London Southend Airport
Airspace Change Proposal

Introduction of Standard Instrument Departure Procedures
to Routes in the London Terminal Control Area
Sponsor Consultation - 2016

Annex C to Part B
of the Consultation Document
Runway 23 Departures to the South

Contents of Annex C to Part B

1. Runway 23[1]: Departures to the South (EKNIV)

1.1. The procedure is known as the **EKNIV 1F** SID and is not a direct replication of either the PDR or the current routing of departing aircraft to the south. It should be noted that aircraft departing from LSA to the south have not, for many years, followed the published route of the PDR. This is explained in Section 3 below.

1.2. EKNIV is a new navigation position within the LTMA over the River Medway Estuary. It has been established by NATS on a new TMA Transit Route (Airway) M91 as part of the LAMP Phase 1a airspace changes in order to reduce the number of departure procedures from LCY and LSA[2]. It also ensures that aircraft departing from LSA will be contained within controlled airspace and adequately separated from other airspace constraints. The introduction of Airway M91 was part of the NATS consultation on the LAMP Phase 1a airspace changes and does not form part of this consultation.

1.3. This route is currently utilised (based on Summer 2015 figures) by approximately 44 scheduled services per week when runway 23 is in use. Forecast traffic growth is expected to lead to approximately 130 flights per week in 2021.

1.4. Figures C1 and C2 below show historic tracks of aircraft departing from runway 23 to the south over comparable 5-week periods in July/August 2014 and 2015 respectively[3].

1.5. Also, as detailed in Section 5 of **Part A** of the Consultation Document, once aircraft are beyond the end of the NAPs they may be tactically routed by LTC or LSA controllers for integration with other traffic flows. This is indicated in the track plots by some plots tracking to the west and east of the core tracks.

[1] As detailed in the main body of the Consultation Document, prior to November 2015 the runway designation at LSA was Runway 24. From November 2015 the designation is Runway 23 due to magnetic variation changes. For ease of reference, the runway is referenced as Runway 23 throughout this document, notwithstanding that for the presentation of historic data it was then designated Runway 24.

[2] The introduction of Airway M91 enables the previous 3 southbound PDRs to Dover (DVR), Lydd (LYD) and Southampton (SAM) to be combined and replaced by a single SID procedure to EKNIV.

[3] It should be noted that the departures in 2014 took place before the introduction of controlled airspace around LSA and thus may include depiction of track deviations below 3500ft to avoid unknown aircraft in proximity to their intended route

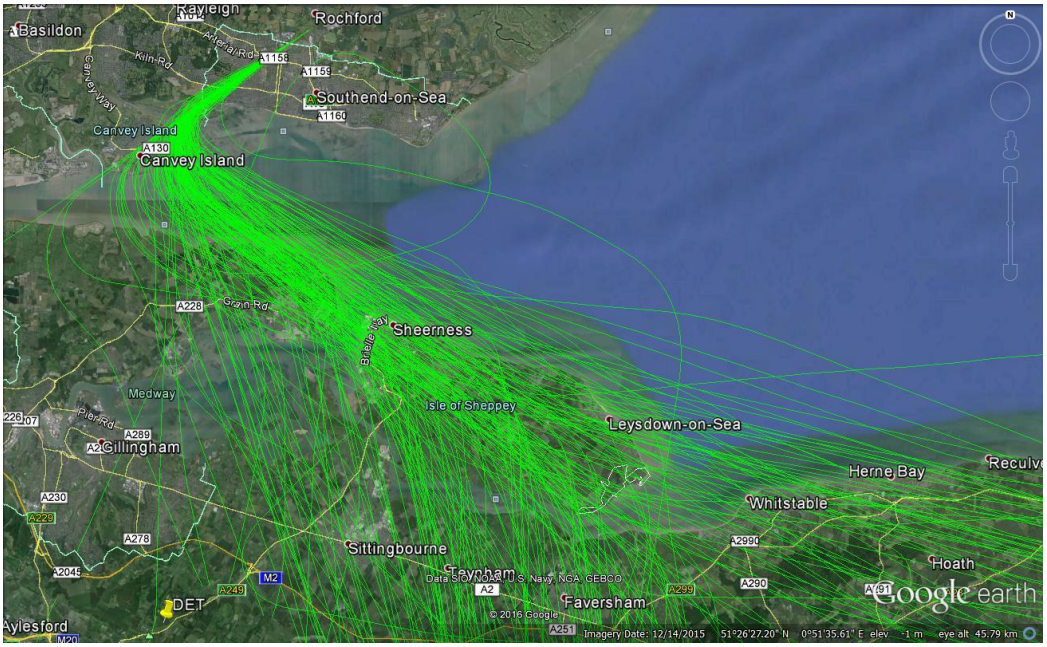


Figure C1: Runway 23. Historic departure tracks to the south 5-week period Jly/Aug 2014

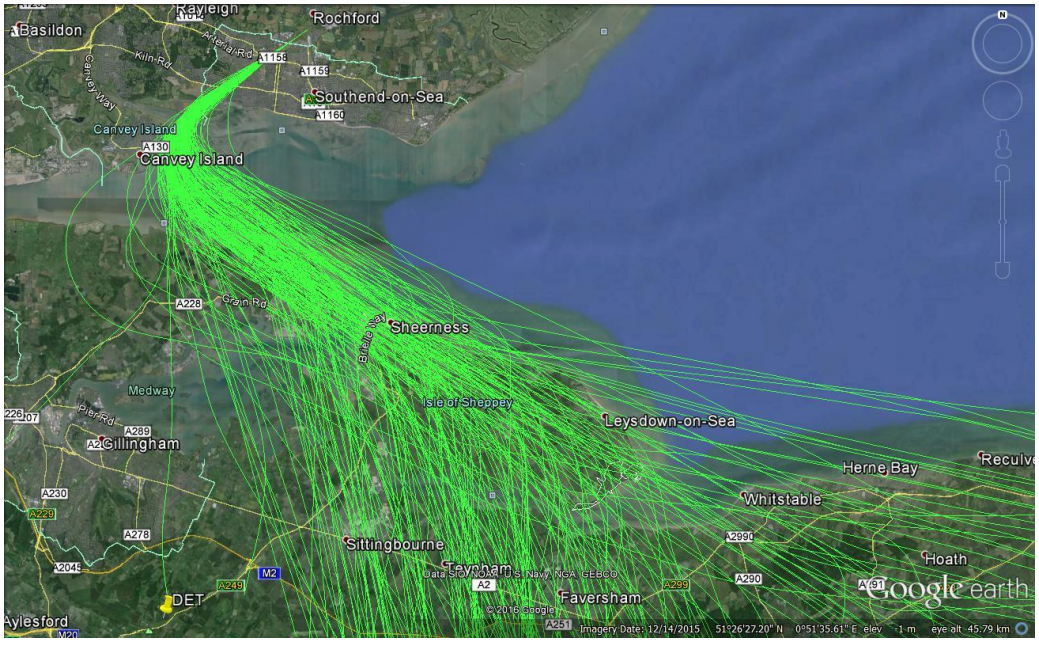


Figure C2: Runway 23. Historic departure tracks to the south 5-week period Jly/Aug 2015

2. The EKNIV 1F SID procedure

2.1. Climb on course 235°M to MCW03, to cross MCW03 not below 1500ft (CF leg), turn left to MCS08 on course 170°M (CF leg), then to EKNIV. Cross MCS08 at 3000ft; cross EKNIV at 3000ft. Maximum speed 210kt IAS to MCS08 then maximum speed 250kt IAS to EKNIV.

2.2. A schematic diagram of the SID is shown in Fig C3 below and a diagram of the SID overlaid on an Ordnance Survey map is shown at Appendix C1.

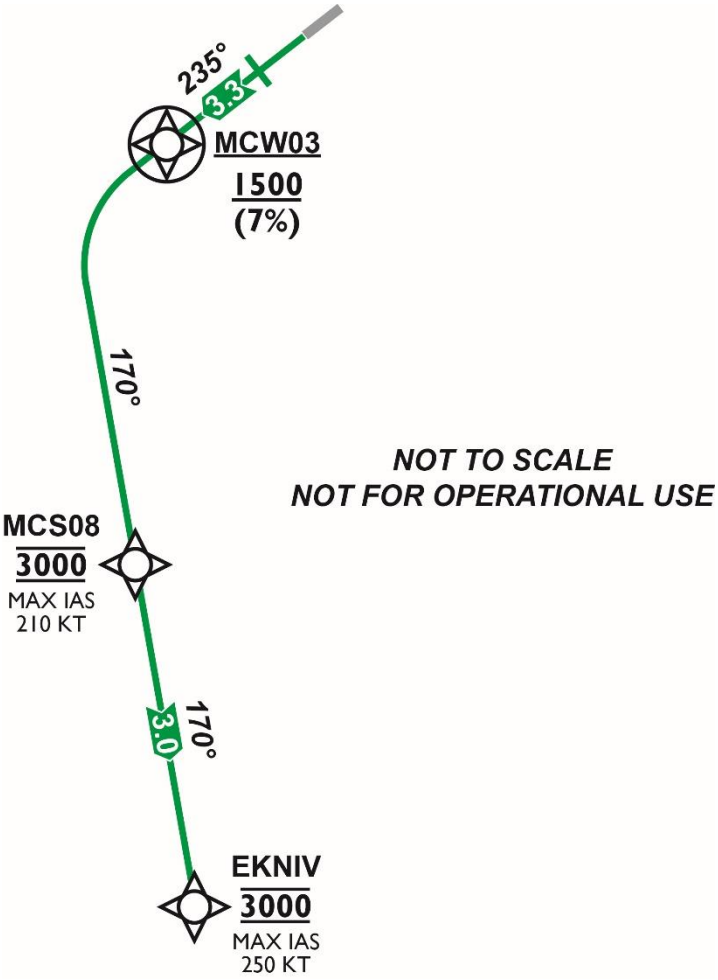


Figure C3: Schematic diagram of EKNIV 1F SID

2.3. Waypoint MCW03 is a flyover waypoint located 3.3NM from the end of the runway, which reflects both the earliest turn and minimum turning altitude of the NAPs as detailed in paragraph 14.2 of **Part B** of the consultation document. It is necessary to locate the waypoint at 3.3NM in order to take account of the fix tolerance of the RNAV waypoint to ensure that aircraft, under the worst navigational circumstances, do not start to turn before reaching 2.5NM from the end of the runway. Specification of not below 1500ft at the waypoint is based on a 7% (425ft/NM) procedure design climb gradient.

2.4. From the end of the NAP the route turns left onto a course of 170°M towards EKNIV, from which point it joins the new Airway M91. The course has been determined by the nominal procedure design turn radius for a turn at 210kt at 25° bank angle, rolling out of the turn directly towards EKNIV. The waypoint MCS08 (flyby waypoint) has been positioned on the roll-out track at the minimum distance from MCW03 that is allowable under the procedure design criteria for a track change of 65° at 210kt in still air and constitutes a viable climb gradient to 3000ft. (Most aircraft will have reached 3000ft well before MCS08.) It is also the point at which the initial speed limit of 210kt, which constrains track dispersion around the first turn, can be relaxed.

2.5. The route passes over the Isle of Grain, avoiding the two Gas Venting Stations[4] (GVS) and a Danger Area[5] on the eastern extremity of Grain by the required safety margin. The route also passes to the west of Stoke Microlight aerodrome. (It is not possible to design a SID procedure which replicates the previous radar-directed routing of aircraft due to the procedure design requirements in respect of the GVS and Danger Area.)

Vertical constraints

2.5.1. An altitude limit of 3000ft is dictated, procedurally, by the inbound leg of the LCY Point Merge Approach procedure (introduced as part of LAMP Phase 1a) descending along the Thames Estuary to 4000ft. This is depicted in Figure C4 below and is necessary for the flight safety requirements in the design of crossing procedures.

[4] Gas Venting Stations are sites where venting of methane gas under high pressure may take place without prior notice. The recommended avoidance area is 1NM radius up to 3500ft ALT.

[5] Danger Area D146 at Yantlett has an avoidance area of radius 0.54NM (1000m), surface to 3000ft ALT.

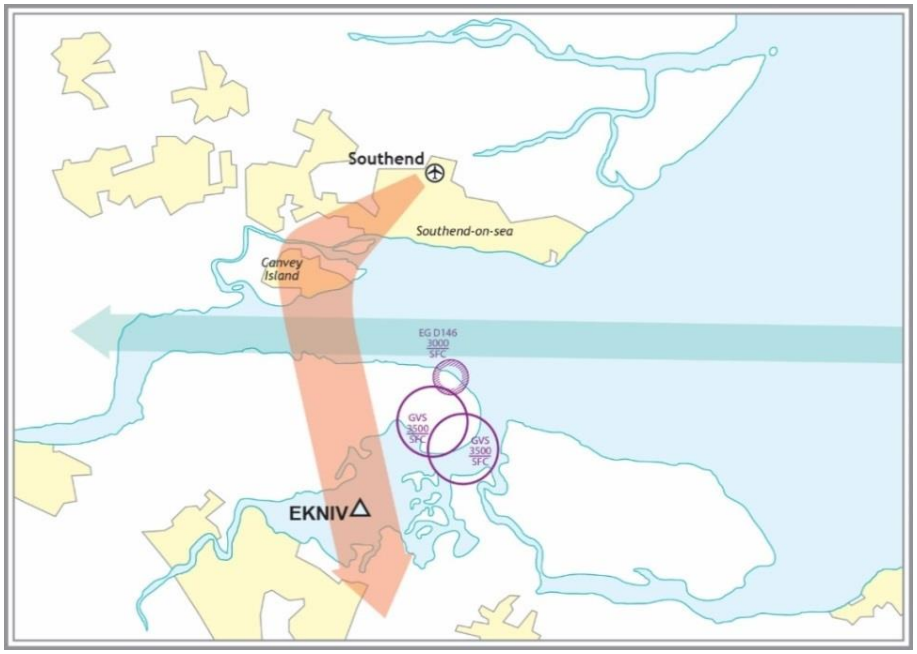


Figure C4: Schematic diagram depicting conflict area between LSA EKNIV SID (red) and LCY Approach procedures (blue).

2.5.2. The SID is not procedurally separated from the LCY approach procedure until reaching EKNIV. Therefore it is not possible to specify a higher altitude as the upper limit of the SID.

2.5.3. However, on a day-to-day basis, if there is not another aircraft in conflict, then aircraft departing from LSA would be given a direct climb clearance to a higher level. Standing agreements will be in place between LSA ATC and LTC Sectors to ensure that climb clearance above 3000ft is given at the earliest opportunity.

2.5.4. Furthermore, standard ATC operating rules require that aircraft within controlled airspace must be retained at least 500ft above the controlled airspace base level. Thus it is incumbent upon LTC controllers to ensure that climb clearance is given to departing aircraft in good time so that they can reach at least 4000ft by the southern boundary of the Southend Control Area (3NM beyond EKNIV).

2.5.5. Empirical evidence indicates that aircraft departing from LSA would regularly be expected to be above 4000ft[6] before reaching EKNIV, notwithstanding that it cannot, for the safety management reasons detailed above, be specified within the procedure. Figure C5 below provides a colour-coded plot of historic climb performance of departing aircraft routing to the south over a 5-week period in Summer 2015.

[6] An A319 given unrestricted climb clearance in typical weather conditions could be expected to be at approximately 5000ft by EKNIV.

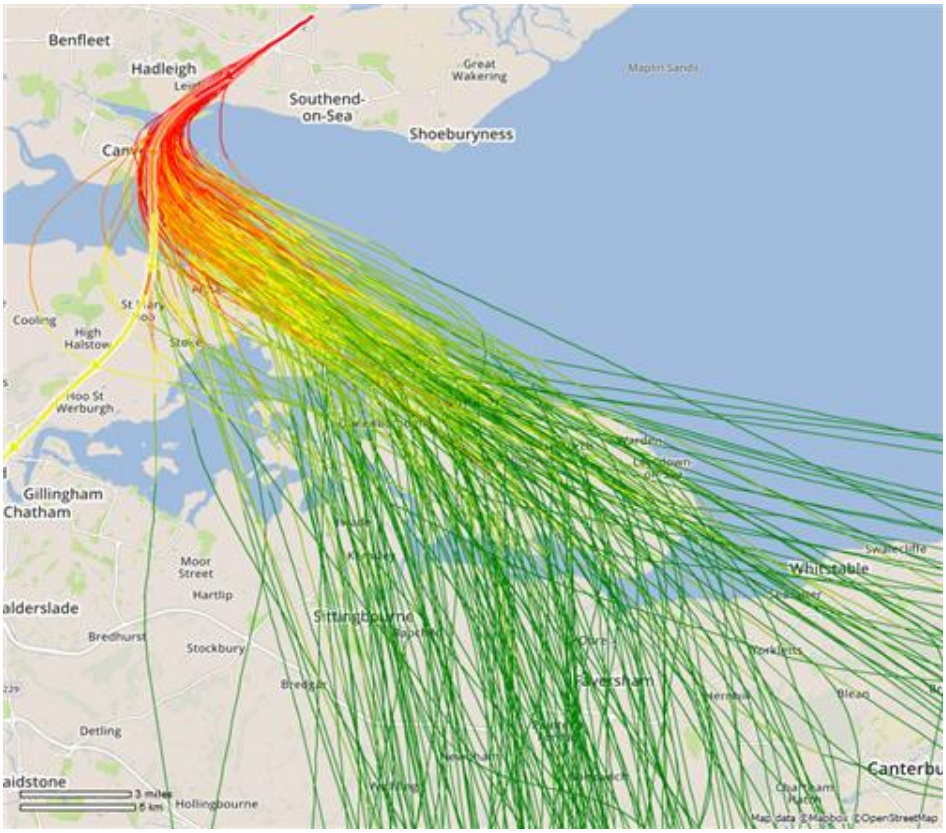


Figure C5: Colour coded climb profile of departing flights Summer 2015.
[Colour coding: Below 3000ft red; 3000 – 4000ft orange; 4000 – 5000ft yellow; 5000 – 7000ft light green; above 7000ft dark green.]

2.5.6. It can be seen from these plots that the majority of aircraft have been given climb clearance above 3000ft before crossing the Thames and are generally in the level band 3000ft – 5000ft before reaching the south bank. Some are higher, in the 5000ft to 7000ft range.

2.5.7. Whilst the effects of the realigned LCY arrival procedure along the Thames Estuary will, to a certain extent, limit the ability for controllers to issue early climb clearance, nonetheless it is anticipated that early climb clearance will be available for the majority of LSA departing flights. (LSA will be monitoring closely the climb profiles of departing aircraft following the introduction of the SID procedures, both with respect to the revised LTMA arrangements as a whole and with respect to the performance of aircraft departing on the EKNIV SID itself.)

Radar Vectoring

2.5.8. As noted in Section 5 and paragraph 9.4 of **Part A** of the consultation document it is essential that controllers retain the operational flexibility to integrate aircraft flight paths with one another to achieve the most effective and efficient overall traffic flow and to get departing aircraft climbing to their cruising levels

as quickly as possible. The NAPs at LSA place no constraints on the routing of aircraft beyond 2.5NM from the end of the runway or above 1500ft. Therefore, once aircraft have completed the NAP segment of the SID procedure, controllers may use radar vectoring to achieve the most efficient and expeditious flight profiles of aircraft at the lower levels of the TMA airspace.

2.5.9. Aircraft departing from LSA towards the south have, for many years, been radar vectored to the east of the PDR as explained in Section 3 below. This has led to a wide dispersion of the resulting tracks because of the variation in turning radius of aircraft at different speeds and in varying weather conditions as depicted in Figures C1, C2 and C5 above.

2.5.10. The proposed SID procedure introduces formal track guidance to the route and speed control to reduce the variation in turning performance. The alignment of the SID is more compatible with the TMA arrangements in the eastern part of the LTMA than the previous PDR alignment.

2.5.11. Thus with the introduction of the SID procedure there will be a lesser operational requirement for ATC tactical intervention in the routing of aircraft in the earlier stages of departure. The operational interface between LSA ATC and LTC Sectors will be focussed more on leaving the aircraft on the SID route rather than radar vectored to the east. However, the option of radar vectoring must remain available to ensure that controllers can achieve the most effective flight profiles and give climb clearance at the earliest opportunity.

2.5.12. Further to the south, once established in the Airways System and climbing towards their cruising levels under the jurisdiction of LTC Sectors, re-routing of aircraft towards their destinations will continue to take place. (This is indicated in Figures C1, C2 and C5 by the wide dispersion of tracks south of Sheppey, when aircraft are generally above 5000ft.)

3. Differences between the EKNIV 1F SID and the PDR and the current routing of departing aircraft

3.1. A diagram showing the proposed EKNIV 1F SID overlaid on the actual tracks of aircraft operating on the current route, as detailed below, is shown at **Appendix C2**. The widths of the swathes depicted in **Appendix C2** are ±1NM from the nominal route centre-line for the outer swathe, which represents the "worst case" flight safety navigational tolerance used for procedure design, and ±0.2NM for the inner swathe, which represents what we expect to be the day-to-day navigation accuracy expected on RNAV-1 routes (based on experience of other ATM applications of RNAV-1 operations elsewhere).

3.2. The published PDR has, since its inception, been aligned on the Detling (DET) VOR/DME ground navigation facility located near to Maidstone. However, as traffic in the LTMA has grown this routeing has become increasingly untenable. Tactical radar-directed ATC clearances, instead of following the PDR, have been the normal ATC practice for many years. A formal radar-directed routing some way to the east of the PDR has been in use by LTC for both LSA and LCY departures. The procedure (known internally between LSA ATC and NATS LTC as "Thames Gate") aims the departing aircraft towards a corridor approximately 5NM wide which encompasses, approximately, the Isle of Sheppey in a south-easterly direction. LCY and LSA departures are routed on radar headings towards[7] the "Gate" before turning south. This arrangement has enabled deconfliction and climb clearance to be achieved much more effectively than routing via DET.

3.3. However, the LAMP Phase 1a airspace development required changes to be made to the handling of LCY arriving traffic, which now all route along the Thames Estuary descending to 4000ft. The LAMP Phase 1a development team concluded that the most effective routing for LSA departing flights, as formal SID procedures, would be beneath the LCY arrival stream from the east and aligned approximately mid-way between the DET and the current routes. (LCY departing aircraft routing via EKNIV will have sufficient mileage on the extended LCY SIDs to climb above the LCY arrival path and therefore no longer conflict with LSA departures.)

3.4. To facilitate this new southbound routeing for both LCY and LSA departures NATS has established a new Airway M91 in the LTMA aligned SODVU (approximately Billericay) – EKNIV (approximately Medway Estuary) – EMKAD (approximately Challock) - LYD. (This Airway is above 4000ft and was included in the NATS consultation on the LAMP Phase 1a changes. It is not the subject of

[7] There is no fixed or "standard" route via the Thames Gate. It is simply an initial "aiming" area and aircraft are turned south or routed further east dependant on the actual traffic situation. Thus, random traffic dispersion can occur anywhere between the Isle of Grain and the eastern extremity of the Isle of Sheppey and comprises both LCY and LSA departing traffic.

this consultation.) LSA departures from runway 23 will join the new Airway at EKNIV.

3.5. The design of the SID via EKNIV introduces formal navigational guidance to the routing of aircraft and takes due regard of the GVS and Danger Area D146 (see footnotes 2 and 3) on the Isle of Grain together with microlight operations at Stoke aerodrome in accordance with the policy requirements for SID design.

3.6. It should be noted that the PDRs were, historically, not designed to any formal procedure design criteria and tracks were not specified with reference to the navigational infrastructure. It is therefore not possible to provide an exact comparison between the nominal track of the SID procedure (designed to PANS-OPS criteria) and the unused PDR.

3.7. Similarly, the tactical "Thames Gate" current operation is based on radar headings determined by the actual traffic situation at the time rather than on a single, predetermined track. Thus the comparison in **Appendix C2** can only be made with respect to the "core" alignment of the historic tracks as derived from the airport NTK equipment.

3.8. Procedure design speed limits were not applied to the PDR or "Thames Gate" operation, other than the standard international airspace speed limit of 250kt IAS outside controlled airspace. We have applied a speed limit of 210kt IAS for the initial turn of the SID procedure to limit the westerly extent of the initial turn by faster aircraft and reduce the overall spread of tracks. In selecting an appropriate speed limit a fine balance is necessary between the preferred operating configuration and speed of the variety of aircraft using the route and the ATM and environmental objectives. The application of the speed limit ensures that LSA departing aircraft do not fly further to the west than is necessary in the turn and assists in resolving the conflict between LSA departures and LCY arrivals as quickly as possible. The procedure design initial speed limit is removed as soon as is practicable within the procedure design criteria.

3.9. With respect to the upper limit of the procedures, before the introduction of controlled airspace the PDR specified an upper limit of 3400ft for departing aircraft until within 5NM of DET. This was to ensure that the aircraft remained outside controlled airspace until given further climb clearance by LTC, the base level of controlled airspace being 3500ft. However, where both aircraft are inside controlled airspace the vertical separation to be applied by ATC is 1000ft. Thus, with the introduction of controlled airspace at LSA in April 2015 the upper limit of the PDRs has been changed to 3000ft.

3.10. Thus to ensure adequate separation in the procedure design the initial level for LSA SID procedures must be 3000ft. However, under the standard ATC rules aircraft in controlled airspace must be retained at least 500ft above the base

level. Therefore it is incumbent upon LTC controllers to ensure that climb clearance is given to departing aircraft so that they can reach 4000ft by the southern boundary of the Southend Control Area (3NM beyond EKNIV), notwithstanding that this cannot be specified within the procedure design.

4. Other Options considered

4.1. **Use of flyby waypoints**

4.1.1. The use of flyby waypoints throughout the procedure design, which is the preferred methodology for aircraft navigation systems, was considered in the outline development of the procedure design.

4.1.2. However, the positioning of the initial waypoint (defining the start of the first turn following noise abatement) to meet both the procedure design criteria and the definition of the noise abatement procedure meant that the track "rolling out" of the turn towards EKNIV would be substantially further to the west of the track achieved by aircraft departing via the "Thames Gate".

4.1.3. Conversely, using a flyover waypoint to define the start of the turn indicated that aircraft would more closely replicate the initial tracks routinely flown by departing aircraft.

4.1.4. LSA has therefore elected to utilise the flyover waypoint configuration to define the first turn rather than flyby configuration.

4.2. **An earlier left turn**: Whilst a left turn before 2.5NM from the end of the runway would offer distinct operational advantages to both LSA ATC and LTC controllers, more people in Leigh-on-Sea would be affected by departing aircraft. LSA is not seeking to change the existing NAPs, or the Section 106 Agreement. Furthermore, an earlier turn would reduce the track distance from take-off to the proximity of Stoke microlight aerodrome and would make it more difficult to ensure vertical or lateral segregation of the airspace activities to be achieved. Therefore, this option is ruled out.

4.3. **A later left turn**: Extending the "straight ahead" element of the departure procedures to beyond the 2.5NM position would exacerbate the interaction between departure procedures from LSA and the arrival flight path to LCY to the extent that separation could not be assured. Thus LSA departing traffic would be wholly dependent on "gaps" between successive LCY arrivals resulting in increased ATC co-ordination, departure delays and, potentially, runway congestion at LSA. Additionally, a later left turn would significantly impact on Rochester Airport operations as well as resulting in greater overflight of Canvey Island, Chatham, Gillingham and Rochester. Therefore this option is not considered feasible and is ruled out.

4.4. **A more westerly track towards DET**: Routing towards DET would place the route back towards the congested airspace around DET where numerous ATS routes cross over each other including, in particular, LHR and LGW outbound flights. As a consequence departing traffic from LSA would not be able to achieve further climb to cruising level as expeditiously as could be achieved with

the proposed route. A more westerly alignment of the route would also increase the conflict between LSA departures and the arrival path to LCY along the Thames Estuary from the new approach procedures. Furthermore the route would lie over Gillingham itself, whereas the proposed SID and Airway M91 pass over the less populated area between Gillingham and Sittingbourne. The current tactical operation towards Sheppey has been in use for a number of years because of the impracticability of the route via DET. Therefore this option has been ruled out.

4.5. **A more easterly route towards Sheppey**: This is not feasible within the procedure design requirements as the procedure must remain clear of the two GVSs and Yantlet Danger Area (D146) (see footnotes 2 and 3) on the eastern extremity of the Isle of Grain. It is not possible, within the procedure design criteria and the airspace constraints of LCY arrivals crossing above, to design a procedure which achieves vertical separation above the GVSs and Danger Area whilst also remaining vertically separated below LCY arrivals. It is not possible, even with a more restrictive speed limit than is proposed, to design a tighter turn which would remain north of Grain and laterally separated to the north of Yantlet Danger Area until east of Grain before turning south. Thus the proposed SID must remain west of the GVSs by the requisite distance, but, at the same time not route as far west as DET. Therefore this procedure design option is ruled out.

4.6. **Higher procedure altitudes**: The new arrival procedures to LCY from the Point Merge area to the east route along the Thames Estuary descending to 4000ft. This is an essential feature of the LAMP Phase 1a airspace configuration which is designed to meet the objectives of the CAA FAS. The departure procedures from LSA must, therefore, remain beneath the LCY arrival procedures until procedurally clear to the south. Procedurally, this is at EKNIV. However, as noted in paragraph 2.5 above, when there is no actual conflict with LCY arriving traffic, LSA departing aircraft would always be given climb clearance before reaching EKNIV in accordance with the Standing Agreements which will be in place.

5. Environmental impact

5.1. The segment of the SID to EKNIV, after the NAP segment, lies across the Thames and Medway Estuaries and the sparsely populated area of the Isle of Grain. This route is slightly to the west of the radar directed routing of departing aircraft that has been in use for a number of years and is necessary to meet both the procedure design requirements and the new airspace arrangements in the LTMA.

5.2. The Airport Noise Contours are not affected by the change from PDR or tactical "Thames Gate" routing to SID as detailed in **Part A** Section 7. The increase in contour size from 2014 to 2021 would occur irrespective of whether the departure procedures remain as current or are changed to SIDs.

5.3. The formalised SID procedure introduces a properly designed track with a navigation standard of RNAV-1. This will result in improved repeatability of tracks in accordance with CAA policy and DfT guidance.

5.4. The introduction of a speed limit for the initial turn of the SID, together with specified tracks towards EKNIV, will reduce the spread of aircraft tracks around the turn and the initial routing towards the Medway Estuary, thereby reducing the number of people affected by departing aircraft on this route.

5.5. Whilst the further out alignment of Airway M91 between EKNIV and EMKAD is to the west of the current tactical routeing, it is seen from the historic track plots in Figures C1, C2 and C5 that a proportion of departing traffic has, in the past, been tactically routed along a comparable track when within controlled airspace. Furthermore it is seen that the track of the Airway M91 to the south of EKNIV passes between the conurbations of Gillingham and Sittingbourne and thus provides a relief from the dispersion of traffic over Sittingbourne itself. On this segment (south of EKNIV) all LSA departing aircraft will be at or above 4000ft[8] (notwithstanding that this cannot be "designed into" the procedure as explained previously) as it is incumbent upon ATC to ensure that aircraft remain at least 500ft above the base of controlled airspace.

5.6. The formalised SID procedure, contained within a controlled airspace infrastructure, will enable LSA ATC to transfer control of departing aircraft directly to LTC Sectors much earlier than was previously the case. (The presence of unknown aircraft in the area prior to the introduction of controlled airspace has been eliminated.) This will also reduce (but not eliminate) the operational requirement for radar vectoring aircraft away from the SID route at low levels. This, in turn, will enable controllers to issue further climb clearance to LSA

[8] Figure C3 indicates that aircraft routing via the Thames Gate procedure at an equivalent distance to EKNIV are all above 4000ft and a significant proportion are above 5000ft.

departures as early as practicable and thus improve the environmental impact of LSA traffic over the North Kent area.

5.7. Whilst the initial climb profile to 3000ft embedded within the SID procedure remains necessary due to the interaction with LCY arrivals procedure to LCY crossing above, it is expected that LSA departures via EKNIV - EMKAD would consistently be above 4000ft before EKNIV. LSA will monitor achieved climb performance of departing aircraft as part of the CAA's Post-Implementation requirements of the ACP.

5.8. Once established in the Airways System and climbing towards their cruising levels under the jurisdiction of LTC Sectors, re-routing of aircraft towards their destinations will continue to take place.

5.9. The SEL Chart at **Appendix C3** shows a slight change to the alignment of the "far out" extremity of the 80dB(A) SEL contour. This is due to the position of the first flyover waypoint which defines the NAP as a consequence of the PANS-OPS procedure design criteria.

5.10. **Table C1** below shows the area and population within the 80 and 90 dB(A) SEL footprints for departures by the Airbus A319 on the current route and the proposed SID procedure.

SEL Value	Runway	Route	Area (Km^2)		Population (thousands)	
			Current route	SID	Current route	SID
90 dB(A)	23	South	2.6	2.6	5.2	4.5
80 dB(A)			12.6	12.5	36.3	37.2

Table C1: SEL Footprints Thames Gate and EKNIV 1F SID

5.11. The Chart at **Appendix C4** shows the departure swathes against which population counts have been made. The criteria against which the swathe widths and length have been determined are detailed in **Part A** paragraph 9.5 of the consultation document. Whilst the swathe widths reflect the general practice used at other UK airports it should be noted that we expect the day-to-day track-keeping performance for departing aircraft using the RNAV-1 SID procedures to be better than the 2km swathe width used for this analysis.

5.12. **Table C2** below provides a comparative count of the number of people within the respective swathes for the current "Thames Gate" routing and the proposed EKNIV 1F SID.

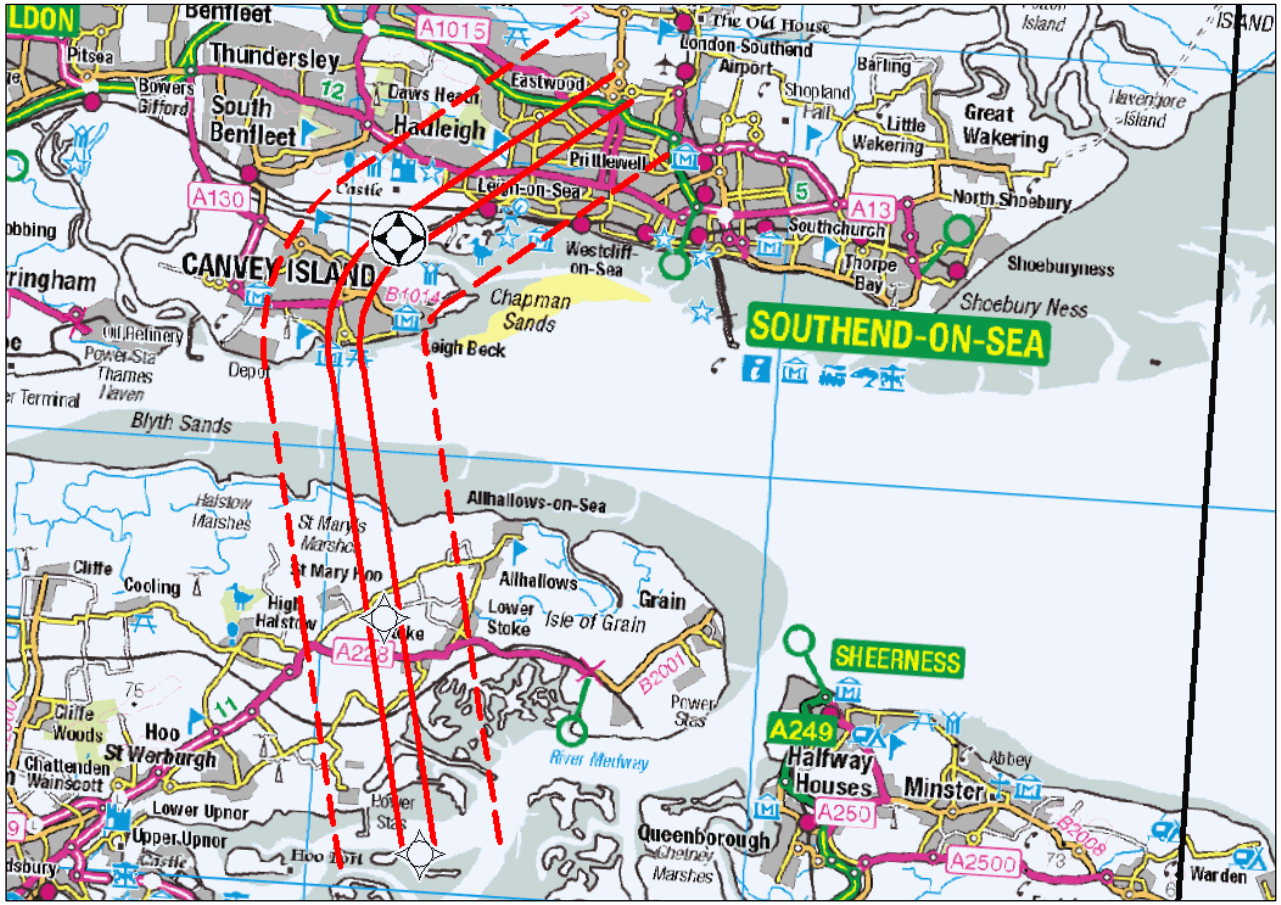
Runway	Route	Population (thousands)	
		Current Route (Thames Gate) (nominal 3km width)	SID (nominal 2km width)
23	South	58.5	45.7

Table C2: Population Count for Thames Gate route and SID

5.13. The introduction of properly constructed RNAV SIDs with a navigation standard of RNAV-1 will result in improved repeatability of tracks in accordance with CAA policy and DfT guidance. The SID, in conjunction with the recently introduced controlled airspace and the improved airspace efficiency resulting from the recently introduced LAMP Phase 1a airspace arrangements, will enable expeditious climb clearance to be given to departing aircraft above the 3000ft initial limitation of the SID procedure when there is not another aircraft in conflict. Furthermore, it is anticipated that the more efficient airspace arrangements will lead to a reduction in the need for ATC to radar vector aircraft away from the SID route at low altitudes in the early stages of departure.

5.14. Therefore, it is concluded that the impact of changing the PDR and the "Thames Gate" operation to a formal SID procedure brings an overall environmental benefit to communities on the ground and has the potential for improved flight profiles and reduced fuel burn for aircraft operators when there is no other aircraft in conflict.

Appendix C1 Diagram of EKNIV 1F SID overlaid on OS topographical map



EKNIV 1F SID: Diagram showing the anticipated maximum track dispersion (±0.2NM; solid red lines) and the maximum navigation tolerance (± 1.0NM; dashed red lines) overlaid on Ordnance Survey map.

Appendix C2: Diagrams of EKNIV 1F SID, and historic tracks of aircraft flying on the current tactical route.

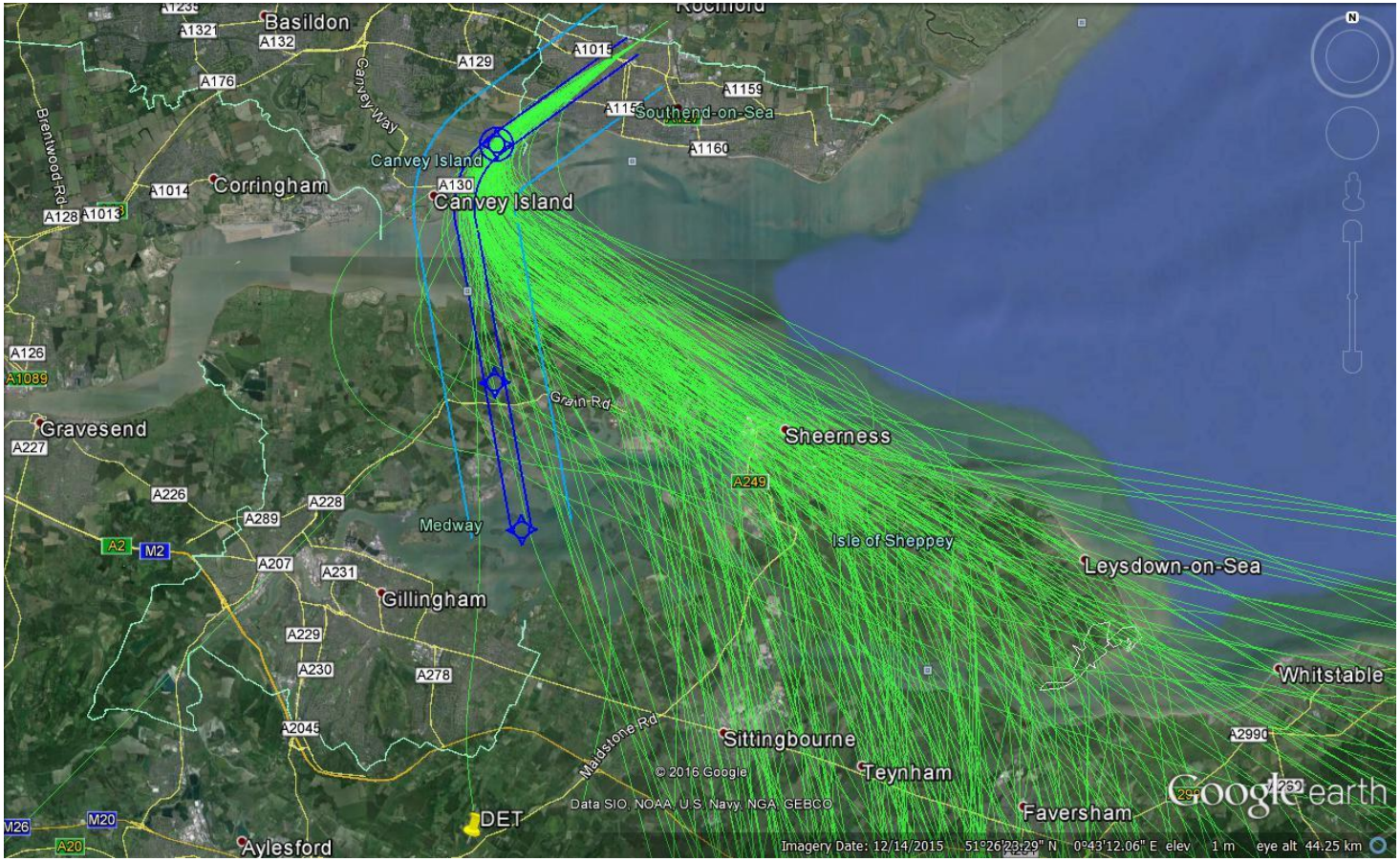


Diagram showing the anticipated maximum track dispersion (±0.2NM; dark blue) and the maximum navigation tolerance (± 1.0NM; light blue) for the EKNIV 1F SID against historic NTK tracks (green) for departing aircraft July/August 2015

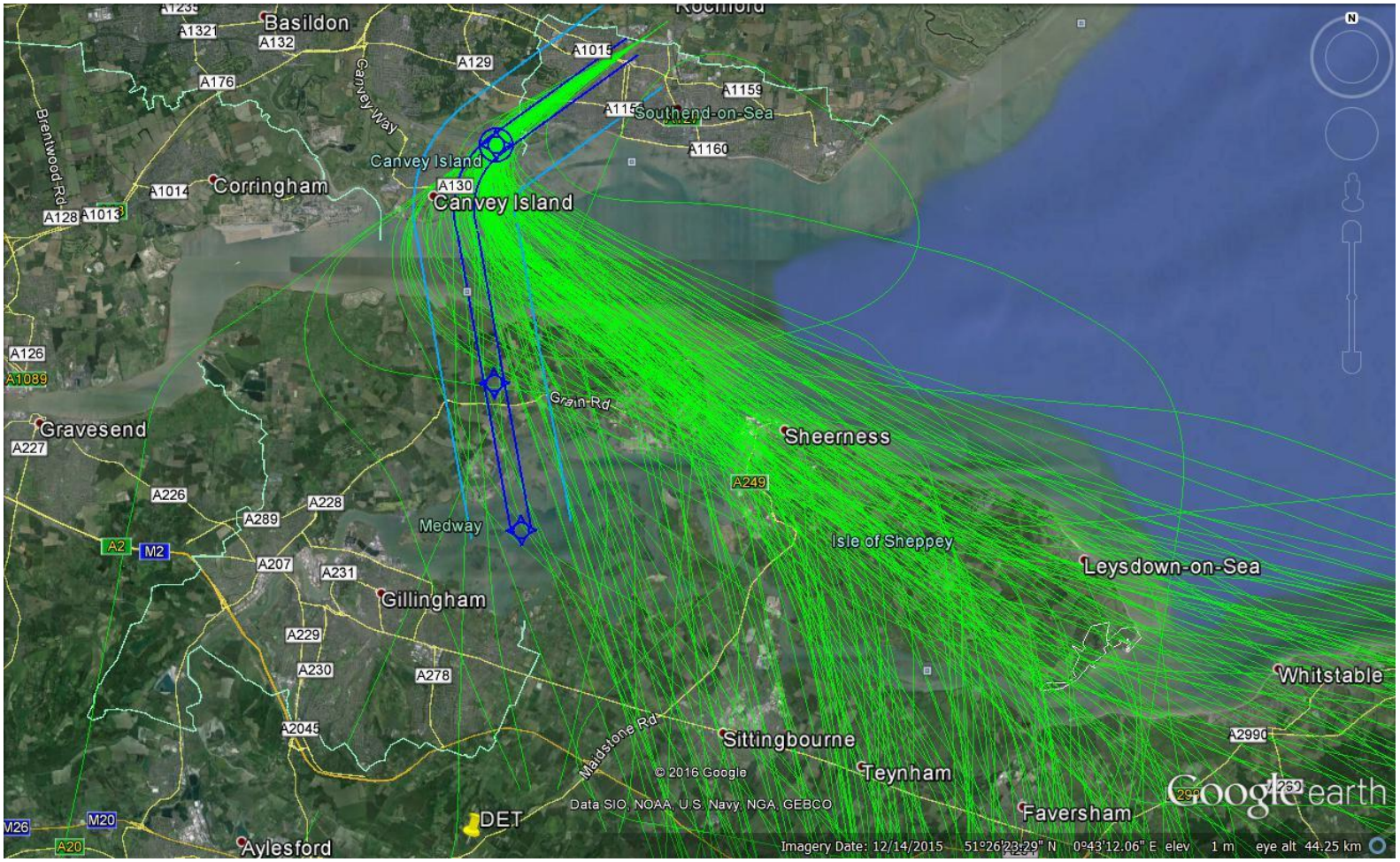
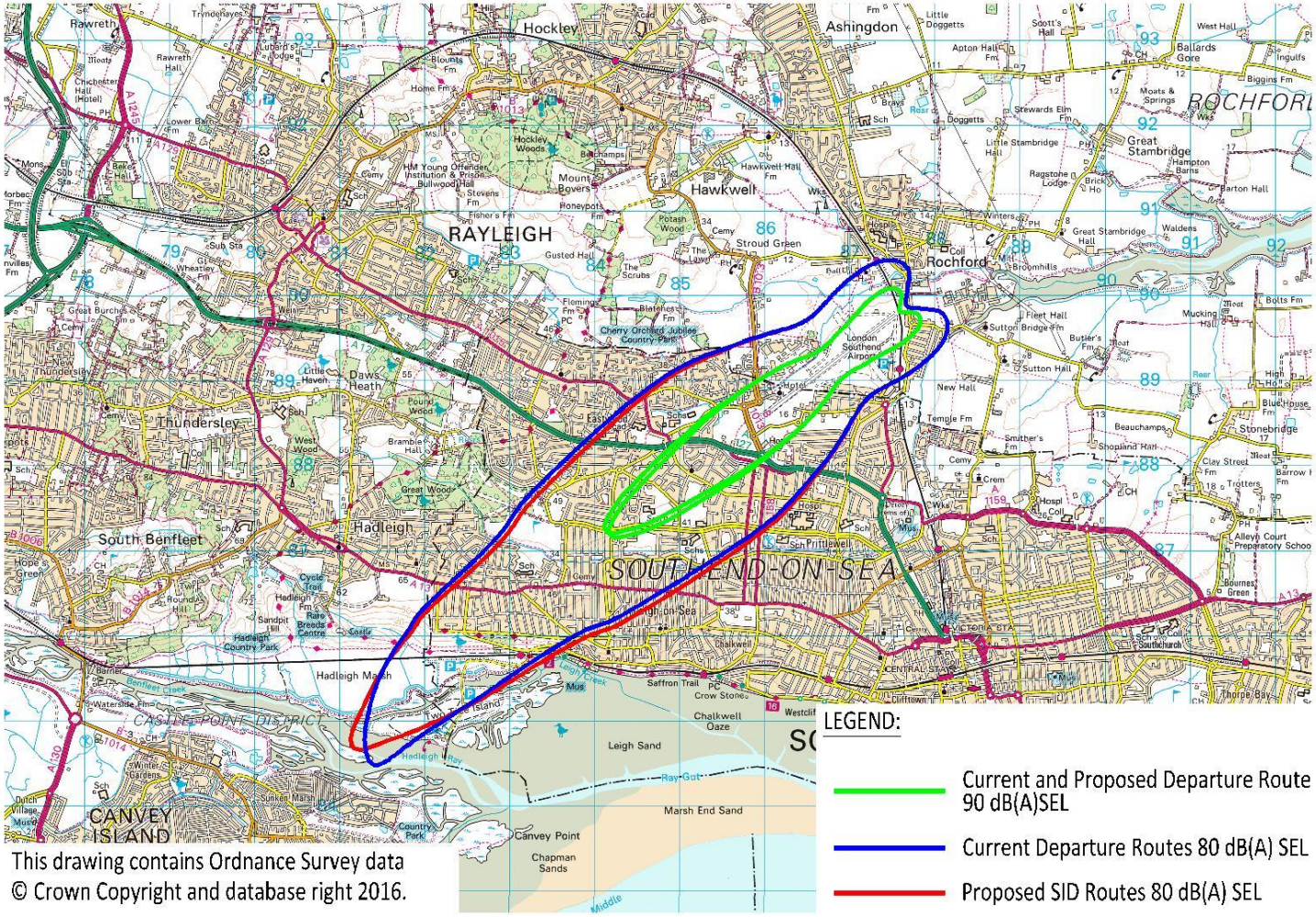
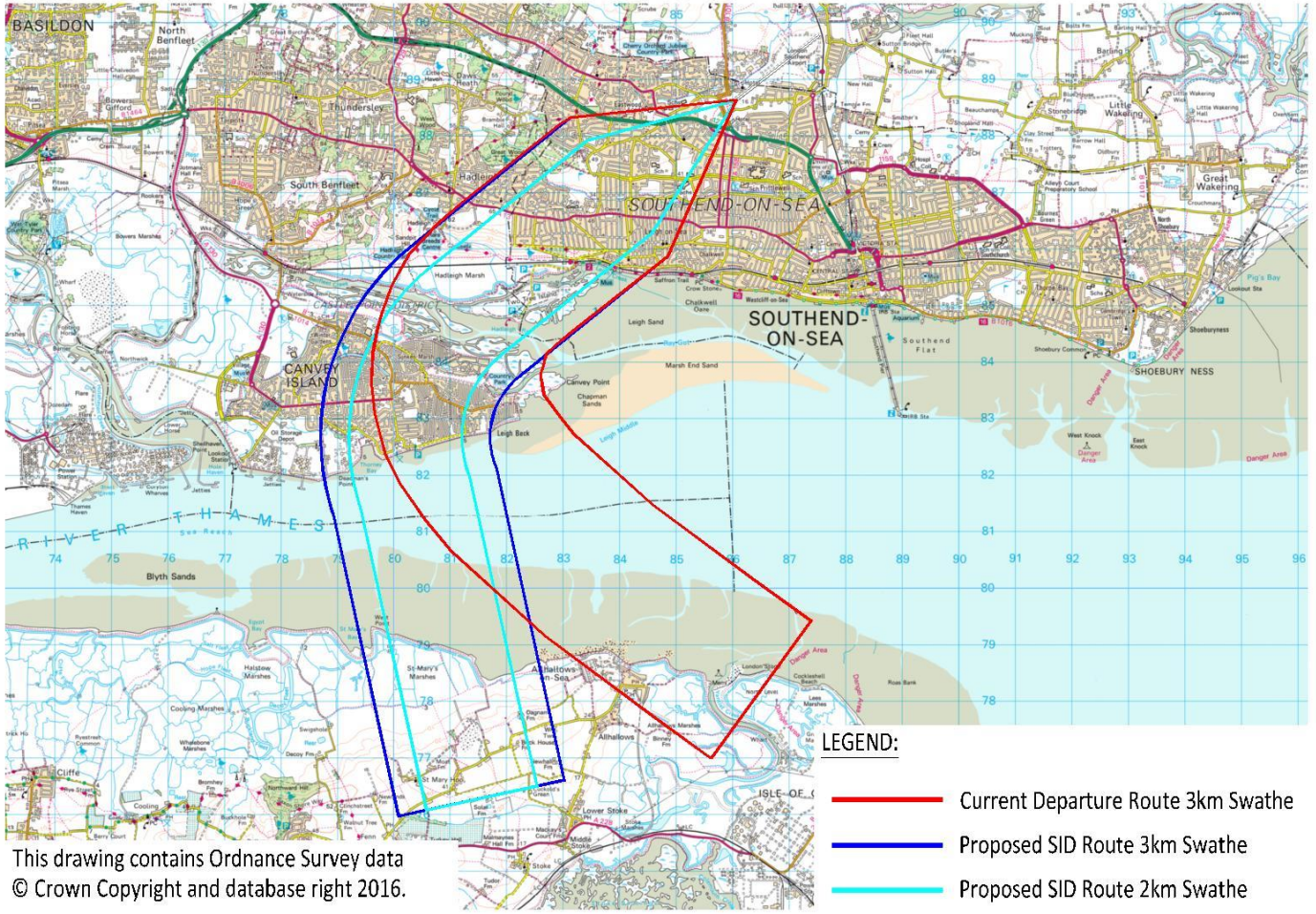


Diagram showing the anticipated maximum track dispersion (±0.2NM; dark blue) and the maximum navigation tolerance (± 1.0NM; light blue) for the EKNIV 1F SID against historic NTK tracks (green) for departing aircraft July/August 2014

Appendix C3 SEL Chart for A319aircraft



Appendix C4 Departure swathes for Thames Gate route and EKNIV 1F SID



(See Part A paragraph 9.6 for explanation of swathe widths and length.)