AQIS Import Clearance Risk Return
ACERA 1001 Study D
Seaports
Report 3

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Executive summary

This report follows Robinson et al. (2009) and supersedes Robinson et al. (2010).

1.1 Outcomes

We define whole pathway level leakage as the estimated rate of undetected failures across all routine first-port inspections. All statistics are computed using visits to class D ports (defined herein).

1. We estimate the whole pathway level approach rate for contamination to be 4.37%.
2. We conservatively estimate the whole pathway level leakage following the adoption of Phase 1, as defined in this report, to be 0.42%.
   (a) This estimate assumes that inspections are 100% effective.
   (b) This estimate is conservative. A better supported estimate is 0.33%.
   (c) The estimated whole-pathway rate of contamination that is of biological concern is 0.22%.
   (d) The estimate ignores any leakage that corresponds to previously uninspected portions of the pathways (e.g., Bunkers and ship-to-ship transfers). This omission results from inability to distinguish such records in VMS.
   (e) The estimate is lower than 0.62%, which was projected by Robinson et al. (2009). The alteration is due to using more data and an improved computation algorithm.
   (f) This estimate should be compared with 0.17%, which is the average leakage that was effectively mandated under Increased Quarantine Intervention (IQI)[1]. It is more than two times higher than the previously-mandated leakage.
   (g) We estimate the leakage within the pathways that fall under Phase 1 to be 1.69%. Leakage that is of biological concern is estimated as 1.11%.
3. We conservatively predict that the whole pathway level leakage following the adoption of Phase 2, as defined in this report, in addition to Phase 1 will be 0.61%.
   (a) This estimate assumes that inspections are 100% effective.
   (b) This estimate is conservative. A better supported estimate is 0.47%.
   (c) The estimated whole-pathway rate of contamination that is of biological concern is 0.28%.
   (d) The estimate ignores any leakage that corresponds to previously uninspected portions of the pathways.

[1] Estimated from the mandated effectiveness of 96% and the estimated approach rate of 4.37%.

(e) We estimate the leakage specific to Phase 2, that is, the leakage specifically within the pathways that fall under Phase 2, to be 0.57%. Leakage that is of biological concern is estimated as 0.35%.

4. The increase in risk that results from a reduction in intervention in the routine first-port inspection pathway should be offset by a concomitant increase in intervention in a riskier pathway. Examples of such opportunities include ballast water, biofouling, and validation inspections.

5. We recommend that steps be taken to align the data capture, processing, and storage for recording the Quarantine Pre-arrival Report for Vessels (QPAR) and subsequent inspections with the requirements of the business rules.

1.2 Risk–return context

In order to preferentially allocate resources to the activities that face the highest risk, the Cargo Branch is developing and implementing policies for the application of a risk-return approach on a number of activities.

Under Increased Quarantine Initiatives (IQI), Programs were required to intervene for 100% of volume, and obligated to achieve a minimum level of intervention. The prescribed minimum level varied across AQIS Programs. This historical approach provides, as a measure of performance, information on the level of activity that is to be undertaken and a numerical standard that is to be achieved.

Biosecurity risk management principles state that rather than focusing efforts on maintaining a prescribed level of activity or quantitative measure of performance, resources should be allocated on the basis of statistical intelligence and scientific assessment. Intervention levels should be responsive to changing risks, and performance should be measured against maintaining an acceptable level of risk.

Future risk management strategies will entail resourcing and guiding a level of intervention to maintain leakage at less than a determined level, where leakage is considered to be the (estimated) amount of undetected movement of goods or vessels of quarantine concern through an intervention process.

1.2.1 Relevance to Beale review

Among the many recommendations made by the Beale report (Beale et al., 2008), this study directly targets:

44 The balance and level of biosecurity resources across the continuum should be determined by a consistent analysis of risks and returns across programs. The level and allocation of resources should be comprehensively reviewed against risk–return profiles at least every five years.

- This report provides an analysis of the risks and returns for the routine first-port inspection of shipping vessels.

52 The National Biosecurity Authority should undertake a continuing program of analysis of risk pathways using data collected from pre–border intelligence and border inspections at control points along the continuum. The results of this analysis should be used to update risk management strategies and measures.

- This report examines the quarantine risk associated with the international shipping vessel pathway.

2

Introduction

2.1 Background

This project, ACERA project 1001d, focuses on assessing the quarantine risk of the initial arrival of ocean-going vessels. This risk is managed using routine first-port inspections. Under Increased Quarantine Intervention (IQI), implemented in 2001, the inspection rate for routine first-port inspections was 100%, regardless of the inspection history of the vessel. ACERA project 1001d focuses on whether routine first-port inspection rates could be reduced for certain vessels.

This report extends the conclusions of Report 1 for ACERA project 1001d (Robinson et al., 2009). This report also supersedes the second report of the project (Robinson et al., 2010) as it provides answers to the same questions but with more data and updated methodology.

The Seaports case study initially used identical methodology to that presented in ACERA reports 0804 and 0804a in order to advise on the expected risk from the adoption of Phase 1 of the risk–return strategy for routine first-port inspection of vessels. This report summarises the results of Phase 1 and provides a summary of the likely effect of adopting Phase 2.

2.2 Deliverables

The deliverables of ACERA project 1001d are as follows:

1. a report that reviews the risk associated with the adoption of Phase 1 of the Seaports risk–return strategy (Robinson et al., 2009),
2. a subsequent report that details statistical models and examples of use for more fine–grained risk profiling, with a spreadsheet, an algorithm, and/or business rules to identify high–risk pathways, and documentation suitable to implement same, and
3. a training workshop and operational deployment.

3

Phase 1 Review

This chapter reviews the performance of Phase 1 of the risk-return business rules for Seaports. Phase 1 involved the releasing, upon satisfactory documentation, of 60% of vessels whose visits comply with the following business rules. Here we use 12 months of inspection data to assess the risk of Phase 1.

3.1 Background

The following are the business rules for Phase 1 risk-based inspections (Version 4).

1. Phase 1 will only affect the following vessel types and locations.
   (a) Bunkers (Alternative Control Measures, ACM 1) and ship-to-ship transfers.
      i. Northern Australia — Darwin
      ii. South West — Fremantle
      iii. North East — Gladstone and Moreton Bay
      iv. Central East — Kurnell No.3 (Botany Bay) (ACM 8), Bank Anchorage (Sydney), Newcastle and Port Kembla
   (b) Vessels visiting Australian installations (ACM 3 and 4) and/or petroleum rigs
      i. Northern Australia — Bayu Undan, Buffalo Venture, Challis Venture, Jabiru Venture, Northern Endeavour and Puffin Field.
      ii. South West — Barrow Island, Cossack Pioneer, Karratha Spirit, Maersk Ngujima-Yin, Modec Venture 11, Nganhurra, Saladin Marine Terminal, Stag 35, Stybarrow Venture, Thevenard Island, Varanus Island, Wandoo A & B, Woolybutt, Pyrenees Venture and Ningaloo Vision.
   (c) Northern Australia — Bing Bong (ACM 2)
   (d) Regular runners (bulk carriers and tankers) to the following locations
      - Northern Australia — Cockatoo Island, Derby, Koolan Island, and Mourilyan
      - South West Region — Cape Cuvier, Dampier, Onslow, Port Walcott, Port Hedland and Useless Loop/Shark Bay
      - North East Region — Abbot Point, Dalrymple Bay, Hay Point, and Lucinda
2. Vessels arriving direct from overseas to a Proclaimed first port or a 20AA port that is not listed above should adhere to the routine vessel inspection (RVI) instructions.
3. Vessels arriving from international waters are risk assessed by using the Vessel Monitoring System, the QPAR and the Ballast Water Summary Form — form 26. The details on the Ballast Water Summary Form are to be assessed using the ballast water inspection report form. If this assessment indicates an issue then the vessel does not qualify for a Pratique Documentation Clearance (PDC).

4. For a vessel to qualify for a PDC it must have:

   - no reported illness or death on board
   - no reported live insects on board
   - no reported live animals on board
   - no reported Asian Gypsy Moth risk
   - managed their waste in accordance with AQIS requirements
   - complied with AQIS ballast water requirements
   - a valid Ship Sanitation Certificate and is not requesting a renewal.
   - passed its last three consecutive RVI inspections within the previous 12 month period at any port in Australia (Non-conformities are classed as a pass).The only exception to this rule is previous ACM ports. Vessels visiting these ports will automatically be deemed eligible for routine first-port documentation clearance for any visit.
   - passed an inspection in an Australian port since the last high risk cargo was carried
   - no adverse comments on VMS that directly affects the risk status of the vessel.

   VESSEL DOES NOT MEET THE ABOVE CRITERIA: If the vessel is in a D port a RVI will be required at that port. If the vessel is at an A, B or C port the RVI is to be conducted at the subsequent Australian port. Refer to rule 12.

5. If a vessel failed an inspection since qualifying for a PDC it must pass an inspection prior to being eligible for a routine first-port documentation clearance.

6. Vessels must continue to pass any subsequent validation inspection to maintain its eligibility for a routine first-port documentation clearance.

7. In phase 1 the validation process is only applicable to vessels that have an international first port visit to the following ports Abbot Point, Cape Cuvier, Cockatoo Island, Dalrymple Bay, Dampier, Derby, Hay Point, Koolan Island, Lucinda, Mourilyan, Onslow, Port Hedland, Port Walcott or Useless Loop / Shark Bay.

8. Validation inspections are to be conducted at a rate of 2 in 5 arrivals (1st and 4th first-port visits only) for vessels visiting the following ports: Abbot Point, Cape Cuvier, Cockatoo Island, Dalrymple Bay, Dampier, Derby, Hay Point, Koolan Island, Lucinda, Mourilyan, Onslow, Port Hedland, Port Walcott and Useless Loop / Shark Bay.

9. Validation inspections for ports listed in section A, B and C of this document are to be conducted at least once a year. Regional Shipping Managers, Port Managers or Shipping Supervisors should consider other methods of validating the information provided by vessels visiting these ports. This may include:

   - conducting a RVI (subject to OH&S requirements, boarding at sea arrangements etc),
   - confirming the details on the QPAR with the master via the agent's mobile phone or via radio after the vessel has arrived at that port.
   - surveillance of personnel visiting the vessel, or
   - provision of information that outlines the AQIS requirements for personnel visiting these vessels.

10. Validation inspections are non chargeable. Inspection charges will only apply when a corrective action has to be implemented e.g. supervising cleaning of grain on deck etc.

11. Vessels proceeding to a subsequent Australian port from any of the ports listed in section 1 that have been processed as a PDC will be subject to the second port re-inspection process. This inspection is not chargeable unless corrective action caused by the vessel has to be implemented. The absence of a sealed galley grinder, gangway or freezer notices, the Treatment Disinfection Order or the Goods Subject to Quarantine form will not constitute a failure. The emphasis is on the documentation the vessel presented at the first port and the condition of the vessel.
12. A vessel that first ports at an A, B or C port and does not qualify for a PDC and proceeding to a subsequent Australian port will be subject to a RVI at that port. The first port is to issue and Approval to Berth, apply the documentation fee and send a second port message to the next Australian port advising that an RVI inspection is required. FFS charges will apply for that inspection.

Vessel visits that comply with these definitions are referred to in this report as eligible for *PDC*. We expect that of those visits, 40% or so will result in inspection in the long term, as the business rules proscribe validation inspection for the first and fourth visit out of each five.

Our analysis of Phase 1 is constrained to those vessels that match criterion 1d above. The reasons for this constraint are as follows. First, extracting data from VMS to match the PDC decision-making process is difficult or impossible for the vessels and visits corresponding to the other criteria (1a–1c). This is because VMS lacks a distinct table for storing "Visits to Australian Waters" as opposed to "port visits" (which are stored in vmVisits) Second, the purpose of this review of Phase 1 is to provide some guidance as to the likely risks and benefits that would accrue from moving to Phase 2. Criterion 1d visits are a much better match for this purpose than the other visits. Therefore, a number of vessel visits that were eligible for PDC were not included in this analysis, mainly bunkers and ship-to-ship transfers.

3.2 Performance Overall

3.2.1 Eligibility for PDC

The overall count of visits that were eligible for the pratique documentary clearance (PDC), and the count of validation inspections, is

```
PDC
    Eligible Not Eligible
        2257        11718
```

Robinson et al. (2009) predicted that about 20% of the overall visits would be eligible for PDC, which is higher than the observed 16.2%. Robinson et al. (2010) observed 15.3%. The difference between the original prediction and the current observation is likely to a number of factors that are explored in the next section. The increase in the observed eligibility rate relative to Robinson et al. (2010) suggests that in the future, the original estimate may prove a better match than it presently seems.

3.2.2 Implementation of PDC

The overall count of visits that underwent validation inspections, of those visits that qualified for PDC, is

```
Validation Inspection
    Inspected Not Inspected
         1036          1221
```

The observed rate of validation inspections (45.9%) is higher than was expected (2 in 5, or 40%). Potential explanations for this greater number are explored in the next section.

These figures are approximately twice as large as those reported in Robinson et al. (2009), which were based on six months of inspection data instead of twelve months.

3.3 Performance for Class 1D ports

3.3.1 Eligibility for PDC

We now provide detailed statistics for the ports that were referred to as *class 1D* ports in the business rules (Table 3.1). The table shows that the uptake within each of the class 1D ports is commensurate with expectations, making allowance for statistical fluctuations. The differences between the AQIS officer's decisions about which vessels qualify for PDC and the Robinson et al. (2009) predictions are minor at best, which provides some comfort.

Table 3.1: Summary of PDC eligibility statistics for selected ports. The data span August 1, 2009 to July 31, 2010 (12 months). *Visits* is the count of all routine first-port visits, *PDC* is the number of visits that were deemed by officers to qualify for PDC and are within the scope of this study, *Percent* is the percentage of visits that were deemed by officers to qualify for PDC, *Predicted* is the percentage of such visits as predicted in Robinson et al. (2009), and *Inspected* is the percentage of PDC visits that are subject to validation inspection (c.f. 40%).

Port	Visits	PDC	Percent	Predicted	Inspected
ABBOT POINT	208	116	55.8	43.6	62.9
CAPE CUVIER	47	8	17.0	31.9	37.5
COCKATOO ISLAND	0	0		5.1	
DALRYMPLE BAY	637	212	33.3	35.4	44.8
DAMPIER	1502	750	49.9	55.7	50.5
DERBY	0	0		46.2	
HAY POINT	361	86	23.8	30.2	50.0
KOOLAN ISLAND	47	9	19.1	21.7	55.6
LUCINDA	18	6	33.3	33.3	66.7
MOURILYAN	21	0	0.0	32.8	
ONSLOW	47	15	31.9	35.0	40.0
PORT HEDLAND	1237	568	45.9	56.1	50.9
PORT WALCOTT	443	275	62.1	61.2	46.2
USELESS LOOP/SHARK BAY	47	18	38.3	53.6	16.7

3.3.2 Regular Runners

We now focus on the PDC decision-making for regular runners, that is, vessels that are described in criterion 1d of the list of vessel types and locations (1D-class ports, page 8). These ports are also listed in Table 3.1. We exclude the counts of vessels that were eligible under the other business rules because counting those vessels is presently impossible with the data provided in VMS. We also note that there were numerous (about 100) instances of vessels that were not regular runners being offered PDC, which accounts for the different PDC counts between Tables 3.1 and 3.2.

To automate the process of checking the PDC decision, we represented the business rules as an algorithm, with minor omissions. The omissions were due to the difficulty of determining certain decisions from the VMS data. Specifically, it was difficult to determine:

- whether the visit was a bunker or ship-to-ship transfer,
- whether or not the ship's sanitation certificate was accepted,
- validity of ballast water, and
- exact timing of previous high-risk cargo (HRC) carriage.

Implementation of PDC

We now summarize the number of PDCs offered by AQIS officers, compared with the number that was predicted by the algorithm, for regular runners.

```
     Algorithm
PDC   Eligible Not Eligible
  No       584          224
  Yes     1913           11
```

NB: these figures are not commensurate with those presented on page 11 because the latter include visits to all Phase-1 eligible ports.

There were $1913 + 224 = 2137$ visits in which the algorithm agreed with the decision, and $584 + 11 = 595$ visits in which the two did not agree. Of these visits, PDC was offered for ineligible visits in 11 instances. We examined the records in VMS for these instances, and concluded that the 11 PDC allocations were probably due to officer error. Also, PDC was not offered in 584 cases in which the algorithm indicated that it should have been. We examined the records in VMS for these instances, and concluded that many of the differences were due to the difficulties outlined above, and therefore the officer's decision was likely correct. However, a portion of the differences were likely due one of several explanations: (i) to conservative decision-making by the AQIS officer, (ii) confusion about the implementation of the business rules, and (iii) unfamiliarity with the new system.

We note in passing that the estimated failure rate for inspections undertaken for visits that were predicted to be eligible for PDC is nearly 5%.

We now summarize the rate of validation inspections performed by AQIS officers, compared with the rate specified by the business rules (two in five; generally the first and fourth visits). These inspections are applied only to visits that qualify for PDC.

```
Validation Inspection
 No Yes
986 947
```

The observed rate of validation inspection in D ports is higher than expected: 49.0%. However, as observed in Robinson et al. (2010), the inspection design is systematic with non-random start. To check the influence of the systematic design upon the inspection rate, we tabulated the number of visits for each vessel during the twelve-month period as follows.

```
  1   2   3   4   5   6   7   8   9  10  11  12  13  14
248 119  73  54  37  37  25  22  12   4   5   2   1   1
```

We see that in the year period, nearly half the vessels visited only once. According to the business rules, all of these vessels should have undergone validation inspection during their single visit. Similarly, 119 vessels should have been inspected one time out of two visits, 73 for one out of three, 54 for two out of four, and so on. Hence, the most likely explanation for the higher than expected rate of validation inspection is the large number of single-visit vessels within the twelve-month timespan. We would naturally expect the validation inspection rate to converge to the mandated level of 40% as the timespan increases. Furthermore, we can compare the validation inspection level to that reported in Robinson et al. (2010), which was 56.6%. The validation inspection rate (45.9%) is clearly approaching the desired 40% level.

Collectively, these statistics suggest that (i) some clarification of the business rules might be beneficial, (ii) that it is likely that AQIS officers will be conservative in their interpretation and implementation of PDC, at least in the initial stages, and that (iii) some of the performance indicators, specifically the rate of validation inspection, will likely improve with time.

Compliance of Inspected Vessels

We now present the results of inspections for those PDC visits that underwent validation inspection in Class 1D ports during the twelve months from August 1, 2009 to July 31, 2010. For the purposes of this analysis we ignore the failures to declare live plants (15 failures). The count of fails and non-fails for validation inspections was therefore

```
Validation Inspection
   Fail Pass/NC
     29     918
```

The overall pass/NC rate was 96.9%. This outcome implies an estimated Phase 1 pathway leakage (of biological concern) of 1.11%.

Table 3.2 provides a classification of in-scope inspection results by port, again for the class 1D ports. The table shows that the failure rate is reasonably constant across ports, again with the bounds of statistical fluctuation, although Lucinda might arguably be an exception.

In comparing the results with the projections presented in Robinson et al. (2009), it is important to keep in mind that the latter reported *whole-pathway* estimates of risk for the adoption of Phase 1. That is, the reported estimates of risk were calculated over all routine first-port inspections for the adoption of Phase 1, although Phase 1 affected only a portion of the routine first-port inspections. The *conservative* whole-pathway estimate of risk for the adoption of Phase 1 using observed data and the previous methodology is 0.42% for failures. This estimate is lower than 0.62%, which was projected by Robinson et al. (2009), and lower than 0.50%, which was projected by Robinson et al. (2010). The difference with the latter figure is due to two causes: estimation from more data, and use of an improved computation algorithm.

We examined the VMS records to identify the reasons for failure; these are presented in Table 3.3. These results show that nearly half of the failures were failures to report live plants on the QPAR. These failures of reporting have been counted as passes in the statistics reported in Table 3.2.

3.4 Summary

Overall, the outcomes for Phase 1 were reasonably well aligned with our expectations. In those circumstances in which the outcomes deviated from our expectations, we were able to explain the differences satisfactorily. Both the methods and the data are updated relative to the reporting of Robinson et al. (2010), so the statistics are slightly different, but the conclusions are similar.

Based on these results, it would be reasonable to try to clarify the business rules, and to review the data capture and storage protocols for processing the QPAR. It should be relatively straightforward for an analyst to verify the decision-making process that underpins the deployment of PDC.

Table 3.2: Summary of compliance statistics for selected ports. The data span August 1, 2009 to July 31, 2010. *PDC* is the number of visits that were deemed by officers to qualify for PDC, *Insp.* is the number of such visits that underwent validation inspection, *Perc.* is the percentage of such visits that underwent validation inspection,*Passed* is the number of such inspections that did not result in a FAIL, *Failed* is the number of such inspections that did result in a FAIL, *App.* is the estimate of the approach rate of contamination expressed as a percentage, and *Leakage* is the estimated leakage rate of contamination expressed as a percentage. All calculations assume 100% inspection effectiveness. Note that fails that involved failure to declare plants have been counted as passes.

Port	PDC	Insp.	Perc.	Passed	Failed	App.	Leakage
ABBOT POINT	114	71	62.3	71	0	0.00	0.0
CAPE CUVIER	7	3	42.9	3	0	0.00	0.0
COCKATOO ISLAND	0	0		0	0		
DALRYMPLE BAY	199	90	45.2	87	3	3.33	1.8
DAMPIER	686	328	47.8	316	12	3.66	1.9
DERBY	0	0		0	0		
HAY POINT	84	42	50.0	40	2	4.76	2.4
KOOLAN ISLAND	9	5	55.6	5	0	0.00	0.0
LUCINDA	6	4	66.7	3	1	25.00	8.3
MOURILYAN	0	0		0	0		
ONSLOW	14	5	35.7	5	0	0.00	0.0
PORT HEDLAND	552	281	50.9	275	6	2.14	1.0
PORT WALCOTT	255	115	45.1	110	5	4.35	2.4
USELESS LOOP/SHARK BAY	16	3	18.8	3	0	0.00	0.0

Table 3.3: Classification of all fails from data used to assess the outcomes of Phase 1 inspections. Some visits recorded more than one fail; there are 44 unique visits. Failures for Declaration are mostly due to the failure to report live plants on the QPAR.

Category	Count
Animals (pets)	0
Ballast water	5
Declaration	21
Insects	2
Insects-mosquitoes	0
Insects-trogoderma	0
Livestock	0
Other	6
Rodents	0
Sanitary condition	3
Waste	11
TOTAL	48

4

Phase 2 Assessment

4.1 Introduction

We now use the algorithms that were developed to deploy the business rules on VMS inspection data to predict the likely effect of Phase 2 upon inspection regimes.

Phase 2 is defined as follows: Pratique Documentation Clearance (PDC) will be applicable to the following vessel types.

1. Bunkers and ship to ship transfers in any proclaimed first port
2. Vessels visiting Australian installations and/or petroleum rigs under Section 20AA of Quarantine Act 1908.
3. Vessels with permission to visit Bing Bong and Karumba (in Northern Australia) under Section 20AA of Quarantine Act 1908.
4. Regular runners (barge, bulk carrier, container, dredge, freighter, general cargo, platform supply, roll on roll off, tanker and tug type vessels only) visiting any proclaimed first port.

Moving to Phase 2 from Phase 1 greatly increases the number of vessel categories and ports that will be eligible for PDC (Table 4.1).

Table 4.1: Summary of inspection statistics for selected visits for Phases 1 and 2. For consistency with Phase 2, we use the *predicted* PDC eligibility for Phase 1 rather than the *realized* PDC eligibility. Fails (NP) refers to the count of fails excluding failure to declared live plants.

Vessels and Ports	**All Visits**			**PDC–Eligible**		
	Visits	Fails	Fails (NP)	Visits	Fails	Fails (NP)
Phase 1 Visits						
ABC Ports	3104	132	93	1652	27	18
D Ports	4328	270	129	2593	77	39
Phase 2 Visits						
ABC Ports	312	15	10	87	4	4
D Ports	3588	155	93	1558	27	22

Most of the increase in PDC–eligible visits is due to the expansion of PDC–eligible ports (Class D) for tankers (726 extra visits) and bulk carriers (1951 extra visits). The balance (1223 visits) are for all other vessel types visiting all eligible ports. We use inspection data collected from August 1 2009 until July 31 2010, inclusive, for all calculations.

A small complication is that the business rules require that a vessel have passes for the last three inspections to qualify for PDC but then only require a pass in the last inspection to maintain PDC eligibility. We will assume that the vessels are qualified for PDC; that is that they require only that the last inspection be a pass, instead of the last three inspections. This assumption will lead to a conservative estimate of the leakage, because vessels that would otherwise not qualify for PDC owing to high leakage patterns will be included. We also assess the effect of using three passes as a criterion instead, below.

Analysis must now be on the basis of predicted PDC eligibility, rather than realized PDC eligibility. A further complication with assessing Phase 2 is that as we have noted in the previous chapter, it is a difficult problem to model the application of this suite of business rules, and there is substantial scope for error.

The reporting and conclusions in this chapter will vary from those reported by Robinson et al. (2010) for two important reasons: 1) the statistics here use a more current dataset than the previous report, and 2) the scope of Phase 2 has changed since the previous report was written.

4.2 Implementation and Compliance

The eligibility and compliance predictions are presented in Table 4.2. Briefly, we expect that about 4150 vessel visits will be eligible for PDC in Phase 2, and that approximately 3% of those vessels will fail at routine first-port inspection. This amounts to an expected pathway leakage (relative to 14000 visits on the pathway) of approximately 0.4%, if we assume that 40% of the visits undergo inspection validation. These figures are aggregated across the estimated leakages of Phase 1 and Phase 2.

In comparing the results with the projections presented in Robinson et al. (2009), as before, it is important to keep in mind that the latter reported *whole-pathway* estimates of risk for the adoption of Phase 1. The conservative whole-pathway estimate of risk for the adoption of Phase 2 including Phase 1, using observed data and the previous methodology is 0.61%. This figure is computed by aggregating the annual leakage for the Phase 1 and Phase 2 visits.

Table 4.2: Summary of predicted compliance statistics for Phase 2 for all Class D ports. The data span August 1, 2009 to July 31, 2009 (12 months). The rows report the expected compliance patterns by visit for (i) all visits with Phase 2 vessel type and port, (ii) as above but only such vessels that are regular runners and whose last inspection was a pass, and (iii) as above but also only such vessels that satisfy PDC on paperwork. The column labels are suitably descriptive. The *Approach* column is the predicted approach rate, and the *Leakage* column is the predicted leakage rate, both expressed as percentages. Note that fails that involved failure to declare plants have been counted as passes.

Status	Inspections	Passes	Non-conformities	Fails	Approach	Leakage
All	6329	6191	309	138	4.23	0.74
History OK	4286	4220	126	66	3.08	0.42
Eligible	4151	4090	115	61	2.92	0.39

All fails are not equal. We drilled down to the causes of failure, which are reported in Table 4.3. Some vessels failed for more than one reason during a visit; hence the failure description count is higher than that reported in Table 4.2.

Table 4.3: Classification of all fails from data used to predict the outcomes of Phase 2 inspections. Eight visits recorded 2 fails and two visits recorded 3; there are 103 unique visits with at least one fail.

Category	Count
Animal/plants	0
Animals (pets)	0
Ballast water	5
Cargo related	0
Declaration	66
Grain	0
Insects	10
Insects-mosquitoes	0
Insects-trogoderma	0
Livestock	0
Other	11
Qrm inspection	0
Rodents	0
Sanitary condition	7
Vermin	0
Waste	17
TOTAL	116

4.3 A Variation

Finally, we assess the effect of using three passes as a PDC criterion instead of one pass as stipulated in the business rules in Table 4.4. The difference between the expected leakages is very modest, and in fact marginally favours the one-pass design (statistics presented in Table 4.2). However, this comparison fails to take account of the likely psychological effect of a three-pass criterion. Arguably, if a master knows that a failure will lead to guaranteed inspections the next three visits, whereas a pass leads to the sustained possibility of PDC, then the crew will be more likely to take pains to be compliant.

Table 4.4: Summary of predicted compliance statistics for Phase 2, using *three passes* as a continuing criterion. The data span August 1, 2009 to July 31, 2010 (12 months). See Table 4.2 for explanation of columns and rows.

Status	Inspections	Passes	Non-conformities	Fails	Approach	Leakage
All	6329	6191	309	138	4.23	0.74
History OK	4058	3994	112	64	3.15	0.40
Eligible	3931	3871	102	60	3.04	0.38

Bibliography

Beale, R., Fairbrother, J., Inglis, A., and Trebeck, D. (2008). *One Biosecurity: a Working Partnership*. Commonwealth of Australia.

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Robinson, A., Goldie, S., Gillow, S., and Tognolini, S. (2010). AQIS Import Clearance Risk Return: Seaports Report 2. Technical Report 1001d 2, Australian Centre of Excellence for Risk Analysis.

Appendix A

Tables

The following collection of summary tables provides some insight into the VMS dataset.

Most of the visits and most of the fails recorded for PDC-eligible visits were in Phase 1.

```
      Fail
Phase FALSE TRUE
    1  7328  104
    2  3869   31
```

When the actual implementation of the business rules agreed with the prediction to decline PDC, the failure rate was more than four times as high as when the actual implementation agreed with the prediction to allow PDC. The failure rate when PDC was allowed but predicted to be declined was slightly higher than the reverse.

```
         Actual
Predicted      FALSE       TRUE
    FALSE 0.11517028 0.05833333
    TRUE  0.04819277 0.02332815
```

Appendix B

Change Log

23 September 2010 Final version; draft watermark removed.

31 August 2010 Initial draft using 12 months Phase 1 inspection data.