

# TRACEABILITY OPTIONS FOR THE CANADIAN PORK INDUSTRY

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## ABSTRACT

This paper will attempt to demonstrate the current status and direction of traceability systems in the pork production industry in Canada, with particular emphasis on what it will mean for Canadian pork producers. Traceability by definition is the ability to trace pork through the production chain. Traceability gives the production chain transparency, and transparency allows customers to understand and trust the product they are buying. Making sure that people continue to buy pork is the bottom line for all of us.

## CURRENT STATUS

The current status of traceability in Canada's pork production system is outlined in Table 1.

**Table 1. Current status of traceability in pork production in Canada.**

	Feed Manufacture	On Farm Feeding and Production			Move Animals	Slaughter and Primal Cuts	Value Added Processing	Sell Product
Location	Feed mill	Farm 1 Grand- parents	Farm 2 Parents	Farm 3 Finishing	Transport	Packer	Processor	Retail
Technology	Business records	Ear tags	Business records	Business records	Tattoo	Bar code	Bar code	Bar code
Precision	Farm level	Animal level	Farm level	Farm level	Farm level	Multiple farms	Packer level	Packer level
Unit	Feed batch	Single animal	Groups of animals	Groups of animals	Group tattoo	Daily cut room output	Box ID	Box ID
Oversight	CFIA*	CQA**	CQA	CQA	CFIA	CFIA	CFIA	CFIA
Bottleneck		No animal movement database				Farm identity lost	Farm and/or packer identity may be lost	

\* CFIA – Canadian Food Inspection Agency

\*\* CQA – Canadian Quality Assurance (CQA™) Program

The current traceability status has some key deficiencies that leave significant risk for all stakeholders in the industry. The two major risk areas are:

### **Foreign Animal Disease Control Options**

A foreign animal disease (FAD) has the potential to devastate the industry; outbreaks in the UK and Holland have cost the industry and public millions of dollars. The Foot and Mouth Disease outbreak in Taiwan devastated their pork industry. Risk of this magnitude affects everyone. Risk mitigation involves investment in and compliance with biosecurity measures, along with a plan for a rapid and efficient containment and eradication of the disease. Containment requires early detection and knowledge of the movement of infected animals. Currently the knowledge of animal movement in Canada is limited.

The major consequence of not knowing animal movements is that Canada cannot be zoned quickly. In the case of a foreign animal disease, the whole country may be considered infected until it can be demonstrated the disease is localized to a region. The more quickly the disease can be shown to be limited to a region, the more quickly international trade can resume with unaffected zones within Canada. Knowing animal movements is fundamental to being able to zone Canada in the event of a foreign animal disease outbreak.

An effective traceability system in Canada is essential to mitigating risk associated with an infectious disease that can disrupt international trade of Canadian pork.

### **Food Safety**

A crisis associated with contaminated pork leads to an immediate need to identify the source of the contamination, as well as finding all other potentially contaminated product. A recall of contaminated pork is expensive both in terms of dollars lost but also in loss of brand confidence and competitiveness to other proteins in the marketplace. Minimizing the extent of the recall and finding contaminated product quickly is the optimal response to a crisis. Currently in Canada, maintaining product identity beyond the cutting room is difficult, although initiatives are underway to address this deficiency. Beyond the cooler, finding the farm of origin for pork products is currently difficult.

Even when the farm of origin is known, pigs in Canada often change farms multiple times from birth to market. Effectively finding the source of contamination requires knowledge of what farms pigs have resided on. Currently there is no systematic information of pig movements in Canada. An effective traceability system would help reduce exposure to the two risk areas, and thus the Canadian industry through the Canadian Pork Council is exploring options into a traceability system in Canada.

### **TRACEABILITY NEEDS**

The current traceability needs in Canada as compiled by the CFIA and industry stakeholders are summarized in Table 2.

**Table 2. Traceability needs in Canada's pork industry.**

	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>	<b>Scenario 4</b>	<b>Scenario 5</b>
Occurrence of an outbreak of	FAD	Indigenous disease	Emerging disease	Food borne disease in humans	Poisoning issue
Point of detection	<ul style="list-style-type: none"> <li>➤ Exported live animals or animal products</li> <li>➤ Slaughter</li> <li>➤ Sow unit</li> <li>➤ Grow-finisher units</li> </ul>	<ul style="list-style-type: none"> <li>➤ Exported live animals or animal products</li> <li>➤ Slaughter</li> <li>➤ Sow unit</li> <li>➤ Grow-finisher units</li> </ul>	<ul style="list-style-type: none"> <li>➤ Exported live animals or animal products</li> <li>➤ Slaughter</li> <li>➤ Sow unit</li> <li>➤ Grow-finisher units</li> </ul>	<ul style="list-style-type: none"> <li>➤ Exported animal products</li> <li>➤ Post slaughter</li> </ul>	<ul style="list-style-type: none"> <li>➤ Exported live animals or animal products</li> <li>➤ Slaughter</li> </ul>
Most probable chase (contacts and time)	Trace all contact last 3-4 weeks	Trace from first possible introduction to expression of disease through life span of afflicted animal	Previous 1 to 2 sites (evolves to scenario 1 or 2)	Trace to slaughter plant and then to the finishing barns that contributed to the product in question	Having confirmed slaughter plant trace to finishing barns, growers and farrowing barns as nature of poison/residue dictates
Most probable contacts of interest	<ul style="list-style-type: none"> <li>➤ Animals</li> <li>➤ Transport vehicles</li> <li>➤ People/fomites</li> <li>➤ Area</li> </ul>	<ul style="list-style-type: none"> <li>➤ Animals</li> </ul>	<ul style="list-style-type: none"> <li>➤ Animals</li> </ul>	<ul style="list-style-type: none"> <li>➤ Animals</li> <li>➤ Transport vehicles</li> </ul>	<ul style="list-style-type: none"> <li>➤ Animals</li> <li>➤ Area</li> </ul>
Most probable transmission (horizontal, vertical, common source)	<ul style="list-style-type: none"> <li>➤ Horizontal</li> <li>➤ Common source</li> </ul>	<ul style="list-style-type: none"> <li>➤ Horizontal</li> <li>➤ Common source</li> </ul>	<ul style="list-style-type: none"> <li>➤ Horizontal</li> <li>➤ Common source</li> </ul>	<ul style="list-style-type: none"> <li>➤ Horizontal</li> <li>➤ Common source</li> </ul>	<ul style="list-style-type: none"> <li>➤ Common source</li> </ul>
Most probable chase (single animal or group)	Group	Group	Group	Group	Group
Most likely unit of interest for the chase	Herd (or group)	Herd (or group)	Herd (or group)	Herd (or group)	Herd (or group)

To address the traceability needs of the industry the following information is needed:

- A standard definition of farm, location or premise where pigs are housed, and
  - When and how many pigs left a premise?
  - When and where did they go to?
  - Who moved them?

To get this information, we need a premise database, a movement database including transportation information, and in some cases, an identification on the pig to link it back to a premises where it lived earlier.

Significant research is being expended in Canada to answer the above questions, but some information has already been generated. The first and most critical piece of information was the definition of swine premise.

### **Premise Definition**

The premise needs to have a common definition across Canada that can be standardized into a database. Often database costs for accuracy maintenance are greater than initially creating the database. Ideally the maintenance costs can be minimized or shared with other stakeholders. The definition of premises for traceability purposes so far has been as follows

*'A swine premise is a contiguous land location, based on provincial land title records, including all structures housing pig(s) and other livestock.'*

In this case, a premises is a land location based on legal deeds, that are kept up to date in municipal databases. Land title records are kept accurate for tax purposes, and like death are clearly defined.

### **Animal Movements**

Animal movements between premises need to be recorded for traceability purposes. Some countries require herd books that log all movements to or from the premises. In some cases these movements are registered in a central database, in others the information remains on farm. Farm business records are essential, but it takes time in the event of a crisis to go to each farm to examine movement records. A central database is useful during a crisis as animal movements can be retrieved quickly, assuming the movement database is up to date. In an animal disease outbreak, response time is critical. A central database needs to be secure and guided by tight disclosure policies.

### **Transportation Information**

In the case of an infectious disease, the transporter can be a source of contamination. Capturing the transporter information is certainly of value. A simple method may be to record the license plate of the trailers hauling the animals, alternatively a transportation log may be used. Again, this information may remain with the farms, the transporters, or in a central database.

## **Animal Identification**

Some countries and commodities require a permanent identification for all animals. This gives the option to link a premises to an identification and thus be able to trace each animal to a premise. Identification without a movement log or identification registry would require a tag or identification for each premise. An evaluation of practical means for identification of pigs is underway. While a permanent ID of each animal is logical for the cattle industry, it is impractical for the poultry industry. Pork production is midway between these two commodities, and in some cases pigs will need to be identified, but in other cases, traceability can likely be achieved without identification of each pig.

Pigs going to slaughter in Canada currently have a permanent identification which is read on the slaughter line. This ID (slap tattoo) is used to reconcile shipments for payment purposes. This identification method could be used for traceability purposes if each tattoo was linked to a specific premises. This would require standardization of tattoos across the country, but would easily allow for traceability back to the last premises for market pigs in Canada.

## **Traceability from Pork and Pork Products**

Perhaps the most effective way to traceback pork, from cut room or beyond to the farm of origin when the animal identification is lost, is through the use of DNA. Maple Leaf Foods have pioneered a system in Canada to trace back pork to the premises where the pig was born. Identigen Genetic Testing Services have successfully piloted a system in Canada. DNA analysis offers an ability to correctly identify a pig from any tissue even from fully cooked product. Advances in technology are making this process increasingly affordable. Figure 1 indicates DNA traceback options currently available.

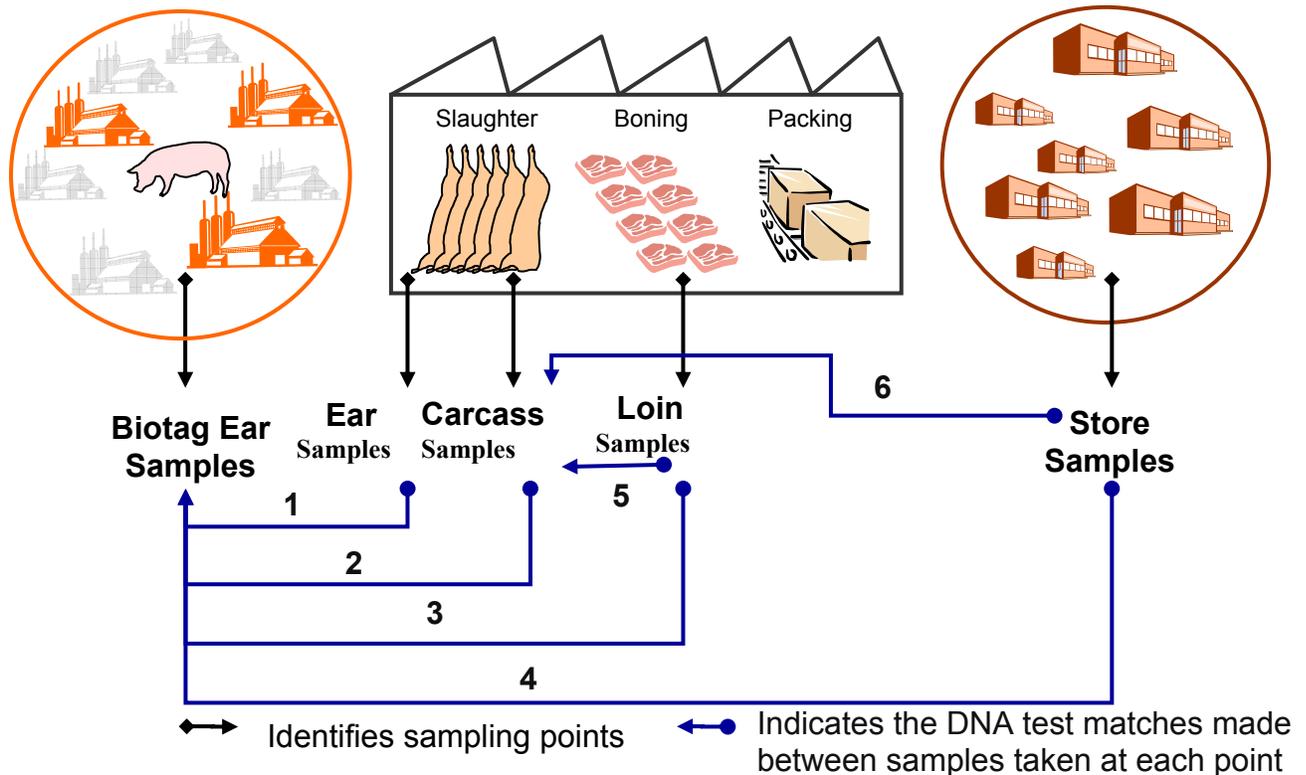
DNA traceability offers matching animal and pork cuts which has benefits beyond crisis management. Currently it is difficult to match the genetics to optimal pork quality. DNA matching allows finding the parentage of pork that is judged superior by consumers and retailers. This offers a significant new genetic selection tool for the industry.

## **EXAMPLE - HOW TRACEABILITY COULD WORK IN CANADA**

### **Scenario Number 1 (from Table 2) - Foreign Animal Disease Outbreak**

Assume a fictitious foreign animal disease outbreak was diagnosed in a barn identified as premise 60329. Baby pigs started dying in large numbers showing signs of central nervous disease and a Pseudorabies diagnosis was made. A question of immediate concern to answer was where has the disease spread? This requires knowing where pigs from premise 60329 have been moved within a specified time interval. This question can be answered through a forward tracing of pig movements starting at least 3 weeks prior to the initial diagnosis.

**Figure 1. DNA sampling and traceback options for commercial pork production.**



### Forward Tracing Movement of Pigs

Figure 2 shows a sample output of a trace forward analysis for premise 60329 – this is an example data set from a prototype traceability system. It returned all the downstream contact premises where the pigs went over a set time interval.

Farm 60329 shipped pigs to premises 60313, 60314, and 60315, and each of those shipped to other farms as shown in Figure 2. This information would guide CFIA personnel to focus on investigating 9 farms in the case of a disease outbreak, as opposed to having to investigate **all** farms in the region.

A more complete examination of the records can yield specific contact information (Figure 3) making date of shipment, destination, number of animals, and license plate readily available. Clearly information such as this is powerful, and access to it would require clear disclosure policies, but the traceback indicates that the pigs did not move outside of a certain region, allowing for a zoning process to begin to be defined.

At the same time, a trace-backward analysis (Figure 4) from premise 60329 would indicate that no animals came into the herd in the time in question.

In the case of infectious disease, vehicles remain sources of infection for subsequent loads of pigs. It is crucial to be able to track vehicle movements and a traceability system can provide such a vehicle trace for this simulated outbreak (Figure 5).

**Figure 2. FAD premises trace forward summary.**

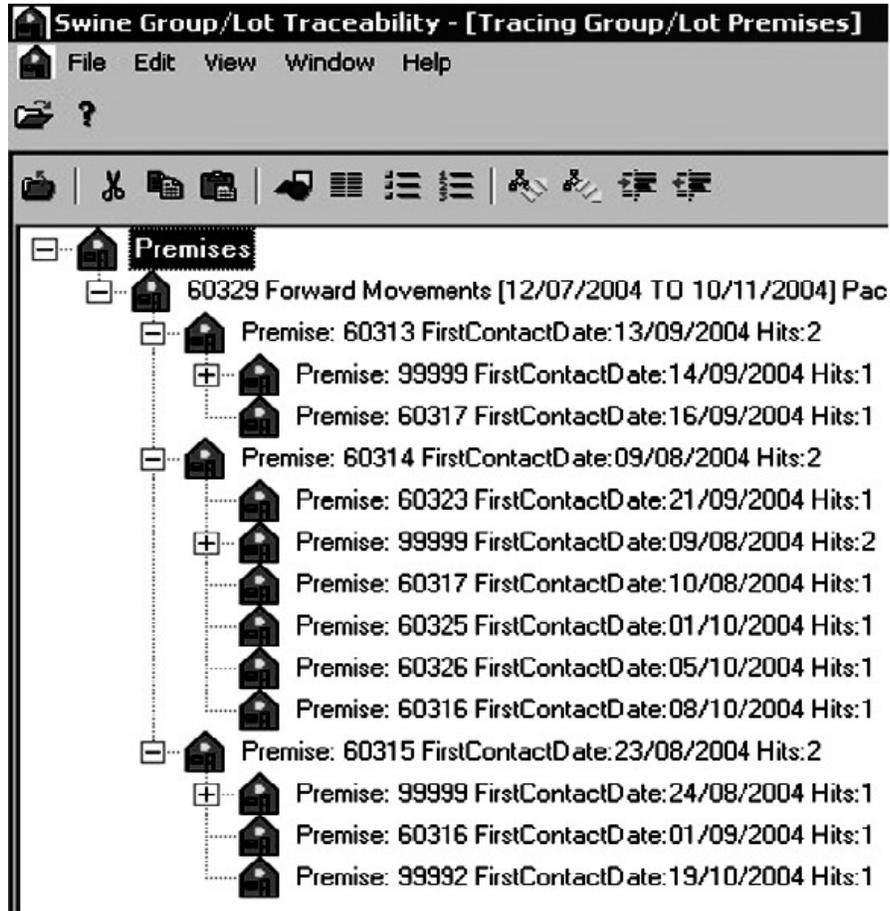
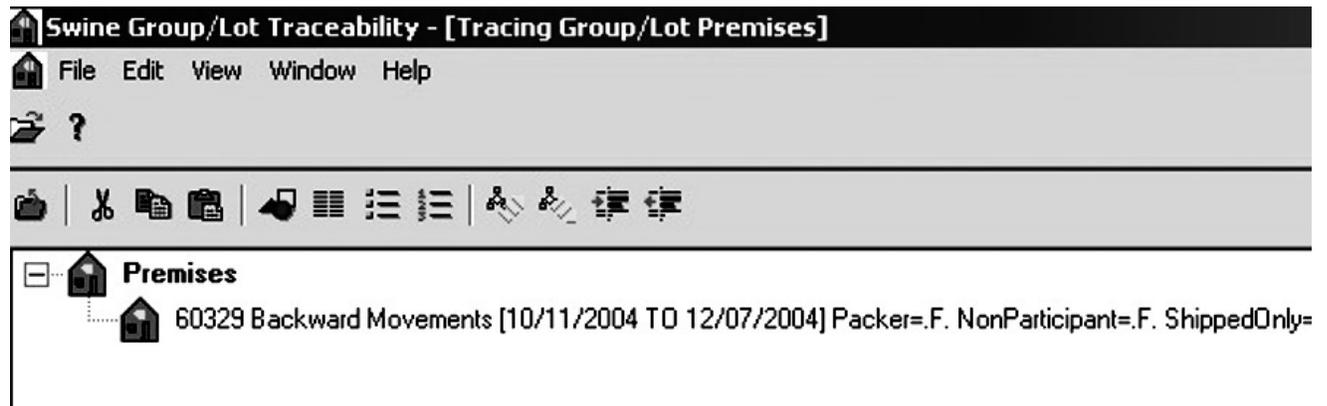


Figure 3. FAD premises trace forward detail.

Date	Data Source	Status	From	To	QShipped	QReceived	Plate#	Prov
30/09/2004	Shipped	Reconciled	60329	60313	73	0	G 32	MB
30/09/2004	Received	Reconciled	60329	60313	73	73	G 32	MB
04/10/2004	Shipped	Not Reconciled	60329	60314	92	0	G 32	MB
02/09/2004	Shipped	Reconciled	60329	60315	89	0	G 32	MB
02/09/2004	Received	Reconciled	60329	60315	89	89	G 32	MB
06/09/2004	Shipped	Reconciled	60329	60315	88	0	G 32	MB
06/09/2004	Received	Reconciled	60329	60315	88	88	G 32	MB
09/09/2004	Shipped	Reconciled	60329	60315	88	0	G 32	MB
09/09/2004	Received	Reconciled	60329	60315	88	88	G 32	MB
09/08/2004	Shipped	Reconciled	60329	60314	78	0	G 32	MB
09/08/2004	Received	Reconciled	60329	60314	78	78	G 32	MB
12/08/2004	Shipped	Reconciled	60329	60314	86	0	G 32	MB
12/08/2004	Received	Reconciled	60329	60314	86	86	G 32	MB
13/09/2004	Shipped	Reconciled	60329	60313	66	0	G 32	MB
13/09/2004	Received	Reconciled	60329	60313	66	66	G 32	MB
16/08/2004	Shipped	Reconciled	60329	60314	75	0	G 32	MB
16/08/2004	Received	Reconciled	60329	60314	75	75	G 32	MB
16/09/2004	Shipped	Reconciled	60329	60313	62	0	G 32	MB
16/09/2004	Received	Reconciled	60329	60313	62	62	G 32	MB
07/10/2004	Shipped	Reconciled	60329	60314	66	0	G 32	MB
07/10/2004	Received	Reconciled	60329	60314	66	66	G 32	MB
11/10/2004	Shipped	Reconciled	60329	60314	68	0	G 32	MB
11/10/2004	Received	Reconciled	60329	60314	68	68	G 32	MB
19/08/2004	Shipped	Reconciled	60329	60314	87	0	G 32	MB
19/08/2004	Received	Reconciled	60329	60314	87	87	G 32	MB
18/10/2004	Shipped	Reconciled	60329	60314	65	0	G 32	MB
18/10/2004	Received	Reconciled	60329	60314	65	65	G 32	MB
21/10/2004	Shipped	Reconciled	60329	60314	74	0	G 32	MB
21/10/2004	Received	Reconciled	60329	60314	74	74	G 32	MB
20/09/2004	Shipped	Reconciled	60329	60313	71	0	G 32	MB

Figure 4. FAD trace back.



**Figure 5. FAD transportation tracking.**

Swine Group/Lot Traceability - [Tracing Group/Lot Premises]

File Edit View Window Help

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Plates

- [-] Z Transport Movements [10/11/2004 TO 12/11/2004]
  - [-] TransportDate:30/09/2004 Event Hits:6
    - [-] Premise: 60311 Hits:2
    - [-] Premise: 60313 Hits:6
    - [-] Premise: 60312 Hits:2
    - [-] Premise: 60329 Hits:2
  - [-] TransportDate:04/10/2004 Event Hits:6
    - [-] Premise: 60311 Hits:2
    - [-] Premise: 60314 Hits:6
    - [-] Premise: 60312 Hits:2
    - [-] Premise: 60329 Hits:1
    - [-] Premise: 99999 Hits:1
  - [-] TransportDate:02/09/2004 Event Hits:6
  - [-] TransportDate:06/09/2004 Event Hits:6
  - [-] TransportDate:09/09/2004 Event Hits:6
  - [-] TransportDate:09/08/2004 Event Hits:6
  - [-] TransportDate:12/08/2004 Event Hits:6
  - [-] TransportDate:13/09/2004 Event Hits:6
  - [-] TransportDate:16/08/2004 Event Hits:6
  - [-] TransportDate:16/09/2004 Event Hits:6
  - [-] TransportDate:07/10/2004 Event Hits:8
  - [-] TransportDate:11/10/2004 Event Hits:6
  - [-] TransportDate:19/08/2004 Event Hits:12
  - [-] TransportDate:18/10/2004 Event Hits:6
  - [-] TransportDate:21/10/2004 Event Hits:6
  - [-] TransportDate:20/09/2004 Event Hits:6
  - [-] TransportDate:23/09/2004 Event Hits:6
  - [-] TransportDate:23/08/2004 Event Hits:6
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  - [-] TransportDate:30/08/2004 Event Hits:6

Date	Data Source	Status	From	To	QShipped	QReceived	Plate#	Prov
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30/09/2004	Received	Reconciled	60311	60313	131	131	G Z	MB
30/09/2004	Shipped	Reconciled	60312	60313	205	0	G Z	MB
30/09/2004	Received	Reconciled	60312	60313	205	205	G Z	MB
30/09/2004	Shipped	Reconciled	60329	60313	73	0	G Z	MB
30/09/2004	Received	Reconciled	60329	60313	73	73	G Z	MB
04/10/2004	Received	Reconciled	60311	60314	199	199	G Z	MB
04/10/2004	Shipped	Reconciled	60312	60314	123	0	G Z	MB
04/10/2004	Received	Reconciled	60312	60314	123	123	G Z	MB
04/10/2004	Shipped	Not Reconciled	60329	60314	92	0	G Z	MB
04/10/2004	Received	Not Reconciled	99999	60314	92	92	G Z	MB
02/09/2004	Received	Reconciled	60311	60315	153	153	G Z	MB
02/09/2004	Shipped	Reconciled	60312	60315	208	0	G Z	MB
02/09/2004	Received	Reconciled	60312	60315	208	208	G Z	MB
02/09/2004	Shipped	Reconciled	60329	60315	89	0	G Z	MB
02/09/2004	Received	Reconciled	60329	60315	89	89	G Z	MB
06/09/2004	Received	Reconciled	60311	60315	220	220	G Z	MB
06/09/2004	Shipped	Reconciled	60312	60315	110	0	G Z	MB
06/09/2004	Received	Reconciled	60312	60315	110	110	G Z	MB
06/09/2004	Shipped	Reconciled	60329	60315	88	0	G Z	MB
06/09/2004	Received	Reconciled	60329	60315	88	88	G Z	MB
09/09/2004	Received	Reconciled	60311	60315	151	151	G Z	MB
09/09/2004	Shipped	Reconciled	60312	60315	232	0	G Z	MB
09/09/2004	Received	Reconciled	60312	60315	232	232	G Z	MB
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09/08/2004	Received	Reconciled	60311	60314	226	226	G Z	MB
09/08/2004	Shipped	Reconciled	60312	60314	154	0	G Z	MB
09/08/2004	Received	Reconciled	60312	60314	154	154	G Z	MB
09/08/2004	Shipped	Reconciled	60329	60314	78	0	G Z	MB
09/08/2004	Received	Reconciled	60329	60314	78	78	G Z	MB