

Sensitive

Office of the Minister for Land Information


Chair, Cabinet Economic Development Committee

**Proposal to authorise joint Ministers to draw down the tagged contingency:
*Improved satellite based positioning to grow an innovative, safe and efficient New Zealand***

Proposal

1. This paper seeks Cabinet agreement to authorise joint Ministers (the Minister of Finance, Minister for Land Information and Minister of Transport) to draw down the tagged contingency agreed in Vote Lands for the initiative *Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient New Zealand* (Initiative 11178).

Executive Summary

2. In April 2019, Cabinet agreed to hold funds in contingency for Land Information New Zealand (LINZ) to build and operate a joint satellite-based augmentation system (SBAS) in partnership with Geoscience Australia. Cabinet also invited the Minister for Land Information to report back by July 2019 on the negotiation approach, proposed delivery model, and cost recovery options for the initiative [CAB-19-MIN-0174.24 refers].
3. SBAS can reduce the margin of error in positions observed from Global Navigation Satellite Systems (GNSS) from 5-10 metres to as low as 50 centimetres.
4. SBAS technology is already provided by governments around the world, due to the way it encourages the development of innovative technologies and provides 'safety of life' positioning. New Zealand and Australia do not currently have access to a reliable, free-to-air augmentation service.
5. I am seeking Cabinet's agreement to allow joint Ministers (the Minister of Finance, Minister for Land Information and Minister of Transport) to draw down the tagged contingency for the initiative.
6. LINZ officials are currently working with Geoscience Australia to finalise the procurement approach, preferred delivery model and supplier for the joint SBAS.
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8. Similar systems overseas are provided as a public good using government funding. At present, it would be difficult to recover costs (e.g. by a levy) in an efficient and fair manner. I propose to not recover costs at this time.

Background

Positioning data provided by Global Navigation Satellite Systems (GNSS) can be inaccurate.

9. Global Navigation Satellite Systems (GNSS) – such as GPS – enable users to determine a geographic position anywhere on the Earth, at land, at sea or in the air. GNSS data is now fundamental to a range of applications and businesses worldwide.
10. GNSS positions can be inaccurate by between 5 to 10 metres, which may limit further development of innovative technologies, efficiency gains and safety improvements.

Augmentation systems (such as SBAS) can improve the accuracy and integrity of GNSS positioning.

11. Satellite-based augmentation systems (SBAS) provide a service for improving the accuracy of open-access GNSS positioning through an additional network of ground-based reference stations [Appendix 1 refers]. SBAS is compatible with existing GNSS technology (e.g. location-based smartphone applications) and, like GNSS, can be provided as an accessible ‘free-to-air’ service.
12. SBAS reduces the positioning error from existing GNSS receivers to as low as 50 centimetres. With enhanced receiver technology, using an additional technique called Precise Point Positioning (PPP), it could be improved to almost 10 centimetres. Both service levels will enable increased innovation, efficiency, and safety across a number of sectors.

New Zealand and Australia currently lag behind the rest of the world.

13. New Zealand and Australia currently have good access to GNSS but no reliable, free-to-air augmentation service.
14. Many governments overseas – including those in North America, Europe and Asia – are already providing SBAS to improve the accuracy and integrity of GNSS positioning across their jurisdictions. These have typically been publicly-funded due to the public good characteristics of such a system, especially when serving ‘safety of life’ applications (e.g. the aviation, rail, maritime and road transport sectors).
15. In early 2017, New Zealand partnered with Australia to deliver a two-year SBAS testbed across Australasia. The final report on this trial indicates that an operational SBAS will bring significant benefits to a number of sectors, including the agriculture, aviation, construction, maritime and rail sectors.
16. In November 2018, the Minister of Transport sought to reaffirm New Zealand’s interest in developing a future partnership with Australia to deliver a joint SBAS. The Australian Minister for Resources and Northern Australia responded positively to this request in December 2018.
17. On 22 February 2019, the Prime Minister and Australian Prime Minister Scott Morrison publicly welcomed the investigations into the feasibility of developing a

shared trans-Tasman SBAS service under the *Australia – New Zealand Science, Research and Innovation Cooperation Agreement (ANZSRICA)*.

18. Advancing SBAS under ANZSRICA acknowledges that trans-Tasman collaboration in science, research and innovation is critical to generating new opportunities, growth and improving wellbeing.

An operational SBAS will drive innovation, deliver efficiency gains and improve safety.

19. Many sectors stand to benefit from an operational SBAS, especially the agriculture and transport sectors. The increased accuracy will drive the development of new technologies (e.g. driverless cars and virtual livestock fencing) and may help to reduce carbon emissions by allowing for reduced fuel consumption. An operational SBAS will also improve the accuracy of surveying, including the New Zealand Defence Force Hydrographic Survey.
20. Although current safety standards for the transport sector are robust, the increased accuracy provided by the SBAS will provide enhanced safety benefits in the form of 'safety of life' positioning. This additional certification means that life-critical services like aviation will be able to rely on SBAS to take off, navigate, and land with greater precision in more challenging weather conditions. It also provides increased assurance to regional airports, many of which do not currently have an electronic guidance system for aircraft.
21. SBAS will especially benefit emergency air services, which often operate in challenging conditions and rely on accurate GNSS positioning in search and rescue operations. The ability to reach incidents quickly, and to rapidly stabilise and transport patients is critical to giving them the highest likelihood of recovery.
22. The increased accuracy provided by the SBAS will also benefit regional services, including agriculture, forestry, commercial aviation and emergency air services.
23. The final report on the two-year SBAS testbed found that an operational SBAS will, over a 30 year period, bring present value economic benefits of AUD \$6.2b to Australia and present value AUD \$1.4b to New Zealand. This indicates that 82% of the benefits are anticipated to accrue to Australia, and 18% to New Zealand (New Zealand has roughly 15% of the combined Australia/New Zealand population).

Seeking agreement for joint Ministers to draw down the tagged contingency

Budget 2019 provided tagged funding for Land Information New Zealand to build and operate the joint SBAS with Geoscience Australia.

24. In April 2019, Cabinet agreed to hold funds in contingency [REDACTED] for LINZ to build and operate a joint SBAS in partnership with Geoscience Australia [CAB-19-MIN-0174.24 refers]. Australia has set aside AUD \$160.9m over four years.
25. I propose that the decision to draw down the tagged contingency be jointly delegated to the Minister of Finance, Minister for Land Information and Minister of Transport.
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Negotiation approach and proposed delivery model

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Options for cost recovery

44. SBAS can be described as a public good service on the basis it is:

44.1 Non-excludable (in that it is not possible to prevent certain parties from receiving the service because the SBAS signals cannot be encrypted¹); and

44.2 Non-rival (in that one party receiving the benefits does not prevent another party from also receiving benefits).

45. SBAS also encourages the development of innovative technologies and provides 'safety of life' positioning. For these reasons, other comparable SBAS are treated as a public good and provided free-of-charge by governments. For instance, EGNOS is a satellite augmentation system provided as a public good by the European Union, which decided against cost recovery as impractical and misaligned with programme objectives.

46. If cost recovery was pursued, it would likely need to be through sector levies because direct user charging is not feasible. This would require the calculation of relative benefits across multiple sectors. It will not be possible to do this with sufficient accuracy until the system is established. For these reasons, I propose not to seek cost recovery at this time.

47. Once users are making full use of the joint SBAS, officials would be able to ascertain how the benefits provided by the SBAS are spread across multiple sectors. This would allow levies to be applied in a manner that is fair and considered appropriate at that time.

48. The earliest this could practically be done is two years after the system is fully operational. This is estimated to be eight years from now; the procurement phase will take two years, followed by a four year building phase.

49. I propose that LINZ reconsiders the issue of cost recovery once SBAS has been fully operational for at least two years (estimated to be eight years from now).

Consultation

50. LINZ has been working with the Treasury and the Ministry of Transport to develop this Cabinet paper.

51. In addition, LINZ consulted with the following agencies: Department of Conservation; Department of the Prime Minister and Cabinet; Government Chief Data Officer (DIA); Ministry for Primary Industries; Ministry of Business, Innovation and Employment; Ministry of Defence; Ministry of Foreign Affairs and Trade; National Cyber Security Centre (GCSB); New Zealand Defence Force; Office of the Privacy Commissioner. The Civil Aviation Authority was also consulted. The Department of Corrections was informed.

¹ It is technically possible to encrypt the additional PPP service [Appendix 1 refers]. However, the Australian proposal is to provide the data in an open (unencrypted) format, due to the benefits it provides (i.e. encourages the development of innovative technologies and provides 'safety of life' positioning).

52. Feedback from agencies was generally positive and showed broad support for this paper.

Financial Implications

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Legislative Implications

57. There are no legislative implications arising from the proposals contained in this paper.

Impact Analysis

58. No Regulatory Impact Analysis is required as there are no legislative implications from the proposals contained in this paper.

Human Rights

59. There are no human rights implications arising from the proposals contained in this paper.

Privacy Implications

60. Although the joint SBAS will provide for more accurate positioning, there are no additional privacy concerns beyond the current state of existing GNSS positioning. This is because the joint SBAS is a one-way transmission system. Users cannot be tracked unless they deliberately grant permission for individual applications to do so.
61. The Office of the Privacy Commissioner has advised that it does not consider it necessary for LINZ to conduct a privacy analysis of the joint SBAS, although LINZ should bear privacy implications in mind throughout the process. LINZ is following this advice.

Gender Implications

62. There are no gender implications arising from the proposals contained in this paper.

Disability Perspective

63. There are no disability implications arising from the proposals contained in this paper.

Publicity

64. This initiative was jointly announced by Hon Eugenie Sage and Hon Phil Twyford on 23 June 2019, as part of the Budget 2019 announcements. However, commercially-sensitive information relating to the ongoing commercial negotiations was not discussed.

Proactive Release

65. This paper will be proactively released within 30 business days of final decisions being taken by Cabinet, in accordance with Cabinet Office circular CO (18) 4.
66. Commercially-sensitive information will be redacted prior to the paper being proactively released.

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Recommendations

Seeking agreement for joint Ministers to draw down the tagged contingency

1. **note** that on 15 April 2019, Cabinet agreed to hold in contingency [REDACTED] [REDACTED] for Land Information New Zealand to build and operate a joint satellite-based augmentation system (SBAS) in partnership with Geoscience Australia [CAB-19-MIN-0174.24 refers];
2. **note** that Cabinet invited the Minister for Land Information to report back to the Cabinet Economic Development Committee by July 2019 on further work on the negotiation approach, proposed delivery model, and cost recovery options for Initiative 11178 [CAB-19-MIN-0174.24 refers];
3. **agree** that, as further work on the negotiation approach, proposed delivery model, and cost recovery options for Initiative 11178 (Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient Economy) has been satisfactorily completed, the decision to jointly draw down the tagged contingency can now be delegated to joint Ministers;
4. **authorise** the Minister for Land Information, Minister of Finance and Minister of Transport to jointly draw down the tagged contingency for Initiative 11178 (Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient Economy) as and when required;

Negotiation approach and proposed delivery model

5. **note** that officials are currently working to finalise the procurement approach, preferred delivery model and supplier for the joint satellite-based augmentation system (SBAS);
6. **note** that it is intended that:

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Financial Implications

9. **note** that SBAS has the characteristics of a public good;
10. **agree** to not seek cost recovery for SBAS at this time;
11. **agree** to reconsider the issue of cost recovery once SBAS has been fully operational for at least two years (estimated to be eight years from now);

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Authorised for lodgement
Hon Eugenie Sage
Minister for Land Information

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Appendix 1

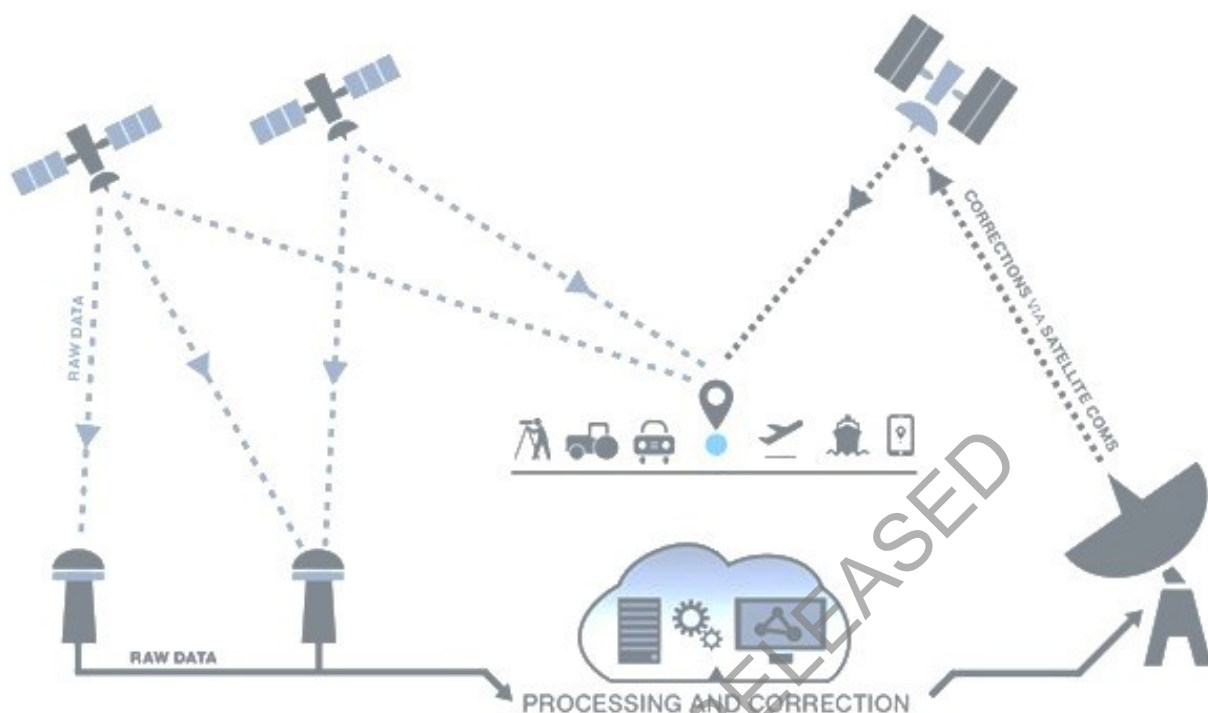


Figure 1 – How SBAS works

1. Each GNSS consists of a constellation of satellites orbiting Earth. GNSS provide positioning data that allows users to determine their geographic position anywhere on the Earth.
2. SBAS uses a network of ground-based reference stations to estimate the inaccuracies in the raw GNSS data and calculate corrections to compensate for them. The corrections are transmitted to users via a geostationary satellite that is complementary to the GNSS signals. The user's GNSS receiver then combines the GNSS and SBAS signals to improve the accuracy of their computed position.
3. The operational infrastructure of a SBAS shown in Figure 1 above includes the following components:
 - Reference stations
 - Master stations
 - Uplink station
 - Communications satellites

4.

The joint SBAS between New Zealand and Australia will offer three correction services.

5. **L1** is the existing standard SBAS correction and is accurate to 0.5 metres. L1 SBAS can be certified for safety-of-life aviation use.
6. **DFMC (Dual Frequency – Multi Constellation)** is the next generation SBAS and can deliver correction signals in challenging environments, such as urban areas. Like L1, DFMC is accurate to 0.5 metres.
7. **PPP (Precise Point Positioning)** is an additional SBAS correction that can provide accuracies of better than 10 centimetres. This service is aimed at users who require enhanced performance for commercial and professional use.

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Appendix 2

1. **note** that on 15 April 2019 Cabinet [CAB-19-MIN-0174.24 refers]:

- 1.1. **agreed** to establish tagged operating and capital contingencies of up to the amounts as follows in Vote Lands, to provide for the initiative *Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient New Zealand* (Initiative 11178):

	\$m – increase/(decrease)					
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24 & Outyears
Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient New Zealand – Tagged Operating Contingency						
Improved Satellite Based Positioning to Grow an Innovative, Safe and Efficient New Zealand – Tagged Capital Contingency						

- 1.2. **invited** the Minister for Land Information to report back to the Cabinet Economic Development Committee by July 2019 on further work on the negotiation approach, proposed delivery model, and cost recovery options for Initiative 11178.