

A large, abstract graphic consisting of several overlapping, wavy bands of color. The colors transition from dark purple on the left, through blue and teal, to green on the right. The bands have a soft, ethereal quality, blending into each other.

Executive Summary: Gap analysis of Public Health Microbiological services in Scotland:

**Analysis across One Health Microbiology
disciplines to meet Public Health / Health
Protection requirements**

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Version 1.0 FINAL



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Version history

Version	Date	Summary of changes
01	26/06/2023	First draft
02	27/06/2023	Introduction and Figure 1 updated
03	25/08/2023	Amendment for Biosecurity
1.0	30/08/2023	Version control updated to final version following PHS Executive Team approval

Contents

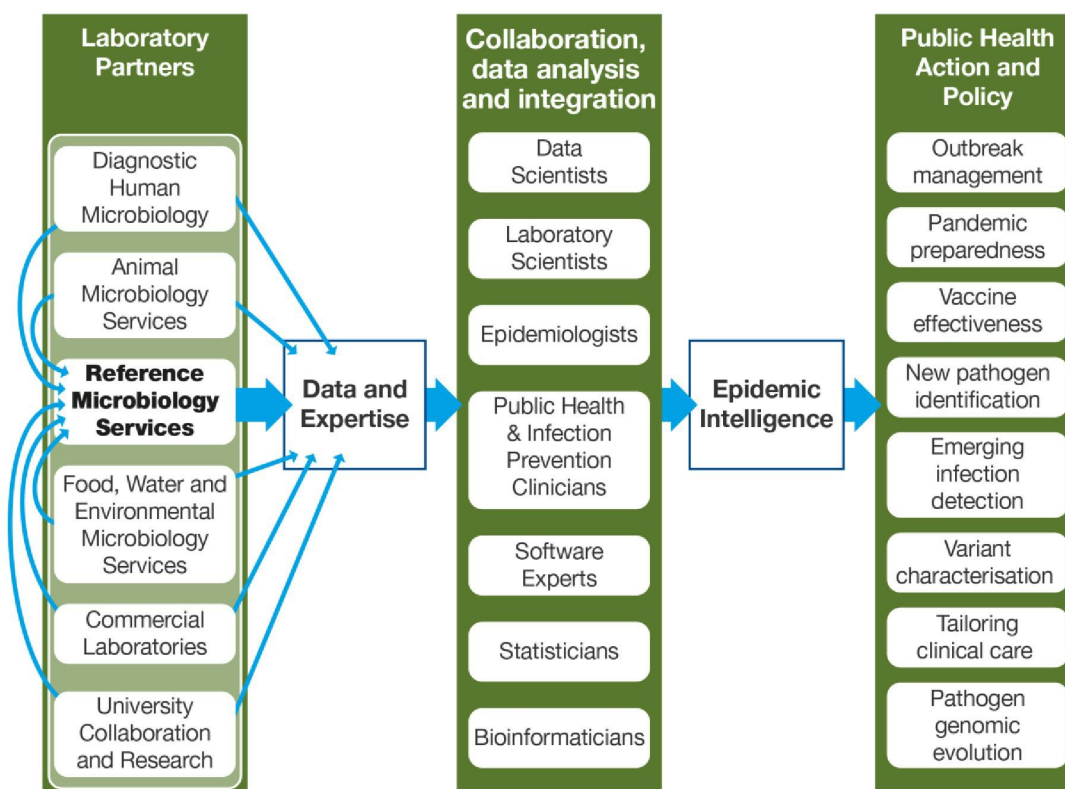
1. Introduction	3
2. Results	6
2.1. Leadership	6
2.2. Governance	8
2.3. Coordination and Monitoring	8
2.4. Service Transformation	10
2.5. Infrastructure Development and Improvement	10
2.6. Quality and Standardisation	11
3. Annex A. Glossary & Abbreviations	13
4. Annex B. Proposed governance arrangements for Public Health Microbiology provision in Scotland	16

1. Introduction

In **Public Health Scotland's strategy 2022 to 2025**, "Prevent Disease" is identified as a priority to improve life expectancy and reduce health inequalities. Within this priority, three areas have been defined: targeting infectious disease to prevent their spread; vaccination programs to reduce vaccine-preventable disease, and pandemic preparedness to be ready for future threats. Public Health Microbiology is vital to the delivery of this strategic priority. It underpins Prevent Disease to enable change in health outcomes and deliver impact.

A Public Health Microbiology (PHM) service is the foundation of national and local infection surveillance, outbreak management and pandemic preparedness in Scotland, providing the means to test human, animal, food and environmental samples for emerging infections, new and existing pathogens and their variants responsible for notifiable disease. The Public Health Microbiology Strategy for Scotland was published in late 2018 and was developed collaboratively with PHM partners and endorsed by the Chief Medical Officer, Chief Nursing Officer, and Chief Veterinary Officer. It identified a model (summarised in **Figure 1**) to achieve an integrated fit-for-purpose Public Health Microbiology service, able to support the requirements of the protecting health function in Scotland.

Figure 1: Scottish Public Health Microbiology end-to-end service delivery model



In line with the Public Health Microbiology Strategy for Scotland (2018), a comprehensive needs analysis was undertaken to capture the specific public health/health protection requirements to deliver fit-for-purpose public health microbiology services in Scotland. A final list of 15 needs were identified and published in 2022 (*Findings and recommendations of Needs Analysis Questionnaire and Workshop to identify the Scottish Public Health requirements from microbiology services, July 2022*).

Figure 2: Identified needs broken down by tranche

<u>Tranche 1</u>	<u>Tranche 2</u>	<u>Tranche 3</u>
1. Interdepartmental SG policy leadership.	6. Fit for purpose sampling methodology and infrastructure.	11. Clearly agreed organisational and individual roles and responsibilities.
2. Strong partnership working with SG and LAs and 'One Health' partners e.g. APHA, FSS	7. Harmonisation of analytical methodologies across the 'One health' micro services.	12. Fit for purpose workforce development pathways.
3. Clear and robust routes to funding	8. A fit for purpose laboratory infrastructure to support all surveillance requirements (clinical, food and enviro).	13. Fit for purpose Pathogen Genomic Services available to support all 'One Health' partners.
4. A national body to lead on coordination between microbiology services	9. A national body responsible for collating and monitoring a list of accredited lab services.	14. Strong links with academia partners for all 'One Health' disciplines.
5. Well governed and resourced reference laboratory services	10. A national body with responsibility for monitoring access to a repertoire of tests for Scotland.	15. A fit for purpose unified end-to-end IT infrastructure.

Note. In undertaking the gap analysis, some needs were combined due to significant overlap during analysis, streamlining the number of needs to 13.

Following on from the needs analysis, a gap analysis was undertaken against each identified need during 2022/23. The gaps and means to address them have each been analysed and agreed through extensive stakeholder engagement. There are 25 recommendations agreed with stakeholders to be taken forward to enable Scotland to have a fit for purpose public health microbiology service. These have been categorised into a series of themes with the recommendations for PHS delivery highlighted for ease of reference. A detailed methodology is provided within the full report (*Gap analysis of Public Health Microbiological Services in Scotland: Analysis across One Health disciplines to meet Public Health / Health Protection requirements, 2023*).

The recommendations were developed with stakeholders and shared extensively to secure consensus agreement and buy-in, including the Scottish Government.

Leadership and governance arrangements for implementation are documented within the recommendations with an accompanying organogram in Annex B. The proposed establishment of a national One Health Microbiology Partnership remains under discussion with the Scottish Government. Next steps shall be to prioritise the recommendations for delivery.

2. Results

The preceding analysis identified 15 requirements to deliver fit for purpose microbiology services in line with public health need (see **Figure 2**). For each need, detailed evidence and analysis is available separately. This executive summary, brings together the recommendations under the following themes:

- ☐ Leadership
- ☐ Governance
- ☐ Coordination and monitoring
- ☐ Quality and standardisation
- ☐ Infrastructure development and improvement
- ☐ Service transformation

2.1. Leadership

Recommendation	Lead
1. A Scottish Government sponsor is nominated to have oversight and coordinate the multiple Scottish Government policy microbiology requirements to meet the needs of public health in Scotland. An early priority would be to map all the internal stakeholders within Scottish Government and their associated microbiology links and requirements to develop inclusive routes to relevant policy development to maximise the efficiency of future laboratory services in Scotland.	SG

Recommendation	Lead
<p>2. Scottish Government to establish a multiagency forum to map the current spend on all microbiology services that support public health in Scotland in order to critically assess if the funding distribution can be improved to provide a more effective, efficient and accessible service at point of use. This should be undertaken in conjunction with Recommendations 1 & 13.</p>	SG
<p>3. Scottish Government to request that PHS identifies a Lead for Public Health Microbiology and establish an interim national One Health Microbiology Partnership that will be co-chaired by PHS and the Scottish Government to provide the necessary governance, coordination and engagement required across all sectors (see detail in Annex B) with a view to:</p> <ul style="list-style-type: none"> <input type="checkbox"/> optimising microbiology services across sectors (NHS, Non-NHS, academic and commercial) and strengthening partnership working <input type="checkbox"/> oversee and coordinate non-NHS public sector microbiology provision in Scotland <input type="checkbox"/> provide strategic governance of non-NHS public sector microbiology laboratory services at national level <input type="checkbox"/> ensure there is resilient capacity and capability in place to meet Scotland's One Health microbiology and biosecurity/biosurveillance needs (including pandemic preparedness). <input type="checkbox"/> provide the national link to 4/5 nations public health microbiology activities. 	SG (PHS coordinate the One Health Microbiology Partnership)
<p>4. PHS to develop a national surveillance strategy to meet health protection needs in Scotland which articulates public health microbiology requirements (both routine and emergency response). This should be developed and implemented in partnership with the Scottish Government, academia, NHS, and Non-NHS Public Sector partners, with robust engagement with microbiology services from across sectors throughout the development and consultation processes.</p>	PHS
<p>5. Chief Nursing Officer Directorate (CNOD)/NHS Scotland Assure/ARHAI Scotland, engaging with others, to complete development of its national Healthcare Associated Infection (HCAI) surveillance recommendations (including a national IPC surveillance eSystem for Scotland) which articulate public health microbiology requirements (both routine and emergency response) for this purpose</p>	CNOD ARHAI NHS Scotland Assure
<p>6. PHS to develop a national pathogens genomic strategy for Scotland in conjunction with the Scottish Government, NHS, non-NHS public sector, commercial and academic partners</p>	PHS
<p>7. Engagement with funding bodies is required to make the case for funding calls or schemes centred round partnership projects (for example via CSO) to match expertise to research and public health questions. Thereafter, to initiate and maintain partnerships across</p>	PHS

Recommendation	Lead
research partners from all over Scotland. PHS to progress this with academic partners, subject to support for this recommendation from the Scottish Universities Life Sciences Alliance (SULSA) and the Scottish Environment Food and Agriculture Institutes (SEFARI).	

2.2. Governance

Recommendation	Lead
8. PHS and ARHAI Scotland to clarify roles and responsibilities for information governance and material governance for samples submitted to reference labs through end-to-end discussion with all stakeholders including NHS and Non-NHS Public sector partners.	PHS ARHAI Scotland
9. PHS and ARHAI Scotland to clarify their respective roles and scope with regard to microbiology services. This should include consideration of developing a unified Public Health Microbiology team to support PHS and NHS Scotland Assure/ARHAI.	PHS ARHAI Scotland
10. With limited operational capacity for development, new services should be prioritised by Pathogen Genomic Oversight Group (PaGOG) for delivery of maximal Public Health need (both health protection and infection control). PHS shall work with partners, to develop guidance on how and when pathogen sequencing should be undertaken (including the potential impact and limitations).	PaGOG
11. Scottish Government CNO team, NHS Scotland Assure/ARHAI and the SMVN Infection Prevention Control Doctors (IPCD) Sub-group to define the medical microbiologist role within the health board setting in delivering the ICD role. Clarity required on both delivery of NHS Clinical infection control and Control of Infection arising from the Healthcare Built Environment in local Health Boards.	SG CNO Team NHS Scotland Assure/ARHAI SMVN IPCD Sub-Group
12. SHPN Public Health Microbiology Group (PHMG) to update its terms of reference in light of the changed health protection landscape post-pandemic and the outcome of the SHPN Review on the strategic direction/role of SHPN to clarify its future scope and remit.	SHPN-PHMG

2.3. Coordination and Monitoring

Recommendation	Lead
13. PHS to collate Scottish Government public health microbiology requirements (both routine and emergency response) into a single framework to coordinate microbiology services between NHS Diagnostic microbiological and reference laboratories, Non-NHS Public sector laboratories, and commercial laboratories (see Recommendation 14). This should include a planned approach to microbiology requirements for pandemic preparedness, biosecurity and also work to resolve the significant risk pertaining to public analyst support for food, feed and water microbiological services in Scotland.	PHS
14. Access to microbiological tests and technological innovation should be nationally coordinated and monitored by the One Health Microbiology Partnership. This shall include: <ul style="list-style-type: none"> <input type="checkbox"/> Review and monitor the geographical distribution of existing microbiology tests to align with public health need and enable efficient access across sectors. <input type="checkbox"/> Overseeing the evaluation of new microbiological tests/technology and assessment of the associated capacity and expertise to implement these within all sectors. <input type="checkbox"/> Providing advice to the Scottish Government as to technologies that should be prioritised/funded for implementation. 	One Health Microbiology Partnership
15. Food Standards Scotland (FSS) and PHS in collaboration with partners should agree how the design of microbiological food and feed sampling programmes can be better aligned with veterinary, and environmental surveillance and monitoring activities across Scotland.	FSS PHS
16. Workforce planning: NHS Education for Scotland (NES)/PHS to engage with national and local workforce planning expertise to build capacity and support the development, implementation, and ongoing review of national and local workforce plans for staff supporting the system wide public health microbiology effort in Scotland. <p>Utilising tools such as the 'six step methodology' the plans should consider:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Defining of the plan <input type="checkbox"/> Forces for workforce change <input type="checkbox"/> Assessing demand <input type="checkbox"/> Assessing supply including succession planning and training pathways <input type="checkbox"/> Develop an action plan <input type="checkbox"/> Implementation and review <input type="checkbox"/> Resource and associated funding 	NES PHS
17. Workforce education and development: Review and thereafter implement the next steps contained in the Scottish Health Protection	NES PHS

Recommendation	Lead
<p>Network (SHPN) 'Outline for Workforce Education and Development for Public Health Microbiology in Scotland' NHS Education for Scotland and Health Protection Scotland, 2019</p> <p>PHS/NES will work with stakeholders to support this implementation of the Outline and promote consideration and incorporation of public health microbiology in local workforce education and development plans by:</p> <ul style="list-style-type: none"> <input type="checkbox"/> in agreement with stakeholders produce a national action plan for implementation <input type="checkbox"/> developing a web-based educational resource hub to support workforce education and development for the workforce <input type="checkbox"/> producing or facilitating access to public health microbiology educational materials <input type="checkbox"/> ensuring educational activities reflect the needs of current and emerging career development pathways <input type="checkbox"/> working with partners in Scotland, the rest of the UK and Europe to identify knowledge and skills matrices and develop new career development pathways to fill identified gaps. 	

2.4. Service Transformation

Recommendation	Lead
<p>18. PHS to work in partnership to a) learn lessons following the Covid pandemic and b) conduct a global review of reference laboratory service delivery models to identify exemplars from other countries of modern, well governed, and efficiently resourced services aligned with public health need. These shall be used to identify a preferred solution for a more integrated NHS reference laboratory service model and develop an associated transition plan, including a framework for further uses of data/materials beyond the direct service.</p>	PHS
<p>19. On behalf of the One Health Microbiology Partnership (see recommendations 3 & 14), PHS and NSS to work collaboratively to initiate and optimise processes for the identification of reference services best provided by other nations and those that are maintained/repatriated to Scotland including some that could be provided by Scotland to all four nations.</p>	PHS NSS

2.5. Infrastructure Development and Improvement

Recommendation	Lead
20. Sampling methodology and infrastructure within the NHS environmental investigations require development. This work should be continued by NHS Scotland Assure.	NHS Scotland Assure
21. Work should be undertaken to identify opportunities to share sampling infrastructure with the rural or island NHS boards. This should be led by Diagnostic Strategic Network (DSN) with support from the Scottish Microbiology & Virology Network (SMVN) and the Laboratories Executive Board (LEB).	DSN
22. PHS to develop modernised, unified end to end national data and digital infrastructure that integrates all microbiology results in Scotland from across sectors (including NHS, Non-NHS Public Sector” and commercial partners) to meet the requirements of the PHS national surveillance strategy (see recommendation 4), NHS Scotland Assure/ARHA recommendations for surveillance (see recommendation 5) and national outbreak/pandemic preparedness as well as evolving biosecurity/biosurveillance needs. These IT/Data infrastructure developments should align with the aims of Scotland’s Digital Health and Care Strategy and be built into relevant demand and work programmes, considering any learning from other countries.	PHS
23. In order to establish and sustain a national fit for purpose pathogen genomics service in Scotland, core bioinformatics infrastructure and reference sequencing laboratory arrangements are required. Additional/redistributed funding is likely to be needed. Early discussions with Scottish Government to explore potential options should be undertaken.	PHS

2.6. Quality and Standardisation

Recommendation	Lead
24. The One Health Microbiology Partnership (see recommendation 3 & Annex B) shall confirm accreditation requirements for NHS, non-NHS public sector, academic and commercial laboratories and provide assurance of attainment to the Scottish Government through the following: <ul style="list-style-type: none"> <input type="checkbox"/> Oversee and monitor laboratory accreditation requirements <input type="checkbox"/> Monitor the attainment of microbiology laboratory accreditation <input type="checkbox"/> Develop and coordinate mechanisms to monitor and intervene where there are failures in laboratory performance demonstrated through monitoring quality assurance data. 	One Health Microbiology Partnership

Recommendation	Lead
<ul style="list-style-type: none"> □ Undertake integrated work with UKAS, National External Quality Assurance Scheme (NEQAS), the Royal College of Pathologists (RCPATH) and other bodies to progress these functions to fully address the gaps identified. □ Develop a framework for the accreditation and laboratory standards for commercial laboratories involved in microbiological testing in Scotland. 	
<p>25. Agreement is reached to ensure that for all disciplines, once a pathogen is isolated (regardless of the isolation method or matrix), that there is a standard method which allows for its characterisation (whether that's molecular profiling through whole genome sequencing/typing or phenotypic tests including antimicrobial resistance).</p>	<p>One Health Microbiology Partnership</p>

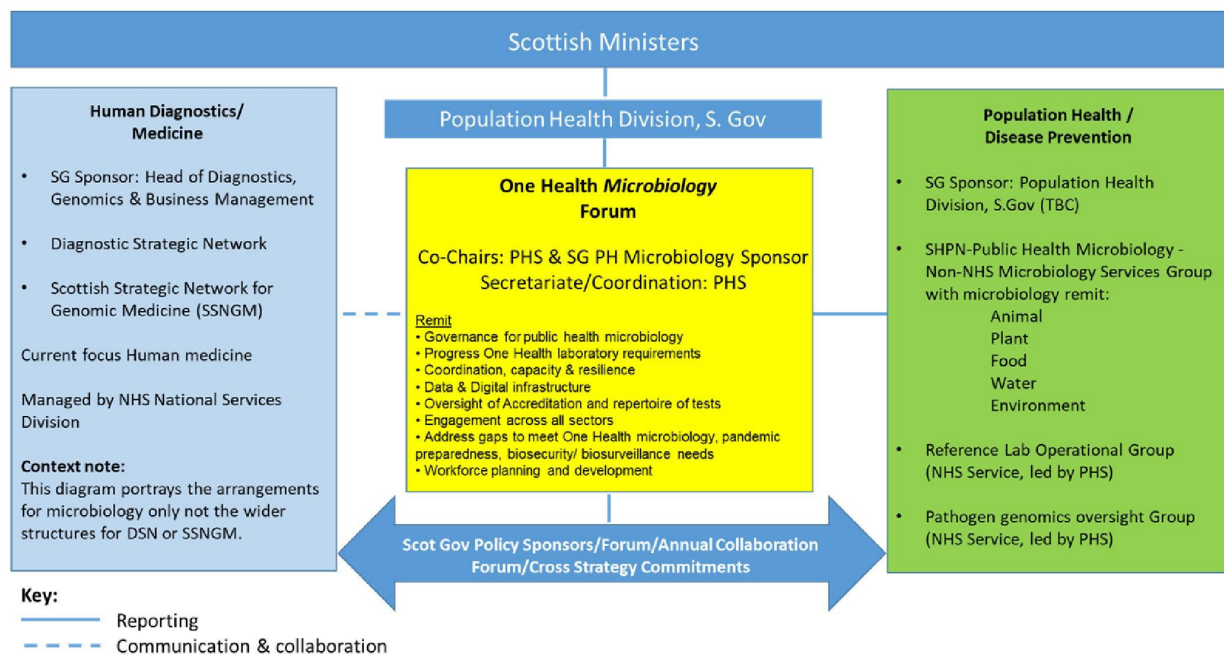
3. Annex A. Glossary & Abbreviations

Term/ Acronym	Definition
Academic Services	Microbiology services delivered by academic establishments that are funded through government or research grant funding routes and are not for profit.
Commercial Services	Microbiology services funded through non-government funding routes and non-academic research funding routes.
CSO	Chief Scientific Officer
ECDC	European Centre for Disease Control
ECOSS	Electronic Communication of Surveillance in Scotland
eDRIS	Electronic Data Research and Innovation Service
Epidemic Intelligence	Encompasses “all activities related to the early identification of potential health hazards that may represent a risk to health ... so that appropriate public health control measures can be recommended.” (https://www.eurosurveillance.org/content/10.2807/esm.11.12.00665-en).
EQIG	ECOSS Quality Improvement Group
5 Nations	Encompasses: the public health services provided by Public Health England, Public Health Wales, Public Health Agency in Northern Ireland, Health Protection Scotland and the Health Protection Surveillance Centre for the Republic of Ireland.
FSS	Food Standards Scotland
Health Protection	Health Protection is a term used to encompass a set of activities within the Public Health function. It involves: Ensuring the safety and quality of food, water, air and the general environment. Preventing the transmission of communicable diseases. (https://www.nes.scot.nhs.uk/education-and-training/by-theme-initiative/public-health/health-protection.aspx).
HPS	Health Protection Scotland

Term/ Acronym	Definition
HPT	Health Protection Team
IPCT	Infection, Prevention and Control Team
Infection Specialists	Infection specialists deliver four separate infection specialties: infectious diseases (ID), medical microbiology (MM), medical virology (MV) and tropical medicine (TM). These specialties are becoming increasingly integrated.
NES	NHS Education for Scotland
NHS	National Health Service
Non-NHS Public Sector	Government funded services which deliver or support public health microbiology in Scotland outwith the NHS. This includes for example, FSS, SEPA, public analyst laboratories, Marine Services Scotland.
NSS	NHS National Services Scotland
One Health	<p>A unifying approach to balance and optimize the health of people, animals and the environment and recognizes that the health of humans, animals and ecosystems are interconnected.</p> <p>Adapted from the definition from the WHO (One health (who.int))</p> <p>By this definition, One Health includes NHS, non-NHS public sector, commercial and academic microbiology services</p>
PGS	Pathogen Genome Sequencing
PHMG	Public Health Microbiology Group
Population Health	“The health outcomes of a group of individuals, including the distribution of such outcomes within the group,” and we argue that the field of population health includes health outcomes, patterns of health determinants, and policies and interventions that link these two. (Kindig, D., & Stoddart, G. (2003). What Is Population Health? American Journal of Public Health, 93(3), 380–383).
Public Analysts	Public Analysts are the highly skilled scientists who form the primary scientific base of the United Kingdom’s public protection enforcement service where chemical analysis and related testing are appropriate. In Scotland Public Analysts are also responsible

Term/ Acronym	Definition
	for microbiological examination of food. http://www.publicanalyst.com/about_us/ .
Public Health	Public Health is defined as “the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society” (Acheson, 1988;WHO). Public health focuses on the entire spectrum of health and wellbeing, not only the eradication of particular diseases. (www.euro.who.int/en/health-topics/Health-systems/public-health-services).
Public Health Microbiology	Adapted from the ECDC consensus definition (https://ecdc.europa.eu/sites/portal/files/media/en/healthtopics/microbiology/Documents/1203_updated-ECDC-public-health-microbiology-strategy-work-plan-2012-2016.pdf).
SACCVS	Scottish Agricultural College Consulting Veterinary Services
SAPG	Scottish Antimicrobial Prescribing Group
SEFARI	Scottish Environment Food and Agriculture Institute
SEPA	Scottish Environment Protection Agency
SHPN	Scottish Health Protection Network
SMI	UK Standards for Microbiological Investigations Group
SMVN	Scottish Microbiology & Virology Network
SULSA	Scottish Universities Life Sciences Alliance
WHO	World Health Organisation

4. Annex B. Proposed interim governance arrangements for Public Health Microbiology provision in Scotland



Interim Note.

The Diagnostic Strategic Network (DSN) is currently being established with a broad scope and shall not have capacity to focus on Public Health Microbiology gaps for some time. The above interim governance structure is proposed in the short to medium term for Public Health Microbiology to enable progress until a time when the DSN has capacity longer term.