal in being presented as part of the Supplementary Capex Process in Q3 2017, in consultation with users.	
Project Deliverable	• 12 NBE Code C stands (including 3 WB stands). • Business Aviation open hangar facility – area 7,000sqm. • Rehabilitated North Apron Taxiway. • GSE Parking Area – area 5,000sqm.	
Asset Life	40 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2016
Planning Complete	Q3 2017
Detail Design Complete	Q2 2018
Construction Commence	Q2 2018 (24 months)
Phase 1 (6NBEs available)	Q3 2019
Project Handover	Q2 2020

SCP 17.2.002
Apron 5H and North Apron Taxiway Rehabilitation

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€3,563,564
Construction Costs	82%	€42,716,487
Design Development and Contigency	11%	€5,720,006
Total	**100%**	**€52,000,058**

Key Assumptions

- Costs based on providing fully operational stands in compliance with EASA requirements.
- Apron parking to be constructed in concrete.
- Apron parking to be provided with AGL, high mast lighting and safeguarded for FEGP.
- Adequate Ground Service Equipment (GSE) parking also to be provided.
- Costs based on tender returns for similar works in 2014 (Apron 5G) adjusted for inflation.
- Costs based on similar ground conditions typical of works in adjacent areas. No allowance for unforseen 'poor' ground conditions. No soil investigation completed.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€42,716,487	1.2	€509,081	€509,081
Civil/Airfield/Environmental Engineer	€42,716,487	3.4	€1,434,682	€1,434,682
Project Management/Other Costs	€42,716,487	3.8	€1,619,802	€1,619,802
Total - to summary				**€3,563,564**

Construction Costs	Quantity	Unit	Rate	Total
New apron pavement area	65,000	m²	€344	€22,366,272
Rehabilitation of existing apron (full)	25,000	m²	€329	€8,236,990
Rehabilitation of existing apron (partial)	15,000	m²	€147	€2,199,610
New Apron Pavement (Business Aviation)	7,000	m²	€246	€1,723,341
New GSE parking area (incl potential areas)	10,000	m²	€222	€2,224,446
Drainage attenuation	65,000	m²	€20	€1,332,205
Electrical and other lighting	105,000	m²	€31	€3,301,418
Preliminaries/Phasing/Operational restrictions	1	Sum	€1,332,205	€1,332,205
Total - to summary				**€42,716,487**

Design Development and Contingency	Value	%	Total	Total
Design Development	€46,280,051	6.7	€3,120,003	€3,120,003
Contingency	€46,280,051	5.6	€2,600,003	€2,600,003
Others	€0	0	€0	€0
Total - to summary				**€5,720,006**

SCP 17.2.003
Upgrade and Realignment of Stands 101–104

Project Summary

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).

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 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.

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.

Dublin Airport Summer 2019 forecast stand demand (based on current growth profiles) has identified a stand requirement of 116 NBEs (Narrow Body Equivalent) during the peak stand demand in the early morning, with a current (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 Section 3.

The Upgrade and Realignment of Stands 101-104 is one of the projects required to address this shortfall. These stands also benefit from the North Apron Taxiway Rehabilitation (carried out under SCP 17.2.002) by enabling aircraft access to the respective stands.

SCP 17.2.003
Upgrade and Realignment of Stands 101–104

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €5.0m
Underpinning Assumptions and Cost Benchmarks	• Costs based on providing fully operational stands with DAAD for gradient greater than 1% to be approved by IAA SRD. • Apron parking to be provided with high mast lighting. • Ground Service Equipment (GSE) parking to be provided. • Surface water attenuation and pollution control facilities to be provided. • Costs based on tender returns for similar works in 2014 (Apron 5G, South Apron and Apron Reconstruction) adjusted for inflation.	
Opex Impacts	• Additional opex costs include, energy costs associated with floodlighting, AGL and deicing disposal as required.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• 6 passenger operational NBE Code C stands.	
Asset Life	15 years (assumes stands will be rehabilitated after 15 years).	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q4 2017
Detail Design Complete	Q4 2017
Construction Commence	Q1 2018 (5 months)
Project Handover	Q4 2018

SCP 17.2.003
Upgrade and Realignment of Stands 101–104

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€342,519
Construction Costs	82%	€4,105,781
Design Development and Contigency	11%	€549,790
Total	**100%**	**€4,998,091**

Key Assumptions

- Costs based on providing fully operational stands with DAAD for gradient greater than 1% approved by IAA SRD.
- Apron parking to be provided high mast lighting.
- Adequate Ground Service Equipment (GSE) parking also to be provided.
- Surface water attenuation and pollution control facilities to be provided.
- Costs based on tender returns for similar works in 2014 (Apron 5G) adjusted for inflation.
- Costs assume stand realignment only.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€4,105,781	1.2	€48,931	€48,931
Civil/Airfield/Environmental Engineer	€4,105,781	3.4	€137,897	€137,897
Project Management/Other Costs	€4,105,781	3.8	€155,691	€155,691
Total - to summary				**€342,519**

Construction Costs	Quantity	Unit	Rate	Total
Rehab Apron Repair Work	3,000	m^2	€434	€1,256,963
High Mast Lighting and Electrical infrastructure (incl Connection to Electrical Substation)	18,000	m^2	€62	€1,077,397
Pollution Control	3,000	m^2	€469	€1,539,139
New surface water and drainage infrastructure	910	m	€264	€232,281
Total - to summary				**€4,105,781**

Design Development and Contingency	Value	%	Total	Total
Design Development	€4,448,301	6.7	€299,885	€299,885
Contingency	€4,448,301	5.6	€249,905	€249,905
Others	€0	0	€0	€0
Total - to summary				**€549,790**

SCP 17.2.004
Hangar 1 and Hangar 2 Stands

Project Summary

This project provides for 3 Code C aircraft parking stands (NBE's – B737, A320 etc.) 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.

Dublin Airport summer 2019 forecast stand demand (based on current growth profiles) has identified a stand requirement of 116 NBEs (Narrow Body Equivalent) during the peak stand demand in the early morning, with a current (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 Section 3.

Hangar 1 and Hangar 2 Stands is one of the projects required to address this shortfall. These stands also benefit from the North Apron Taxiway Rehabilitation (carried out under SCP 17.2.002) by enabling aircraft access to the respective stands.

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

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

SCP 17.2.004
Hangar 1 and Hangar 2 Stands

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €14.3m (Including €1.6m for apron taxiway rehabilitation)
Underpinning Assumptions and Cost Benchmarks	• Costs based on providing fully operational stands in compliance with EASA requirements. • Apron parking to be constructed in concrete. • Apron parking to be provided with AGL, high mast lighting and safeguarded for FEGP. • Adequate Ground Service Equipment (GSE) parking also to be provided. • Surface water attenuation and pollution control facilities to be provided. • Costs based on tender returns for similar works in 2014 (Apron 5G, South Apron and Apron Rehabilitation) adjusted for inflation.	
Opex Impacts	• Incremental opex costs include, energy costs associated with floodlighting and AGL, and snow clearing costs as required.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• 3 NBE Code C stands.	
Asset Life	30 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q4 2017
Construction Commence	Q2 2018 (13 months)
Project Handover	Q3 2019

SCP 17.2.004
Hangar 1 and Hangar 2 Stands

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€979,028
Construction Costs	82%	€11,735,621
Design Development and Contigency	11%	€1,571,474
Total	**100%**	**€14,286,123**

Key Assumptions

- Costs based on providing fully operational stands in compliance with EASA requirements.
- Apron parking to be constructed in concrete.
- Apron parking to be provided with AGL, high mast lighting and safeguarded for FEGP.
- Adequate Ground Service Equipment (GSE) parking also to be provided.
- Costs based on tender returns for similar works in 2014 (Apron 5G) adjusted for inflation.
- Apron area of 19,700m².
- Costs assume relocation of existing tenants to existing on site facilities.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€11,735,621	1.2	€139,861	€139,861
Civil/Airfield/Environmental Engineer	€11,735,621	3.4	€394,154	€394,154
Project Management/Other Costs	€11,735,621	3.8	€445,013	€445,013
Total - to summary				**€979,028**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
Apron Area	19,700	m²	€352	€6,933,376
Rehabilitation main taxiway route to new North Apron stands	4,000	m²	€322	€1,288,000
Electrical Work	23,700	m²	€37	€876,900
Demolitions incl making good to building	1,300	m²	€416	€540,301
Upgrade to access roads and	1	Sum	€736,799	€736,799
Refurbishment of office space to accommodate displaced tenants plus temporary stoage and relocation costs	400	m²	€3,401	€1,360,245
Total - to summary				**€11,735,621**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	€12,714,649	6.7	€857,167	€857,167
Contingency	€12,714,649	5.6	€714,306	€714,306
Others	€0	0	€0	€0
Total - to summary				**€1,571,474**

SCP 17.2.005
West Apron Stands

Project Summary

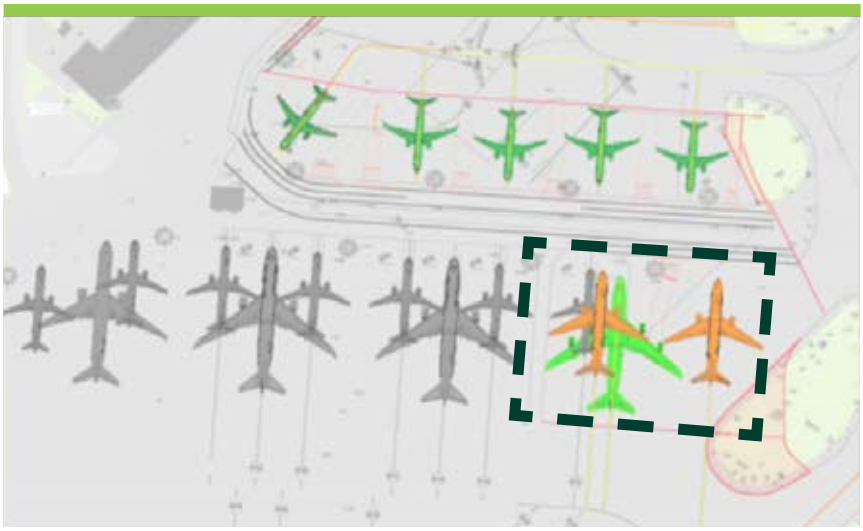
This project creates:

- 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.
- An upgrade of and existing Code C stand to a Code E MARS configuration.

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

Dublin Airport Summer 2019 forecast stand demand (based on current growth profiles) has identified a stand requirement of 116 NBEs (Narrow Body Equivalent) during the peak stand demand in the early morning. The current (Q1 2017) stand supply is of 105 NBEs. This results in a shortfall of 11 stands and with contingency provision, the shortfall increases to 21 stands, as detailed in Section 3.

A key element of the 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.



SCP 17.2.005
West Apron Stands

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Business Volume Growth	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €2.5m
Underpinning Assumptions and Cost Benchmarks	• Costs based on providing fully operational stands in compliance with EASA requirements. • Apron parking to be constructed in concrete. • Apron parking to be provided with AGL and high mast lighting. • Costs based on tender returns for similar works in 2014 (Apron 5G, South Apron Stands and Apron Rehabilitation) adjusted for inflation.	
Opex Impacts	• Additional opex costs include floodlighting, AGL, and snow clearing/deicing.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex in Q3, with users.	
Project Deliverable	• 1 Code D stand. • 1 upgrade from Code C to code D. • 1 upgrade from Code C to Code E (MARS) configuration. • 1 upgrade from restricted Code C to Full Code C.	
Asset Life	40 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design complete	Q1 2018
Planning Complete	Q1 2018
Detail Design Complete	Q2 2018
Construction Commence	Q3 2018 (5 months)
Project Handover	Q1 2019

SCP 17.2.005
West Apron Stands

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	6%	€161,875
Construction Costs	79%	€1,974,090
Design Development and Contigency	14%	€359,459
Total	**100%***	**€2,495,424**

*This is due to rounding.

Key Assumptions

- Costs based on providing fully operational stands in compliance with EASA requirements.
- Apron parking to be constructed in concrete.
- Apron parking to be provided with AGL and high mast lighting.
- Costs based on tender returns for similar works in 2014 (Apron 5G) adjusted for inflation.
- Apron area is 2,500m².
- Costs based on similar ground conditions typical of works in adjacent areas. No allowance for unforseen 'poor' ground conditions. No soil investigation completed.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€1,974,090	1.5%	€29,611	€29,611
Civil/Airfield/Environmental Engineer	€1,974,090	3.2%	€63,171	€63,171
Project Management/Other Costs	€1,974,090	3.5%	€69,093	€69,093
Total - to summary				**€161,875**

Construction Costs	Quantity	Unit	Rate	Total
Apron Area	2,500	m²	€541	€1,353,090
Electrical Work	25	Nr	€4,140	€103,500
Temporary Facilities	1	Sum	€517,500	€517,500
Total - to summary				**€1,974,090**

Design Development and Contingency	Value	%	Total	Total
Design Development	€2,135,965	8.0	€170,858	€170,858
Contingency	€2,135,965	8.8	€188,601	€188,601
Others	€0	0	€0	€0
Total - to summary				**€359,459**

SCP 17.2.006
Pier 2 Underpass Widening

Project Summary

This project comprises the widening of Pier 2 underpass to allow unrestricted access for busses 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 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.

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.

To provide a more predictable and efficient route for busses and fuel bowser traffic, it is necessary to widen the Pier 2 Underpass. 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.

SCP 17.2.006
Pier 2 Underpass Widening

Project Details Summary		
Category Aircraft Parking/Stands	**Overall Capex Type** Apron Infrastructure	
Primary Driver Operational Efficiency	**Secondary Driver(s)** Safety	**Total Capex Requirement** €5m
Underpinning Assumptions and Cost Benchmarks	• Steel transfer frame structure. • Costs based on tender returns on similar works in 2014 (Terminal 2 Transfers, Bussing Lounge, Pier 1 Extension) and adjusted for inflation. • Costs based on phased construction and night works and minimum disruption to operations.	
Opex Impacts	• None envisaged.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• Widened Pier 2 Underpass, capable of facilitating fuel bowsers and bussing. • More consistent bussing operation to North Apron and Apron 5G stands. • Greater efficiency for fuel bowsers. • Elevated safety – busses and fuel bowsers will no longer have to drive around Pier 2 (10 active stands) when accessing stands north of Pier 2. • Improved On Time Performance.	
Asset Life	15 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q4 2017
Planning Complete	Q4 2017
Detail Design Complete	Q1 2018
Construction Commence	Q3 2018 (15 months)
Project Handover	Q3 2019

SCP 17.2.006
Pier 2 Underpass Widening

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	6%	€298,193
Construction Costs	85%	€4,259,894
Design Development and Contigency	9%	€441,484
Total	**100%**	**€4,999,571**

Key Assumptions

- Widened Pier 2 Underpass, capable of facilitating fuel bowsers and bussing.
- Phased to minimise impact on operations.
- Works completed in sections to minimise time when Pier 2 Underpass would not be available.
- Cost based on structure above being suitable to accommodate revised structural arrangement.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€4,259,894	1.0	€42,599	€42,599
Civil/Airfield/Environmental Engineer	€4,259,894	3.0	€127,797	€127,797
Project Management/Other Costs	€4,259,894	3.0	€127,797	€127,797
Total - to summary				**€298,193**

Construction Costs	Quantity	Unit	Rate	Total
Alterations and Installation of new Steel work	20	t	€24,433	€488,658
Demolition work	840	m^2	€511	€429,180
Construction work	840	m^2	€3,133	€2,632,074
Maintaining Passenger Operations	1	Sum	€709,982	€709,982
Total - to summary				**€4,259,894**

Design Development and Contingency	Value	%	Total	Total
Design Development	€4,558,087	4.0	€182,323	€182,323
Contingency	€4,558,087	5.7	€259,161	€259,161
Others	€0	0	€0	€0
Total - to summary				**€441,484**

SCP 17.2.007
Pier 3 Underpass Widening

Project Summary

This project comprises the widening of Pier 3 Underpass to allow unrestricted access for fuel bowsers and busses 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.

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.

To provide a more consistent and efficient route for buses and fuel bowser traffic, it is necessary to widen the Pier 3 Underpass. 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.

SCP 17.2.007
Pier 3 Underpass Widening

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Safety	**Total Capex Requirement** €0.2m
Underpinning Assumptions and Cost Benchmarks	• Costs based on no structural works required. • Costs are based on tender returns for similar projects (South Apron stands, Pier 1 Extension) and adjusted for inflation.	
Opex Impacts	• None envisaged.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• Widened Pier 3 Underpass, capable of facilitating fuel bowsers and bussing. • Required to provide consistent bussing operation to North Apron. • Increased efficiency for fuel bowsers. • Elevate safety – busses and fuel bowsers will no longer have to drive around Pier 3. • Improved On Time Performance.	
Asset Life	5 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q3 2017
Construction Commence	Q3 2017 (2 months)
Project Handover	Q1 2018

SCP 17.2.007
Pier 3 Underpass Widening

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€13,863
Construction Costs	85%	€166,174
Design Development and Contigency	10%	€19,339
Total	**100%**	**€199,376**

Key Assumptions

- Widened Pier 3 Underpass, capable of facilitating fuel bowsers and bussing.
- Phased to minimise impact on operations.
- Works completed in sections to minimise time when Pier 3 Underpass would not be available.
- Cost based on no structural works.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€166,174	1.2	€1,980	€1,980
Civil/Airfield/Environmental Engineer	€166,174	3.4	€5,581	€5,581
Project Management/ Other Costs	€166,174	3.8	€6,301	€6,301
Total - to summary				**€13,863**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
Alterations to existing underpass configuration	840	m^2	€109	€91,396
Installation and construction works	840	m^2	€89	€74,778
Total - to summary				**€166,174**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	€180,037	4.4	€7,975	€7,975
Contingency	€180,037	6.3	€11,364	€11,364
Others	€0	0	€0	€0
Total - to summary				**€19,339**

SCP 17.2.008
West Apron Surface Access

Project Summary

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, as detailed below.

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.

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.

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.

SCP 17.2.008
West Apron Surface Access

Project Details Summary		
Category Aircraft Parking/Stands		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €3.0m
Underpinning Assumptions and Cost Benchmarks	• Cost based on providing fully compliant solution. • Cost based on asphalt construction. • Cost includes upgrade of perimeter road from IONA strip to West Apron. • Airfield Ground Lighting (e.g. stop bars) to be included. • Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer. • Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay, CPSRA) and adjusted for inflation. • Cost based on accessing IONA strip without the need for additional road construction on west side of RWY 16/34. • Access will not be available when RWY 16/34 is in use as a runway.Alternative access around the perimeter road will be necessary. • IAA SRD approval will be required following detail design and operational solution.	
Opex Impacts	• Opex costs include airfield escorts to manage runway crossing point.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• Surface access with appropriate controls in place to provide direct access to West Apron. • c.2,000 sqm of road pavement.	
Asset Life	10 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q1 2018
Construction Commence	Q3 2018 (12 months)
Project Handover	Q3 2019

SCP 17.2.008
West Apron Surface Access

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	7%	€208,593
Construction Costs	83%	€2,500,407
Design Development and Contigency	10%	€291,000
Total	**100%**	**€3,000,000**

Key Assumptions

- Cost based on connecting into existing IONA strip on west side of RWY 16/34.
- Cost based on asphalt construction.
- Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer.
- Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.
- Scope includes widening existing IONA strip, installation of edge lighting and markings.
- Widening of existing preimeter road.
- Construction of new road 10m wide incl. automated barriers on either side, markings, lighting, signage and FOD detection.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€2,500,407	1.2%	€29,799	€29,799
Civil/Airfield/Environmental Engineer	€2,500,407	3.4%	€83,979	€83,979
Project Management/Other Costs	€2,500,407	3.8%	€94,815	€94,815
Total - to summary				**€208,593**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
Construction works	1	Sum	€2,050,334	€2,050,334
Temporary works to maintain aircraft operations	1	Sum	€450,073	€450,073
Total - to summary				**€2,500,407**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	€2,709,000	4.4%	€120,000	€120,000
Contingency	€2,709,000	6.3%	€171,000	€171,000
Others	€0	0%	€0	€0
Total - to summary				**€291,000**

SCP 17.3.001
Link 3 Extension Taxiway

Project Summary

This project comprises an additional 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.

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

- To provide a more effective taxiway system for the airport.
- To elevate levels of safety.
- To address the forecast increases in traffic flows.

The suite of projects includes:

- Link 6 Taxiway .
- Link 3 Taxiway.
- Realigned Taxiway A.
- Dual Taxiway F.

This suite of projects provides the following collective benefits, based on busy day simulation modelling:

- An average reduction in departure delay per movement of between. 10%-14%.
- An average reduction in Arrival delay per movement of 47%-56%.
- An overall reduction in departure delay of 5 hours per day.
- An overall reduction in arrival delay of 2 hours per day.

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 independent consultants.
- It provides congestion relief from F-Inner and F-Outer 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.
- It provides an additional entrance point for short take off for RWY 34 departures and in Dual Runway Operations (DRO) again reducing ROT.

SCP 17.3.001
Link 3 Extension Taxiway

Project Details Summary		
Category Airfield/Taxiways		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €4.0m
Underpinning Assumptions and Cost Benchmarks	• Cost based on providing fully compliant Code E taxiway. • Cost based on asphalt construction. • Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves. • Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer. • Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation. • Capital cost dependant on implementation of Dual F Taxiway. There is a capital cost of €800,000 if Dual F Taxiway does not proceed.	
Opex Impacts	• Additional opex costs include AGL Energy costs and de-icing costs as necessary.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• New Code E taxiway connecting Link 3 to RWY 16/34. • c.2700 sqm of taxiway pavement (3950m^2 if Dual F Taxiway does not proceed). • Taxiway AGL.	
Asset Life	30 years.	

Project Delivery Key Milestones	
Project Delivery Approach	This project will be delivered in conjunction with the following projects due to their interface: • Realigned Taxiway A. • Dual Taxiway F.
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q2 2018
Construction Commence	Q4 2018 (28 months - in conjunction with other adjacent projects).
Project Handover	Q1 2021

SCP 17.3.001
Link 3 Extension Taxiway

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	6%	€241,138
Construction Costs	84%	€3,349,145
Design Development and Contigency	10%	€378,503
Total	**100%**	**€3,968,786**

Key Assumptions

- Cost based on providing fully compliant Code E taxiway.
- Cost based on asphalt construction.
- Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves.
- Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway
- Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.
- Costs based on constructing in conjunction with Dual F Taxiways and Realigned Taxiway A.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€3,349,145	1.0	€33,491	€33,491
Civil/Airfield/Environmental Engineer	€3,349,145	3.0	€100,474	€100,474
Project Management/Other Costs	€3,349,145	3.2	€107,173	€107,173
Total - to summary				**€241,138**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
New Taxiway Pavement	2,700	m²	€644	€1,738,033
Electrical Work	2,700	m²	€155	€418,800
Drainage	2,700	m²	€331	€894,234
Tempoaray works to maintain aircraft operations	1	Sum	€290,165	€298,078
Total - to summary				**€3,349,145**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	€3,590,283	5.5	€197,466	€197,466
Contingency	€3,590,283	5.0	€181,037	€181,037
Others	€0	0	€0	€0
Total - to summary				**€378,503**

SCP 17.3.002
Realignment of Taxiway A

Project Summary

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.

This project is part of a suite of airfield taxiway projects necessary to improve efficiency, to provide a more effective taxiway system for the airport, to elevate levels of safety and to address the forecast increased in traffic flows. The suite of projects includes:

- Link 6 Taxiway .
- Link 3 Taxiway.
- Realigned Taxiway A.
- Dual Taxiway F.

This suite of projects provides the following collective benefits, based on busy day simulation modelling:

- An average reduction in departure delay per movement of between 10%-14%.
- An average reduction in arrival delay per movement of 47%-56%.
- An overall reduction in departure delay of 5 hours per day.
- An overall reduction in arrival delay of 2 hours per day.

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).
- It allows Taxiway A be used as an exit facilitating reduced ROT in RWY 16 operations.

SCP 17.3.002
Realignment of Taxiway A

Project Details Summary		
Category Airfield/Taxiways		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €5.7m
Underpinning Assumptions and Cost Benchmarks	• Cost based on providing fully compliant Code F taxiway. • Cost based on asphalt construction. • Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves. • Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer. • Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.	
Opex Impacts	• Additional opex costs include AGL operational costs.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• Realigned Taxiway A providing Code F separation from Taxiway B2. • Elevated safety and reduced Hotspot complexity. • c.3,500 sqm of taxiway pavement.	
Asset Life	30 years.	

Project Delivery Key Milestones	
Project Delivery Approach	This project will be delivered in conjunction with the following projects due to their interface: • Link 3 Taxiway Extension. • Dual Taxiway F.
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q2 2018
Construction Commence	Q4 2018 (28 months - in conjunction with other adjacent projects)
Project Handover	Q1 2021

SCP 17.3.002
Realignment of Taxiway A

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	6%	€351,757
Construction Costs	85%	€4,851,822
Design Development and Contigency	8%	€472,076
Total	**100%***	**€5,675,655**

*This is due to rounding.

Key Assumptions

- Cost based on providing fully compliant Code F taxiway.
- Cost based on asphalt construction.
- Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves.
- Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway
- Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.
- Costs based on constructing in conjunction with Dual F Taxiways and Taxiway Link 3.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€4,851,822	1.0	€48,518	€48,518
Civil/Airfield/Environmental Engineer	€4,851,822	3.0	€145,555	€145,555
Project Management/Other Costs	€4,851,822	3.3	€157,684	€157,684
Total - to summary				**€351,757**

Construction Costs	Quantity	Unit	Rate	Total
New Taxiway Pavement	5,600	m²	€563	€3,150,007
Electrical Work	5,600	m²	€154	€863,483
Drainage	5,600	m²	€75	€419,166
Tempoaray works to maintain aircraft operations	1	Sum	€419,166	€419,166
Total - to summary				**€4,851,822**

Design Development and Contingency	Value	%	Total	Total
Design Development	€5,203,579	5.1	€265,383	€265,383
Contingency	€5,203,579	4.0	€206,693	€206,693
Others	€0	0	€0	€0
Total - to summary				**€472,076**

SCP 17.3.003
Dual Taxiway F

Project Summary

This project involves the continuation of the Taxiway F-Inner/Taxiway F-Outer axes (Code E–Code C) 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.

This project is part of a suite of airfield taxiway projects necessary to improve efficiency, to provide a more effective taxiway system for the airport, to increase levels of safety and to address the forecast increased in traffic flows. The suite of projects includes:

- Link 6 Taxiway.
- Link 3 Taxiway .
- Realigned Taxiway A.
- Dual Taxiway F.

This suite of projects provides the following collective benefits, based on busy day simulation modelling:

- An average reduction in departure delay per movement of between 10%-14%.
- An average reduction in arrival delay per movement of 47%-56%.
- An overall reduction in departure delay of 5 hours per day.
- An overall reduction in arrival delay of 2 hours per day.

Dual Taxiway F provides 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 widebody and narrowbody 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.
- Provides new and improved towing options.

SCP 17.3.003
Dual Taxiway F

Project Details Summary		
Category Airfield/Taxiways		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €15.5m
Underpinning Assumptions and Cost Benchmarks	• Cost based on providing fully compliant Code E-Code C taxiway. • Cost based on asphalt construction. • Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves. • Cost based on phased construction with minimum impact on operations. This will require taxiway diversions on Taxiway F-Outer and F-Inner. • Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.	
Opex Impacts	• Additional opex costs include AGL Energy costs and de-icing costs as necessary.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• Realigned Code E Taxiway F-Outer, Code C Taxiway F-Inner providing Code E to Code C separation between Taxiway H1 and Taxiway A. • 19,000 sqm of taxiway pavement.	
Asset Life	30 years	

Project Delivery Key Milestones	
Project Delivery Approach	This project will be delivered in conjunction with the following projects due to their interface: • Link 3 Taxiway Extension. • Realigned Taxiway A.
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q2 2018
Construction Commence	Q4 2018 (28 months - in conjunction with other adjacent projects).
Project Handover	Q1 2021

SCP 17.3.003
Dual Taxiway F

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	5%	€807,096
Construction Costs	91%	€14,159,575
Design Development and Contigency	3%	€542,658
Total	**100%***	**€15,509,329**

*This is due to rounding.

Key Assumptions

- Cost based on providing fully compliant Code E - Code C taxiway on existing alignment.
- Cost based on asphalt construction.
- Airfield Ground Lighting)AGL) to be included with inset centreline lights and edge lights on curves.
- Cost based on phased construction with minimum impact on operations. This will require taxiway diversions on Taxiway F-Outer and F-Inner.
- Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.
- Apron area is 19,410m^2.
- Costs based on constructing in conjunction with Taxiway A and Taxiway Link 3.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis

Design and Management Costs	Value	% Fee	Total Fee	Total
Planning/Building Control/ Cost Consultants	€14,159,575	1.2	€169,915	€169,915
Civil/Airfield/Environmental Engineer	€14,159,575	2.0	€283,192	€283,192
Project Management/Other Costs	€14,159,575	2.5	€353,989	€353,989
Total - to summary				**€807,096**

Construction Costs	Quantity	Unit	Rate	Total
New Taxiway Pavement	19,410	m^2	€526	€10,218,996
Electrical Work	19,410	m^2	€95	€1,853,629
Drainage	19,410	m^2	€72	€1,391,300
Tempoaray works to maintain aircraft operations	1	Sum	€695,650	€695,650
Total - to summary				**€14,159,575**

Design Development and Contingency	Value	%	Total	Total
Design Development	€14,966,671	2.4	€363,058	€363,058
Contingency	€14,966,671	1.2	€179,600	€179,600
Others	€0	0	€0	€0
Total - to summary				**€542,658**

SCP 17.3.004
Link 6 Extension Taxiway

Project Summary

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.

This project is part of a suite of airfield taxiway projects necessary to improve efficiency, to provide a more effective taxiway system for the airport, to increase levels of safety and to address the forecast increased in traffic flows. The suite of projects includes:

- Link 6 Taxiway.
- Link 3 Taxiway.
- Realigned Taxiway A.
- Dual Taxiway F.

This suite of projects provides the following collective benefits, based on busy day simulation modelling:

- An average reduction in Departure delay per movement of between 10%-14%.
- An average reduction in Arrival delay per movement of 47%-56%.
- An overall reduction in departure delay of 5 hours per day.
- An overall reduction in arrival delay of 2 hours per day.

The Link 5 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.
- Povides 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.
- Facilitates future North Runway traffic flows.

SCP 17.3.004
Link 6 Extension Taxiway

Project Details Summary		
Category Airfield/Taxiways		
Primary Driver Operational Efficiency	**Secondary Driver(s)** Addressing User Requests	**Total Capex Requirement** €5.1m
Underpinning Assumptions and Cost Benchmarks	• Cost based on providing fully compliant Code E taxiway. • Cost based on asphalt construction. • Airfield Ground Lighting (AGL) to be included with inset centreline lights and edge lights on curves. • Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer. • Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.	
Opex Impacts	• Additional opex costs include AGL operational costs and de-icing costs as required.	
Stakeholder Evaluation and Consultation Status	• This proposal is being presented as part of the Supplementary Capex Process in Q3 2017.	
Project Deliverable	• New Code E taxiway from Link 6 to RWY 16/34. • c.4,000 sqm of taxiway pavement. • Taxiway AGL.	
Asset Life	30 years.	

Project Delivery Key Milestones	
Feasibility/Outline Design Complete	Q3 2017
Planning Complete	Q3 2017
Detail Design Complete	Q1 2018
Construction Commence	Q2 2018 (9 months)
Project Handover	Q1 2019

SCP 17.3.004
Link 6 Extension Taxiway

LEVEL 1 - Cost Analysis	Represents	Total
Design and Management Costs	6%	€326,673
Construction Costs	85%	€4,355,635
Design Development and Contigency	8%	€412,589
Total	**100%***	**€5,094,897**

*This is due to rounding.

Key Assumptions

- Cost based on providing fully compliant Code E taxiway.
- Cost based on asphalt construction.
- Airfield Ground Lighting)AGL) to be included with inset centreline lights and edge lights on curves.
- Cost based on phased construction with minimum impact on operations. This will require work in RWY 16/34 flight strip and taxiway diversions on Taxiway F-Outer.
- Cost based on tender returns for similar works in 2016 (RWY 10/28 overlay) and adjusted for inflation.
- Unit Rate costs vary for each area due to high level nature of estimate along with unique assumptions for each area.

LEVEL 2 - Cost Analysis				
Design and Management Costs	**Value**	**% Fee**	**Total Fee**	**Total**
Planning/Building Control/ Cost Consultants	€4,355,635	1.0	€43,556	€43,556
Civil/Airfield/Environmental Engineer	€4,355,635	3.0	€130,669	€130,669
Project Management/Other Costs	€4,355,635	3.5	€152,447	€152,447
Total - to summary				**€326,673**
Construction Costs	**Quantity**	**Unit**	**Rate**	**Total**
New Taxiway Pavement	4,000	m^2	€598	€2,392,834
Electrical Work	4,000	m^2	€119	€475,831
Drainage	4,000	m^2	€316	€1,263,925
Tempoaray works to maintain aircraft operations	1	Sum	€223,046	€223,046
Total - to summary				**€4,355,635**
Design Development and Contingency	**Value**	**%**	**Total**	**Total**
Design Development	€4,682,308	4.9	€229,433	€229,433
Contingency	€4,682,308	3.9	€183,156	€183,156
Others	€0	0	€0	€0
Total - to summary				**€412,589**

APPENDIX C

Deferred Project Sheets

Appendix C
Deferred Projects

The following projects were reviewed and considered, however they are not being proposed for progression on the basis that they did not meet the key principles of PACE.

SCP Reference	Project Title	Low €'m	High €'m
Passenger Processing			
SCP 17.1.005	Terminal 2 Check-in Building Extension East Side	20.0	20.0
SCP 17.1.006	Terminal 1 Central Search Expansion	2.0	2.0
SCP 17.1.007	Terminal 2 Central Search Expansion	1.0	1.0
SCP 17.1.008	Customs and Border Protection (US	2.6	2.6
SCP 17.1.009	Pier 1 Immigration Alternative	6.5	6.5
Stands and Associated Projects			
SCP 17.2.009	South Apron Stands Phase 2	30.0	30.0
SCP 17.2.010	Pier 3 Remote Stands	18.0	18.0
SCP 17.2.011	West Apron Stands (6xNBE)	15.0	15.0
SCP 17.2.012	West Apron Access Tunnel	100.0	150.0
SCP 17.2.013	Pier 3 Extension	70.0	120.0
Airfield/Taxiway			
SCP 17.3.005	RWY 10-28 Rapid Exit Taxiways (RETs)	9.0	9.0
SCP 17.3.006	RWY 28 End-around Taxiway	50.0	50.0
	Cumulative Total	**324.1**	**424.1**

SCP 17.1.005
Terminal 2 Check-in Extension Eastside

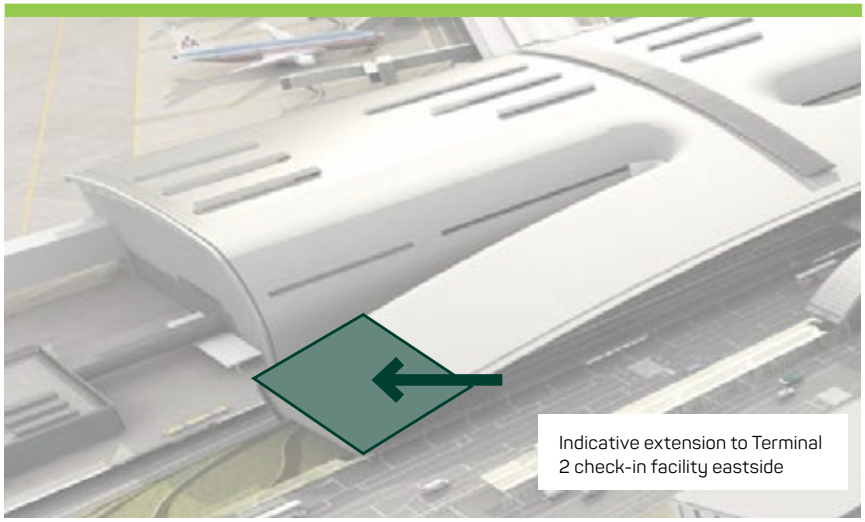
Project Output	Cost	Programme
Terminal 2 Check-in Ext. Eastside	€20m	3.5 years

Project Summary

The capacity assessment in Section 3 identified the need for 6-8 check-in desks on the east side of Terminal 2. The additional infrastructure is required to manage the expected growth to 2019. A proposal to extend the check-in hall on the east side of Terminal 2 Check-In building, to create the additional space required, was reviewed.

This extension provides for:

- Gross building floor area extension of 980sqm.
- 10 check-in desks.
- 270sqm of queue space.
- Relocation of existing ticket desks on the east gable.
- New toilet block.
- Modification to existing fire escape stairs.
- Extension of baggage belt system.
- Associated mechanical and electrical works.
- Diversion of existing external services.



Indicative extension to Terminal 2 check-in facility eastside

Dublin Airport Recommendation

CUSS Phase 1 and 2 has delivered cost efficient solutions and improved customer experiences in both terminals. Dublin Airport recommends proceeding with CUSS Phase 3 as it is a more cost efficient solution and can facilitate 2019 check-in demand. This extension project is a significant investment and cannot be delivered in the required time frame to accommodate expected demand.

SCP 17.1.006
Terminal 1 Central Search Expansion

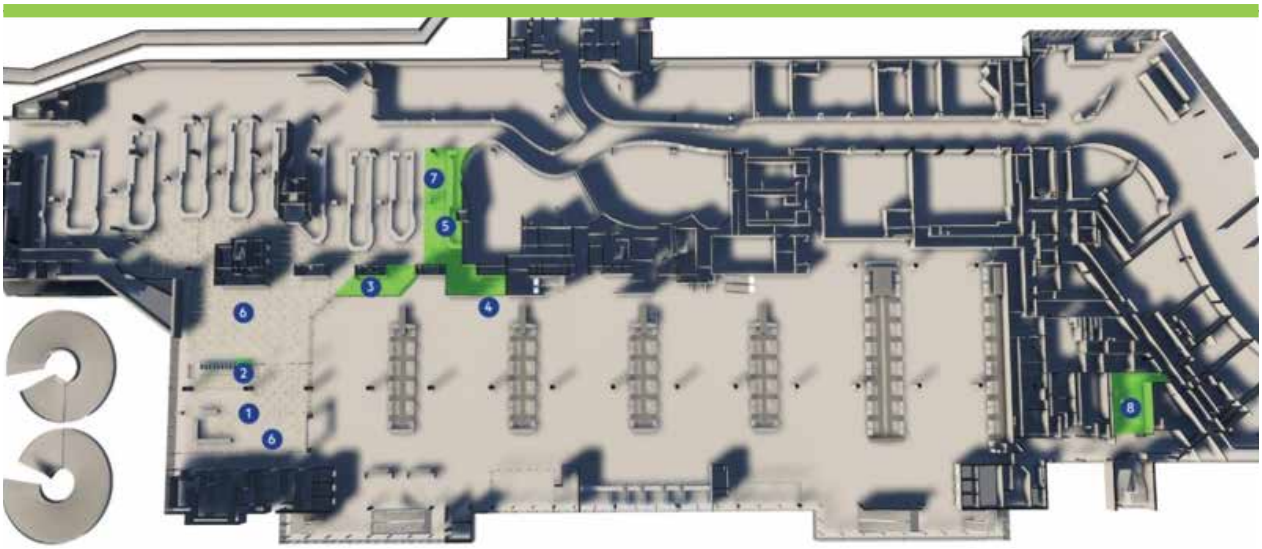
Project Output	Cost	Programme
Additional ATRS lanes	€2.0m	9 months

Project Summary

Terminal 1 Central Search has 15 Automatic Tray Return System (ATRS) security lanes. The capacity assessment confirmed that this is sufficient for the 2019 demand.

If however, LAGs (Liquids and Gels) Phase II/III legislation is implemented through the enactment of the EU regulation, this will impose further requirements on the Central Search process. Preliminary indications are that these additional requirements will reduce the Terminal 1 Central Search lane processing rate by 15%. Should this scenario materialise in the current CIP period, the existing Terminal 1 Central Search infrastructure would not be sufficient to meet the level of service required during peak demand periods.

In the event that LAGs Phase II is implemented, two extra security lanes would be required. A solution was identified to provide 2 ATRS Central Search lanes by converting the existing staff security and Fast Track lanes to passenger ATRS lanes and by converting the existing staff and fast track security lanes. Staff security and Fast-track would require relocation to another area.



Dublin Airport Recommendation

In the event LAG's Phase II is implemented or if there are significant changes to the forecast demand profile within the current regulatory period, this project will be required. An appropriate trigger mechanism to allow this project would be required.

SCP 17.1.007
Terminal 2 Central Search Expansion

Project Output	Cost	Programme
Extra Security Lane	€1m	6 months

Project Summary

Terminal 2 Central Search has 18 traditional security lanes (non ATRS). The capacity analysis confirmed that this is sufficient for the 2019 demand.

If however, LAGs (Liquids and Gels) Phase II/III legislation is implemented through the enactment of the EU regulation, this will impose further requirements on the Central Search process. Preliminary indications are that these additional requirements will reduce the Terminal 2 Central Search lane processing rate by 15%. Should this scenario materialise in the current CIP period, the existing Terminal 2 Central Search infrastructure would not be sufficient to meet the level of service required during peak demand periods.

In the event that LAGs Phase II is implemented, one extra security lanes would be required. This project also looked at realigning the existing security lanes to increase efficiency.

Terminal 2 additional lanes

Dublin Airport Recommendation

In the event LAG's Phase II is implemented or if there are significant changes to the forecast demand profile within the current regulatory period, this project will be required. An appropriate trigger mechanism to allow this project would be required.

SCP 17.1.008
US Preclearance Expansion

Project Output	Cost	Programme
Extension at Departure level	€2.6m	18 months

Project Summary

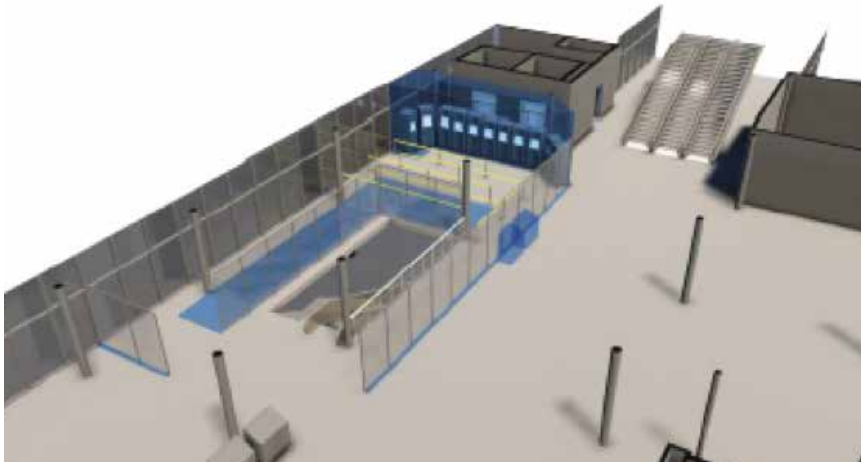
The capacity analysis confirmed that there are constraints in US Preclearance at peak periods, primarily resulting from a shortage in TSA processing capacity.

An option to extend the TSA footprint to facilitate additional screening lanes was discounted early in the process as this would result in the loss of an aircraft stand and would reduce the width of the Pier 4 underpass.

An alternative was developed to extend the existing APC kiosk process together with a "corralled" queuing space on the departures level (above the US Preclearance facility). This proposal included queue and kiosk layout amendments within the facility. The project would entail the construction of an extension to the building at Departures level to create space for kiosks.

The project entails:

- Queue management alterations with increased departures level APC kiosk usage.
- Removal of escalator.
- Partial infill of Vertical Circulation Core (VCC) void and escalator space.
- 2 Document Verification Officer (DVO) positions.
- Expansion of departures floor space.



Dublin Airport Recommendation

This project only provides temporary capacity relief to accommodate the demand up to 2019, where the facility would then become constrained again. In addition, the feasibility, design, planning and construction of this facility would take circa 18 months and at which point the facility would be constrained. As a result, to avoid nugatory expenditure, we recommend that this option is deferred until a more permanent solution is developed as part of the Masterplan process.

SCP 17.1.009
Pier 1 Immigration Alternative

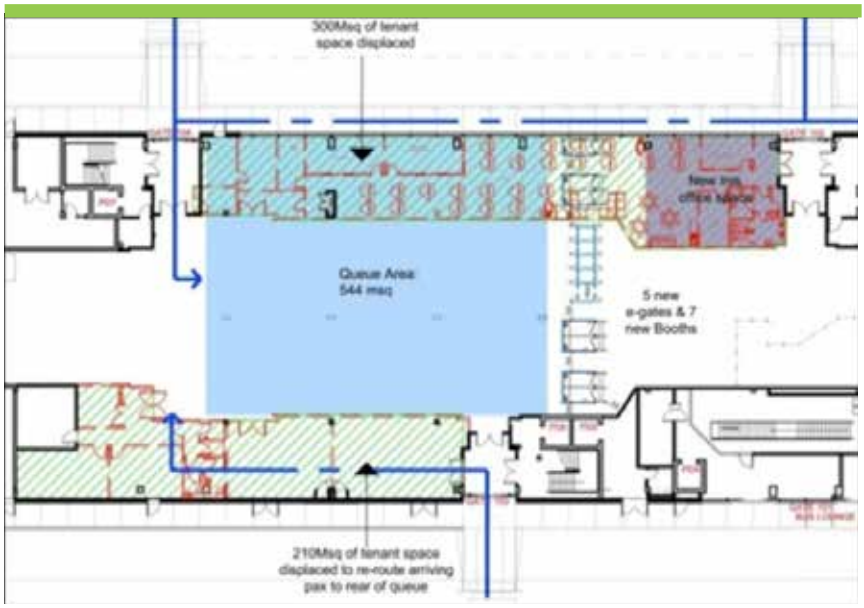
Project Output	Cost	Programme
Pier Immigration Alternative	€6.5m	24 months

Project Summary

As an alternative to extending the Pier 1 and Pier 2 Immigration facility, Dublin Airport explored an option to decentralise Pier 1 and Pier 2 Immigration by providing an additional a stand-alone Immigration facility on the ground floor of Pier 1. In this option the new/additional facility would process passengers arriving onto Pier 1, while the existing facility would continue to process passengers arriving onto Pier 2 and passengers arriving into the existing Terminal 1 bus injection point. The Pier 1 Immigration facility was designed within the limits of the available space. The size of the facility in terms of processing power was limited by the width of the pier. The designed facility provided:

- 7 Immigration booths.
- 5 e-gates.
- 544sqm of queuing space.
- Processing rate – 2,700 pax/hr.

A number of tenants located on the ground floor of Pier 1 would need to be relocated to accommodate this facility. The cost associated with this relocation is included in the overall project cost.



SCP 17.1.009
Pier 1 Immigration Alternative

Project Summary (Cont.)

Metric	Pier 1/2 Extension		Pier 1 New Facility	
Ability to meet 2019 demand	Capacity available to meet 2019 demand - 4,300 vs. 3,644 (Capacity vs. Demand)		Facility is under pressure with 2019 demand - 2,700 vs. 2,882 (Capacity vs. Demand)	
Scalability	Build future-proofed for second floor expansion		Build not futured-proofed beyond 2,700 pax/hr	
Operational Robustness	This facility can cope with unplanned forecast changes of up to + 640 pax/hr i.e. all Pier 1 a/c arriving within one hour		This facility has no capacity to process more demand from unplanned schedule changes	
Operational Efficiency	Centralised INIS operation		This would result in a decentralised INIS operation	
Cost	€9.6m		€6.5m	

SCP 17.2.009
South Apron Stands Phase 2 (5 NBEs)

Project Output	Cost	Programme
5 Code C Stands	€30m	48 months (includes multiple relocations)

Project Summary

South Apron Stands Phase 2 entails the construction of 5 NBE stands on the south side of the South Apron as illustrated in the visual.

The South Apron Stands Phase 2 was evaluated against a group of stand development options and did not meet the key principles of PACE i.e. it could not be delivered within the timeframe and it was high risk due to the multiple stakeholder interactions and the planning/environmental issues.

- The 4+ year delivery programme means this option cannot be delivered within the prevailing CIP period and solution does not meet the PACE key principles/objectives. It should however be reviewed for inclusion in the next CIP 2020 to 2024.
- There is significant cost, programme and risk attached to delivery of this infrastructure. The site area is currently occupied by a number of buildings and services (12 in total) that are required to be relocated in advance of construction commencing. These are identified on the graphic below.

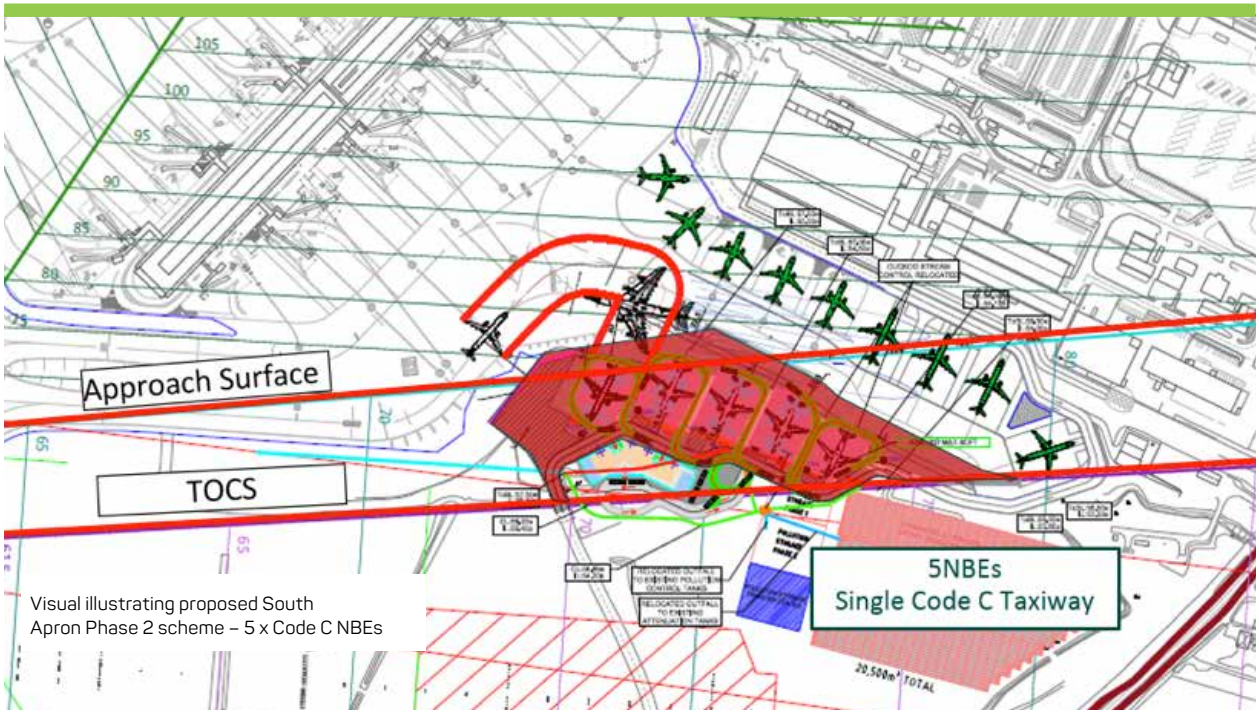
The relocation of these facilities requires new sites to be agreed with key stakeholders, planning applications to be prepared, planning permissions to be granted by Fingal County Council and An Bord Pleanála, new facilities to be constructed, tenants to be relocated, existing facilities to be demolished, new embankments to be constructed (with associated compaction) and new stands to be constructed. The draft timeline for this project indicates completion in circa 2022 and this does not meet the PACE objective.

- There are also high risk environmental issues with the necessary diversion of the Cuckoo Stream and the construction of a 3m–5m high embankment due to the difference in level from existing to proposed. These environmental issues would require a significant amount of engagement and agreement with local authorities, fisheries authority and other environmental agencies to progress.
- There are concerns that the introduction of 4 new stands and PBZ on the South Apron could give rise to increased levels of congestion. Further simulation modeling would be required to understand the impact of the increased level activity in the area associated with the Phase 2 stands.

SCP 17.2.009
South Apron Stands Phase 2 (5 NBEs)

Project Summary (Cont.)

- This project is likely to exacerbate the complexities of operating in the South Apron i.e. the single lane taxiway requires synchronization of aircraft movements.
- The estimated cost of delivering these stands is also higher than would be expected at €6m/stand, for the reasons detailed above.



Visual illustrating proposed South Apron Phase 2 scheme – 5 x Code C NBEs

Dublin Airport Recommendation

It is recommended to progress less complex, more efficient alternative solutions. Additional stands on the South Apron may have value for customers and should continue to be evaluated as development options for potential consideration - either under the next five-year plan or through the masterplanning process.

SCP 17.2.010
Pier 3 Remote Stands (4 NBE)

Project Output	Cost	Programme
4 NBE (of which one can only service a reduced Code aircraft)	€18m	36 months

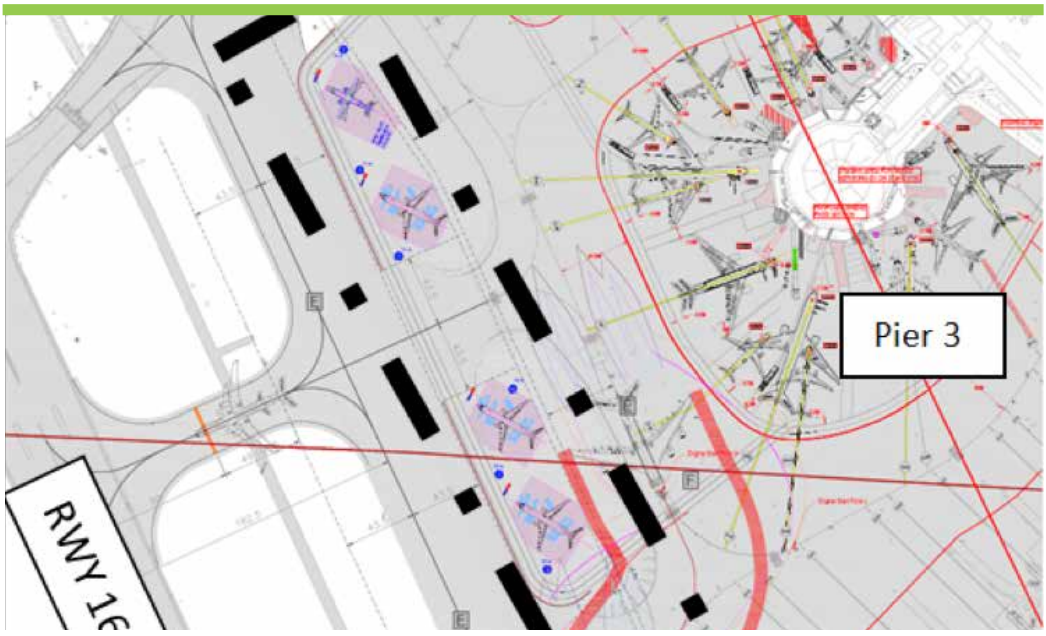
Project Summary

Pier 3 remote stands were developed as an option to provide additional stand infrastructure to accomodate the expected 2019 stand demand. The project entails:

- The infill of grassed areas opposite Pier 3 to create 3 full Code C stands and 1 reduced Code C.
- The extension of the existing Taxiway F-Outer to provide the necessary clearance to the stands from taxiing aircraft.
- The installation of high mast lighting to provide necessary illumination for EASA compliance.
- The necessary pollution control facilities to enable aircraft deicing on stand.

This option was evaluated against the group of stand development options. This proposal did not meet the principles of PACE as:

- The stands cannot be used as fully operational stands for embarking and disembarking passengers due to safety concerns following a number of risk assessments. The location of these stands requires crossing of a primary taxiway and is surrounded on all sides by moving aircraft and has associated jet blast issues.
- It does therefore not meet the requirement for additional passenger operational stands.
- This option only provides 3 NBEs suitable for full Code C aircraft and a reduced Code C aircraft.



Dublin Airport Recommendation

It is recommended to not proceed with this project as it does not deliver incremental passenger service stands and may have a negative impact on safety (challenging location).

SCP 17.2.011
West Apron Stands (6 NBE)

Project Output	Cost	Programme
6 stands (NBE) on the West Apron	€15m	24 months

Project Summary

This project entails the construction of 6 NBE stands on grassed area to the south of the existing West Apron.

The project was evaluated against a group of stand development options and did not meet the principles of PACE as:

- The delivery of these stands does not increase the stand inventory available for passenger operations without an access tunnel under RWY 16/34. It would not be feasible for passenger busses, baggage, and aircraft servicing vehicles to use the current Northern Perimeter road nor the future Northern Perimeter road on completion of the North Runway and the journey time is not viable to sustain efficient passenger operations.

Dublin Airport Recommendation

The benefits from this project cannot be realised in this regulatory period, therefore evaluation to be progressed under the masterplanning process.

SCP 17.2.012
West Apron Access Tunnel

Project Output	Cost	Programme
West Apron Access Tunnel	€100m-€150m*	5 years

Project Summary

It is not feasible to carry out scheduled commercial passenger operations on the West Apron without efficient access to and from the Terminal processors on the eastern campus.

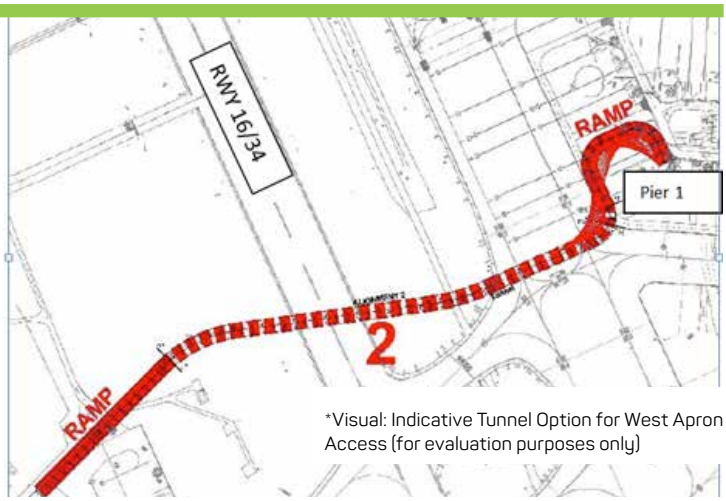
The two existing primary routes to and from the West Apron are across RWY 16/34 and via the Northern Perimeter Road. Neither of these options lend themselves to feasible passenger operations due to restrictions and travel times. Surface access across RWY 16/34 will only be available when RWY 16/34 when it is in use as a taxiway and not as a runway. On completion of the North Runway, this will increase to an 8 km journey.

A vehicle tunnel connecting the eastern campus with the West Apron was considered as an alternative. A preliminary design for a tunnel was drafted and costed to facilitate all vehicles required to service passenger operation on the West Apron.

The West Apron access tunnel is not being proposed as part of the PACE programme for the following reasons:

a. The project would not be deliverable within the current CIP period and would take approximately 5 years to deliver including planning, feasibility, design and construction.
b. Dublin Airport is currently developing a new masterplan. Without the guidance of the masterplan, a surface access tunnel cannot progress at this stage as the location/type /size etc. cannot be fully defined.

*Cost depends on tunnel gauge, alignment, construction method, impact on operations etc.



*Visual: Indicative Tunnel Option for West Apron Access (for evaluation purposes only)

Dublin Airport Recommendation

Tunnel options are being evaluated under the masterplanning process.

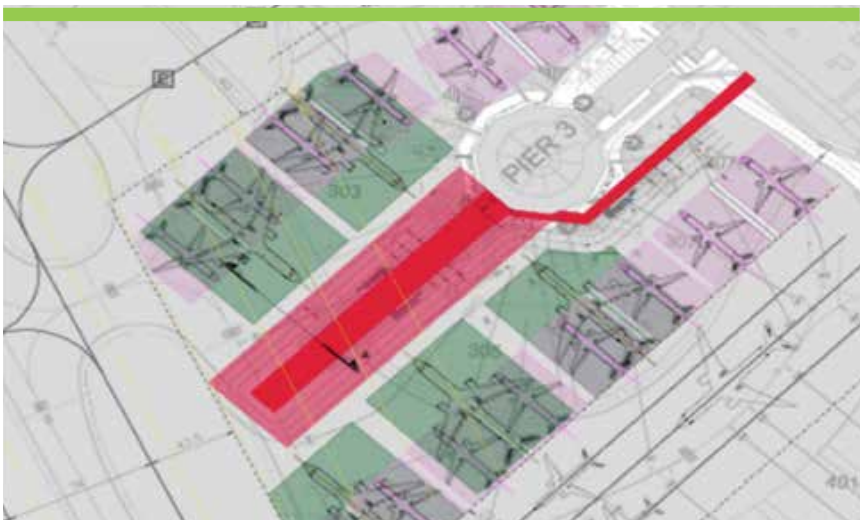
SCP 17.2.013
Pier 3 Extension

Project Output	Cost	Programme
Pier 3 Extension	€70m-€120m	4 years

Project Summary

The capacity assessment in Section 3 of this document identified a shortfall of stands on Pier 4 to facilitate the expected 2019 US Preclearance peak stand demand. A capital solution to extend Pier 3 with a link to Pier 4, as illustrated in the visual, was considered. This proposed development would provide:

- 3 NBE stands.
- New pier segment with full segregation of US Preclearance and non-US Precleared Passengers.
- A link to and from Pier 4.
- Gate space to facilitate 6 simultaneous departures.



Dublin Airport Recommendation

This project cannot be completed within the current regulatory period. Further evaluation is required through the masterplanning process.

SCP 17.3.005
RWY 10/28 Rapid Exit Taxiways (RETs)

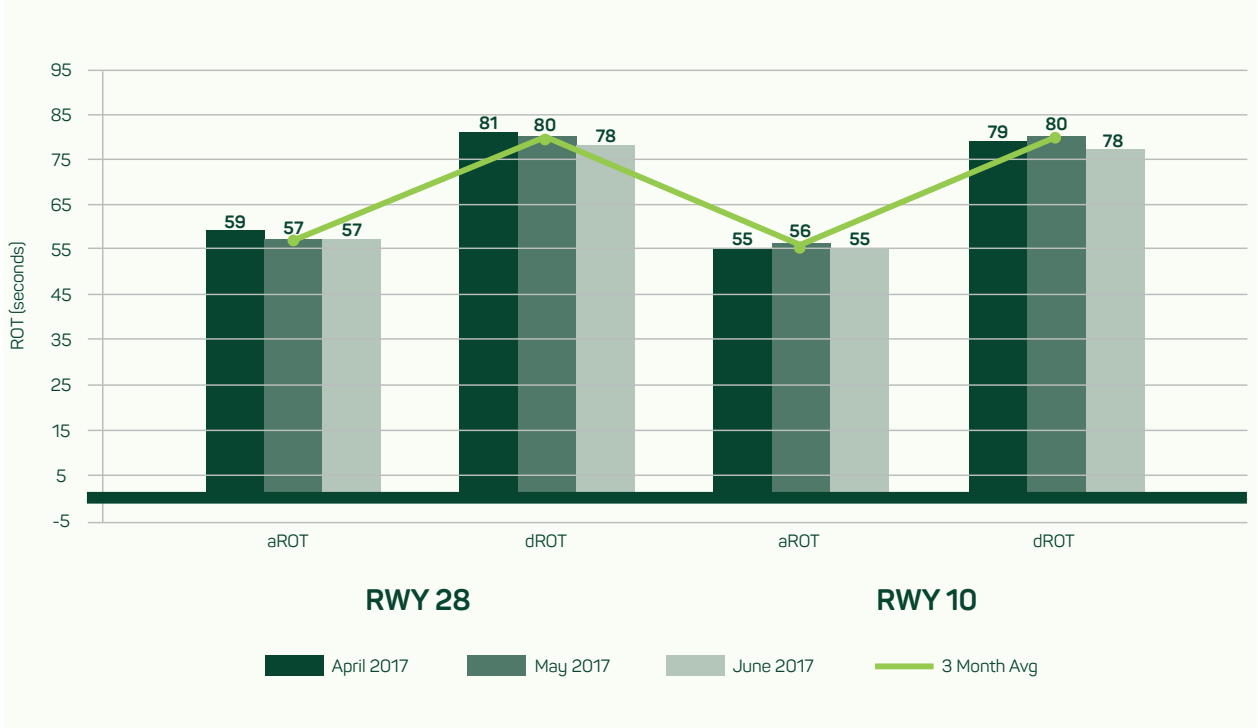
Project Output	Cost	Programme
Rapid Exit Taxiways (RETs) RWY 10/28	€9m	24 to 36 months (depending on acceptable level of operational disruption)

Project Summary

Rapid Exit Taxiways (RETs) options were developed as a measure to increase runway capacity. The function of the RET infrastructure is to enable arriving aircraft to exit the runway earlier and at greater speeds than would be possible on a standard runway exit taxiway, thereby reducing runway occupancy time.

While there is one existing designated RET for RWY 28, Taxiway E6, the orientation of runway exit taxiways in this direction is not suitable for rapid runway vacation and subsequent onward taxiing at speed, due to the need to back-turn at a reflexive angle (180 degrees) onto Taxiway B6 in the opposite direction. Although there are no current declared RETs for RWY 10, existing Taxiway E3 is best aligned for onward taxiing onto Taxiway H2 or Taxiway B3.

From the graph below, it can be seen that RWY 10 and RWY 28 arrival runway occupancy times (aROT) are very similar even though RWY 10 does not have a declared RET.



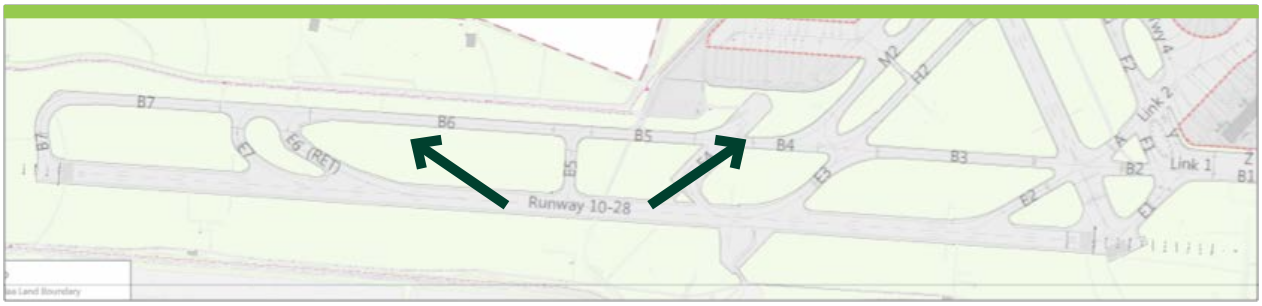
SCP 17.3.005
RWY 10/28 Rapid Exit Taxiways (RETs)

Project Summary (Cont.)

Current performance statistics for taxiway exit usage are detailed on the table below, for June 2017;

RWY	Aircraft Type	TWY	Target (% Mvts)	%Mvts	
10	Code A, B and C	TWY E3 or before	≥90%	97%	✓
10	Code D and E	TWY E2 or before	≥85%	81%	✗
28	Code A and B	TWY E5 or before	≥85%	90%	✓
28	Code C and D	TWY E6 or before	≥98%	100%	✓

Notwithstanding this, the benefit of an additional RET between Taxiway E5 and Taxiway E6 for RWY 28 operations and at Taxiway E4 for RWY 10 operations, was evaluated.



RETs have potential efficiencies for departures following arrivals. As the arrival runway occupancy time can be potentially reduced, departure take-off clearance may be issued slightly earlier.

In a parallel runway scenario, when the North Runway is operational (most likely case when RETs would be delivered), it is possible that RWY 28L (existing runway) will be the primary arrival runway for westerly operations and RWY 10R (existing runway) will be the primary departure runway for easterly operations, for segregated mode. Therefore, a RWY 28 RET is expected to be utilised to a greater extent as the primary Arrivals Runway in segregated mode and during mixed mode periods. The minimum arrival-arrival separations on approach will apply (particularly in segregated mode) as the limiting factor, so there is no tangible benefit to runway capacity of a RET for arrivals-only runway, although it may slightly reduce inbound taxi times. RWY 10R (existing runway) would have a lesser benefit as the primary departure runway.

Benefits

- Expected reduction in average arrival runway occupancy time, enabling earlier DEP take-off clearances or reduced taxi times.
- Minimises risk of missed approach and more likely to guarantee minimum radar separation by encouraging pilots to vacate Runway more quickly.
- Beneficial for mixed ARR/DEP waves. No capacity benefit for A-A due to minimum separation required on approach.

SCP 17.3.005
RWY 10-28 Rapid Exit Taxiways (RETs)

Project Summary (Cont.)

Potential locations for RWY 10/28 RETs

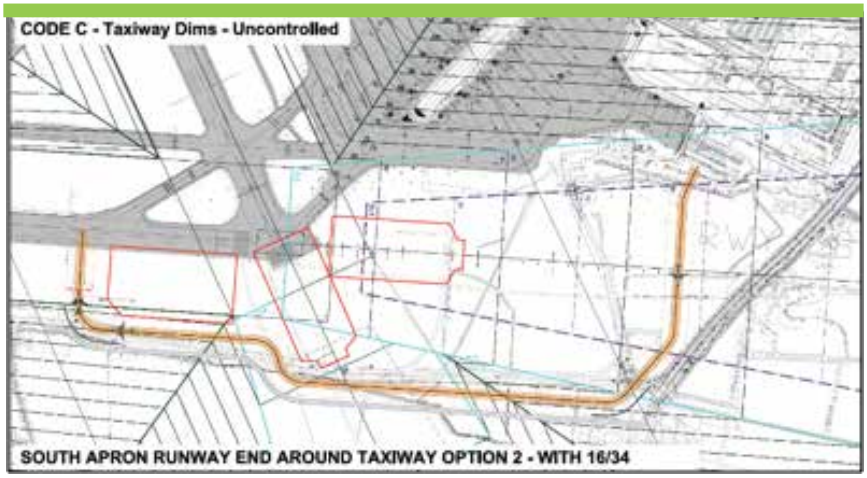
Dublin Airport Recommendation	**The simulation modelling found that while RETs reduce runway occupancy times, the time saving did not allow for an additional movement during the peak period. On this basis, this project is not being recommended as part of the PACE programme.**

SCP 17.3.006
RWY28 End-around Taxiway (South Apron Access)

Project Output	Cost	Programme
RWY 28 End-Around Taxiway and Line-up Points	€50m	5 years +

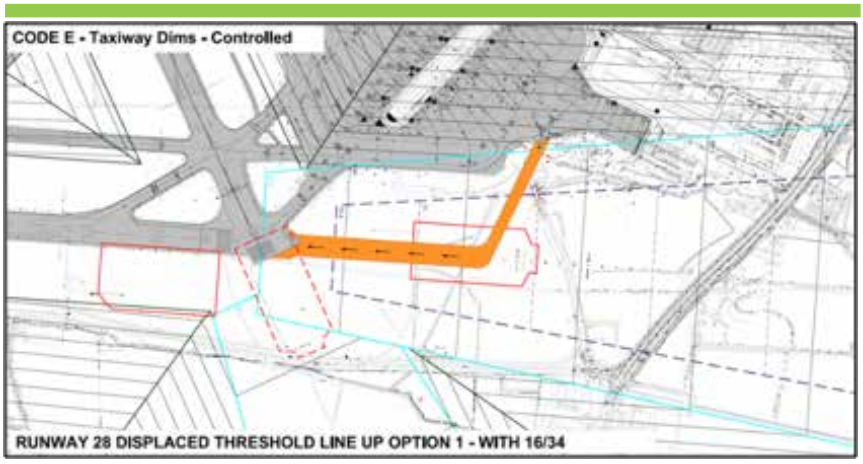
Project Summary

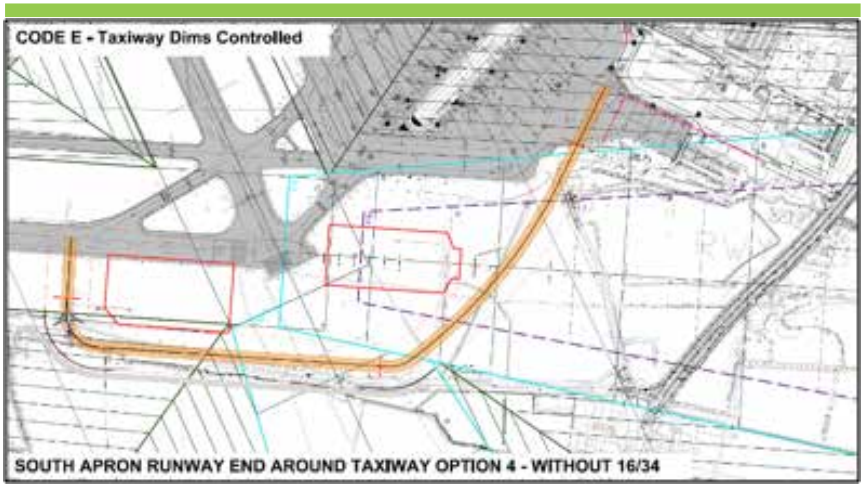
Options for RWY 28 end-around taxiway and line-up schemes were developed in response to users feedback to ease congestion in the South Apron, and improve access to RWY 28 for traffic departing from the South Apron. The options considered are highlighted below:



SCP 17.3.006
RWY 28 End-around Taxiway (South Apron Access)

Project Summary (Cont.)





All of the above options have design and compliance challenges including:

- Code C–Code E compliance. Code E compliance would require taxiway traversing the R132 (Option 4 above).
- Obstacle Limitation Surface (OLS) infringement, associated holding points and their impact on runway capacity.
- Intersection departure–reduced TORA on RWY 28.
- Type A Chart (1.2% slope) penetration and the impact on aircraft performance.
- Navigational aids assessment and the impact of RWY 28 glideslope which may require relocation.
- Longer access time to RWY 28 and potential negative impact on capacity
- Relocation of RWY 10 Instrument Landing System (localizer) and modifications to approach lighting.
- Collinstown Cross Road realignment and associated planning requirements.
- Land ownership and impact of local authority (public roads) and third parties.
- Preferred mode of operation in a dual parallel runway scenario. If the existing south runway (RWY 28L) was the primary arrival runway for westerly operations, this project would have limited benefit.
- Significant challenges with planning permission.
- Due to holding requirements, there is potential to exacerbate congestion in the South Apron.

SCP 17.3.006
RWY 28 End-around Taxiway (South Apron Access)

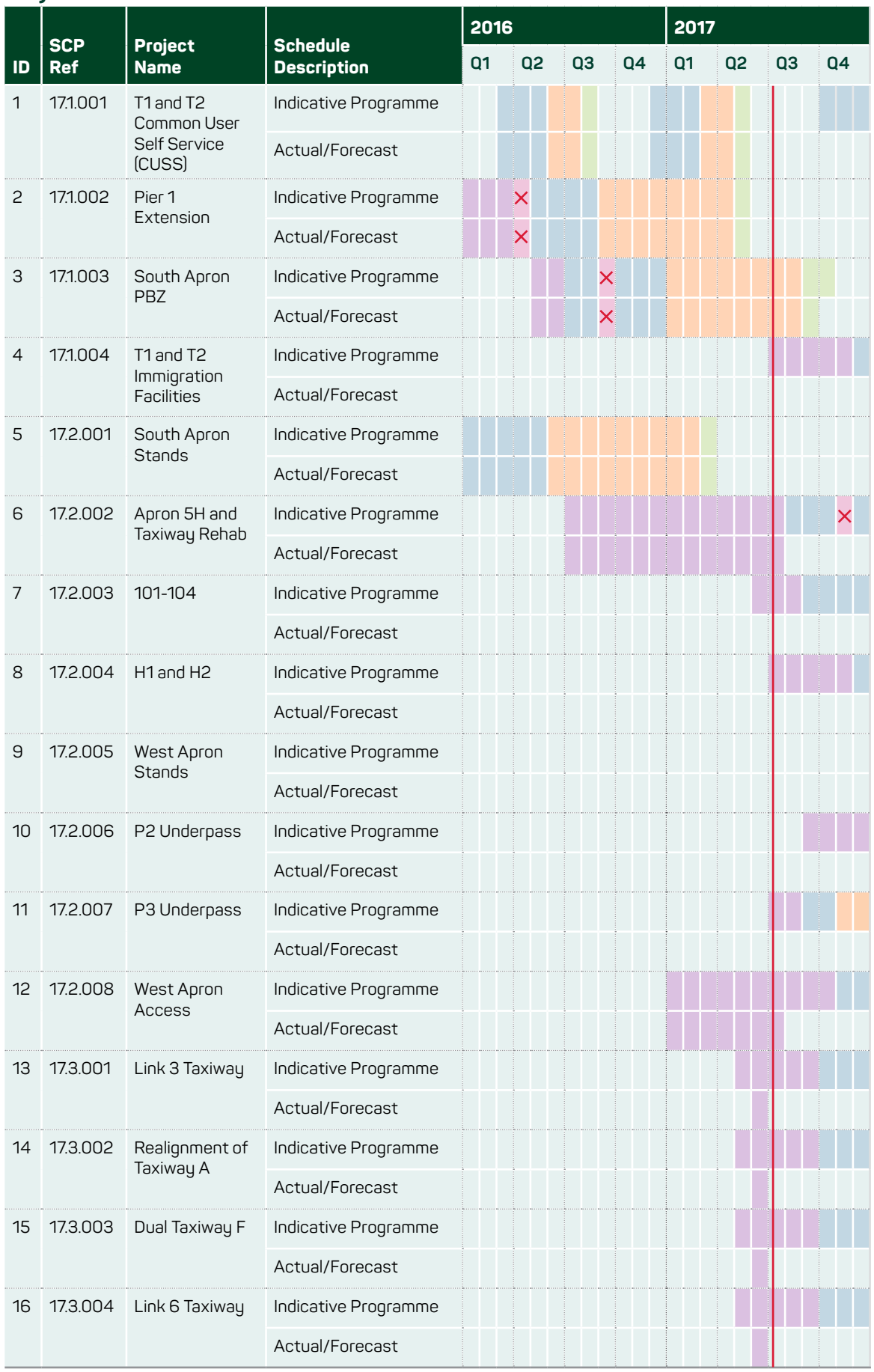
Project Summary (Cont.)	
Dublin Airport Recommendation	As this project would represent a significant investment, additional clarity on both the emerging masterplan and the mode of operation for the North Runway is essential before detailed feasibility could commence to prevent nugatory expenditure. Dublin Airport is recommending deferring this project pending clarity on the above.

APPENDIX D

PACE Project Timelines

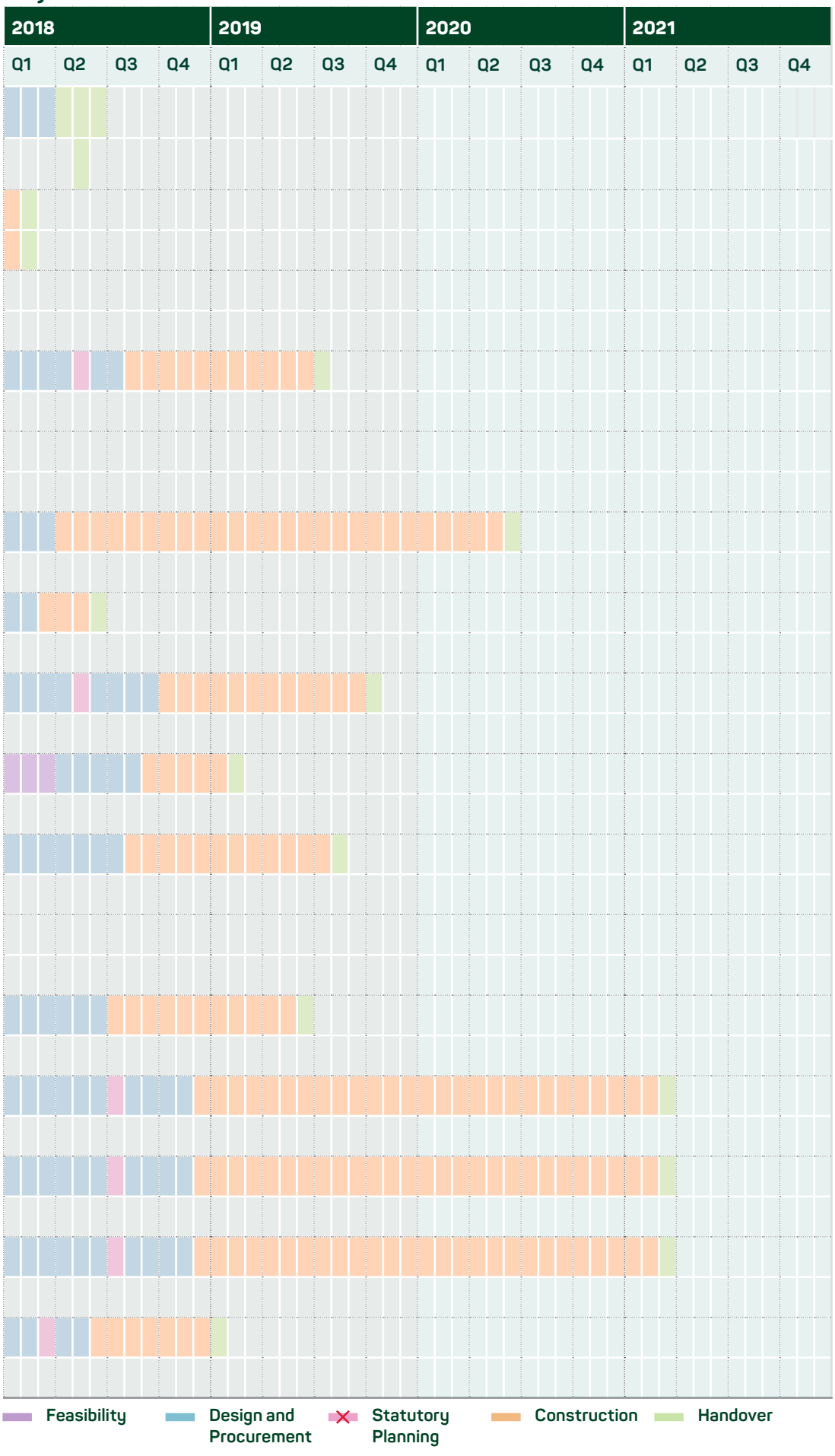
PACE
Project Timelines

ID	SCP Ref	Project Name	Schedule Description
1	17.1.001	T1 and T2 Common User Self Service (CUSS)	Indicative Programme
			Actual/Forecast
2	17.1.002	Pier 1 Extension	Indicative Programme
			Actual/Forecast
3	17.1.003	South Apron PBZ	Indicative Programme
			Actual/Forecast
4	17.1.004	T1 and T2 Immigration Facilities	Indicative Programme
			Actual/Forecast
5	17.2.001	South Apron Stands	Indicative Programme
			Actual/Forecast
6	17.2.002	Apron 5H and Taxiway Rehab	Indicative Programme
			Actual/Forecast
7	17.2.003	101-104	Indicative Programme
			Actual/Forecast
8	17.2.004	H1 and H2	Indicative Programme
			Actual/Forecast
9	17.2.005	West Apron Stands	Indicative Programme
			Actual/Forecast
10	17.2.006	P2 Underpass	Indicative Programme
			Actual/Forecast
11	17.2.007	P3 Underpass	Indicative Programme
			Actual/Forecast
12	17.2.008	West Apron Access	Indicative Programme
			Actual/Forecast
13	17.3.001	Link 3 Taxiway	Indicative Programme
			Actual/Forecast
14	17.3.002	Realignment of Taxiway A	Indicative Programme
			Actual/Forecast
15	17.3.003	Dual Taxiway F	Indicative Programme
			Actual/Forecast
16	17.3.004	Link 6 Taxiway	Indicative Programme
			Actual/Forecast



Feasibility | Design and Procurement | Statutory Planning | Construction | Handover

PACE
Project Timelines



APPENDIX E

Masterplan Compliance

Masterplan Compliance

Project Title	Masterplan Asset Life	Project Asset Life	Notes
Pier 1 Extension	40	40	This project does not constrain future masterplan development.
South Apron PBZ	15	15	This project does not constrain future masterplan development.
Terminal 1 and Terminal 2 CUSS	5	5	This project does not constrain future masterplan development.
Terminal 1 Immigration	15	15	The Immigration facility may have a reduced asset life pending longer term development of terminal facilities. The building structure may however be used for alternative uses if not required in the new masterplan.
Terminal 2 Immigration	15	15	This project does not constrain future masterplan development.
South Apron Stands	40	40	This project does not constrain future masterplan development.
Apron 5H	40	40	This project does not constrain future masterplan development.
Upgrade and Realignment of Stands 101 – 104	15	15	This project does not constrain future masterplan development.
Hangar 1 and 2 Stands	30	30	This project is consistent with any future clearance of this area for stand development; final stand layout may evolve with future masterplan layouts. Masterplan asset life based on stand pavement.
West Apron Stands	40	40	This project is consistent with future stand development in the area; final stand layout may evolve with future masterplan layouts.
Pier 2 Underpass	15	15	This project does not constrain future masterplan development.
Pier 3 Underpass	5	5	This project does not constrain future masterplan development.
Link 6 Taxiway	20	20	This project does not constrain future masterplan development.
Link 3 Taxiway	30	30	This project does not constrain future masterplan development.
Realignment of Taxiway A	20	20	This project does not constrain future masterplan development.
Dual Taxiway F	20	20	This project does not constrain future masterplan development.
West Apron Access	10	30	This project has a reduced asset life assigned (10 years) to allow for the possibility of a future tunnel to the West Apron which is safeguarded in the current masterplan. The overall spend on this project is modest in the amount of €3m and is capital efficient insofar as it offers a benefit over the period relative to the cost of the project.

APPENDIX F

Supplementary Capex Price Cap Effects

Supplementary Capex Price Cap Effects Overall

Part 1 | Estimated isolated effect of supplementary capital project on the price cap.

	Base Value
WACC	5.79%
Passenger Numbers	27,900,000

	Asset Life	Supplementary Capex	Price Cap Effect
	5	6,100,000	€0.05
	10	4,700,000	€0.02
	15	41,600,000	€0.15
	20	26,300,000	€0.08
	30	18,300,000	€0.05
	40	72,600,000	€0.16
Isolated Impact On The Price Cap			€0.51[1]

[1] This is the direct effect on the price cap without considering indirect effects such as increased passenger numbers.

Part 2 | Overall estimate of the increase in the price cap from a project to add capacity.

	Base Value	Required Input	Optional Inputs
Commercial Revenue	0.64		
Operating Costs	0.16		
2019 Base Price Cap	€8.68		
Estimated Increase In Passengers Resulting From Capex		3,600,000	
Revised Total Passengers With Supplementary Capex	31,500,000[2]		
Commercial Revenue Increase	€14,583,508[3]		
Operating Cost Increase	€4,258,250[4]		
Price cap with supplementary capex	€7.81[5]		
Decrease in price cap due to supplementary capex	€0.87[6]		

[2] This is the predicted number of passengers taking account of the increased capacity from supplementary capex.

[3] This is the predicted increase in Commercial Revenues generated by the extra passengers.

[4] This is the predicted increase in Operating Costs generated by the extra passengers.

[5] This is the estimated price cap taking account of the direct effect of the capex and the indirect effects of increased pasenger numbers.

[6] This is the overall estimate of the effect on the price cap of the supplementary capex.

Suggested Elasticity Options

2016 Outturn	2015 Outturn	2014 Outturn	2013 Outturn	2013-2016 Average Outturn	2013-2016 Overall Outturn
1.16	1.03	1.61	1.09	1.22	1.23
0.89	0.58	0.43	0.50	0.60	0.61

Supplementary Capex Price Cap Effects Group 1

Please note that this model is intended solely to show potential effects of supplementary capital expenditure on a future price cap. Neither the approach set out nor any of the values used for estimation should be considered as pre-empting a decision of the Commission.

Part 1 | Estimated isolated effect of supplementary capital project on the price cap.

	Base Value
WACC	5.79%
Passenger Numbers	27,900,000

	Asset Life	Supplementary Capex	Price Cap Effect
	5	2,900,000	€0.02
	10	1,700,000	€0.01
	15	22,000,000	€0.08
	40	18,100,000	€0.04
Isolated Impact On The Price Cap			€0.15[1]

[1] This is the direct effect on the price cap without considering indirect effects such as increased passenger numbers.

Part 2 | Overall estimate of the increase in the price cap from a project to add capacity.

	Base Value	Required Input	Optional Inputs
Commercial Revenue	0.64		
Operating Costs	0.16		
2019 Base Price Cap	€8.68		
Estimated Increase In Passengers Resulting From Capex		1,300,000	
Revised Total Passengers With Supplementary Capex	29,200,000[2]		
Commercial Revenue Increase	€5,266,267[3]		
Operating Cost Increase	€1,537,701[4]		
Price Cap With Supplementary Capex	€8.31[5]		
Decrease In Price Cap Due To Supplementary Capex	€0.37[6]		

[2] This is the predicted number of passengers taking account of the increased capacity from supplementary capex.

[3] This is the predicted increase in Commercial Revenues generated by the extra passengers.

[4] This is the predicted increase in Operating Costs generated by the extra passengers.

[5] This is the estimated price cap taking account of the direct effect of the capex and the indirect effects of increased pasenger numbers.

[6] This is the overall estimate of the effect on the price cap of the supplementary capex.

Suggested Elasticity Options

2016 Outturn	2015 Outturn	2014 Outturn	2013 Outturn	2013-2016 Average Outturn	2013-2016 Overall Outturn
1.16	1.03	1.61	1.09	1.22	1.23
0.89	0.58	0.43	0.50	0.60	0.61

Supplementary Capex Price Cap Effects Group 2

Part 1 | Estimated isolated effect of supplementary capital project on the price cap.

	Base Value
WACC	5.79%
Passenger Numbers	29,200,000

	Asset Life	Supplementary Capex	Price Cap Effect
	5	3,200,000	€0.03
	10	3,000,000	€0.01
	15	19,600,000	€0.07
	20	26,300,000	€0.07
	30	18,300,000	€0.04
	40	54,500,000	€0.12
Isolated Impact On The Price Cap			€0.34[1]

[1] This is the direct effect on the price cap without considering indirect effects such as increased passenger numbers.

Part 2 | Overall estimate of the increase in the price cap from a project to add capacity.

	Base Value	Required Input	Optional Inputs
Commercial Revenue	0.64		
Operating Costs	0.16		
2019 Base Price Cap	€8.68		
Estimated Increase In Passengers Resulting From Capex		2,300,000	
Revised Total Passengers With Supplementary Capex	31,500,000[2]		
Commercial Revenue Increase	€8,902,433[3]		
Operating Cost Increase	€2,599,428[4]		
Price Cap With Supplementary Capex	€8.16[5]		
Decrease In Price Cap Due To Supplementary Capex	€0.52[6]		

[2] This is the predicted number of passengers taking account of the increased capacity from supplementary capex.

[3] This is the predicted increase in Commercial Revenues generated by the extra passengers.

[4] This is the predicted increase in Operating Costs generated by the extra passengers.

[5] This is the estimated price cap taking account of the direct effect of the capex and the indirect effects of increased pasenger numbers.

[6] This is the overall estimate of the effect on the price cap of the supplementary capex.

Suggested Elasticity Options

2016 Outturn	2015 Outturn	2014 Outturn	2013 Outturn	2013-2016 Average Outturn	2013-2016 Overall Outturn
1.16	1.03	1.61	1.09	1.22	1.23
0.89	0.58	0.43	0.50	0.60	0.61

Please direct all correspondence relating to this consultation process (including queries and final submissions) to:
pace@dublinairport.com