Briefing

Providing alternative testing options for the border workforce

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To:	Hon Chris Hipkins, Minister for COVID-19 Response		

Contact for telephone discussion

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Minister's office to complete:

☐ Approved ☐ Decline ☐ Noted

☐ Needs change ☐ Seen ☐ Overtaken by events

☐ See Minister's Notes ☐ Withdrawn

Comment:

Providing alternative testing options for the border workforce

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To:	Hon Chris Hipkins, Minister for COVID-19 Response		

Purpose of report

1. This report provides advice on options to offer alternative testing methods, such as saliva PCR testing, to supplement or replace nasopharyngeal PCR testing.
2. The advice reflects the evolving context of the border workforce being vaccinated, developing evidence regarding saliva PCR testing and maintaining compliance levels with the mandatory testing regime by offering less invasive testing methods.
3. This report discloses all relevant information and implications.

Summary

4. The mandatory testing regime and vaccination programme for our border workforce are key elements of the public health settings to prevent transmission of COVID-19 across the border and into our communities.
5. Government has been concerned about compliance with the border worker testing regime, and the effectiveness of identifying cases promptly at the border.
6. The Ministry of Health is taking steps to address this. We are developing a multi-pronged approach to improve and maintain compliance and effectiveness across our testing regime more broadly, including:
    a. putting a monitoring framework in place
    b. increasing the visibility of compliance
    c. ensuring robust reporting
    d. investigating ways to increase the available testing options, including less invasive methods such as PCR testing using a saliva sample.
7. To ensure that we are able to fully address the root causes of any potential compliance issues, we are undertaking work to better understand compliance behaviour and barriers in relation to the testing regime.
8. Anecdotal reports from worker representatives indicate increasing resistance to repetitive nasopharyngeal swab testing for border workers who are subject to the mandatory testing requirements. There are also very rare reports of physical impacts such as nasal bleeds. The Ministry has looked at options to make testing easier and less invasive with the intent that this reduces testing fatigue or reluctance issues.
9. Additionally, the science and technology in relation to COVID-19 testing is a rapidly developing field, so it is important that our tool kit of available testing methods continues to evolve to reflect this.

10. Further, the border workforce is now vaccinated, and this strengthens the need for a robust surveillance testing regime. Workers who have been vaccinated will have a very high likelihood that they will be protected from serious illness. If workers do become infected, they are less likely to be symptomatic and therefore may not be alerted to the need for testing. Regular and ongoing surveillance testing to identify cases of COVID-19 will continue to be an important control measure.

11. We have considered how saliva PCR testing could be integrated within the current surveillance testing regime. We assessed three options – maintaining the status quo, supplementing, or replacing nasopharyngeal PCR testing with saliva PCR testing.

12. Currently the international and domestic evidence available confirms that saliva PCR testing is less sensitive than nasopharyngeal PCR testing, but the effectiveness improves with increased frequency of saliva PCR testing to be on a par with nasopharyngeal PCR testing.

13. In light of the currently available evidence, it is **not recommended** that saliva PCR testing be used:

    a. for testing symptomatic cases for COVID-19

    b. as a replacement for all nasopharyngeal PCR tests within the surveillance testing regime.

14. The current evidence supports the use of saliva PCR testing as part of a surveillance programme where the frequency of testing offsets any reduction in testing sensitivity, and where regular nasopharyngeal PCR is also in use.

15. In order to provide border workers subject to mandatory testing with more choice and less invasive testing options, it is **recommended** that:

    a. the Ministry of Health and border agencies promote the existing less invasive option of a dual swab (oropharyngeal and anterior nasal) approved since 2020 through a communications campaign to border sector workers

    b. an alternative testing option is agreed and implemented in a staged programme, which supplements the nasopharyngeal PCR test with frequent saliva PCR tests, as follows:

        i. implementing a graduated roll out of saliva PCR testing to enable data to be collected and assessed to build the New Zealand evidence on the efficacy and suitability of various saliva PCR tests, before moving to wider scale saliva PCR testing

        ii. that for workers currently subject to mandatory nasopharyngeal PCR testing every seven days, testing over a fortnightly period could consist of a single nasopharyngeal PCR test and saliva PCR testing every two to three days.

16. It is currently not possible to implement saliva testing at scale within current testing arrangements. A procurement process is nearly complete to confirm a supplier for end-to--end saliva testing services across New Zealand. This includes the collection of saliva samples from workers, transportation of samples from collection sites to laboratories, processing of these samples using a PCR test platform in an appropriately accredited laboratory, and reporting of the results as part of the national public health response.

17. The Request for Proposal (RFP) process for saliva testing services is expected to be completed shortly. The outcome of the RFP process would enable a saliva testing regime to be implemented by a staggered process starting at the end of May 2021.

Recommendations

We recommend you:

a) **Note** that the Ministry of Health continues to investigate opportunities to enhance compliance with the mandatory border worker testing regime through offering alternative and less invasive testing methods — **Noted** ✓

b) **Note** that surveillance testing will be important for a vaccinated border workforce as if workers become infected, they may not exhibit symptoms and be alerted to seek testing — **Noted** ✓

c) **Note** that saliva PCR testing is less sensitive than nasopharyngeal PCR, but increased frequency of saliva testing will improve testing confidence and potentially allow the earlier detection of cases compared with weekly nasopharyngeal PCR — **Noted** ✓

d) **Note** that the current evidence available does not support replacing nasopharyngeal PCR testing with saliva PCR testing — **Noted** ✓

e) **Agree** to enhance compliance with the mandatory testing regime by implementing:

(i) a communication campaign to highlight the existing alternative option of the dual oropharyngeal and anterior nasal swab — **Yes** / **No**

(ii) an alternative option for workers subject to mandatory testing every seven days, consisting of a single nasopharyngeal PCR test supplemented with saliva PCR tests every two to three days, over a 14 day testing period — **Yes** / **No**

f) **Note** that implementing a graduated roll out of saliva PCR testing will enable data to be collected and assessed to build the New Zealand evidence on the efficacy and suitability of various saliva PCR tests, before decisions are made regarding moving to wider scale saliva PCR testing — **Noted** ✓

g) **Note** that the Surveillance Strategy and Testing Plan continues to be reviewed and iteratively updated to reflect the emerging new technologies and testing modalities that would be suitable for the New Zealand COVID-19 testing context. — **Noted** ✓

Sue Gordon
Deputy Chief Executive
COVID-19 Health System Response
Date:

Hon Chris Hipkins
Minister for COVID-19 Response
Date: 4/5/2021

Providing alternative testing options for the border workforce

Testing is a key element of our border protection settings

1. The Elimination Strategy underpins our current health response to COVID-19, and the "Keep it Out" pillar outlines the pre-border and at border settings to prevent the transmission into New Zealand from new arrivals. We aim to have strong and proportionate border settings that adapt as the health risk settings shift.
2. As knowledge about COVID-19 evolves, the Ministry continues to iteratively review the Surveillance Strategy and Testing Plan to ensure that our current surveillance and testing approach is based on emerging evidence and best practice. The next review is due to be completed in June 2021.
3. The mandatory testing regime for our border workforce is a key element of those public health settings to detect infection promptly and prevent transmission across the border and into our communities.
4. It is vital that we ensure compliance with the mandatory testing regime is maintained, and where there is a decline in compliance rates, that this is addressed and improved.
5. It is critical that any substitute testing regime improves our ability to accurately identify border incursions.

The Government has been concerned about compliance with testing requirements

6. Following recent cases of transmission within the border workforce, the Government and officials have been concerned about compliance with the border worker testing regime.
7. Understanding the root causes of compliance issues is key. To ensure that we are able to fully address the causes of any potential compliance issues, we are undertaking work to better understand compliance behaviour and barriers in relation to the testing regime.

We are developing a multi-pronged approach to increasing compliance

8. As highlighted in the advice provided last week [HR2021915 refers] the Ministry continues to work to ensure that the mandatory testing regime is user-friendly, less burdensome, and that there is support for workers and PCBUs to comply.
9. We are developing a multi-pronged approach aligned with the compliance framework to implement measures to improve and maintain compliance across our testing regime more broadly. This work includes:
    a. putting a monitoring framework in place
    b. increasing the visibility of compliance
    c. ensuring robust reporting

d. investigating ways to increase the available testing options, including less invasive methods such as saliva PCR testing.

10. This suite of measures aims to ensure that there is maximum compliance with the mandatory testing regime by border workers.

11. The use of the Border Workforce Testing Register became mandatory from 27 April 2021. Holding all border worker testing information in a single repository will help us to monitor and assess levels of compliance, and where we observe any changes over time or drops in compliance, to investigate the causes further. The Ministry will undertake an ongoing programme of insights via qualitative research such as focus groups.

12. This briefing focuses on options to use less invasive testing measures as part of our long-term approach to surveillance testing at the border, and what role saliva testing can play in this.

We have investigated less invasive testing methods such as saliva testing to support greater compliance

13. Currently the approved testing methods for these border workers subject to mandatory testing are either (i) a nasopharyngeal swab or (ii) dual oropharyngeal and anterior nasal (lower nostril) swab.

14. The recent amendment to the COVID-19 Public Health Response (Required Testing) Order 2020 added saliva testing to the available testing types. Currently in the New Zealand context, no saliva test has been sufficiently tested and validated, or authorised by the Director-General of Health (the Director-General) for testing or surveillance use as part of the public health response.

Testing modalities continue to evolve

15. As highlighted above, the Surveillance Strategy and Testing Plan continue to be reviewed and iteratively updated to reflect the emerging new technologies and testing modalities that would be suitable for the New Zealand COVID-19 testing context.

16. Testing modalities are rapidly evolving as we learn more about COVID-19, new variants, and emerging technologies to improve testing processes.

17. Antigen testing may be used for detecting acute infection, but the current evidence shows that these tests have low sensitivity. A small number of point-of-care antigen tests are being evaluated by the Institute of Environmental Science and Research Limited (ESR).

Risks that may impact compliance with ongoing mandatory testing

18. Given the sustained length of time that testing will be required for border workers and the increased frequency of testing for some, there is a risk that compliance will continue to drop over time without steps taken to address this.

19. Nasopharyngeal swabs are invasive, and concerns have been raised about the cumulative impact for workers who will be required to undergo long term mandatory testing.

20. There are potential impacts of nasopharyngeal swabs, including:

    a. physical impacts: epistaxis (nosebleeds) (after single swabs normally mild and self-limiting), nasal discomfort, headache, earache, and rhinorrhea; and

b. psychological impacts: anxiety, reluctance, testing fatigue.

21. As the vaccination programme for border workers progresses, surveillance testing may become more important. Vaccines offer a high degree of protection for individuals who are vaccinated, alongside a range of other public health measures. A worker who has been vaccinated will have a very high likelihood that they will be protected from serious illness or death. If a vaccinated worker did become infected, they may not exhibit symptoms and therefore may not seek testing outside of the surveillance testing regime.

22. There is a risk that ongoing use of invasive testing methods could create testing reluctance or fatigue, and compliance with the testing regime could reduce given this.

23. Air New Zealand has been undertaking a trial of saliva tests and has been surveying workers about testing methods and their preferences. The Ministry will liaise with Air New Zealand to see if lessons can be drawn from this work.

24. The Ministry will continue to assess whether behaviour insights drawn from vaccine and testing hesitancy and other areas would be relevant and can be applied to encourage border workers to sustain compliance with mandatory testing over sustained periods of time.

Providing greater choice and less invasive testing methods may lessen risk of non-compliance

25. We are currently analysing options for how saliva PCR testing could be part of the current testing regime, while ensuring that we provide a continuing level of assurance, and potentially reducing the testing burden experienced by individuals.

26. Our analysis below takes account of the scientific and technical data from both New Zealand and overseas about clinical effectiveness and impacts on compliance, the cost and economic implications, and our ability to implement.

27. Saliva PCR testing is considered slightly less sensitive than nasopharyngeal swabs. However, advice from the New Zealand Microbiology Network and our epidemiologists, based on international and New Zealand-based validation data and research, is that increasing the frequency of testing will increase the overall sensitivity of the testing regime.

28. No New Zealand diagnostic laboratory has opted for a saliva swab that is placed under the tongue for 30 seconds (also referred to as a sucked swab) and then placed into transport media, like some of our Australian counterpart laboratories, due to the loss of sensitivity. The method all New Zealand laboratories employ involves drooling saliva into a collection device. A slight drawback is the request to refrain from eating, drinking, chewing and smoking for half an hour beforehand in order to avoid PCR inhibition, especially when extraction free methods are used (e.g. SalivaDirect and covidSHIELD).

29. In February 2021, the Australian Public Health Laboratory Network (the PHLN) advised that much remains unknown about the impact of saliva collection method variation, processing protocols, and population (i.e. paediatric vs adult, swab vs neat saliva, and late vs early in disease course). Both published and emerging modelling studies provide evidence that a use case exists for saliva in certain settings such as surveillance with frequent testing (daily or every few days). High test frequency for screening purposes may offset limits to test sensitivity.

30. In practice, saliva PCR testing of border workers is in place within New South Wales with daily swabs taken on the days that workers are present. Counterparts in the Northern Territories report that there had been many issues with saliva sample testing (including high Ct values) so they were continuing to use oronasopharyngeal swabs.

31. Within New Zealand, our low prevalence of COVID-19 has meant that the validation of alternative testing methodologies has been slow to be completed.

32. We understand that recently the *COVID-19 Independent Continuous Review, Improvement and Advice Group* has suggested that there is a strong case for adopting saliva testing as the main method for testing in New Zealand. The Ministry believes there is a role for saliva testing within the New Zealand context, but not as the main method of testing.

33. In March 2021, New Zealand Microbiology Network (NZMN) issued a statement on saliva testing. It did not recommend the use of saliva as a diagnostic assay for testing of symptomatic patients or asymptomatic contacts of confirmed cases for SARS-CoV-2.

34. The NZMN noted that saliva testing may be acceptable as part of a surveillance programme where the frequency of testing offsets any reduction in testing sensitivity and where the nasopharyngeal PCR is also in use.

35. Currently ESR is collecting saliva samples from returnees in the Jet Park quarantine facility as part of an effort to collect positive saliva samples for clinical validation in diagnostic laboratories. So far, a substantial proportion of COVID-19 participants in Jet Park test negative in their saliva for SARS-CoV-2 (25% - 42% depending on the saliva PCR method) which is a warning sign that saliva testing may miss certain COVID-19 cases under certain circumstances. Most of these samples were collected days after a PCR positive nasopharyngeal swab and may account for the loss of sensitivity. It has been difficult on occasion to obtain saliva samples within 48 hours of a positive result from nasopharyngeal PCR to perform a direct sensitivity comparison. Going forward, further consideration will be given to how best to collect paired samples at the same time.

36. Within the New Zealand context, there is an increasing number of laboratories to choose from that have obtained IANZ accreditation to use saliva PCR as a sample type, though only under the scope of surveillance testing and with clinical evaluation data pending.

37. Emerging evidence in relation to some saliva PCR collection and testing methodology indicated that positive results are able to be detected earlier than from self-collected nasal swabs, but the viral load was lower in saliva samples.

Options analysis

38. We have considered three options in relation to saliva testing in the context of the mandatory testing regime, as follows:

    a. maintaining status quo

    b. supplementing the use of a nasopharyngeal swab with saliva testing every two to three days

    c. replacement of the nasopharyngeal swab with daily saliva testing.

39. The table in Appendix One outlines the assessment of each of the alternatives against the criteria of clinical effectiveness, financial, implementation, and compliance factors.

40. As highlighted above, the currently available evidence does not support saliva PCR testing being used as a full replacement for all nasopharyngeal PCR tests.

41. There is merit in providing more options and testing choice for border workers subject to mandatory testing requirements.

42. Additionally, although saliva PCR testing is less sensitive than nasopharyngeal PCR, increased frequency of testing will improve testing confidence and potentially allow the earlier detection of cases.

43. As a first step, the Ministry will enhance communication for border workers about the existing and less invasive option of a dual swab (a swab from the oropharyngeal and anterior nasal/lower nostril) to build awareness of the choice.

44. Additionally, subject to your agreement, it is proposed that an additional surveillance option is implemented using a nasopharyngeal PCR test supplemented with frequent saliva PCR testing, as follows:

    a. a graduated roll out of saliva PCR testing to enable data to be collected and assessed to build the New Zealand evidence on the efficacy and suitability of various saliva PCR tests, before moving to wider scale saliva PCR testing

    b. for workers currently subject to mandatory testing every seven days, testing over a fortnightly period would consist of a nasopharyngeal PCR test and saliva PCR testing every two to three days.

45. Building an evidence base from a graduated roll out of saliva PCR testing will enable an assessment of the different testing methodologies used by various laboratories and the efficacy of each.

46. Consideration will also be given to those lower risk border workers currently required to be tested every 14 days. Further advice will be provided on suitable testing frequencies which balance the efficacy of saliva and nasopharyngeal swab tests, the potential incubation period and transmission risk.

47. ESR advice is that there are two key areas of information that need to be obtained before moving to wide scale saliva PCR testing:

    a. **Experience on the negative result return rate from the border worker surveillance testing.** This will look at the number of invalid results (there are many reasons for invalid results, such as presence of inhibitors / particular matter/ too little sample or too thick for the automated pipetting system) as well as the number of inconclusive results (for instance weak positive signal in one gene target which in most cases are false positives). This is important because where there is testing of individuals who are not repeatedly tested, we will need to recall them every time we fail to produce a clear negative result. This will have resource implications. As the border surveillance will test thousands of workers in a week, this information should be able to be obtained within a month.

    b. **Comparison data for the individual laboratories' test results**. Understanding how individual laboratories compare with each other when testing clinical positive saliva samples, will take longer as ESR are slowly building a library of saliva samples from the Jet Park quarantine facility which can be sent to laboratories (including the winner of the RFP) to see what sort of sensitivity issues there are with the different

platforms. This process and development of evidence of efficacy of specific saliva PCR testing processes will take approximately two months.

Operational implications

Volumes

48. It is currently estimated that approximately 20,000 to 22,000 workers at our border are subject to the mandatory testing requirements, and approximately 8,000 of these required to be tested every seven days currently. This number will fluctuate as rosters and work patterns change.

Estimated costs

49. There will be cost implications for adding frequent saliva tests into the mandatory surveillance testing regime.

50. If you agree to the recommended supplementary testing regime for workers required to be tested every seven days to a regime over a fortnightly period of a single nasopharyngeal swab and four saliva tests (at a frequency of every two to three days), we estimate that:

    a. this will cost $423-$543 per individual worker depending on the saliva testing frequency per testing period (fortnightly), therefore approximately $11,000-$14,000 per worker per annum

    b. on the working assumption of approximately 8,000 workers on seven day testing cycles, the estimated cost per annum would be up to $90-120 million.

51. In addition to the direct costs for the saliva PCR testing, there would also be operational costs and resources required to prepare and implement new testing processes and systems within the MIQFs and at our air and maritime borders.

Procurement process

52. It is currently not possible to implement saliva testing at scale within current testing resources. The laboratory network indicated that within current arrangements, implementation of saliva PCR testing would reduce the functional capacity of the laboratory network and limit the ability to respond in the event of a surge in community testing.

53. A procurement process is nearly complete to confirm a supplier to provide end-to-end saliva PCR testing services in New Zealand. The RFP would enable a large-scale saliva PCR testing regime to be implemented without impacting on current public health testing capacity. A national mechanism for delivery has been identified.

54. Work is already underway to operationalise saliva testing in anticipation that it will be part of the mandatory testing regime in due course. This involves, for example, confirming the requirements and processes for workers on variable rosters or off work during the testing period.

55. The use of less invasive alternative testing methods will reduce risks of adverse events. Reduced sensitivity of a single test may be mitigated by regular testing and by

intermittent use of nasopharyngeal swabs. Saliva testing may also be less likely to detect the very weak positives that those post COVID-19 can produce. This could prevent resources spent on historical cases.

56. If more frequent mandatory testing using saliva swabs is agreed to as a routine part of the mandatory testing regime, amendment of the COVID-19 Public Health (Required Testing) Order 2020 will be required.

How the New Zealand Bill of Rights Act 1990 applies to the mandatory testing regime

57. Increasing the frequency for mandatory testing of border workers will engage the New Zealand Bill of Rights Act 1990 (BORA). In particular, testing engages section 21 of BORA - the right to be secure against unreasonable search and seizure.

58. If this search is to be reasonable, the public health rationale for any mandatory testing requirements needs to be clear to justify limits to rights under BORA. We need to consider the rationale for testing, the degree of intrusiveness and nature of search, and the frequency of testing of different groups. The rationale for testing remains unchanged – COVID-19 is largely uncontrolled outside of New Zealand and regular testing of border workers is likely to reduce the risk of transmission of COVID-19 into the community.

59. A limitation on a right should be no more than reasonably necessary. The degree of intrusiveness of possible test methods and nature of the search has been considered. Public health advice about the level of risk to the individual workers and potential transmission into the community, the efficacy of different testing methods and the degree of invasiveness have been considered.

60. We consider that, overall, there is a public health rationale for increasing the testing frequency where a less invasive testing type is utilised, to justify the limitations under BORA.

Equity

61. The impacts of COVID-19 fall very differently across New Zealand communities. Māori and Pacific communities and those living with disabilities, in lower socio-economic groups and crowded or institutional settings bear a greater portion of both health and economic impacts and risks if there is an outbreak of COVID-19 in the community.

62. The mandatory border worker testing regime has been a key part of the response to prevent the outbreak or spread of COVID-19 to the community, particularly those communities with many workers in border settings.

63. The *COVID-19 Independent Continuous Review, Improvement and Advice Group* has highlighted the need for vaccine efficacy to be considered with an equity lens. More explicitly noting that vaccine (and many medication trials) are conducted in 'WEIRD' populations, i.e. 'Western Educated Industrialised Rich Democratic Individuals'.

64. Consideration will continue to be given to testing within the New Zealand context and our populations. In particular to the impact of and the appropriateness of maintaining a higher level of surveillance, testing and surge capacity post-vaccination in South Auckland and other communities around the country who work at or engaged with other border points.

Next steps

65. The Ministry of Health will promote the existing less invasive option of a dual swab (a swab from the oropharyngeal and anterior nasal) through a communications campaign to border sector workers.

66. If the alternative option of supplementing the existing nasopharyngeal PCR tests with frequent saliva PCR tests for workers currently subject to mandatory testing every 7 days is agreed;

    a. an amendment to the COVID-19 Public Health Response (Required Testing) Order 2021 will be drafted for your consideration

    b. further advice about the operational implications, timeframes, and the progress of the RFP will be also provided.

67. The Ministry of Health will continue to review and iteratively update the Surveillance Strategy and Testing Plan to reflect the evolving science and technological developments across COVID-19 testing. Further advice on the next iteration will be provided to you in June 2021.

ENDS.

Appendix 1: Table of Options

Options in relation to expanding surveillance testing modalities within the mandatory testing regime

<table>
<tr><th>Options</th><th>Detail</th><th>Clinical Effectiveness:</th><th>Financial:
Cost and Economic Implications</th><th>Implementation:
Ability to implement and supply chain implications</th><th>Compliance:
Impact on behavioural and compliance factors</th></tr>
<tr><td>Option 1(a): Maintain Status Quo – Predominantly nasopharyngeal swab</td><td>1(a) Nasopharyngeal swab: (Benchtop reverse transcription polymerase chain reaction (RT-PCR))

Invasive swab taken from nasopharynx

(Noting that saliva is currently available on a voluntary basis in MIQ in addition to nasopharyngeal PCR)</td><td>Sensitivity – 85 to 100%
Specificity – 94 to 100 %

Currently RT-PCR testing of nasopharyngeal swabs is seen as the “gold standard” test and is highly reliable.

Factors that reduce efficacy:
• variable practices in collection and collection by untrained practitioners
• timing when swab taken</td><td>Price per test = $183

Price per person over testing period = $366</td><td>• Currently able to process high testing volumes with no degradation in turnaround time
• No concerns regarding the availability of consumables at present
• Pooling of samples has been validated
• Implementation of E-Ordering (currently in progress) will assist in managing the flow of samples
• IANZ accredited as a diagnostic test
• Rapid testing options available and in use</td><td>Risks
• Invasive nature of test
• Increasing health complications resulting from repeat testing (nasal bleeds, nasal obstructions)
• Testing fatigue</td></tr>
<tr><td>Option 1(b): Increase awareness of the dual swab option - oropharyngeal and anterior nasal</td><td>Dual oropharyngeal and anterior nasal swab is currently an available alternative test to nasopharyngeal swabbing for individuals being tested frequently or who cannot have a nasopharyngeal swab</td><td>Sensitivity–89 to 100%
Specificity – 97 to 100%

Factors that reduce efficacy:
• adequacy of the sample</td><td>Price per test = $183

Price per person over period = $366

(Note: There are not two separate swabs taken, but one swab used to sample the back of the throat and then to sample from the anterior nares)</td><td>• Able to be managed within the existing laboratory workflow and with current consumables

• Implementation of E-Ordering will assist in managing the flow of samples</td><td>• Can be self-collected
• Less invasive than nasopharyngeal swab therefore may improve compliance
• Currently an available alternative, but workers may not be fully aware of choice. Opportunity for an information campaign to raise awareness of choice.</td></tr>
<tr><td>Option 2: Supplement use of nasopharyngeal swab with regular saliva PCR testing</td><td>For example:
(a) every three days – for workers required to be tested every 7 days, over a 14 day period there would be day 1 nasopharyngeal PCR, and days 4, 7, 10, 13 saliva PCR test

(b) every two days - for workers required to be tested every 7 days, over a 14 day period there would be day 1 nasopharyngeal PCR, and days 3, 5, 7, 9, 11,13 saliva PCR test

<table><tr><th></th><th>Relative risk reduction with high sensitivity tests (NP PCR tests)</th><th>Relative risk reduction lower sensitivity tests (assuming additional tests are 50% less sensitive than NP PCR)</th></tr><tr><td>7-day testing (weekly)</td><td>Baseline (NP PCR test)</td><td>Baseline (NP PCR test)</td></tr><tr><td>4-day testing</td><td>50-66% reduction</td><td>28% reduction</td></tr><tr><td>2-day testing</td><td>84-95% reduction</td><td>52-66% reduction</td></tr><tr><td>1-day testing (daily)</td><td>98% reduction</td><td>88% reduction</td></tr></table></td><td>Combination of Option 1 and 3.
• Saliva PCR is less sensitive than nasopharyngeal PCR but the confidence levels overlaps with increased frequency

Advantages:
• effectiveness – more frequent testing may identify cases in MIQ and border workers earlier than at present with the fortnightly approach
• as cohorts of border workers are vaccinated, the risk of COVID-19 reduces and the case for surveillance testing increases

Factors that may reduce efficacy of saliva testing
• timing of sampling
• adequacy of sample (donor prep, volume, contamination, inhibitors)</td><td>Price per test =
• $183 nasopharyngeal swab
• less than $60 saliva test (single)

Price per person over 14 day testing period
= $423 (every three days)
= $543 (every two days)</td><td>• Nasopharyngeal swabbing can continue to be analysed as per existing laboratory workflows
• Implementation of saliva testing at this scale is dependent on the results of the tender process
• Relatively burdensome to implement, given the need for an individual to take time out for tests at increased frequencies
• Some complexity in implementing, and potential for misunderstanding whether they should be giving a nasopharyngeal swab or a saliva sample
• Saliva samples are not able to be “pooled” so efficiencies from pooling not available</td><td>• Saliva samples can be self-collected
• A reduction in number of nasopharyngeal swabs may improve compliance
• Individual work rosters may mean that workers are not at work on days when tests scheduled</td></tr>
<tr><td>Option 3: Replacement of the nasopharyngeal swab with daily saliva PCR testing</td><td></td><td>Sensitivity – 60 to100%
Specificity – 97 to 100%

Clinical sensitivity in comparison to nasopharyngeal swab based testing has not been determined in New Zealand labs yet. The collection of the samples needed for paired testing is in progress.

Factors that may reduce efficacy of saliva testing
• timing of sampling
• adequacy of sample (donor prep, volume, contamination, inhibitors)</td><td>Price per test =
• less than $60 saliva test (single)

Price per person over testing period = $600
(assuming that testing is undertaken on days worked and the individual works 10 days over a fortnightly period)</td><td>• No concerns regarding the availability of consumables
• Implementation of saliva testing at this scale is dependent on the results of the tender process
• Relatively burdensome to implement, given the need for an individual to take time out for a test every day
• Sample technically more difficult to handle than nasopharyngeal swab.</td><td>• Saliva samples can be self-collected
• Less invasive than nasopharyngeal swab therefore may improve compliance
• Individual rosters may mean people are not at work on days where tests are scheduled</td></tr>
</table>