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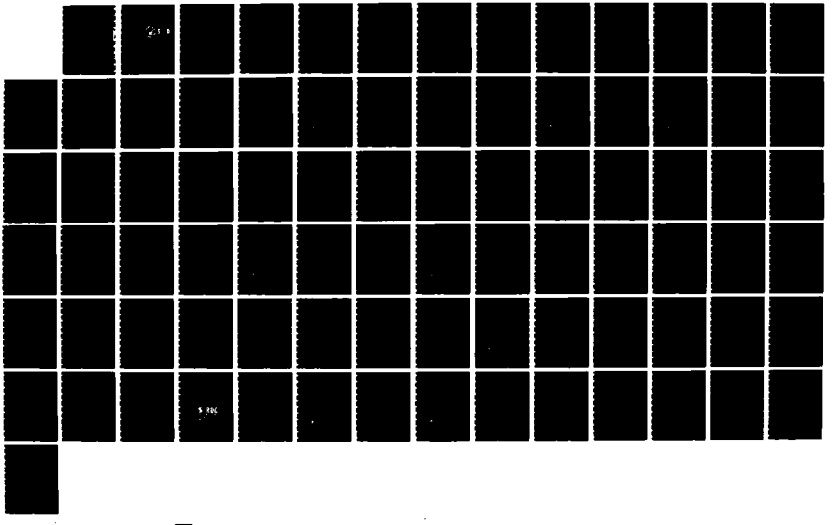

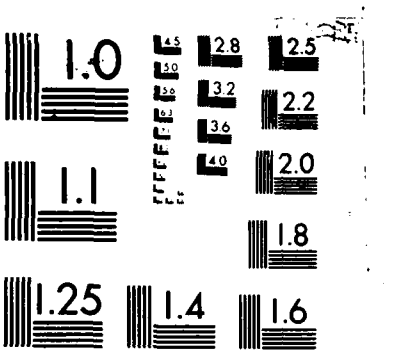

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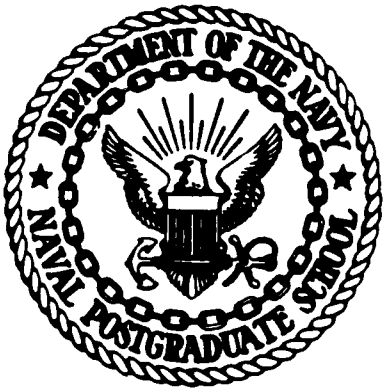

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THESIS

A SURVEY OF COMMERCIAL LOCAL DELIVERY SECURITY METHODS AND THEIR POTENTIAL FOR APPLICATION AT NSC SAN DIEGO, CALIFORNIA

by

William J. Fenzan

December 1986

Thesis Advisor Dan C. Boger

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In the light of recent emphasis on material accountability in the Navy's supply system, Naval Supply Centers (NSCs) need a method for evaluating commercial security practices and adapting them for use in the military environment. Local delivery is an especially vulnerable stage in the physical distribution process for both commercial and military activities. This study surveys three commercial local delivery operations. Private sector local delivery systems studied are described and security measures they use are discussed in the context of their total system. Their effectiveness at providing shipment integrity and minimal delivery delay is compared with similar measures of effectiveness calculated using Naval Supply Center, San Diego delivery statistics. Where greater comparative effectiveness is observed in commercial operations, recommendations for adapting commercial procedures to the Navy's system are offered.

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A Survey of Commercial Local Delivery Security Methods and their Potential for Application at NSC San Diego, California

by

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

In the light of recent emphasis on material accountability in the Navy's supply system, Naval Supply Centers (NSCs) need a method for evaluating commercial security practices and adapting them for use in the military environment. Local delivery is an especially vulnerable stage in the physical distribution process for both commercial and military activities. This study surveys three commercial local delivery operations. Private sector local delivery systems studied are described and security measures they use are discussed in the context of their total system. Their effectiveness at providing shipment integrity and minimal delivery delay is compared with similar measures of effectiveness calculated using Naval Supply Center, San Diego delivery statistics. Where greater comparative effectiveness is observed in commercial operations, recommendations for adapting commercial procedures to the Navy's system are offered.

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I. INTRODUCTION

Several studies have been made of local delivery system costs at Naval Supply Centers (NSCs), primarily to measure the effects of the Shore Establishment Realignment (SER) implemented in 1980. The SER program consolidated the management of wholesale material located at Naval Air Station (NAS) industrial facilities and stock account material at NSCs to provide economies in personnel, equipment, and material assets [Ref. 1: p. 10]. While studies by Orr, Flohr, and Eller and Moore [Refs. 1,2,3] provide a data base for determining the efficiency of local delivery procedures at NSC San Diego (NSCSD) with respect to total cost, security of local deliveries was not evaluated.

Recent strategic planning conferences held by Naval Supply Systems Command (NAVSUP) flag officers and key personnel as well as press reports of material theft from the supply system have underscored the need for results-oriented management. In the future, NAVSUP headquarters will be run like a business and will operate as a corporate entity by providing direction to field activities. This direction will cover three broad areas: material management, material accountability, and business management. [Ref. 4: p. 17]

In the area of material accountability, physical security of material issues is specifically addressed. Activities are recommended to "Increase/improve physical constraints and safeguards through continual upgrades to security aspects of facilities while enhancing material issue control and tracking techniques" [Ref. 5: p. 4]. Activities are also urged to expand knowledge of current threats through wide distribution of feedback data and to better balance operational requirements with material accountability and physical security concerns.

A. PURPOSE

The purpose of this thesis is to survey local delivery procedures used by commercial firms engaged in distribution of highly pilferable commodities and determine if effective commercial techniques can be adapted for use by NSCSD. Commercial firms delivering pilferable merchandise have a strong vested interest in keeping abreast of recent advances in security technology due to the presence of strong competitive forces in the marketplace.

Commercial procedures followed to ensure security of delivered material will be evaluated in relation to those of NSCSD to determine whether or not private sector operations are distributing their goods more effectively than the military. If better security methods are identified, recommendations will be made to improve NSCSD local delivery procedures. Since NSCSD is a field activity of NAVSUP, identification of threats to material security is in line with the strategic plan discussed above.

B. METHODOLOGY

Past Naval Postgraduate School (NPS) theses provided most of the background for this study. Additional information came from several articles in the *U.S. Navy Supply Corps Newsletter* and pertinent NSCSD publications/instructions.

A field trip was taken to NSCSD to familiarize the author with current local delivery procedures and security improvements. Data were collected for later analysis and comparison to similar data from commercial firms. Field trips were also made to three commercial local delivery operations near the Naval Postgraduate School to gather comparative data.

Interviews were conducted with local delivery system managers as an integral part of all field trips. These interviews and concurrent reference to working papers, schedules, and management data bases provided most of the raw data analyzed. Report of Discrepancy (ROD) data and Local Delivery Individual Production Report (LDIP) data were especially helpful in providing comparable statistics.

THESIS ORGANIZATION

This thesis is organized in five chapters. Chapter I provides a brief introduction to the thesis topic, discusses the purpose of the thesis, methodology used, and thesis organization. Chapter II describes the current local delivery procedures used at NSC San Diego and discusses security of government local deliveries made by NSCSD. The third chapter of this thesis surveys three commercial local delivery operations. Both delivery procedures and security measures of these systems are described. Local Delivery system effectiveness at NSCSD is analysed in Chapter IV and compared to effectivness of Commercial systems. Finally, Chapter V presents conclusions and recommendations.

II. LOCAL DELIVERY PROCEDURES AT NSC SAN DIEGO

A. BACKGROUND

The Naval Supply Center, San Diego is a major stock point for material on the West Coast. NSCSD operates five major distribution centers in southern California to meet requirements generated by customers afloat and ashore. These distribution centers are:

1) *Broadway Complex*--Administrative headquarters for all NSCSD operations. A warehousing site for all frozen and chill provisions, some non-aviation binnable material, and some bulk material. California Ice (Cal Ice), a commercial firm under contract to store fresh fruit and vegetables (FFV), is located approximately one and a half miles southeast of the Broadway complex.

2) *National City Annex (NCA)*--Primarily a fleet service distribution center. The consolidation point for bulk and general stores (GSK) material enroute to ships. Warehousing site for dry and non-perishable provisions. Navy Integrated Storage, Tracking, and Retrieval System (NISTARS) warehouses are located at NCA.

3) *North Island Annex*--Provides warehousing for virtually all aviation items supporting the Naval Air Station (NAS) and Naval Air Rework Facility (NARF) on North Island.

4) *Point Loma Annex*--A supply and distribution point for bulk petroleum products. Also, berthing site for submarines and their tenders. Each tender has a small receiving shed in the pier area.

5) *Long Beach Annex*--A warehouse site for materials stored for the Long Beach Naval Shipyard (LBNSY) and Long Beach Naval Station. It also serves as a central receiving and distribution site for fleet support material enroute from the Broadway complex and NCA.

Since the Broadway complex and NCA are located centrally in the NSCSD physical distribution system, this thesis will discuss only security of their local deliveries. The other three major distribution centers deal in a specialty support role and so have very different security-related considerations.

Presently, NCA functions as the central hub of the NSC local delivery system. The Broadway complex, which previously functioned as a distribution center, is now only a limited storage site for NSC material. All local delivery administrative personnel have relocated to offices at NCA where dispatch and consolidation are also accomplished. Many buildings that were part of the supply center in the Broadway complex are now occupied by tenant commands. Eventually, all of the Broadway complex administration offices and warehouses will be relocated at NCA then Broadway facilities will be turned over to the City of San Diego for commercial development [Ref. 1: p. 18].

B. DELIVERY PROCEDURES

To describe the NSCSD local delivery system simply, material delivered is grouped into six classes:

1) *Bulk*--material too large to be stored on standard 40 by 48 inch pallets.
2) *General Stores Material* (*GSK*)--items stored on pallet racks and in bins.
3) *Provisions*--dry stores, fresh fruit and vegetables (FFV), and items requiring refrigerated storage.
4) *Repairables*--high cost end items returned to the supply system for repair if damaged or worn out.
5) *Hazardous*--materials requiring certification for transport over public rights-of-way.
6) *Special*--pilferable commodities, such as clothing, not in other categories.

Storage of these commodities at NSCSD is determined by customer demand--fleet issue material is generally warehoused at NCA, while both fleet issue and shore station items are stored at the Broadway complex. In general, both bulk and bin material is stored at NCA while Broadway warehouses have been emptied of bulk materials in anticipation of the final relocation to NCA warehouses.

Storage location is also affected by the growing capacity of the Navy Integrated Storage, Tracking, and Retrieval System (NISTARS) warehouses located at NCA. As they have been completed, material has been moved from the older Broadway complex warehouses to NISTARS facilities[1] at NCA. Although all NISTARS construction has been completed, the complementary Navy Automated Transportation Documents System (NAVADS) software is not yet available to handle NISTARS system issues. Present plans project completion of NISTARS/NAVADS integration by July 1987. When the NISTARS/NAVADS system is completed, local delivery procedures are expected to change. Greatly improved security is expected for pallet-sized loads which will be packed in triwalls, shrink-wrapped, and better documented.

Table 1 shows the current primary storage sites for the six major classes described above. Numbers in the columns refer to assigned warehouse numbers at the two locations indicated. Placement of numbered warehouses within the Broadway complex and NCA is shown in Figures 2.1 and 2.2. Shading around building borders indicates NSCSD control. Other buildings either provide a support function or house separate tenant commands. Shaded buildings not listed in Table 1 either perform an overflow storage function or are not currently being used for material storage.

---

[1]NISTARS warehouses at NCA are buildings 3302, 3304, and P-035.

TABLE 1
NSCSD COMMODITY STORAGE SITES

	Main Storage Location(s)	
Commodity	*Broadway*	*NCA*
Bulk	none	64/69
GSK		
a) pallet rack items	12/125	69/70
b) bin items	12/125	3304
Provisions		
a) freeze/chill	7	none
b) FFV	Cal Ice	none
c) dry stores	none	66
Repairables	12	70/322
Hazardous	none	P-035
Special	125	3302/66 63/322

Material is distributed within the Broadway complex and NCA using forklifts and straddle trucks after being palletized. Forklifts carry only one pallet. They are most effective for short trips between warehouses. Due to their limited hauling capacity, they are rarely used to deliver material outside the NSCSD perimeter.

Straddle trucks are the primary delivery vehicle for fleet material. They can transport up to seven pallet loads, self load and unload, and travel relatively fast. Straddle trucks operate well moving palletized material between warehouses and from the fleet consolidation area in building 3304A at NCA to Naval Station piers. They are prohibited, however, from operating on public highways.

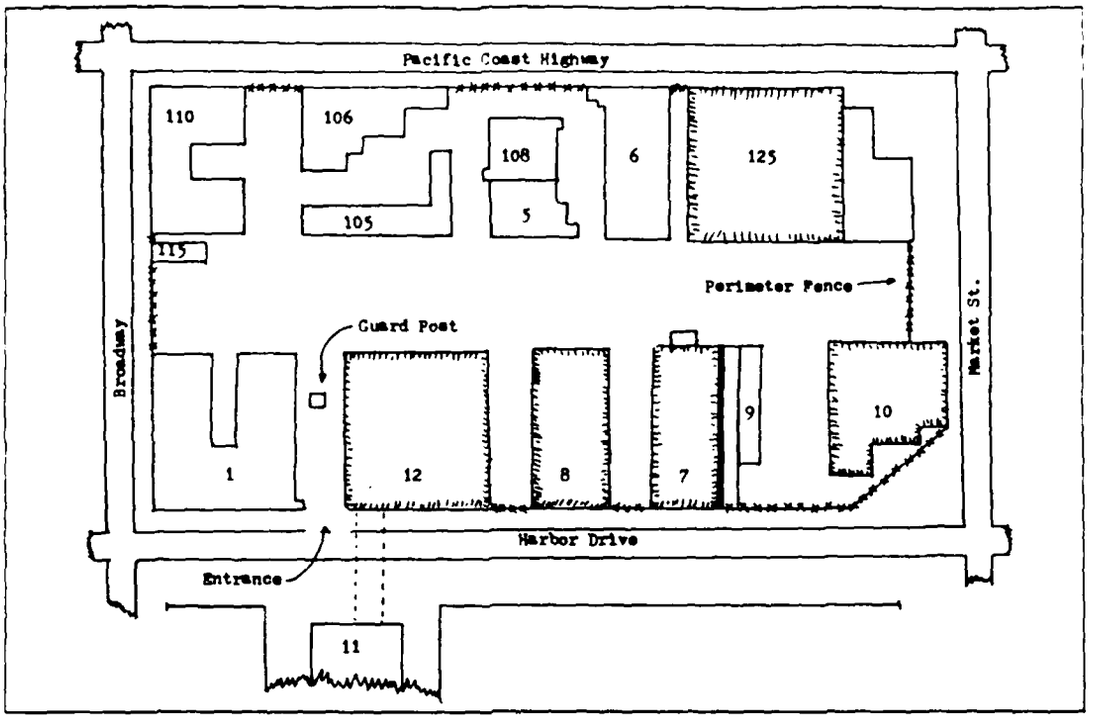

Figure 2.1 The NSCSD Broadway Complex.

A Bulk Materials Handling System (BMHS) transporter discussed in earlier theses is no longer used to make inter-warehouse distributions of palletized unit loads between buildings 12 and 11 at the Broadway complex since building 11 is no longer used to store material. Movement of bulk materials from Broadway to NCA relieved NSCSD of the need to maintain the aging BMHS transporter system. It now functions as a pallet staging platform on the building 12 receiving dock. All inter-warehouse transfers at the Broadway complex are made with straddle trucks.

Handling cargo enroute to piers a *second time* at the NCA consolidation point in building 3304A poses some risk to physical security of issues. Figure 2.3 shows the present configuration of this consolidation area. Areas within building 3304A where material is consolidated are divided into customer sorting bays. Each of these bays is identified by a numbered, movable wall sign. The security cage in this holding area has been identified as inadequate during several inspections. A larger, improved cage is presently planned for the area, although the actual start date for construction has not been promulgated. Restricted entry to the NCA compound by the use of an access list is reported to be effective in keeping out unauthorized visitors and protecting material.

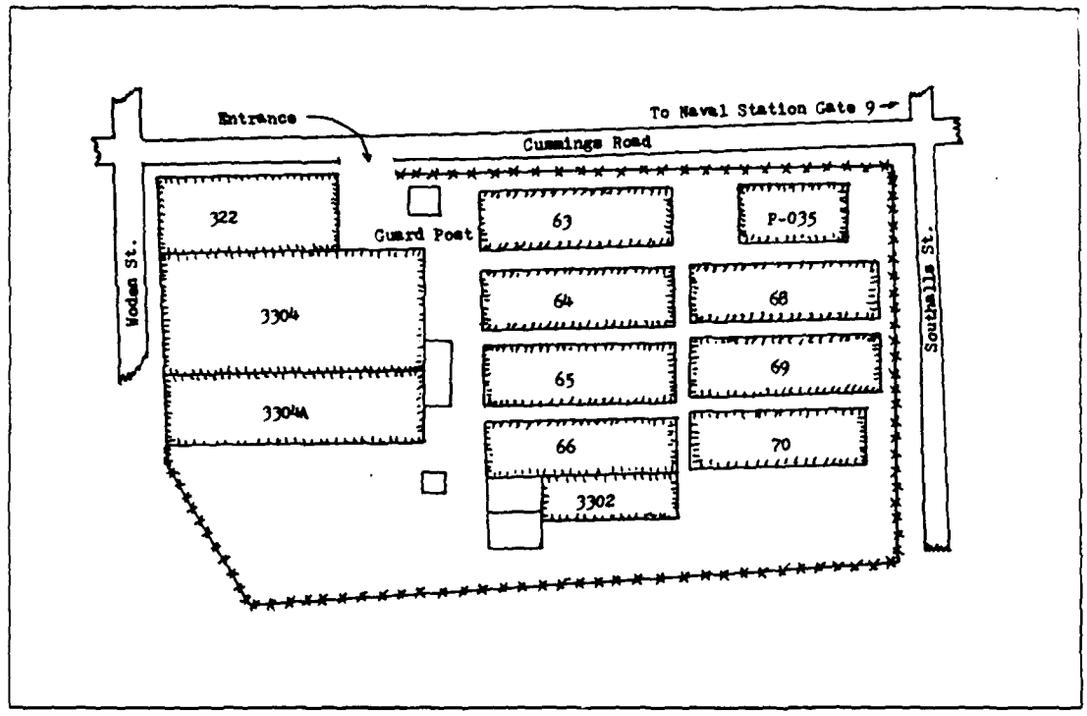

Figure 2.2 National City Annex (NCA) Storage Sites.

Deliveries are made between the Broadway complex and NCA by motor carrier so they can be consolidated at building 3304A. Off-station customers are serviced either by organic means or commercial carrier. Prior to May 1979, NSCSD used its own equipment to perform all local delivery. A NAVSUP Inspector General report, however, documented a material loss and poor response time problem. It was determined that ceiling point constraints prevented NSCSD from employing an adequate number of trucks and trailers.

To solve the problem, NAVSUP granted approval to use commercial drayage as a supplement to NSCSD assets [Ref. 1: p. 25]. NSC operated vehicles make most off-station deliveries to non-fleet type local customers. Although equipment is rented through the Public Works Center (PWC), it is fully operated by NSC personnel. A significant advantage to use of PWC equipment is that NSCSD does not have to perform repairs. Routine preventive maintenance, however, is required of and performed by NSCSD personnel. Table 2 presents a summary of local delivery motor carriers used by NSCSD to perform local delivery. Today, up to seven commercial

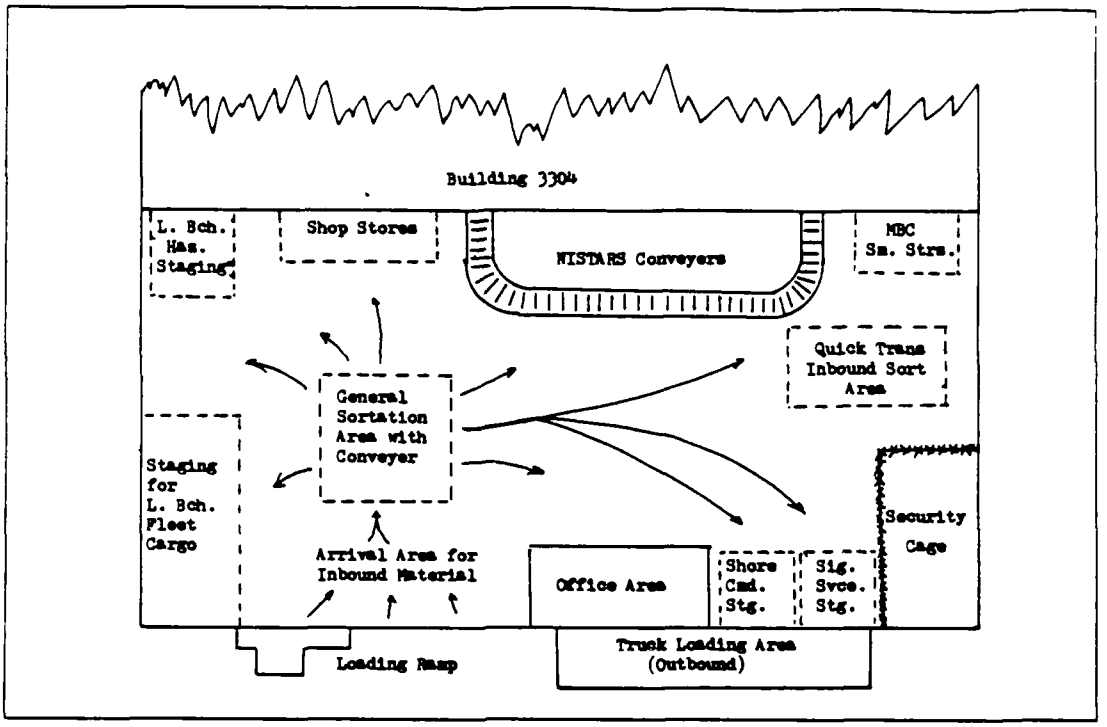

Figure 2.3 Building 3304A Consolidation Area.

vehicles are contracted for daily by NSCSD. As many as five of these trucks augment NSC vehicles making local off-station deliveries within a radius of 100 miles[2] from the consolidation area at NCA.

Dispatching of trucks starts early. Morning shift workers arriving at 3:00 am pre-load trucks for delivery and stage material for the day shift while foremen advise the dispatcher of ready to move unit loads. Deliveries by straddle trucks to the fleet piers are made between 3:00 am and 5:00 am daily, when they are likely to meet very little traffic congestion. Deliveries are scheduled for shore activities during normal working hours for the activity to ensure timely offload and prompt stowage at the customer's site.

The dispatcher at the National City Annex controls movement of vehicles using a radio net. Drivers report departure and trip completion using vehicle mounted or hand held radios. Each driver records this information on a Local Delivery Individual Production (LDIP) report form.

[2]Past NPS theses have used a 100 mile radius to define *local* delivery.

TABLE 2
LOCAL DELIVERY VEHICLES

Vehicle Type	*Qty*	*Commodity*
NSC Operated		
--Pickup truck, ½ ton	8	Urgent GSK
		Special (1)
--Stake truck, 2 ½ ton	1	Urgent GSK
7 ½ ton	1	Repairables
--Van, 5 ton	2	Urgent GSK
2 ½ ton	1	Special (1)
--Van, 2 ½ ton, refrigerated	1	Urgent FFV
		Freeze & Chill
--Tractor, 5 ton	1	
7 ½ ton	14	
10 ton	11	
15 ton	1	
--Van, 32 ft.	8	Dry Provisions
35 ft.	4	" "
40 ft.	3	" "
--Trailer, 40 ft., flatbed	20	GSK
--Trailer, 35 ft., lowboy	1	Bulk
55 ft., "	1	"
Commercial Hire		
--Stake Truck, 2 ½ ton	2	Urgent GSK
--Tractor/trailer, 42 ft.	5	GSK
Owned by NSCSD		
--Straddle truck	8	GSK

Note (1): Special items include repairables, signature service deliveries, and classified material.

Delivery schedules are designed to restrict hold time for material to within the Uniform Material Movement and Issue Priority System (UMMIPS) standards. Special consideration is given to afloat and air station customers. This policy is in accordance with NAVSUP emphasis on "Service to the Fleet." [Ref. 1: p. 38].

Customers for the NSCSD local delivery system are scattered around the Naval Station/National City Annex hub. Figure 2.4 shows the location of principal local delivery customers. Within a radius of 100 miles of the NCA are approximately 350 supported commands. About one half of these (188) are shore activities either receiving support directly or indirectly through a larger command [Ref. 2: p. 57].

The physical flow of material from the NCA hub follows several distinct routings to minimize trips scheduled. Although the zone delivery concept mentioned in earlier NPS theses is no longer used, current routings are still based primarily on geographic considerations. Briefly stated, major routings for local deliveries are:

- *Broadway to NCA shuttle*--Dedicated trucks move material from Broadway complex warehouses to the NCA consolidation point. Material can also return to Broadway from NCA on this routing.
- *NCA to Long Beach shuttle*--Dedicated trucks move material twice daily to Long Beach for local distribution to both fleet and shore customers there (actually 125 miles from NSCSD-not considered part of local delivery for this thesis).
- *NCA to Camp Pendleton*--Dedicated truck deliveries are made twice a week. Camp Pendleton, located 38 miles northwest of the Broadway complex, is outside the area covered by Figure 2.4 Sealed vans are used to make these trips under Government Bill of Lading (GBL) documentation on a per trip basis.
- *NCA to Point Loma*--Deliveries are made to the Marine Corps Recruit Depot (MCRD), the Naval Training Center (NTC), and Point Loma on a Point Loma run. Both Shore and fleet customers are located on Point Loma.
- *NCA to North Island*--The Naval Amphibious Base, the Naval Air Station (NAS), and fleet units berthed at NAS North Island receive material on trucks going to North Island.
- *NCA to the Naval Air Station (NAS) Miramar*--Dedicated trucks deliver material to NAS Miramar at 7:30 am each morning. Deliveries are made at a specific time to ensure a full crew of workers is available to promptly offload trucks.
- *NCA to the Naval Regional Medical Center (NRMC)*--Dedicated trucks deliver materials to the NRMC as necessary to ensure prompt service.
- *NCA to the Defense Property Disposal Office, Imperial Beach*--Material delivered to the DPDO is generally for turn-in rather than use. Therefore, this is not a normal regular local delivery routing.
- *NCA to Naval Station Piers*--Deliveries are made by straddle truck to pier areas early in the morning.

Other deliveries are made using routings different from those listed above on an as needed basis. An example of this type of delivery is the dispatch of provisions from Cal Ice to ships. The highly perishable nature of this type of cargo as well as the constant

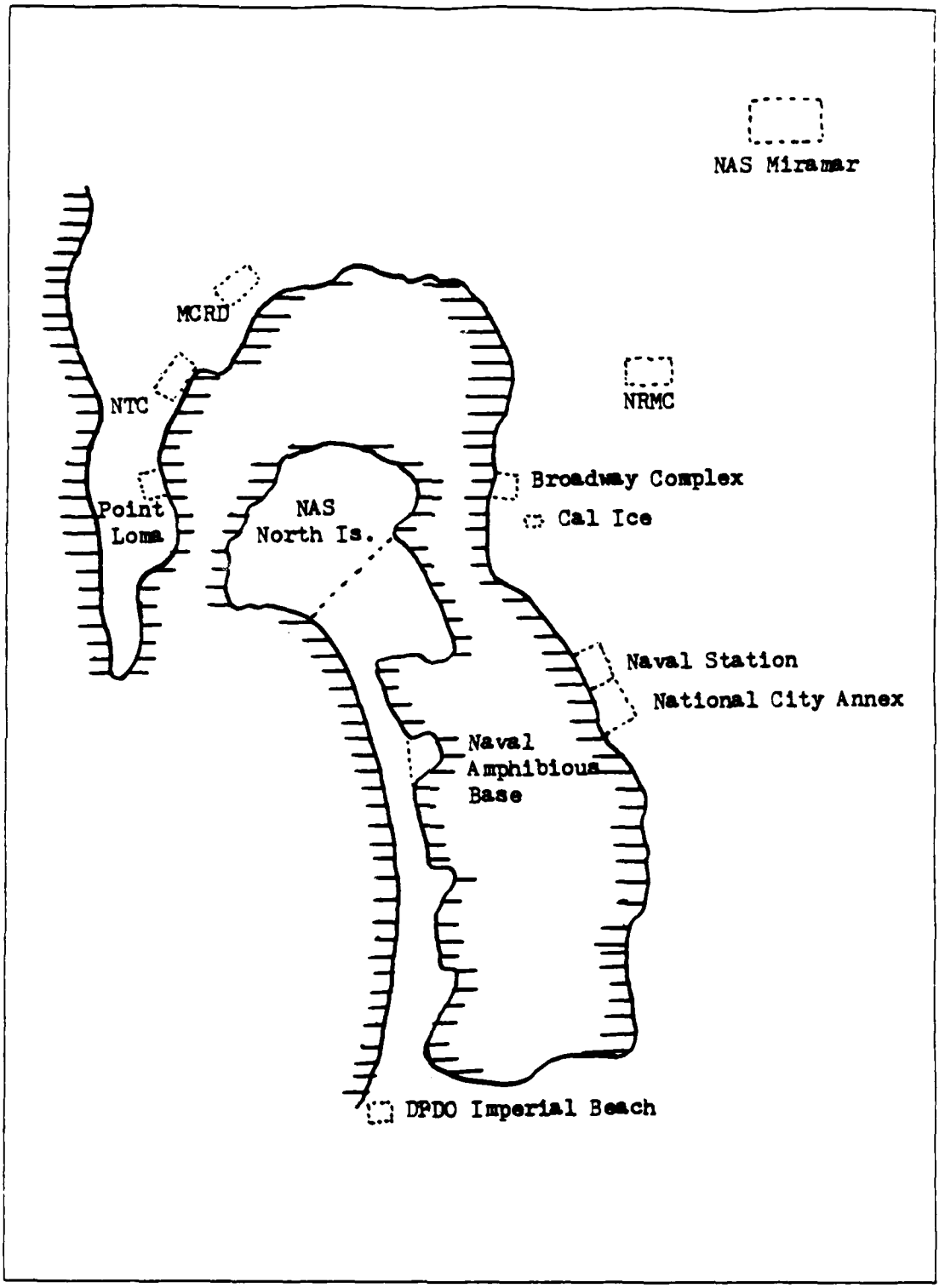

Figure 2.4 NSCSD Local Customer Distribution.

shifting of ships receiving provisions precludes establishment of consistent routes. Urgently needed material is also dispatched on a requirements basis.

The number of afloat activities served by the NSCSD local delivery system varies widely. Most fleet customers are berthed at Naval Station piers, at the North Island Annex, or at fuel piers on Point Loma. Ships are rarely moored at outer buoys in the harbor. However, when they are, and local deliveries are required, they are made by barges arranged through NSCSD customer services department [Ref. 6: p. 3-4].

C. SECURITY OF THE NSCSD LOCAL DELIVERY SYSTEM

Security of material issued by NSCSD can be seen as a combination of four factors contributing to the safe delivery of line items to customers [Ref. 7: p. 3]. These factors are:

1) *Physical security*--determined by how access to materials is controlled.
2) *Procedural security*--measured by adequacy of policies and rules safeguarding cargo.
3) *Technological security*--defined as use of state-of-the-art techniques to improve security.
4) *Personnel security*--established by the quality of the people involved in maintaining security.

Although the most obvious of these factors, physical security, is stressed in the new NAVSUP strategic plan, all factors play an important role in the security of issued items.

Physical security of NSCSD is presently very good. About six months ago work was completed on a construction project that fenced in the perimeter of both the Broadway complex and the warehouse area at NCA. Figures 2.1 and 2.2 show the location of these barriers. Guard service is provided on a 24 hour basis at entry points to both storage areas.

Bulk commodities are afforded physical security mostly by their nature. Large, heavy bulk items must be transported by motor carrier or rail out of NSCSD storage areas. Gate guards require a property pass for items that are obviously not personal property and when the driver is not an NSCSD employee making a delivery. This is an effective physical deterrent to theft of bulk materials.

GSK items are more vulnerable to pilferage than any other commodity. Entry restrictions, badge requirements, and alert employees are counted on to control access to GSK storage areas in the warehouse compound. Only personnel on an access list can approach the storage and consolidation areas. Employees working in the

warehouse area have plastic laminated badges. Visitors are also issued plastic identification badges after gate clearance. GSK material in warehouses is, therefore, considered very secure.

In transit, GSK generally travels by flatbed trailer. Vans are not used because most NSCSD customers do not have loading docks needed to offload enclosed vans. Side access to pallets provided by flatbed trailers also enables receiving personnel to offload faster. A request submitted by local delivery management to purchase Hesse enclosed trailers designed to improve intransit security of palletized cargo was not acted on due to the high cost ($30,000) of the equipment. These Hesse trailers provide the same handling advantages as presently used flatbed trailers along with the ability to enclose the entire shipment using slide down doors similar to those used on canned drink delivery trucks. [Ref. 8]

Probably the most likely time for a breach in physical security of GSK items is after they are delivered pierside for later pickup by fleet customers in the early morning. Material delivered to piers is protected by a duty watchstander screening traffic and a vehicle barrier at the head of each pier. Although these security precautions are designed primarily to counter terrorist attacks, they have some deterrent value for stores pilferage as well.

Locked pallet cages used three years ago to safeguard pilferable items delivered to the pier [Ref. 1: p. 28] are no longer being used. This security measure was stopped for several reasons. First, the cages are expensive. Second, they were extremely prone to damage and deterioration. Third, NSCSD experienced something like a 75% loss rate on these cages. Finally, use of cages delayed delivery time significantly when the person with the key could not be found in a timely manner. [Ref. 8]

Although most GSK delivered to shore activities is sent on flatbed trailers, it is probably more physically secure than material sent to ships. GSK going to shore customers is consolidated at NCA building 3304A then sent directly to customers during normal working hours. Some activities, such as Camp Pendleton, have a firm and regular receiving time to further cut time material is exposed to view before storage. Material sent to shore activities is also less vulnerable to pilferage at its final destination since larger quantities delivered at shore commands are generally stowed by Material Handling Equipment (MHE) rather than working parties.

Physical security of provisions is given less attention than other commodities due to the relatively low value of individual items. Also, all provisions deliveries are

manifested providing NSC managers better visibility over individual shipments than they have over GSK material. The perishable nature of provisions further helps to speed stowage at the receiving site.

Repairables, hazardous materials, group 1 issues, and special commodities are given the highest level of physical security. Special commodities such as retail clothing, controlled equipage, and classified/controlled materials are kept in locked, access restricted storerooms. Signature service is required for deliveries of this type of material. All signature service deliveries are made using small, enclosed vans which afford the items better protection than open flatbed trailers delivering general GSK shipments. When this material is delivered, signature control hand to hand is required. Largely because of these extreme precautions, physical security of these high value highly sensitive items is considered excellent if procedures are followed.

Procedural security involves controls built into the local delivery system to ensure issued material reaches the customer. At the warehouses, this means inventory accuracy must be attained. Following a special effort resulting from a Secretary of the Navy (SECNAV) tasking in 1982, NSCSD has improved its warehouse inventory accuracy dramatically. Location accuracy in warehouses has risen to 97.5% in Fiscal Year (FY) 1984 from a base of 92.0% in FY 1982 [Ref. 9: p. 21]. A quality assurance reporting system which provides performance statistics down to the individual worker is the procedure used to reach a location accuracy above the 97% NAVSUP standard. Recent quality assurance statistics show continued high level of accuracy.

Despite the enviable improvements made in procedural security of material in warehouses, little has been done to improve procedural aspects of local delivery. Some problems noted by past NPS theses are still present. These are:

- Double handling of local delivery material due to the dispersion of physical facilities. Occasionally, material issued from Broadway complex warehouses is sent to NCA building 3304A as an issue then returned to a tenant command in the Broadway complex the next day. When the Broadway complex is turned over to the city of San Diego, this problem should be eliminated.
- Data collection procedures are not sufficiently finite to provide management information needed to maximize efficiency. Pallets loaded on trucks may fully utilize the available cube or may not depending on the estimation of the driver. Driver estimates are spot checked by managers visually.

Of the points raised, perhaps the greatest threat to security is represented by the second. This procedure allows drivers to adjust for partial pallet loads on the LDIP report form by converting an actual pallet count to measurement tons then to a standard pallet count. Drivers not spot checked could adjust pallet loads to cover shortages since they provide the only record of pallets delivered.

Feedback to NSCSD managers on the performance of the local delivery system is also provided by the Report of Discrepancy (ROD), Standard Form 364, which records customer complaints. These reports and the feedback they generate will be described in Chapter Four along with data trends on performance of the NSCSD local delivery system.

Technological security improvements are strongly linked to the full utilization of the NISTARS/NAVADS program. On full implementation, NISTARS will be capable of tracking material from time of receipt to time of issue while NAVADS will improve speed and accuracy of documentation and cause the generation of local delivery manifests. Also, bin items issued by the NISTARS system will be consolidated by customer, and shrink wrapped prior to delivery on the truck dock. This will cut the number of shipments necessary and greatly reduce vulnerability of material to pilferage.

Other state-of-the-art security inovations being tested and implemented at NSCSD are:

- the Fleet On-Line Inquiry and Requisitioning System which allows large ships access to the NSCSD data base for read only follow up data and requisition submittal [Ref. 10: p. 14].
- the Advanced Traceability and Control (ATAC) system which allows better visibility over repairables through information processing at central hubs. A hub is currently being established at NSCSD [Ref. 11: p. 16].
- the Prototype Issue/Receipt Data Form--Bar coded documents produced on a Xerox 9700 laser printer are used to provide management with 100% proof of shipment data for all group 1 issues. Procedures may be extended to provide fuller traceability for all issues at smaller Supply Centers. [Ref. 12: p. 13].

Personnel security concerns the people involved in local delivery at NSCSD. As stated earlier, all drivers are NSCSD employees hired through the local civilian personnel office. Warehouse workers and drivers employed are in civil service wage grades five to eight. Employee integrity and commitment to security are determined by quality assurance reporting and appraisal by the worker's supervisor. When a new employee reports for work, they are required to attend eight hours of basic instruction on warehouse procedures. An additional forty hours of safety and security instruction is also mandatory. The fact that five times as much instruction is devoted to safety and security than to basic job environment orientation indicates the high degree of importance NSCSD management places on its personnel security program.

III. COMMERCIAL LOCAL DELIVERY PROCEDURES

A. INTRODUCTION

In this chapter, three commercial local delivery operations will be briefly described. A discussion of the flow of material from central warehouses to outlying stores will be followed by a description of basic security measures used by each system to ensure safe shipment delivery. Differences and similarities between commercial operations and NSCSD delivery procedures will be commented on throughout the chapter where necessary to better explain or clarify important points.

The most significant *general* differences between commercial local delivery operations studied and the NSCSD operation are:

- *Range of products distributed*--NSCSD delivers a much wider range of items than commercial businesses. Bulk items, such as ship propellers, are shipped frequently to local customers by NSCSD. Commercial firms are much more specialized. Bulk materials, for example, are never shipped locally by the three companies surveyed.
- *Centralization of the distribution hub*--The location of NSCSD is firmly fixed. Changes in the distribution of customers have less effect on the location of the NSCSD facilities than they do for commercial companies. Commercial firms leasing warehouse space are better able than NSCSD to shift their distribution hub if needed.
- *Size of the distribution center*--Due to its much wider scope of operations, NSCSD has the need to operate several specialized distribution centers in the San Diego area. Taken together, these specialized centers cover a larger area and contain more facilities, equipment, and personnel than most commercial local delivery operations. Also, the volume of shipments made per month from NSCSD exceeds that of any of the three commercial firms studied.
- *Local delivery area*--Commercial firms' stores are generally distributed over a larger geographic area. While NSCSD local delivery customers are primarily along the coast, commercial stores are more evenly distributed.
- *Customer discrimination*--The Navy policy of "service to the fleet" creates a special class of customer for NSCSD. This policy requires the highest standards of local delivery service be provided to ships. Shore commands are placed in a different category of service due to their greater accessability. Commercial local delivery operations have more uniform service standards since all of their stores are given the same level of service.
- *Shipment documentation*--Commercial firms surveyed have better visibility over individual shipments than NSCSD. While NSCSD uses more documentation on shipments, collects more data, and produces more management reports data summaries than commercial firms, the sheer volume of information collected reduces visibility over individual shipments. Also, active shipment data is retained for use longer by NSCSD than in commercial local delivery systems.

These fundamental differences in operation are barriers to simple, direct comparison of commercial to NSCSD local delivery operations. No commercial local delivery system can compare directly in all respects to the NSCSD system primarily due to the reasons summarized above.

Despite these differences, however, there are also similarities in commercial local delivery procedures that offer opportunities for the exchange of security improvement ideas that could enhance both the commercial operations studied and NSCSD local delivery. Some basic similarities between commercial local delivery operations studied and NSCSD are:

- *Storage methods*--Both commercial operations studied and NSCSD use 40 by 48 inch hardwood pallets and nearly identical pallet racks to store GSK type pilferable items. Separate commodities are segregated in different warehouses or designated sections of a single warehouse.
- *Use of a single hub*--Both the commercial local delivery systems studied and NSCSD use a single distribution center to the maximum extent possible. NSCSD has made significant progress in centralizing their distribution of GSK type issues to a central hub at NCA. This closely approximates what commercial businesses try to do to improve local delivery to stores.
- *Use of non-automated warehouse procedures*--Although NISTARS NAVADS is scheduled to be fully operational in about a year, both NSCSD and the commercial firms studied use people, non-automated materials handling equipment, and paper documentation when picking, sorting, and consolidating local delivery trailer shipments.
- *Motor carriers*--Both NSCSD and the businesses surveyed use tractor trailer motor carriers to deliver local shipments. Although one commercial distribution center has rail spurs available, rail is only used for delivery of incoming shipments.
- *Independence of customers*--Commercial firms studied generally ship to individual stores. Store managers are responsible for control of inventory received in much the same way as commanding officers are responsible for material they receive from the Navy supply system via NSCSD.[3]

These similarities in local delivery of GSK type material form a basis for comparing local delivery systems. This chapter will provide information comparable to that in Chapter II for both local delivery procedures and security measures used by commercial local delivery systems.

Three commercial systems are discussed. First, a large volume local delivery system used by Safeway Stores, Inc. to distribute grocery items such as dry provisions, general use consumables, and low value specialty items to its stores is described. Next, a Safeway subsidiary operation for high value items is presented that covers the distribution of beverages and sundry items to Liquor Barn Stores. A system used by Long's Drug Stores that hires other firms to perform local delivery is also presented for comparison. Finally, a short section summarizes security procedures commercial firms use that are possibly applicable at NSC San Diego.

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[3]One important *difference*, though, in the two systems is that store managers receive direct financial credit for valid shortages while credits provided for shortages in shipment to Navy commands are sent to the command's immediate superior who *may* apply it to the account of the short-shipped command.

B. SAFEWAY STORES

Safeway Stores Inc., referred to as Safeway, operates the largest food retailing business in the world. They operate more than 2,500 stores worldwide. Of these, nearly 600 are operated in the United Kingdom, Canada, West Germany, and Australia. Total company sales in 1983 were $18.6 billion with earnings of $183.3 million. The earnings were 14.8% ahead of the 1982 results and came on top of a 47% improvement in 1982 over 1981. During the period 1978-1981, though, net income had plummeted 32%. [Ref. 13: pp. 40-42]

Much of the credit for the post-1980 improvement is attributed to Peter McGowan, Safeway's Chief Executive Officer (CEO). When Mr. McGowan became CEO in 1980, he was instrumental in encouraging the company to experiment more in order to recapture market share from growing regional grocery chains. This experimentation primarily involved merchandising a wider variety of non-food items in Safeway's grocery stores and developing free standing specialty shop operations. An example of one of these specialty shop operations is the Liquor Barn chain discussed in the third section of this chapter. [Ref. 13: p. 42]

This growth into non-food items has created a need for stronger local delivery security measures than the company had in place before its expansion. Most of these new measures safeguard higher value merchandise distributed to stores from a warehouse in Fremont, California. These newer measures will be discussed in the section on the Liquor Barn operation after the basic Safeway local delivery system and its security methods are described.

1. Delivery Procedures

For the comparative purposes of this thesis, delivery procedures of only one of Safeway's divisions will be described. The Northern California division contains approximately 250 stores located in California, Hawaii, and part of Nevada. The division was formed in June 1986 when the smaller Sacramento division merged with Safeway's San Francisco division [Ref. 14]. It is interesting to note that the new Northern California division is trying to centralize its delivery system by phasing out the old central hub of the Sacramento division, a warehouse leased from a company called Transco in Sacramento, California. NSCSD is essentially trying to do the same thing in its phaseout of the Broadway complex in downtown San Diego. The central hub of the new Northern California division is the old hub of the San Francisco division, a warehouse complex in Richmond, California.

A summary of the principal distribution centers of the Northern California division is provided below to give some idea of the scope of its operations. Major facilities are:

1) *Richmond Distribution Center (RDC)*--functions as the central hub of the local delivery system for low value sundries, meat, frozen foods, miscellaneous dairy related products, produce, and grocery items.

2) *Fremont Variety Warehouse*--stocks high value sundries such as film, cigarettes, and appliances. Also, liquor and associated merchandise are stocked here for both Safeway stores and Liquor Barns. Fremont Variety is located next to the Safeway division headquarters.

3) *The San Leandro Milk Plant*--prepares milk for direct distribution to stores. Dispatching is separate from both RDC and Fremont Variety operations.

4) *Oakland Ice*--prepares and ships ice cream products and bagged ice as a separate operation.

5) *Bakery Division*--delivers bakery products to stores. Separate drivers from a different union local drive delivery trucks for the bakery operation.

Non-alcoholic beverage production is conducted at a bottling plant near the RDC facility. Soft drinks are consolidated, though, at the grocery warehouse in the RDC compound with pallets of dry stores for delivery rather than travelling direct from a production facility to stores as is the case with milk, ice cream, and bakery products.

Table 3 presents the Safeway storage sites for major categories of commodities distributed to stores. The format for this table is similar to that for Table 1 from Chapter II so that a comparison can be made between the Safeway operation and the range of NSCSD storage sites. Relative location of these sites is shown later. Figure 3.1 provides a layout diagram of the RDC showing the location of major commodity storage warehouses. The flow path of material through the grocery warehouse is shown with dotted arrows. Truck flow through the complex is indicated with solid arrows.

Material is distributed within warehouses by electric tow motors and forklifts. Forklifts are used to move full pallets onto pallet racks and between rack locations. Tow motors are used by employees building pallets for outbound shipment. These employees are called selectors.

Selectors pick merchandise from pallets in the warehouse racks using a computer-generated store invoice to guide their selections for each pallet built. This invoice lists an item code and standard name for each item to be selected, the quantity requested and warehouse pallet rack locations. Each computerized invoice prints out orders by store with a weight and cube calculated for each store shipment. The computer also calculates the number of pallets required to fill each order. [Ref. 14]

TABLE 3
SAFEWAY COMMODITY STORAGE SITES

Commodity	*Main Storage Location*
GSK	
a) pallet rack items (low value)	Richmond
(high value)	Fremont
b) bin items	Fremont
Provisions	
a) freeze/chill (meat, frozen foods, etc.)	Richmond
(ice cream)	Oakland Ice
(milk products)	San Leandro
b) FFV (produce)	Richmond
c) dry stores (grocery)	Richmond
(bakery)	Richmond

Store orders are picked starting with the heaviest items first. To facilitate the selector's work, pallets storing the heaviest items are all stored at one side of the warehouse. Selectors start picking their pallet at this side. As the selector works his way toward the other side of the warehouse, items become lighter. This storage system ensures pallets are built with the heaviest items on the bottom and lighter items on top reducing the potential for intransit damage to relatively fragile, lighter merchandise.

Once pallets are made up, they are staged for loading aboard trailers. Employees called loaders check the contents of each pallet in the staging area and fill out pallet identification tags. Pallet identification tags are color coded by commodity and show destination and pallet weight. Any shortages noted by loaders in the item count on the pallet compared to the computer-generated invoice are annotated on the invoice and reconciled immediately with the assistance of a floor supervisor. Loaders then compile a trailer loading slip from data on pallet tags. Shipments for individual stores are segregated as much as possible and loaders generally try to minimize split shipments.

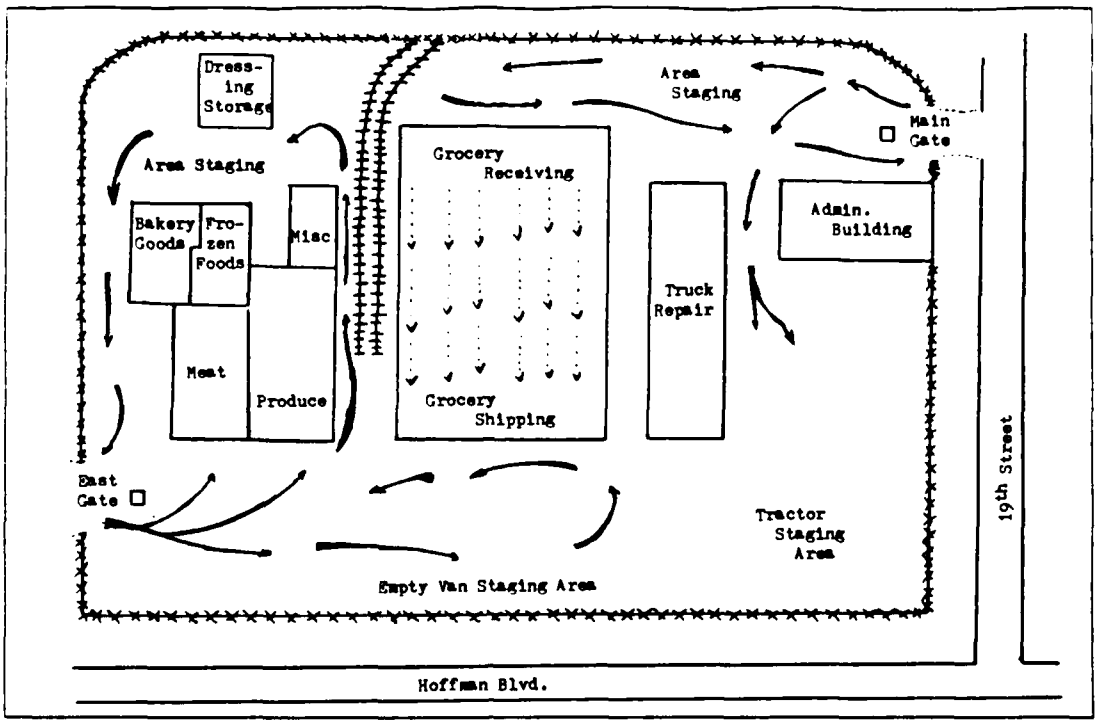


Figure 3.1 Safeway's Richmond Distribution Center.

As a trailer is loaded, pallet tags are pulled from pallets and attached to the trailer loading slip. Then, the completed trailer loading slip with pallet tags attached and store invoices are taken to the dispatch office. There all this paperwork is placed in an envelope. On the outside of the envelope are listed the stores where the trailer is going, whether the trailer contains a split load or full load, and the total number of pallets on the trailer. In the case of a split shipment, a load tag is attached to the envelope listing the stores receiving merchandise and the number of pallets loaded for each store.

Loading occurs around the clock at the Richmond facility. Trailers with shipments for the farthest stores are stuffed between midnight and 3:00 am for a 4:00 am dispatch. At 5:00 am all bakery products are dispatched. Groceries leave at 6:00 am, 7:00 am, 8:00 am, 10:00 am, and 12:00 noon. Perishables are dispatched at 10:00 am, 12:00 noon, 2:00 pm, and 6:00 pm. Another series of grocery trailers are dispatched at 2:00 pm, 6:00 pm, and 12:00 midnight. This loading sequence, while flexible, has proven to be the most efficient method of dispatching from the RDC warehouse.

Six dispatchers are employed at the RDC complex. They are always hired from the ranks of senior company drivers. All have significant driving experience, knowledge of possible routings, and familiarity with company policies so their judgement in making dispatch decisions is considered effective by the company.

Routings to stores are rarely the same twice in a row for the same driver due to fluctuation in store orders. No set vehicle scheduling pattern is used to route trucks. Any stops or deviations from the dispatcher's assigned routing must be explained on the driver's log and verified by Tachograph readings on the driver's return to the RDC compound. Tachographs are mechanical devices that measure engine revolutions per minute and over-the-road speed. Any indication that truck speed during a run has exceeded 55 MPH is noted by management. Tachograph readings have been used to counsel drivers on their performance. [Ref. 14]

Drivers for local delivery runs are selected using a bid system. Once the dispatcher has determined routings for the first twenty to twenty-five trailers, he calls drivers in from a waiting area about a half hour before the run is scheduled in order of seniority. The driver employed by the company the longest has first choice among the loads available. The next senior driver is then called in to choose among the remaining nineteen to twenty-four trailers. This entire process of dispatching twenty to twenty-five trailers is repeated for each dispatch time.

Drivers awarded a route pick up a driver's trip log form, two blank Tachograph wheels, and the envelope with trailer paperwork. The envelope with paperwork is then locked in the back of the trailer by its driver. Tachograph wheels are inserted in the cab-mounted Tachograph, and the driver begins annotating his trip log.

Equipment used to make local deliveries is standard for the company. Safeway owns about 200 tractors and about 500 trailers. Most trailers are forty-five foot enclosed vans with the company logo prominently displayed on each side. Some forty foot enclosed vans are also operated. A truck repair shop, fueling area, and wash rack are all located in the RDC compound. Ready access to these facilities ensures better security for shipments since tractors and trailers are never out of company control.

On arrival at a store, drivers contact the store's inventory control clerk. Together they open the trailer and perform receiving procedures. As soon as the pallets marked for that store are offloaded and the pallet count matches with the

envelope paperwork, the driver may leave that store to either make other deliveries or return to the RDC compound. If any discrepancies are noted, the inventory control clerk or his store manager may immediately call on a dedicated line to the RDC and request a search for the missing merchandise.

Stores in the Northern California division are organized in districts by geographic location. Figure 3.2 shows the location of these districts in relation to the RDC and other Safeway facilities. Each district contains approximately twelve stores. Appendix A provides a complete listing of districts within the Northern California division and lists all stores in these districts by store number and city.

2. **Security Measures**

Security of Safeway's grocery distribution system will be discussed within the framework of the four security factors presented in Chapter II. Although this description of techniques is purposely abbreviated to protect proprietary and sensitive company information, it fairly represents key elements of local delivery security.

Physical security of the RDC is considered very important by Safeway management [Ref. 14]. The RDC perimeter is surrounded by a seven foot high chain link fence topped with barbed wire. Two gates to the compound are shown in Figure 3.1. Gates are manned on a twenty-four hour basis. Lighting is provided around the perimeter by pole street lights at approximately 100 foot intervals. Once a week, or more, the perimeter is inspected for burnt out lighting, gaps in the fence, or any other deficiency. Responsibility for this inspection rotates among the guard supervisors. Spot checks of guard supervisor inspections are conducted by the RDC security investigator on a random basis at least monthly.

The gate security system at the RDC provides visitors to the compound with a paper visitor pass that is inexpensive, yet provides an added dimension of control. Appendix B shows an example of one of these paper visitor passes.

Physical security at Safeway stores has also been enhanced by the programmed installation of precision docks at all stores built since 1975. This includes almost 50% of the Northern division stores [Ref. 14]. Precision docks allow Safeway trailers to be backed up directly to the enclosed warehouse section of the store. Prior to 1975, store loading docks were designed to accommodate four to ten pallets on an open dock from the trailer being unloaded. When these pallets were received, they would be stored inside the store warehouse. The new docks, then, eliminate outside exposure time for all shipments.

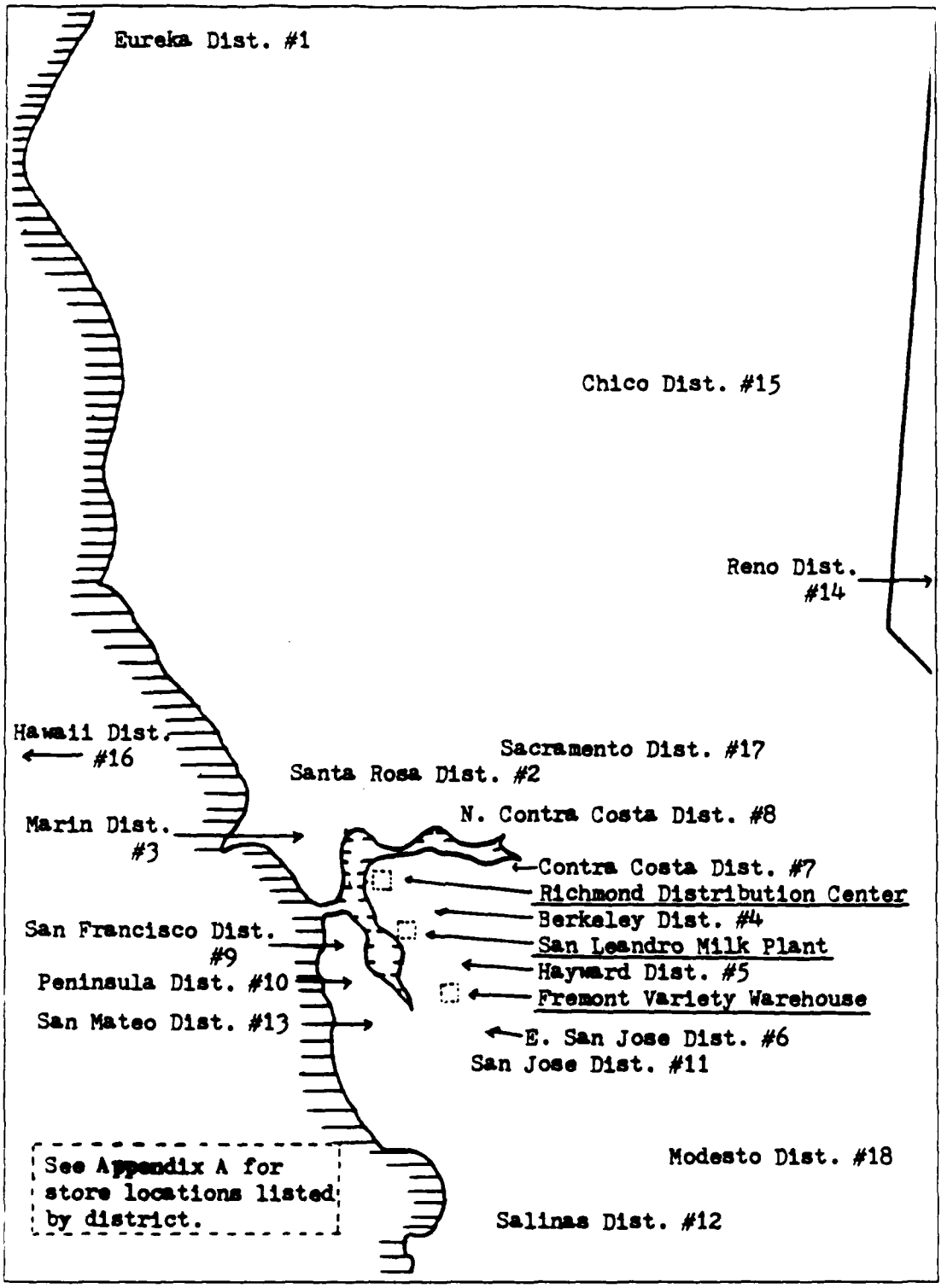


Figure 3.2 Distribution of Safeway Store Districts.

A standard policy for trailers parked in the compound also enhances physical security of merchandise stored at the distribution center. This policy has four important elements. They are:

1) Only empty trailers are parked along the inside fence perimeter.
2) In trailer parking areas, trailers are parked end to end as much as possible to prevent doors from being opened.
3) All loaded trailers not backed into loading docks are locked.
4) Most empty trailers waiting to be loaded are stored such that they can be easily observed from one of the guard shacks.

Damaged trailers are taken out of service immediately and, as noted earlier, repaired at company owned facilities within the RDC compound.

Procedural security in the Safeway system is based on checks and balances built into the entire system and not simply on the intransit segment of the process [Ref. 14]. If a shortage is spotted at the RDC, it is corrected immediately. At store receiving docks, the store manager may report a $250 book value shortage or the absence of at least one pallet on a dedicated hotline to the distribution center. This hotline is answered by an assistant manager at the RDC and the floor manager at the Fremont Variety warehouse. Both these individuals man offices overlooking the loading dock area. They also have computer terminals near their desks that provide either cathode ray tube (CRT) display or printed copy of data base information. A "cycle inventory" program can be run that calculates either:

- the number of *pallets* awaiting delivery in the case of RDC "cycle inventories"
- the number of *cases* of a particular item that should be in listed pallet rack locations or on made-up pallets awaiting delivery in the case of Fremont Variety "cycle inventories".

Generally, shortages are resolved promptly by visual inspection of the loading area by the warehouse manager. If this does not resolve the problem, a "cycle inventory" printout is given to a floor supervisor and a prompt warehouse audit for the missing pallet or case ensues.

Both visual inspections and spot inventories are made easier by the continual policing of the warehouse by a team of janitors. These men are the only authorized employees who may touch broken cases of merchandise. Even selectors, who are continuously moving among the racks, are prohibited from touching less than case quantities of merchandise at the RDC facility. Efforts by the crew of janitors in maintaining warehouse cleanliness and order in the pallet racks greatly facilitates simple visual inspections and tends to minimize the need to perform a "cycle inventory" for many reported shortages.

If missing merchandise cannot be located, a copy of the hotline monitor's log and copies of all shipment paperwork is sent to a security investigator within one week of the hotline call. Presently, there are nine security investigators in the Northern California division. Investigators perform a close audit at both the receiving store and the originating warehouse in an effort to resolve the discrepancy.

Approximately ten to twelve hotline calls are received per week by the monitor. Over 80% of those calls are resolved within one week by the hotline monitor and warehouse personnel. The remaining 20% are referred to an investigator. Investigators usually are able to resolve about half the cases referred to them within the week they have to audit shipment records. Virtually all hotline calls are completely resolved within two weeks and filed. Cases that are still unresolved by investigators are referred to warehouse managers for prompt adjudication. [Ref. 14]

The hotline monitor, RDC management, and security investigators are all assisted in maintaining a high level of security for local delivery shipments by technology. Relatively recent efforts to improve local delivery security include:

- Installation of a new gate pass system at the RDC. Photo identification cards with a magnetic strip have been issued to all employees of the distribution center. These cards are used to gain access to the RDC complex through a series of unmanned gates around the perimeter. The system can be adjusted to bar employees from entering the wrong gate or even the right gate at the wrong time. System cost is about $70,000 plus around $0.45 per card. Movements in and out of the compound are recorded and daily printed output is reviewed by security guards. [Ref. 14]

- Use of a computer based load planning program that issues an itemized store invoice, and calculates the shipment's cube, weight, and book value greatly helps dispatchers plan routings. This same software package can also assist in the scheduling and routing of shipments to minimize driver wait time. Also, as mentioned earlier, this package can perform a perpetual inventory allowing prompt warehouse spot checks for missing pallets or even individual case item quantities for high value merchandise. [Ref. 15: pp. 36-39]. According to management, software cost is over $50,000. The exact price is held as confidential.

- Tachographs in delivery truck cabs provide independent verification of drivers' logs. Speed is measured on one graph and engine revolutions per minute (RPMs) are measured on another. The RPM graph is so sensitive it can detect movement in the trailer behind the cab. This feature greatly assists Safeway security investigators. [Ref. 15: pp. 36-39] Both speed and RPM measuring devices cost about $200 each. Blank forms can be purchased for around $25 per 100 graphs.

- Installation of Rockwell International Tripmaster computers in tractor cabs. This new system is being tried on an experimental basis by the company to provide management with more readable summaries of drivers trips than provided by Tachograph wheels. Cab-mounted devices have been installed in some of the trucks only within the last six months. They record movement and store data on cassette tapes which are removed at the completion of each trip and sent to company headquarters for analysis. [Ref. 14] The Tripmaster computer cab device costs about $1,000 itself. Extractors needed to interpret information collected by the cab device cost about $1,000 for hand-held devices or $3,000 for equipment that transfers data directly into an IBM personal computer system.

The specific details of other security precautions taken at the RDC such as alarm systems, guard rotation schedules, and other security devices are considered confidential by the company.

Personnel security at the RDC is performed largely through the system of checks and balances described earlier. Janitors maintain cleanliness and order among the pallet racks, selectors monitor the work of janitors, and loaders check selectors. Floor supervisors, in turn, monitor the entire section of employees. Each new employee is given a two week apprenticeship to an experienced worker. During this time, training in basic security and safety is provided along with an explanation of the worker's new job. This has proven to be better than a highly structured training program due to the frequent turnover in warehouse labor. Although supervisors provide some training in personnel security during a new workers training period, most instruction comes from the employee's peers. Reinforcement of points made by co-workers often comes later from supervisors in the Safeway method of training than in the NSCSD method of more formalized indoctrination.

C. LIQUOR BARN STORES

As noted earlier, Liquor Barns are a recently established chain of specialty shops operated by Safeway Stores, Inc.. Safeway leases an empty grocery store to establish a new Liquor Barn, remodeling is done, then the new store is stocked and opened. Stores sell primarily case lots of alcoholic beverages to the public at discount prices. Bulk purchasing by Safeway enables Liquor Barn stores to be competitive. Although case lot sales are the major emphasis for the stores, sales of non-alcoholic beverages, individual bottles, and related sundry items are also offered.

1. Delivery Procedures

Local delivery to the forty-three currently operated Liquor Barns starts from the Safeway Fremont Variety warehouse. Figure 3.3 shows the general configuration of this distribution center. The Fremont warehouse differs from other company warehouses at the RDC in several ways to specifically enhance security of stored pilferable items. Instead of two gates into the perimeter as at the RDC, Fremont Variety has only one gate. Arrows in Figure 3.3 show the general flow of merchandise through the compound. Merchandise is first received in the back of the building, then moved to a warehouse or pallet rack section as necessary to maintain stock levels in the pallet racks.

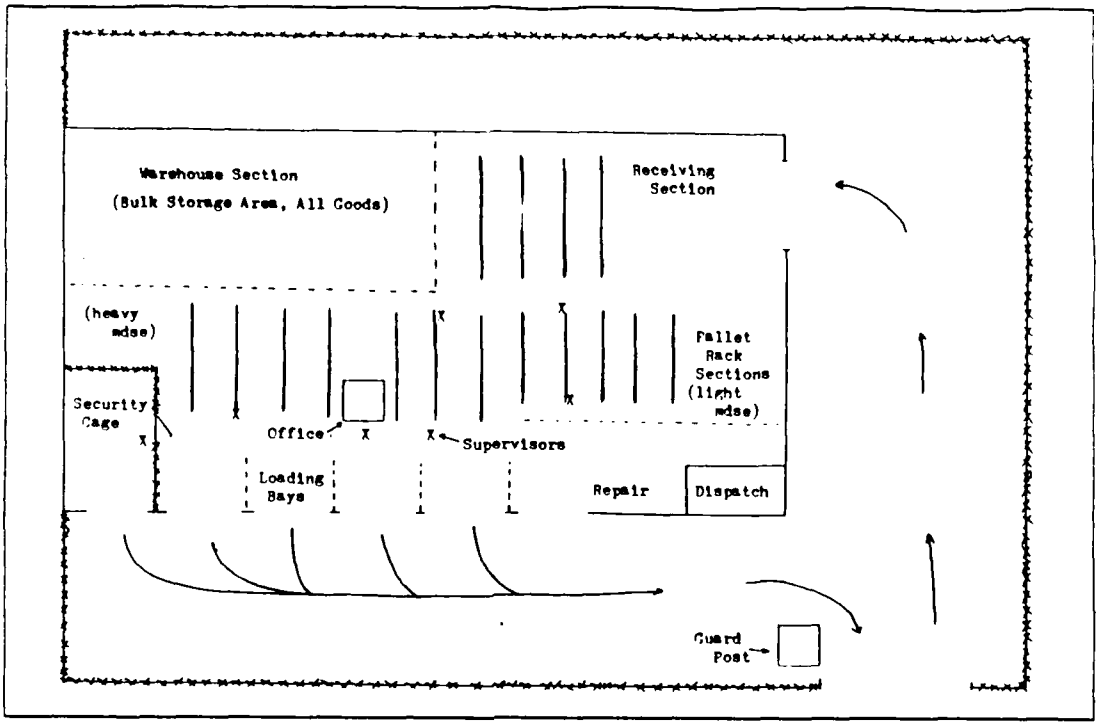


Figure 3.3 Fremont Variety Warehouse.

Selectors move pallet loads through the warehouse using tow motors as at the RDC compound. A notable difference between the RDC and Fremont Variety operations, though, is the larger number of supervisors present at Fremont Variety. Fremont Variety has less than half the floor space of the grocery warehouse at the RDC, yet has more supervisors on the payroll [Ref. 16].

Loaders at the Fremont Variety warehouse must take greater care in forming trailer loads than RDC loaders. Fremont Variety sends trailers to three basic types of locations. These are:

1) directly from Fremont Variety to a Liquor Barn Store.
2) directly from Fremont Variety to a Safeway Store in the old San Francisco district.
3) indirectly to a Safeway store in the old Sacramento district via the Transco warehouse in Sacramento, California.

Use of the Transco warehouse as an intermediate distribution center will be discontinued when the present property lease expires and the new Northern California division infrastructure is better developed.

Modification of the pallet identification tags used by the loaders is necessary to ensure accuracy in local consolidation and documentation. Different color tags are used to indicate the type of merchandise on a particular pallet. A store number on the identification tag indicates a pallet's destination. Extra security precautions are taken to protect merchandise going through the Transco warehouse and Liquor Barns, so correctly tagging pallets is vital.

Trailer loading slips at the Fremont Variety warehouse are made up the same way as those in Richmond. Dispatch and bidding for loads by the drivers is also virtually identical except that the volume is less. Fremont Variety ships about twenty-six trailers a day over a five day workweek. An average trailer load is twenty to twenty-one pallets with a maximum of twenty-two positions available in each forty-five foot van. Company policy requires at least eighteen pallets be loaded for an 80% cube utilization rate. [Ref. 16]

Figure 3.4 shows the distribution of Liquor Barn Stores around the delivery hub in Fremont, California. Appendix C lists these stores and groups them in their assigned districts.

2. **Security Measures**

Since the Fremont Variety warehouse stores only high value merchandise, security is more important here than at the RDC facility. New security systems had to be installed to protect not only stored merchandise but also items shipped to stores via the Transco warehouse for a *second* handling prior to final delivery.

Basic physical security is provided around the warehouse perimeter by chain link fence with lighting arranged every 100 feet. There is only one entry point into the Fremont complex. Access gates opened by magnetic strip identification cards are not installed. All employees and visitors are asked to open bags, briefcases, or sealed containers on the way out by the gate guard.

Security boxes are used to consolidate small items on a pallet. These boxes are approximately eighteen inches by eighteen inches by twenty-four inches in dimensions. They are grey, opaque plastic pressed on a metal frame. Lids snap on to shield pilferable merchandise from view. Security boxes are mainly used to pack high value items delivered to Safeway stores through the Transco warehouse. Very expensive small, direct shipments to Liquor Barns, however, are also sent via security box. Boxes are shrink wrapped after the lid is snapped on as an added precaution. [Ref. 16]

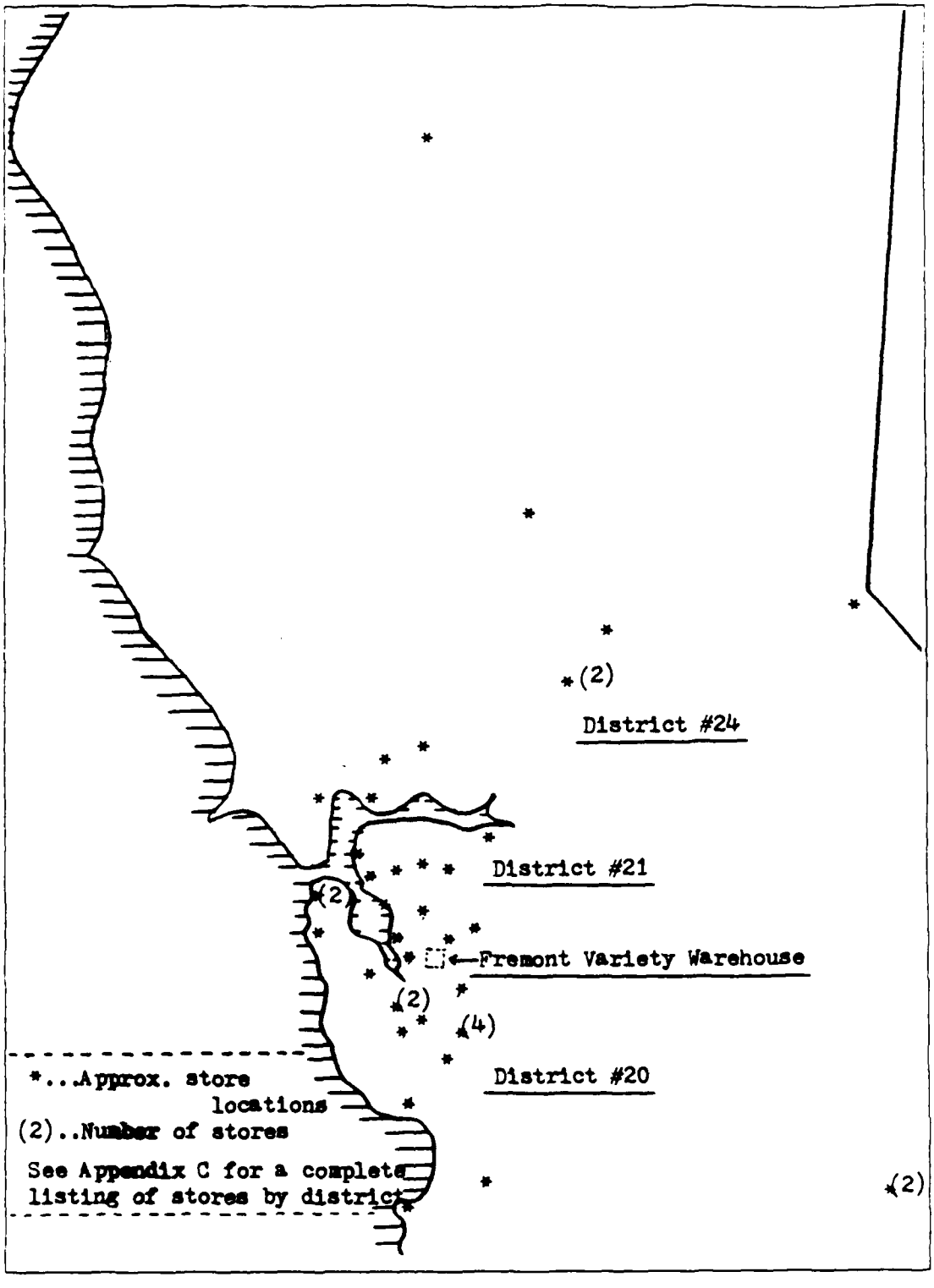


Figure 3.4 Distribution of Liquor Barn Stores.

Shrink wrap is applied manually from rolls to roughly 90% of the pallets built at Fremont Variety warehouse. It is used for both product safety and security. Since most of the higher value merchandise is in small cases, shrink wrap is necessary to keep the individual cases on each pallet together firmly. Shrink wrap also deters theft of opportunity when partial cases are exposed on open pallets.

Procedural security over local delivery shipments from Fremont Variety to Liquor Barns and Safeway stores is also different from that at Richmond. Employee searches are performed at the end of each shift. Workers remain within the fence perimeter during lunch periods and rest breaks. Also, supervisors are more likely to be encountered at Fremont Variety than at the RDC complex. The ratio of day shift supervisors at Fremont Variety is one to each seven workers. At the RDC, the ratio is one to each twelve workers. [Ref. 16]

One storage row in the Fremont warehouse is considered the most sensitive to pilferage. A security cage has been built around the cigarette shipment section. The location of this cage in the warehouse is shown in Figure 3.3. Cigarettes are especially sensitive to pilferage because of the need to stamp each individual pack with the Alcohol, Tobacco, and Firearms (ATF) tax stamp. This is done mechanically at the far end of the cage. During the process, though, some cartons and cases always remain unsealed at the end of a stamping cycle. Until they can be resealed, open cartons and cases are segregated and shrink wrapped away from the tax stamp and pallet selection areas within the cage.

Another pallet rack section outside the security cage contains only open cases of bottled liquor. At each end of this section is a supervisor's station. Only twelve selectors at a time are allowed to work between the supervisors in this row. These employees are closely monitored when picking stock and as with the workers in the security cage, they are searched at the end of their shift.

As at the RDC, the entire loading area at the Fremont warehouse is exposed to view from a centrally located supervisory office. Trailer loading is performed in the same manner as at the RDC compound. Shipment paperwork is also the same. At the report of a shipment shortage, however, the procedures differ from those used to deliver RDC merchandise. Tracking by the computer is performed at the case level in Fremont as opposed to the perpetual inventory of pallets performed at Richmond. Given the reporting threshold of $250 or one whole pallet needed to report a shortage, it is necessary to be able to track cases of the high value merchandise and the pallets of groceries.

Security investigators benefit from this better level of tracking. On average, three hotline calls reporting missing merchandise are received each day during the five day workweek at Fremont Variety. The local floor supervisors working with the monitor are able to resolve about 90% of these using either visual inspection or computer "cycle inventory" procedures. The remaining 10% of hotline calls are referred to a security investigator for more through study. This is better than the 80% floor supervisor resolution rate experienced at the Richmond facility. [Ref. 16]

Technological security in the Liquor Barn delivery process is composed of computer assisted tracking for case lot quantities, a sophisticated and confidential alarm system at the Fremont Variety warehouse, and Tachograph/Tripmaster audit trails for actual delivery time control.

Personnel security is improved on in the Fremont Variety operation. Only the most senior warehouse employees are allowed to work in the security cage area or the bottled liquor section. Supervisor contact with workers is frequent.

D. LONG'S DRUG STORES

Long's Drug Stores California Inc. is a California-based chain of retail drug stores affiliated with Long's Drug Stores, Inc. headquartered in New York. Presently, the company operates 205 superstores in the Western United States and eighteen stores in Hawaii. Long's, like Safeway, has plunged heavily into the sale of general merchandise in an effort to reach a broader market of consumers [Ref. 17: p. 31].

Store managers have even more autonomy than those working for Safeway or Liquor Barn stores. Approximately 85% of stocked merchandise at Long's retail outlets is ordered directly from suppliers by individual store managers. The remaining 15% represents nationally advertised sale merchandise bought in quantity by corporate headquarters in Walnut Creek, California and delivered by a commercial trucking firm under contract. [Ref. 18]

The purpose in allowing store managers to order most of their own merchandise for direct delivery is explained by two major points of Long's business strategy. First, store managers tailor their merchandise to appeal to locales. For example, the Alaskan stores feature hunting and fishing gear, Northern California outlets push ski equipment, and Phoenix stores cater to retirees [Ref. 17: p. 31]. Second, stores are operated as profit centers to reduce management overhead costs. This allows stores more merchandising flexibility and enhances their customer appeal compared to other chain operations. [Ref. 18]

This strategy has proven effective in recent years. Long's saw a 10% rise in profits in fiscal 1985 which ended January 31, 1986. In the current year, second quarter profits were flat, though for the entire first half of 1986 company net profits were up 5% [Ref. 17: p. 31].

1. **Delivery Procedures**

The process that begins the local delivery cycle starts with a planning meeting held at corporate headquarters about one month before the start of a nationwide advertising campaign. About fifty store managers and headquarters staff determine items that will be purchased and nationally promoted. Rough estimates of item quantities and tentative delivery schedules are also drawn up at this meeting to help individual store managers plan local promotional campaigns.

After this meeting, headquarters staff arranges a supplier for the merchandise and notifies delivery contractors of tentative plans. Ten days before the start of the national advertising campaign, final orders are due from all the stores. These final quantities and delivery schedules are entered into a computer data base as soon as they are received at headquarters. Arrangements made earlier with the local delivery contractor are then confirmed so the distribution of merchandise through the warehouse to stores can be performed in conjunction with appearance of advertisements.

Presently, three companies are used to deliver merchandise to Long's California stores. Each company maintains a computer link to Long's corporate headquarters, a warehouse that functions as a distribution hub, and access to enough trucks or a common carrier to perform weekly deliveries. These companies and their delivery areas are:

- *LTL Enterprises*--delivers from a warehouse in Hayward, California to about 85% of Long's stores. Deliveries are made from Bend, Oregon in the north to Bakersfield, California in the south and Reno, Nevada in the east.
- *Weber SCW*--distributes merchandise to about 10% of the company's stores. A hub is established in Anaheim, California that makes deliveries north to Bakersfield, California, south to Oceanside, California, and east to San Bernardino, California.
- *Weber SDW*--delivers to about 5% of Long's stores from a warehouse in San Diego, California. Stores served are located in an area from Oceanside in the north to San Ysidro in the south and east to Yuma, Arizona.

Hawaiian stores are sent containerized shipments monthly. This merchandise is delivered to the Port of Oakland by LTL Enterprises under arrangements separate from the store delivery contract. Merchandise is containerized at the port and shipped to Hawaii by Matson Lines. [Ref. 18]

Trucking companies performing delivery service for Long's Drug Stores lease commercial warehouse space for use as a distribution center. The largest of these in California is the LTL Enterprises facility in Fremont. A total of 300,000 square feet of space is required to handle the present volume of material LTL ships to stores. Since warehouses used by LTL and other contractors change periodically to take advantage of better leasing opportunities, no fixed plan is established for storage at warehousing sites.

Merchandise ordered by Long's headquarters is delivered to contractor warehouses and listed on packing lists telecommunicated to warehouses from Walnut Creek. Material is palletized, sorted, and stored in pallet racks for a few days while final orders are arriving at Long's headquarters from the stores. These final orders are also transmitted to a warehouse printer when ready so the contractor can make up outgoing pallets. Store orders are made up of case lots palletized and shrink-wrapped, then consolidated in trailers for pickup by independent drivers.

Drivers delivering trailers contact the store receiving manager on arriving at a store to obtain a signature denoting proof of delivery. This signature is vital to the trucking company since it shifts responsibility for shipment security to the store. As soon as the delivery is accepted, the driver can depart with delivery paperwork and the empty trailer.

Long s Drug Stores are distributed widely in California. Figure 3.5 shows the location of districts located around the LTL Enterprises hub in Fremont. Other hubs listed above are not shown in Figure 3.5. They service Long's stores in the same manner as the LTL Enterprises warehouse operation. A complete listing of company stores, including stores outside California, is provided in Appendix D for information.

Actual shipments from the warehouse to stores are closely monitored by the redistribution manager. Any shortages discovered at the store are reported by telephone to an employee dedicated to monitor these calls. She attempts to resolve any problems immediately with the delivery contractor. Since the delivery contractor is liable for total book value of shipments, it is in his best interest to correct discrepancies if possible in *all* cases when they are discovered. If this is not feasible, the redistribution manager reroutes material as needed to balance the total amount of stock among stores. [Ref. 18] Any financial loss bourne by Long's due to the need for redistribution is investigated with a view towards claiming reimbursement from the local delivery contractor.

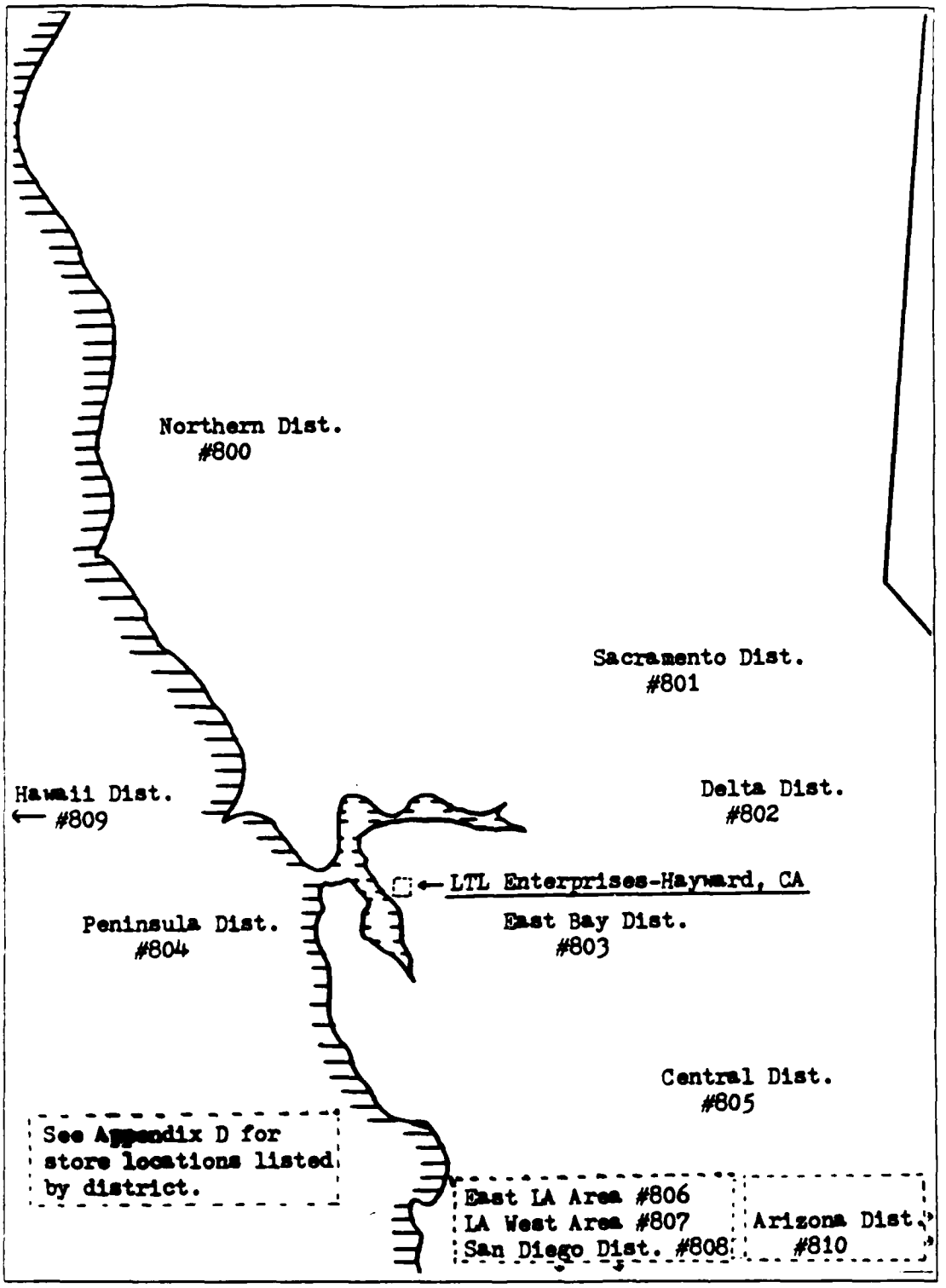


Figure 3.5 Distribution of Long's Drug Store Districts.

2. **Security Measures**

Due to the degree of financial accountability imposed on the local delivery contractor, Long's management is relieved of the need to provide directly for physical security of local delivery shipments. Trucking company's facilities are evaluated during the bidding process and periodically after contract award to ascertain continued adequacy of physical security measures provided.

The essential element of Long's security measures for deliveries is the system of procedures they use to enforce terms of their contract with trucking firms. Since ad campaigns promote a changing variety of items, stock handled by contractors is merely being collected from delivery vendors, consolidated after a brief storage period, then shipped out to stores within about one week. The short amount of time material is actually in the hands of the delivery firm affords protection by itself since exposure time of goods to pilferage or theft is minimized.

As with Safeway grocery distribution, only case lots of merchandise are delivered. This policy simplifys receiving, reduces the opportunity for theft and contributes to tighter overall merchandise control. Use of shrink wrap to encase pallets and signature service for all deliveries further contribute to effective procedural security of the system.

Technology in the form of computer software that compiles store orders, consolidates information on packing lists, and telecommunicates this list to warehouses for use also makes a significant contribution to security of the Long's Drug Stores local delivery system. IBM software is used to generate lists that provide warehouse workers with quantities and an item name for each pallet in a store's shipment. Management is able to access the data base to trace shipments at the case level if necessary [Ref. 18]. This software is considered proprietary information by company management since programs were tailored for their use by a consulting service.

Personnel security for shipments to stores involves one full-time employee dedicated to monitoring a hotline from the stores used to report delivery discrepancies. Since there is no threshold limit for reporting and accountability is strictly enforced, the job done by the hotline monitor is critical. Another factor that increases the importance of the monitor's job is that due to the nature of Long's nationwide ad campaigns, the company requires all discrepancies to be resolved within seventy-two hours. Because of this high degree of responsibility, the position of hotline monitor has always been filled by an experienced company employee trained in company policies. [Ref. 18]

E. SUMMARY OF SECURITY TECHNIQUES

Commercial operations surveyed use security techniques to ensure safe delivery of a product from the central distribution hub of a district to individual stores. Stages in the flow of goods through the local delivery system are listed below followed by a summary of security measures used by each commercial operation studied.

- *Distribution Center Storage*

Safeway: A lighted, guarded, and fenced perimeter surrounds the warehouse complex. Equipment (trailers, docks) is designed to enhance security. Checks and balances are built into the loading operation. Magnetic strip identification cards and paper visitor passes augment the perimeter access list. Pallet racks are carefully policed to make inventory control easier.

Liquor Barn: A lighted, guarded, and fenced perimeter surrounds a single warehouse. Searches are conducted at the gate. More sophisticated alarm systems are installed here than at the RDC. Security boxes and shrink wrap are used extensively for both item safety and security. A high ratio of supervisors to workers is provided. Less than case lot merchandise is segregated. Operations are overseen from a central observation point.

Long's: The function is contracted out to a specialist who provides for security.

- *Local Delivery Transit*

Safeway: Enclosed vans designed to company specifications are used to make all local deliveries. All maintenance and repair of vehicles is performed in a company controlled area. Trailers are locked in transit. Drivers are awarded routes based on seniority. They are required to complete a detailed log for each trip. Cab mounted Tachographs provide a supervisory check on drivers. Dispatching and routing is assisted by computer generated store invoices effectively representing a manifest of the shipment.

Liquor Barn: Intransit security measures to protect merchandise are essentially the same as described for Safeway above. Additional seniority with the company, though, is required to drive delivery runs to Liquor Barns.

Long's: The function is contracted out to a specialist who provides for intransit local delivery security.

- *Discrepancy Investigation*

Safeway: A telephone hotline monitored by the RDC manager's assistant provides prompt notification of trouble. A computer assisted "cycle inventory" procedure allows quick inventories of pallet loads in the warehouse if visual inspection of the loading area fails to disclose a lost pallet. A security investigator is readily available to audit local delivery problems not resolved within one week.

Liquor Barn: Investigation procedures are basically the same as for Safeway delivery discrepancies except that case lot rather than pallet "cycle inventories" provide a better audit trail for investigation.

Long's: A telephone hotline and computerized data base allow close supervision of the local delivery contractor. Discrepancies are generally resolved within seventy-two hours.

This summary presents only the key elements in the local delivery security plan used by the systems discussed in this chapter. Some of these measures are being used by NSCSD in its security program. The next chapter will compare system effectiveness to determine whether or not it would be helpful for NSCSD to adopt more of these security practices.

IV. COMPARATIVE ANALYSIS OF SYSTEMS

A. INTRODUCTION

Costs have been used to measure NSCSD local delivery *efficiency* in past NPS theses by evaluating system performance in terms of resources used to perform local delivery. Stoner and Wankel offer a good definition of efficiency:

> Efficiency--that is, the ability to get things done correctly--is an "input-output" concept. An efficient manager is one who achieves outputs, or results, that measure up to the inputs (labor, materials, and time) used to achieve them. Managers who are able to minimize the cost of the resources they use to attain their goals are acting efficiently. [Ref. 19: p. 9]

Use of efficiency to evaluate systems is good if there is only one possible output of a system or only one output is desired. Simple systems that offer few options for managers are best evaluated by measures of efficiency.

In systems where there is choice among outputs, *effectiveness* is a better measure of performance. Effectiveness is also defined by Stoner and Wankel:

> Effectiveness, ... is the ability to choose appropriate objectives. An effective manager is one who selects the right things to get done. A manager who selects an inappropriate objective--the production only of large cars when demand for small cars is soaring--is an ineffective manager. Such a manager would be ineffective even if the large cars were produced with maximum efficiency. No amount of efficiency can compensate for lack of effectiveness. [Ref. 19: p. 9]

Since the goal of the NSCSD local delivery system is to safely deliver material issued in a timely manner, objectives that contribute to this end are appropriate. Achievement of these objectives is discussed in this chapter.

Measurement of effectiveness is usually performed against an established standard or goal. NAVSUP has established a delivery accuracy standard and two performance goals for issue discrepancy reporting that measure the effectiveness of local delivery security or objectives that contribute to it. These benchmarks are used to analyze current performance of the NSCSD system and compare its effectiveness to that of the three commercial operations studied. Also, delivery time standards developed by Orr [Ref. 1: p. 44] are used to evaluate transit time exposure of local delivery shipments to possible pilferage, theft, or other threat to successful local delivery.

B. NSC SAN DIEGO SECURITY EFFECTIVENESS

Determining a good indicator of effectiveness for a system as complex as that used by NSCSD is not an easy task. For internal control purposes, NSCSD generates a monthly quality level percentage based upon local delivery sampling results. The quality level of NSCSD local delivery is calculated by determining the percentage of issues sampled that are presumed to have been safely delivered to a local delivery customer.

A sample is taken by an inventory team in the building 3304A consolidation area of items marked for local delivery. Errors noted by the team are divided by the number of items sampled and multiplied by 100 for an error percentage. Errors are defined as material which is in the wrong location. This error percentage is then subtracted from 100 to determine a quality level percentage. Quality level percentages are reported monthly to higher authority with other statistics. They are not used for internal management of the local delivery function. Table 4 presents recent data showing that the local delivery system quality level exceeds the 99.0% NAVSUP standard.

Investigation into how sampling was performed to determine the quality level for local delivery disclosed several weaknesses in technique. Weaknesses in sampling procedures noted were:

- Samples of local deliveries are taken in the customer bays of building 3304A *rather than in the customer's receiving area.* Sampling service quality during the *transit* from consolidation area to the customer is not performed.
- Most, if not all, samples are taken after 7:30 am when the inventory teams arrive for work. Since local delivery to fleet customers occurs primarily between the hours of 3:00 am to 5:00 am, effectiveness in making these deliveries may not be as fully audited as deliveries to shore customers which occur later.
- Only location accuracy is checked. Paperwork with each item sampled is checked only for its destination. If that destination matches that of the bay it was found in, a correct delivery is recorded. Quantities present are not systematically checked to ensure that the right *quantity* ordered is being delivered.
- The number of samples taken is determined by manhours available to perform work rather than being based on a percentage of total deliveries made to customers. Rather than fitting workdays to a sample, sampling is fit to a standard workday.

Sampling the actual delivery function is considerably more costly than auditing deliveries in bays as is done under current sampling procedures. Getting feedback from customers concerning actual receipt of shipments would involve placing a large administrative burden on customers by way of a reporting requirement or would require use of more manpower by the NSCSD Quality Assurance Branch (Code 80) to perform "tailgate" audits of shipments between the warehouse and consignee.

TABLE 4

NSCSD DELIVERY ACCURACY STATISTICS

Month	*Quality Level*	*NAVSUP Standard*
May 1985	99.6	99.0
June 1985	99.9	99.0
July 1985	99.9	99.0
August 1985	99.9	99.0
September 1985	99.8	99.0
October 1985	99.8	99.0
November 1985	99.9	99.0
December 1985	99.6	99.0
January 1986	99.5	99.0
February 1986	99.8	99.0
March 1986	99.9	99.0
April 1986	99.9	99.0
May 1986	99.9	99.0

Placing samplers on different work shifts and conducting some "tailgate" audits to compose a more complete picture of local delivery quality may be done in the future if indicators show a decline in service quality or more manpower is provided to perform higher quality sampling. Presently, NSCSD management does not consider it cost effective to apply more resources to improve the quality assurance of local delivery operations. [Ref. 20]

A new software package called STATMAN promises to develop better sampling procedures for *all* NSCSD quality assurance statistical testing. STATMAN is a flexible string of programs that provide inventory accuracy statistics for Navy stock points. In addition to providing a single measure of inventory accuracy, STATMAN provides a sampling program that generates inventory accuracy statistics for segments of the total data base. Adaptation of this package to provide better sampling of local deliveries for analysis promises to generate a better way of compiling performance indicators in the future.

1. **ROD Data Analysis**

To obtain a clearer picture of local delivery effectiveness, report of discrepancy (ROD) data were collected for analysis at NSCSD. The ROD, Standard Form 364, is the means by which activities may report packaging and shipping-type item discrepancies which can be attributed to shipper error. Shipping-type item discrepancies are defined as variations in the quantity or condition of goods from that shown on the authorized shipping document due to an error on the part of the activity pulling and preparing the material for shipment [Ref. 21: p. 1-1]. Since variation in the quantity or condition of goods from that shown on the shipping document can also be caused by pilferage, damage, or theft occuring during the delivery process, the ROD can also be used to report inadequate local delivery security.

When a shipment is placed in the custody of the Department of Defense (DOD) transportation system and discrepancies occur that are the fault of the carrier, they are reportable on a Transportation Discrepancy Report (TDR) rather than a ROD form. Since all NSCSD local delivery is performed in house rather than through a carrier, ROD input represents the proper method of reporting discrepancies for serviced commands. Customers submitting RODs reporting discrepancies in a local delivery must submit a ROD within fifteen days of receiving the material. Information on the ROD form can be grouped into three broad categories:

1) General information including the name of the preparer, name of the shipper, date the report was prepared, and whether the discrepancy reported involves a shipping or packaging error.

2) Specific item information including the stock number, name, quantity and cost involved as well as the nature of the discrepancy.

3) Action information including a recommendation for disposition of damaged or overage material, a request for expedited replacement for shorted items, or other remarks pertaining to the discrepancy.

An example of the ROD report form is shown in Appendix E. Only the front of the form is shown. The other side provides feedback to the command reporting a discrepancy. Final disposition of the report is explained on the back of the form.

All ROD reports arrive daily by mail at the Customer Services Division (Code 1053) office. Data from each form is entered into a Wang OIS 140 word processor by one of two GS-5 supply clerks. Next, the supply clerk works with the Inventory Reconciliation Branch (Code 553) or the Material Department's shipping and packing sections (Code 303) to determine validity of the report and resolve the customer's complaint. If necessary, one of the two Storage Divisions (Code 301 302) provides information to complete action on the ROD form.

Monthly, and as required to monitor trends, a ROD Tracking History List is generated by the Wang system. This list contains the following information on RODs being researched currently by the supply clerks:

- Date the ROD was received
- Requisition document number of the shipment
- Discrepancy type code
- Date of any NSCSD warehouse spot inventory
- Supply clerk working the ROD
- Cognizance symbol and stock number of the item
- NSCSD warehouse location code
- Dollar value involved

Information is coded on the list with a legend provided at the top of the report's first page. The report is distributed to the Customer Services Officer (Code 105), Material Department (Code 300), and the Aviation Department (Code 600) for review and analysis by management.

Unfortunately, the Wang word processor and its supporting software are only capable of performing simple sorting of data. Statistical testing of ROD data is not performed to determine the significance of apparent trends. The supply clerks dedicated to processing and tracking incoming RODs, while both enthusiastic and industrious, have not been trained to perform higher level trend analysis. They are fully occupied researching the RODs that arrive and tracking completion of spot inventories performed by the Inventory Reconciliation Branch.

Since billets needed to perform any expanded processing, tracking, or reporting requirements have traditionally been provided by in-house reallocation of the productive workforce, any new program to improve analysis is evaluated carefully. Improvements in the Wang software are being implemented gradually to improve the tools available to the clerks presently tracking RODs.

Another report issued by NSCSD quarterly is the Stock Point ROD Statistical Report (NAVSUP Report 4440-97) which provides summary data on RODs received, rejected, completed, and dollar values involved. Also reported are processing time statistics and numbers of RODs received by discrepancy type code. This report is not routinely routed internally as is the ROD Tracking History List. It is sent to NAVSUP to fulfill a reporting requirement.

Analysis of data from this report is used in this thesis to determine effectiveness of NSCS local delivery security. NAVSUP has established the following performance goals for RODs incoming to stock points [Ref. 21: p. 5]:

1) The number of validated RODs ≤ 0.1% of issues.
2) At least 90% of RODs received are processed on time.

A validated ROD is defined as one accepted by the stock point for processing after liability for the discrepancy is acknowledged. The time standard for ROD processing is established as forty-five calender days from receipt of the ROD [Ref. 21: p. 2-1].

To determine how close NSCSD is to reaching these goals, the following information was needed:

1) The total number of NSCSD issues for each period evaluated.
2) The number of validated RODs accepted for processing.
3) The processing time required to complete a sample of ROD forms.

In collecting this information it became apparent that some filtering of the data was needed to arrive at a meaningful *net effectiveness ratio* for assessing local delivery. Gross effectiveness of the entire issue process measured by the NAVSUP performance goal includes product quality deficiencies, shortcomings in product technical markings, and other factors not directly related to analysis of local delivery security. For comparative purposes, though, gross effectiveness figures will also be provided in tables. Data used are presented in Table 5 and Table 6.

Issue totals were obtained from the Material Department for each month of fiscal year (FY) 1985 and for the first nine months of FY 1986. A total for FY 1984 was also used to calculate an average quarterly issue figure. Quarterly issue figures were computed because comparable ROD data reporting for FY 1986 changed from monthly to quarterly at the start of the fiscal year. All issue data includes both Material Department issues and Aviation Department issues. Eller and Moore determined that 87.5% of material shipped by NSCSD was delivered locally [Ref. 2: p. 54]. Since this ratio is still believed to be accurate by NSCSD management [Ref. 8], it is used to reduce the number of issues in the net effectiveness ratios presented later. Table 5 shows the issue data collected for this analysis.

Total RODs validated by processing were obtained from extracts of the NAVSUP 4440-97 reports submitted. This report includes ROD data on Foreign Military Sales (FMS) shipments. While this type of ROD contributes toward evaluation of gross issue effectiveness, these RODs are not included in net effectiveness

TABLE 5
NSCSD ISSUE DATA

Qtr/FY	*Total Issues*	*87.5%*	*0.1%*
4th/84	360,616	315,539	361
1st/85	330,490	289,179	330
2nd/85	380,190	332,666	380
3rd/85	417,955	365,711	418
4th/85	420,220	367,693	420
1st/86	448,670	392,586	449
2nd/86	454,925	398,059	455
3rd/86	483,549	423,105	484

TABLE 6
NSCSD ROD DATA

Qtr/FY	*Total RODs*	*Net Effectiveness RODs **	*0.1% of Issues*
4th/84	1,502	--	361
1st/85	1,300	771	330
2nd/85	1,152	614	380
3rd/85	1,069	533	418
4th/85	1,264	712	420
1st/86	980	577	449
2nd/86	1,092	742	455
3rd/86	1,802	967	484

* Note: Codes counted were C1, M1, S1, S2, and W1.

RODs filtered from totals in Table 6. Also, only five of the twenty-seven discrepancy code categories were chosen to represent valid indicators of strength or weakness in local delivery security.

RODs reporting the following types of discrepancies are considered good indicators of local delivery security net effectiveness:

1) *Code C1*--Material arrived in a condition other than that indicated on the release receipt document (i.e., *damage in transit*).

2) *Code M1*--Material arrived addressed to the wrong activity (i.e., *improperly routed*).

3) *Code S1*--Material that arrived was less than the quantity printed on the receipt document (i.e., *shortage*).

4) *Code S2*--Material that arrived was less than the quantity requested (i.e., *possible shortage*).

5) *Code W1*--Material that arrived was incorrect. (i.e., *possible unauthorized warehouse substitution*).

Other categories not counted as contributing significantly to net effectiveness of local delivery security are:

1) *Condition of Material* (Codes C2, C3)--expired shelf life and damaged parcel post shipment.

2) *Supply Documentation* (Codes D1, D2, D3)--documentation not received, illegible, or incomplete.

3) *Overage Duplicate Shipments* (Codes O1, O2, O3)--excess quantities received.

4) *Packing Discrepancies* (Codes P1, P2, P3, P4)--improper packing, preservation, or marking noted.

5) *Product Quality Deficiencies* (Code Q1)--applicable to Grant Aid and FMS shipments only.

6) *Shortage of Material* (Code S3)--non-receipt of a parcel post shipment.

7) *Item Technical Data Markings* (Codes T1, T2, T3, T4, T5, T6)--data markings missing, illegible, or incomplete.

8) *Wrong Item* (Code W2)--unacceptable substitute.

9) *Other Discrepancies* (Code Z1)--used to indicate remarks that provide only feedback information to the shipper.

These other categories of discrepancy, while indicating a problem in issue effectiveness, are not considered to be direct indicators for evaluating local delivery security.

Chapter 1, section 2 of the Report of Discrepancy (ROD) Manual (NAVSUPINST 4440.179) contains a fuller description of all discrepancy codes and categories. Table 6 presents net effectiveness RODs extracted from the discrepancy code analysis section of NAVSUP 4440-97 reports. Net effectiveness RODs are compared to total RODs and 0.1% of issues, the NAVSUP gross effectiveness goal.

For later comparison to data obtained from commercial firms, effectiveness ratios were calculated. They are presented in Table 7. The gross effectiveness ratio was calculated by dividing quarterly total RODs in Table 6 by the total issues for that quarter shown in Table 5. A net effectiveness ratio was computed by dividing the number of net effectiveness RODs in Table 6 by 87.5% of total quarterly issues shown in Table 5. The NAVSUP goal is a constant converted from a percentage to a ratio.

TABLE 7
ROD/ISSUES EFFECTIVENESS RATIOS

Qtr FY	*Gross*	*Net*	*NAVSUP Goal*
4th 84	0.0041651	--	0.001
1st 85	0.0039336	0.0026662	0.001
2nd 85	0.0030301	0.0018457	0.001
3rd 85	0.0025577	0.0014574	0.001
4th 85	0.0030079	0.0019364	0.001
1st 86	0.0021842	0.0014697	0.001
2nd 86	0.0024004	0.0018640	0.001
3rd 86	0.0037277	0.0022855	0.001

Although these ratios offer a simple measure of effectiveness for evaluating the overall issue process and local delivery, there are several concerns associated with the ratios presented. Among these are the following:

- Lack of data segregation for only the local delivery function of the issue process forces reliance on approximation to calculate net effectiveness ratios.
- No information is provided in the NAVSUP instruction explaining the derivation of performance effectiveness goals and standards for RODs. Validity of these goals, therefore, cannot be independently evaluated.
- Since a significant amount of time and effort is required to complete a ROD form by the customer, many discrepancies above the $100 reporting threshold may go unreported by smaller commands (e.g., *ships*).

Despite these concerns which could form the basis of further study, these effectiveness ratios are believed to be the best available measure of gross issue effectiveness and performance effectiveness of local delivery security.

Testing was also performed to evaluate the timeliness of ROD processing compared to the NAVSUP performance goal of at least 90% processed within one to forty-five days. Table 8 presents the results of an analysis performed on a sample of 1,012 completed RODs. ROD data were obtained from a sort of records covering RODs completed in April, May, and June 1986. The sort provided a listing of completed RODs during this period. Each record included a receipt date and a processing completion date. Days taken to complete each ROD were calculated from these data along with other information to facilitate data manipulation. Resulting values were input on the NPS mainframe computer and analyzed using the MINITAB© statistical computing system.

TABLE 8
NSCSD PROCESSING TIME STATISTICS

RODs completed in	*All*	*%*	*Shore*	*%*	*Ships*	*%*	*Other*	*%*
1 to 45 days	944	93.3	661	95.0	198	90.4	85	87.6
46 to 90 days	65	6.4	34	4.9	19	8.7	12	12.4
91 to 120 days	3	0.3	1	0.1	2	0.9	0	-
Over 120 days	0	-	0	-	0	-	0	-
Totals	1012	100	696	100	219	100	98	100

Presentation follows the format prescribed for reporting processing time statistics on the NAVSUP 4440-97 report. According to NAVSUP's instruction [Ref. 21], only total RODs processed need be evaluated in relation to the 90% performance goal. Data breakdown for the categories "Shore", "Ships", and "Other" was done to learn if fleet customers do, in fact, receive better service in the form of faster ROD processing than shore-based customers. The category "Other" includes Army, Air Force, and FMS shipment discrepancies reported on ROD forms during the period. Many FMS RODs arriving from overseas are weeks or months old when they arrive. RODs become more difficult to process with age. Research, therefore, is harder to perform than for afloat or shore command reports which generally arrive soon after discrepancies are noted.

2. LDIP Data Analysis

Another measure of effectiveness used to evaluate local delivery at NSCSD involves the time used to perform elements of the function. This measure is used by the NSCSD Transportation Division dispatcher who monitors the effectiveness of individual drivers [Ref. 8]. Standards developed for loading, transit to the local delivery customer, unloading, and total delivery time are compared periodically to current driver performance. If significant deviation is noted, the driver is counselled.

The Local Delivery Individual Production (LDIP) report is used to generate data for this measure of effectiveness. Appendix F shows a sample form. This daily trip report is filled out by every driver and spot checked by supervisors. Drivers also have times noted on the Daily Dispatching Record (NSC 4640.4-Rev. 12-85) maintained by the dispatcher in his office. This record is updated each time a driver reports on the radio net. The record, however, is only used to monitor drivers during the duty day of the dispatcher. His duty day usually spans the hours of 7:00 am to 4:00 pm. When runs are performed outside these hours the LDIP report is used alone to monitor drivers.

NSCSD no longer uses a Wang word processor to provide monthly status reports of LDIP data as reported by Orr [Ref. 1: p. 29]. Reports generated by the Wang system were not found to be useful enough to justify manhours spent entering data and sorting it into useable output [Ref. 8]. Only periodic audits of LDIP data by dispatchers or driver's supervisors are currently performed to determine driver effectiveness, efficiency, and delivery trends. Since an automated data base is no longer available, sampling is done to analyze effectiveness of individual drivers.

During a field trip to NSCSD, a total sample of 194 trip times was taken from LDIP reports. Data were analyzed to determine if items delivered locally to shore commands were being effectively delivered in terms of the time standards presented by Orr in 1983 [Ref. 1: p. 44]. Since afloat commands frequently change delivery location only shore commands were sampled to provide comparative times. No standards have been developed for local delivery to afloat customers. Tables 9, 10, 11, 12, and 13 present this comparison of current sample data with established standards.

In these tables, destination refers to one of the four principal local delivery areas of the NSCSD system. Each of these destinations is serviced from the NCA hub. The sample size for each destination is shown in the "N" column. To facilitate comparison with the standard, mean times for each destination sample have been rounded to the nearest whole integer. Standard deviation from the mean is shown in the "St. Dev." column of each table.

TABLE 9
NSCSD LOAD TIME PERFORMANCE

Destination	*N*	*Mean*	*St. Dev*	*Standard*
NAS North Is.	96	58 min.	31.23	60 min.
Point Loma	72	71 min.	36.38	60 min.
NAS Miramar	17	67 min.	28.11	60 min.
NRMC Balboa	9	58 min.	24.62	60 min.

TABLE 10
NSCSD TRANSIT TIME PERFORMANCE

Destination	*N*	*Mean*	*St. Dev*	*Standard*
NAS North Is.	96	30 min.	18.32	23 min.
Point Loma	72	30 min.	7.79	30 min.
NAS Miramar	17	33 min.	6.39	35 min.
NRMC Balboa	9	22 min.	3.54	18 min.

TABLE 11
NSCSD UNLOADING TIME PERFORMANCE

Destination	*N*	*Mean*	*St. Dev*	*Standard*
NAS North Is.	96	34 min.	19.92	28 min.
Point Loma	72	35 min.	15.55	39 min.
NAS Miramar	17	31 min.	12.19	37 min.
NRMC Balboa	9	23 min.	9.68	23 min.

TABLE 12
NSCSD DRIVER DELAY AWAITING OFFLOAD

Destination	*N*	*Mean*	*St. Dev*	*Standard*
NAS North Is.	96	12 min.	12.57	17 min.
Point Loma	72	12 min.	18.48	28 min.
NAS Miramar	17	11 min.	13.98	19 min.
NRMC Balboa	9	14 min.	13.41	5 min.

TABLE 13
NSCSD TOTAL DRIVER DELIVERY TIME

Destination	*N*	*Mean*	*St. Dev*	*Standard*
NAS North Is.	96	134 min.	46.98	128 min.
Point Loma	72	148 min.	48.10	157 min.
NAS Miramar	17	143 min.	37.38	151 min.
NRMC Balboa	9	117 min.	32.51	106 min.

Comparison of current means with standard times in Tables 9, 10, 11, 12, and 13 show that current means are very close to standards. Large standard deviations reflect wide variability in the data times from means indicated. It is interesting to note that actual transit times appear to vary less from the mean than loading, unloading or delay times in this sample. Large standard deviations in Tables 9, 11, and 12 may reflect variance in support provided to drivers since others beside the driver are involved in determining speed of these operations. It is also important to note that the number of destinations sampled was limited to the four primary delivery routes used to service shore commands. Since most serviced commands are located near NAS North Island and Point Loma, more runs are made to these areas than to NAS Miramar or NRMC Balboa.

C. COMMERCIAL SECURITY EFFECTIVENESS

Differences in the local delivery systems studied make it difficult to arrive at a method for comparing effectiveness of NSCSD and commercial operations. While NSCSD has NAVSUP standards and goals to strive towards, no written standards are generally used in commercial systems. Effectiveness is determined by overall profitability of individual stores. Local delivery security contributes only partially to store profitability. Even so, considerable attention is payed to the receiving function at destination so that proper control over merchandise is maintained and the effectiveness of local delivery security can be evaluated.

Since control over receiving at local delivery destinations is also stressed in the Navy system, there is some degree of comparability between the NAVSUP performance goals and commercial standards with respect to the percentage of material shipped which actually arrives at its destination. Taking this a step further, there is also some comparability between the ratio of RODs to issues and a similar ratio that can be calculated for commercial systems.

While no exact parallel to the ROD exists in commercial operations, hotline calls reporting shortages provide essentially similar feedback on the success or failure of the system in delivering merchandise. Managers of all three commercial operations studied monitored the average number of hotline calls received per week as a key indicator of delivery effectiveness.

An estimate of material dispatched is also currently maintained by commercial management. While the Navy concept of an "issue" is not used, the number of pallets moved from the distribution hub to stores can be calculated by multiplying the number of trailers dispatched by the average cube utilization rate and then multiplying the resulting product by a time factor to get the average number of pallets moved per quarter. These are assumed to equate to issues made by the NSCSD system.

1. Ratio Comparison

Table 14 shows the derivation of gross and net effectiveness ratios for the three commercial operations studied. Only average figures were available from cognizant managers. Also, hotline calls could be reporting a shortage of at least one pallet of merchandise or a $250 dollar value shortage in the case of Safeway or Liquor Barn. Long's managers may report any shortage. This is a higher reporting threshold than the $100 limit used by NSCSD management. Total hotline calls represent *all* incoming feedback to the system. As is the case with RODs used to provide feedback

to NSCSD, hotline calls are sometimes used simply to convey information that is urgent yet not directly related to local delivery security. As noted earlier in Chapter III, most calls are resolved within a very short period of time. Many hotline calls received simply represent an error in paperwork preparation that can be resolved by the hotline monitor.

Hotline calls referred to an investigator shown in the second line of the table represent net reported discrepancies in shipment since these are more likely to result from pilferage than a simple clerical error. Percentages used to convert total feedback numbers into net figures were discussed in sections covering each operation. For Safeway, the referral rate for RDC discrepancies reported is about 20% of total hotline calls. The rate for Liquor Barn merchandise sent out from Fremont Variety is about 10% of calls reflecting the tighter security measures in place. The rate of referral for the Long's operation is also about 10% of total hotline calls received.

Utilization of the twenty-six available pallet positions per trailer by Long's Drug Store management is less than that of both Safeway and Liquor Barn. Due to the smaller size of Long's stores, less trailer space on average is used. This has the effect of reducing their overall cube utilization rate [Ref. 18].

Discussion with managers of the three operations studied disclosed a variation in pallets dispatched per quarter. While figures used in Table 14 reflect current output, seasonal variation occurs throughout the year. Holidays cause significant increase in pallets shipped for both the Safeway and Liquor Barn operations. Increases in pallets shipped from Long's warehouse occur at random intervals, too. They are not, however, necessarily linked to discrete events or circumstances. These "spikes" in the data are smoothed out in the averages presented for all three commercial operations.

Table 15 compares gross effectiveness ratios for NSCSD presented in Table 7 with those calculated in Table 14 for commercial operations. The data shows little difference between NSCSD and commercial operations in terms of gross effectiveness. A similar comparison for net effectiveness ratios is presented in Table 16 which shows commercial firms to be more effective than NSCSD once easily resolved or non-applicable reports are filtered out of ROD totals. It is interesting to note that the Safeway operation comes closest to matching the NAVSUP goal (0.001) of issue effectiveness. NSCSD slightly exceeds the goal. Both Liquor Barn and Long's operations significantly exceed the goal. These relative standings indicate that improvement of ratios may be possible by use of commercial techniques used by the three operations studied.

TABLE 14

CALCULATION OF COMMERCIAL EFFECTIVENESS RATIOS

	Safeway	*Liquor Barn*	*Long's*
Hotline Calls per Quarter			
1. Total (Average)	720	180	120
2. Referred (Average)	144	18	12
Average Trailers Dispatched per Quarter			
3. Total	6,480	1,560	1,560
Cube Utilization Rate			
4. Percentage	80%	80%	70%
5. Pallet Positions	21	21	18
Average Pallets Dispatched per Quarter			
6. Total	136,080	32,760	28,080
Gross Effectiveness			
7. Ratios	0.0052910	0.0054945	0.0042735
Net Effectiveness			
8. Ratios	0.0010582	0.0005495	0.0004274

Data Sources:

Line #1--Company Management

Line #2--Line #1 × Company Referral Rate

Line #3--Company Management

Line #4--Company Management

Line #5--Line #4 × 26 total pallet positions per trailer

Line #6--Line #3 × Line #5

Line #7--Line #1 + Line #6

Line #8--Line #2 + Line #6

TABLE 15

COMPARISON OF GROSS EFFECTIVENESS RATIOS

Qtr/FY	*Safeway*	*Liquor Barn*	*Long's*	*NSCSD*
4th/84	0.0052910	0.0054945	0.0042735	0.0041651
1st/85	0.0052910	0.0054945	0.0042735	0.0039336
2nd/85	0.0052910	0.0054945	0.0042735	0.0030301
3rd/85	0.0052910	0.0054945	0.0042735	0.0025577
4th/85	0.0052910	0.0054945	0.0042735	0.0030079
1st/86	0.0052910	0.0054945	0.0042735	0.0021842
2nd/86	0.0052910	0.0054945	0.0042735	0.0024004
3rd/86	0.0052910	0.0054945	0.0042735	0.0037277

TABLE 16

COMPARISON OF NET EFFECTIVENESS RATIOS

Qtr/FY	*Safeway*	*Liquor Barn*	*Long's*	*NSCSD*
1st/85	0.0010582	0.0005495	0.0004274	0.0026662
2nd/85	0.0010582	0.0005495	0.0004274	0.0018457
3rd/85	0.0010582	0.0005495	0.0004274	0.0014574
4th/85	0.0010582	0.0005495	0.0004274	0.0019364
1st/86	0.0010582	0.0005495	0.0004274	0.0014697
2nd/86	0.0010582	0.0005495	0.0004274	0.0018640
3rd/86	0.0010582	0.0005495	0.0004274	0.0022855

2. **Time Data Analysis**

Several comparative tests were performed on time data. Since NSCSD employs both government and civilian drivers, effectiveness of these two groups were compared. **Table** 17 shows the results of testing sample variances for a data set with 194 observations. Of these, 103 were government employees and ninety-one were commercial drivers. Data were sampled from LDIP reports submitted by drivers delivering to four of the major customer concentration areas. These are Naval Air Station (NAS) North Island, NAS Miramar, Naval Regional Medical Center (NRMC) Balboa and Point Loma.

TABLE 17
COMPARISON OF DRIVER MEAN TIMES

Delivery Function	Government *Driver*	Commercial *Driver*	Significant Difference *in Means?*
Loading	72 min.	54 min.	Yes
Transit	32 min.	27 min.	Yes
Unloading	32 min.	35 min.	No
Delay	14 min.	10 min.	No
Total Time	150 min.	126 min.	Yes

Note: Determination of significance made on the basis of an analysis of variance performed on the data. An F statistic was used to test inequality of variances with $\alpha = .025$ in a two tailed test.

It should be noted that government employees are on straight hourly salary while commercial drivers are paid by the trip. There is a strong incentive, therefore, for commercial drivers to complete as many trips as possible within the workday. This incentive is missing for government employees. Though commercial drivers tend to make more trips in less time, they cost approximately 30% more than government drivers. Therefore, they are considered less efficient overall than government drivers by NSCSD management even though they appear to be more effective. [Ref. 8]

Driver effectiveness in minimizing exposure time of merchandise delivered by commercial operations could not be directly compared to data obtained from NSCSD. Both Safeway and Liquor Barn systems use a drivers log form similar to the LDIP form used by the Navy. A blank driver log form is shown in Appendix F. Long's Drug Stores operation, however, relies on enforcement of contract terms to motivate delivery companies to control driver performance. Consequently, Long's management has no time information comparable to information collected by NSCSD.

Since Safeway management was reluctant to release driver log form data, an alternate testing procedure was used to determine how effective their drivers are in performing local deliveries. A sample of seventy-six time observations was taken from driver log forms for the Fremont Variety delivery operation and compared to times recorded on the Tachograph revolutions-per-minute (RPM) graph used for the trips involved. Data were tested to see if log entries matched Tachograph readings to a significant degree.

Two Tachograph graphs are mounted in devices installed in all tractor cabs. The graph recording vehicle speed is shown in Appendix G. Graduations are marked in miles-per-hour on the inner circle of the wheel. Time is shown around the outer circle. The other graph used on each trip is the RPM graph which measures engine revolutions. Again, time is indicated around the outer circle of the graph. The Tachograph device is so sensitive it records movement in the trailer on the RPM graph even if the engine is not running. [Ref. 16]

Comparison of times recorded on drivers' log forms to times indicated on RPM graphs was performed on a sample of seventy-six observations using the MINITAB© statistical computing system. A t-test was performed on the data to determine if the mean of log times made by drivers was equal with 95% confidence to the mean of the matching Tachograph reading for the time involved. The test showed that means of the two samples tested could be considered equal with 95% confidence.

Next, data were sorted to see how far from a perfect match log entries were from times indicated by Tachograph interpretation. A summary of these data is presented in Table 18 which shows a range of observations differing from a perfect match between log and Tachograph times that closely approximates a normal distribution.

Early times noted indicate that the driver logged a time earlier than that noted by the RPM Tachograph. Matches in times occurred when the time on the driver log

form was the same as that recorded on the RPM Tachograph wheel. Late times are where the time recorded on the driver log was later than the time indicated on the Tachograph. Percentages are shown to more clearly show the closeness of these differences to a perfect match between logged times and Tachograph times.

TABLE 18
COMPARISON OF LOG TO TACHOGRAPH DATA

Time	*Observations*	*% of Total*
Early		
> 15 min.	0	0
15 min.	2	3
10 min.	3	4
5 min.	16	21
Match	14	18
Late		
5 min.	18	24
10 min.	14	18
15 min.	7	9
> 15 min.	2	3
Total	76	100

In working with the data, only one significant outlier was noted. An observation of a log entry forty-five minutes later than the Tachograph showed movement was recorded. This much variance in times would be the first type of disparity sought by an investigator in the process of researching a referred hotline call reporting a shipping discrepancy. Independent verification of driver logs using Tachograph data has been very helpful in the past in detection of trends in driver performance as well. In cases where it is difficult to read Tachograph information, the company has access to experienced interpreters of Tachograph recordings in the person of former California Highway Patrol officers. [Ref. 16]

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Despite the wide scope of operations at NSCSD, they have an extremely high location accuracy in their warehouses. Enhancement of physical security by completion of a new perimeter fence at the Broadway complex and NCA and better access control procedures have probably contributed towards improvement of inventory control. Commercial operations also have fenced perimeters and access restrictions for their distribution centers. In the case of Safeway operations at the RDC, there are further capabilities present for terminal security in the system use of magnetic strip identification cards. Use of shrink wrap and plastic security boxes to consolidate less than case lot quantities is prevalent at the Liquor Barn storage hub. Long's avoids the need to provide distribution center physical security entirely by contracting the function out to another specialized firm.

While commercial operations use enclosed vans to make deliveries, NSCSD uses primarily flat-bed trailers. Safeway vans used to make deliveries to both Safeway stores and Liquor Barn outlets were designed to company specifications. Use of precision docks at Safeway stores built since 1975 has also contributed to in-transit physical security. All maintainance and repairs for these vehicles is performed in-house.

Augmentation of the drivers' log data used to monitor driver performance is provided by Tachographs and Tripmaster devices mounted in Safeway vehicles. These devices provide an added check on the accuracy of drivers' logs. A test of correlation between times recorded on a sample of Tachograph wheels and drivers' logs showed that Tachographs do provide a reliable verification of times recorded in logs.

Commercial firms have an independent verification of driver effectiveness built in to their delivery operations. Safeway and Liquor Barn use Tachograph devices while Long's relies on receipt clerk inventories conducted immediately at the point of delivery. NSCSD relies on mail feedback to a third party (Customer Services Branch) for an assessment of overall delivery effectiveness.

Commercial firms differ from NSCSD by reporting delivery discrepancies much faster. In virtually every case, discrepancies are reported by phone on the day of delivery or at least within seventy-two hours. Navy procedures, however, require mail

reporting with a fifteen day delay threshold. The present timeframes and reliance on mail reports is far less effective in evaluating security adequacy than telephone monitoring.

Speed of discrepancy resolution is also affected by the availability of computer assistance. Computer generated manifesting of local delivery shipments greatly helps all of the commercial systems in both maintaining delivery effectiveness and in investigating discrepancies reported. NSCSD use of the Wang word processor, however, is limited to sorting data entries. Investigation of discrepancy reports using the Wang system is presently not feasible, or at best very awkward and time consuming.

Delivery accuracy statistics at NSCSD currently exceed the NAVSUP standard. However, procedures used for sampling local deliveries to evaluate system effectiveness are not ideal. Analysis of ROD feedback indicates that NSCSD has not yet reached the NAVSUP goal for gross issue effectiveness since the number of validated RODs is greater than 0.1% of issues. Though this seems to be a problem, validity of the goal is questionable in light of the scope of supply center operations and the type of items that may be reported on RODs. The data can be used, however, to calculate a measure of effectiveness (net effectiveness) that can be compared to similar ratios calculated for commercial local delivery operations. When gross effectiveness is compared between NSCSD and commercial firms, NSCSD has a better ratio. Comparison of net effectiveness ratios, however, shows that commercial local delivery operations seem to be more effective.

Although NSCSD is processing RODs within the time standard established, this standard is extremely longer than discrepancy resolution time allowed in private industry. A shorter timeframe from discrepancy discovery to reporting results in more control over the report process. It also improves chances for prompt resolution and identification of specific security problems.

The shorter the transit delivery time, the less likely material will be exposed to pilferage or loss enroute. Analysis of LDIP data indicates NSCSD drivers generally meet time standards established. Less variation in time occurs during the transit when drivers have exclusive control over performance. When drivers are dependent on others to perform a function, such as loading or unloading, time variation widens. This reinforces the need to reduce handling of material in transit as much as possible.

A marked difference between net effectiveness ratios shown in Table 16 indicates that use of shrink wrap to consolidate pallet loads, enclosed vans, independent verification of drivers' logs, computer assistance, prompter discrepancy reporting, and possibly other commercial techniques are working well to improve commercial net effectiveness ratios.

B. RECOMMENDATIONS

Improvements based on commercial practices can be applied to all four factors contributing towards NSCSD local delivery security. Physical security, while excellent in the warehouse area of NSCSD, is not comparable to commercial operations for the time material is in transit to delivery points. Differences also exist in procedural, technological, and personnel security methods. These differences are the source of ideas that have the potential to improve NSCSD net effectiveness ratios.

Physical security at NSCSD warehouses is excellent. Improvement could be made, however, in protecting material between the warehouse and its local delivery destination. Shrink wrap and plastic boxes used at the Fremont Variety warehouse could be used to reduce the vulnerability of goods delivered in small quantities. Consolidation using shrink wrap, plastic boxes, or sealed triwalls would be useful in preventing pilferage of GSK material delivered to the piers. It could also reduce the number of signatures required for delivery of signature service materials.

Use of Hesse trailers to protect intransit shipments should be explored further. They incorporate both the protection of enclosed vans used by commercial operations and handling advantages present in currently used flatbed trailers.

Procedural security methods represent the largest category of potential improvement for NSCSD local delivery security overall. Use of a contractor to perform local delivery as is done by Long's Drug Stores could result in the best ROD net effectiveness ratio possible. Using a contractor would require careful performance monitoring with computer generated manifests to maintain quality service.

Use of manifests even for deliveries using government-owned equipment is recommended as a control measure because of the audit trail they provide investigators. Contact could be made with software sales representatives to ascertain availability of suitable merchandise manifesting programs compatible with NSCSD hardware for use until the full implementation of NISTARS/NAVADS programs.

Telephone reporting of discrepancies is also recommended provided ceiling points and other resources are available to properly monitor and follow up on calls. Use of phone reporting should allow a broader segment of feedback and considerably improve customer service.

Reporting requirements currently do not generate meaningful feedback to all NSCSD managers involved in local delivery operations. Reports based on effectiveness of local delivery could be made simpler if credit for shortages could be given promptly to the reporting command rather than its immediate superior.

A better control system could probably be generated using the ROD/ISSUE data base, perhaps using new reporting formats which highlight local delivery problems. Adaptation of new software for using this data base might be possible using the Wang system currently in use. If this option is not feasible, use of personal computers with tailored software is recommended to improve management reports.

Technology involved in local delivery security at NSCSD should be improved by installation of Tachographs in tractor cabs. Experts trained to read these devices and detect tampering should also be hired to complement their use. These devices would provide an independent audit trail for investigations should a major theft ever occur. Also, they would assist managers on a daily basis in monitoring driver performance objectively.

Application of improved procedural and technological security measures should bring with them concurrent improvement in personnel security. Personnel security in commercial operations is reinforced by procedures that promote segregation of duties. Only employees with significant seniority should be allowed to handle the most pilferable commodities. A high supervisor to employee ratio should also be used as an effective control measure.

Achievement of technological security by NSCSD is still somewhere in the future. Although the NAVADS software needed to fully implement NISTARS is due in July 1987, past slippages have promoted pessimism towards the likelihood of a fully operational system being completed on schedule. Therefore, prompt implementation of these recommendations is proposed.

Finally, it should be noted that efforts to improve all types of security at NSCSD are ongoing and part of a continuous process. Although the command has done well recently in improving inventory accuracy, more needs to be done in the local delivery area if NAVSUP's new direction is to be followed into the future.

APPENDIX A

NORTHERN DIVISION SAFEWAY STORES

#1 Eureka Dist.

641-Eureka
712-Eureka
715-McKinleyville
744-Ukiah
793-Arcata
954-Crescent City
965-Willits
975-Fortuna
978-Ft. Bragg
983-Lakeport
984-Clearlake

#2 Santa Rosa Dist.

568-Santa Rosa
713-Santa Rosa
728-Santa Rosa
732-Napa
762-St. Helena
780-Santa Rosa
796-Petaluma
911-Sonoma
913-Napa
918-Rohnert Park
933-Sebastopol
950-Guerneville
956-Santa Rosa
998-Healdsburg

#3 Marin Dist.

318-Corte Madera
509-San Francisco
558-San Francisco
592-San Francisco
637-Larkspur
653-San Rafael
661-Mill Valley
711-San Francisco
723-San Anselmo
729-Novato
785-San Francisco
788-Mill Valley
932-San Rafael
979-Novato
4600-Tiburon
4601-San Francisco

#4 Berkeley Dist.

600-Oakland
613-Berkeley
638-Oakland
654-Oakland
669-Oakland
676-Albany
677-Oakland
687-Oakland
691-Berkeley
751-El Cerrito
908-Oakland
921-San Pablo
926-Richmond
966-San Pablo

#5 Hayward Dist.

309-Fremont
315-San Leandro
582-Alameda
664-Hayward
670-San Leandro
768-Castro Valley
790-San Leandro
797-Hayward
925-Union City
942-Newark
951-Alameda
971-Hayward
993-Fremont
994-San Leandro

#6 E. San Jose Dist.

312-San Jose
313-Sunnyvale
526-Santa Clara
698-Milpitas
699-Santa Clara
700-Santa Clara
746-Sunnyvale
763-Santa Clara
767-San Jose
929-San Jose
987-San Jose
988-San Jose
3012-San Jose
3016-San Jose
3018-San Jose

#7 Contra Costa Dist.

113-Tracy
697-Walnut Creek
701-Walnut Creek
722-San Ramon
738-Pleasanton
783-Lafayette
910-Livermore
917-Walnut Creek
936-Walnut Creek
962-Alamo
967-Orinda
969-Moraga
982-San Ramon
4603-Danville

#8 N. Contra Costa Dist.

239-Vacaville
261-Fairfield
595-Concord
714-Pinole
756-Vallejo
774-Benicia
902-Pleasant Hill
928-Pleasant Hill
931-Concord
935-Pittsburg
939-Martinez
955-Concord
968-Vallejo
972-Martinez
976-Rodeo
989-Vallejo

#9 San Francisco Dist.

507-San Francisco
667-San Francisco
683-San Francisco
739-San Francisco
759-San Francisco
773-San Francisco
909-San Francisco
964-San Francisco
985-San Francisco
995-San Francisco

#10 Peninsula Dist.

609-San Carlos
618-Millbrae
639-San Mateo
668 Belmont
682 Palo Alto
694-San Mateo
705-Mt. View
708-Foster City
747-Redwood City
776-Belmont
781-Mt. View
948-Burlingame
970-San Mateo
3021-Mt. View
3022-Palo Alto

#11 San Jose Dist.

311-Gilroy
612-Los Altos
663-San Jose
673-Campbell
695-San Jose
709-Menlo Park
716-San Jose
737-Los Altos
741-San Jose
742-Los Gatos
771-Los Altos
915-Los Gatos
919-Saratoga
986-Morgan Hill
990-Menlo Park
997-San Jose

#12 Salinas Dist.

300-Scotts Valley
465-Monterey
636-Santa Cruz
640-Aptos
679-Salinas
706-Carmel
719-Marina
724-King City
749-Carmel
761-Pacific Grove
786-Felton
799-Santa Cruz
904-Soquel
922-Salinas
953-Monterey

#13 N. San Mateo Dist.

304-Pacifica
308-Half Moon Bay
310-San Francisco
659-Daly City
765-So. San Fran.
777-So. San Fran.
784-Pacifica
3008-Pacifica
3023-Daly City
3027-So. San Fran.
3031-Daly City

#14 Reno Dist.

102-Susanville
147-Kings Beach
157-Roundhill, Nev.
160-Lovelock, Nev.
167-Fallon, Nev.
170-So. Lake Tahoe
181-Truckee
184-Reno, Nev.
245-Reno, Nev.
247-Carson City, Nev.
255-Hawthorne, Nev.
258-Tahoe City, Nev.
260-Sparks, Nev.
262-Quincy

#15 Chico Dist.

177-Redding
178-Burney
180-Chico
193-Yuba City
231-Willows
232-Oroville
252-Enterprise
256-Chico
273-Anderson
287-Gridley
295-Corning
302-Paradise
540-Redding

#16 Hawaii Dist.

201-Honolulu
203-Honolulu
204-Honolulu
205-Kailua
207-Kaneohe
208-Kailua
211-Honolulu
214-Aiea
215-Honolulu
218-Mililani
220-Maui
221-Hilo

#17 Sacramento Dist.

111-Grass Valley
141-Carmichael
155-N. Sacramento
169-Davis
190-Sacramento
235-Auburn
242-Sacramento
244-Grass Valley
251-Sacramento
263-Sacramento
269-W. Sacramento
282-Woodland
286-Rocklin
301-Davis

#18 Modesto Dist.

159-Stockton
171-Pollock Pines
175-Sonora
179-Fresno
183-Altaville
186-Turlock
234-Selma
236-Stockton
241-Clovis
259-Manteca
265-Fresno
278-Placer
279-Jackson
293-Cameron Park
523-Stockton
536-Lodi
545-Fresno

APPENDIX B
RDC VISITOR PASS

The pass used at Safeway's Richmond Distribution Center (RDC) to identify visitors to the complex is printed on paper with adhesive backing. The adhesive used enables visitors to attach the pass to outer clothing for brief periods. These passes are bought in five different colors. Each day a different color is chosen at random by the guard supervisor. All persons entering the RDC perimeter must either have one of these passes or a magnetic strip/photo identification pass issued only to employees. The paper RDC visitor pass has a control number that is entered in the visitor control log at one of the two entry gates. At any particular time, an audit of visitors to the RDC can be conducted by guard supervisors. Though inexpensive, this pass has proved effective in maintaining visitor control and providing an additional security precaution.

APPENDIX C

LIQUOR BARN STORES

Dist. #20	*Dist. #21*	*Dist. #24*
2001-Daly City	2008 Alameda	2032-San Rafael
2002-San Jose	2009-Fremont	2048-Antioch
2024-San Jose	2023-San Francisco	2049-Fresno
2035-Pacific Grove	2026-Walnut Creek	2052-Fresno
2036-Santa Cruz	2029-San Francisco	2053-Sacramento
2037-Mt. View	2031-Castro Valley	2054-Citrus Heights
2044-Santa Clara	2034-Albany	2055-Sacramento
2045-Milpitas	2038-Hayward	2057-Modesto
2046-Redwood City	2074-San Pablo	2073-Redding
2063-San Jose	2075-San Leandro	2099-Yuba City
2068-Salinas	2102-Orinda	2112-Fairfield
2100-San Jose	2138-Dublin	2118-Napa
2101-Campbell	2163-Fremont	2130-So. Lake Tahoe
2139-Mt. View	2168-Lafayette	2161-Vallejo
2140-Sunnyvale		

Note: Liquor Barn Stores are grouped in districts that are numbered with Safeway district and store numbers.

APPENDIX D

LONG'S DRUG STORES CALIFORNIA, INC.

#800 Northern Dist.

32-Novato
36-San Anselmo
38-Fairfield
39-Santa Rosa
40-San Rafael
58-Santa Rosa
65-Eureka
96-Vacaville
99-Ukiah
103-Anchorage, AK
111-Vallejo
144-Bend, OR
152-Sonoma
157-Anchorage, AK
163-Petaluma
214-Napa
218-Sebastopol
219-Greenbrae

#801 Sacramento Dist.

86-Carmichael
93-Citrus Heights
100-Sacramento
101-Sacramento
105-Sacramento
146-Carson City, NV
150-Auburn
155-Grass Valley
168-Reno, NV
170-Sparks, NV
174-Truckee
175-Sacramento
177-Reno, NV
178-Sparks, NV
184-Placerville
191-Reno, NV
193-Rancho Cordova

#802 Delta Dist.

27-Modesto
47-Chico
48-Lodi
54-Merced
68-Marysville
81-Redding
109-Stockton
118-Turlock
142-Davis
147-Stockton
158-Oroville
171-Modesto
180-Woodland
187-Tracy
207-Manteca
208-Sonora
223-Ceres
233-Jackson
243-Lodi

#803 East Bay Dist.

02-El Cerrito
03-Fremont
05-Alameda
07-Oakland
11-San Pablo
24-Oakland
26-Concord
30-Pinole
37-Hayward
42-Walnut Creek
49-Fremont
53-Hayward
56-San Leandro
64-Livermore
72-Antioch
77-Danville
87-San Leandro
94-Walnut Creek
106-Concord
179-Pleasant Hill
203-Moraga
211-San Ramon
230-Pittsburg
232-San Leandro
234-Fremont

#804 Peninsula Dist.

44-San Mateo
46-Daly City
66-Mountain View
67-Redwood City
70-Sunnyvale
75-Santa Clara
82-Campbell
84-San Bruno
85-San Jose
88-San Jose
89-Burlingame
91-San Jose
108-San Jose
113-San Mateo
114-Cupertino
115-Saratoga
161-Milpitas
169-Gilroy
172-San Carlos
192-Sunnyvale
198-Sunnyvale
212-Morgan Hill
216-Half Moon Bay
229-San Jose
245-Foster City

#805 Central Dist.

06-Fresno
14-Fresno
22-Fresno
28-Visalia
33-Santa Cruz
35-Salinas
41-Fresno
45-Capitola
51-Carmel
59-Fresno
76-Watsonville
78-Clovis
79-Monterey
107-Hanford
141-Porterville
149-Fresno
159-Madera
181-Tulare
186-Salinas
197-Scotts Valley
200-Bakersfield
204-Bakersfield
205-Fresno
209-Visalia
215-Bakersfield
239-Bakersfield

#806 East LA Area

16-West Covina
31-San Bernardino
34-San Bernardino
71-West Covina
73-Hemet
83-Palm Springs
119-Upland
153-Rancho Mirage
166-Glendora
183-Hemet
196-Redlands
224-Moreno

#807 LA West Area

09-Buena Park
15-Fullerton
50-Rolling Hills Estates
61-Tarzana
98-Santa Maria
102-Santa Barbara
110-La Habra
112-Hacienda Heights
140-Camarillo
156-Goleta
165-Lancaster
194-Valencia
195-Simi Valley
201-Costa Mesa
217-Lompoc
221-Thousand Oaks
222-San Luis Obispo
236-Ventura
241-Thousand Oaks
242-Mission Viejo
246-Laguna Hills

#808 San Diego Dist.

04-San Diego
10-San Diego
12-San Diego
13-Encinitas
18-El Cajon
19-La Mesa
55-Chula Vista
63-Oceanside
69-Escondido
74-National City
80-San Diego
90-El Centro
95-El Cajon
97-San Ysidro
143-Calexico
145-Yuma, AZ
154-San Diego
162-La Mesa
190-Poway
240-Chula Vista

#809 Hawaii Dist.

20-Honolulu
21-Honolulu
23-Honolulu
25-Honolulu
29-Pearl City
52-Hilo
57-Honolulu
60-Maui, Kahului Mall
62-Kaneohe
92-Aiea
104-Kailua
116-Honolulu
164-Honolulu
185-Honolulu
189-Lihue, Kauai
202-Mililani Town
227-Hilo
237-Lahaina, Maui

#810 Arizona Dist.

117-Sun City, AZ
148-Mesa, AZ
151-Phoenix, AZ
160-Scottsdale, AZ
167-Phoenix, AZ
173-Mesa, AZ
176-Tucson, AZ
182-Phoenix, AZ
188-Flagstaff, AZ
199-Prescott, AZ
206-Tucson, AZ
210-Chandler, AZ
213-Mesa, AZ
220-Colorado Springs, CO
225-Sierra Vista, AZ
226-Fort Collins, CO
228-Tucson, AZ
231-Colorado Springs, CO
235-Phoenix, AZ
238-Glenwood Springs, CO
244-Tucson, AZ

APPENDIX E

ROD FORM (NAVSUP FORM 364)

REPORT OF DISCREPANCY (ROD)

☐ SHIPPING ☐ PACKAGING

1. DATE OF PREPARATION	2. REPORT NUMBER

3. TO (*Name and address, include ZIP Code*)	4. FROM (*Name and address, include ZIP Code*)

5a. SHIPPER'S NAME	5b. NUMBER AND DATE OF INVOICE	6. TRANSPORTATION DOCUMENT NUMBER (*GBL, Waybill, TCN, etc.*)

7a. SHIPPER'S NUMBER (*Purchase Order/Shipment, Contract, etc.*)	7b. OFFICE ADMINISTERING CONTRACT	8. REQUISITIONER'S NUMBER (*Requisition, Purchase Request, etc.*)

9 SHIPMENT, BILLING, AND RECEIPT DATA				10. DISCREPANCY DATA				11.
NSN/PART NUMBER AND NOMENCLATURE (a)	UNIT OF ISSUE (b)	QUANTITY SHIPPED/ BILLED (c)	QUANTITY RECEIVED (d)	QUANTITY (a)	UNIT PRICE (b)	TOTAL COST (c)	CODE[1] (d)	ACTION CODE[2]

12. REMARKS (*Continue on separate sheet of paper if necessary*)

[1] DISCREPANCY CODES	[2] ACTION CODES
CONDITION OF MATERIAL C1 – In condition other than that indicated on receipt/receipt document C2 – Exceed shelf life C3 – Damaged parcel post shipment SUPPLY DOCUMENTATION D1 – Not received D2 – Illegible or mutilated D3 – Incomplete, improper, or without authority (*Only when receipt cannot be properly processed*) MISDIRECTED MATERIAL W1 – Addressed to wrong activity OVERAGE/DUPLICATE SHIPMENTS O1 – Quantity in excess of that on receipt document O2 – Quantity in excess of that requested (*Other than unit of issue pack*) O3 – Quantity duplicates shipment PACKING DISCREPANCY P1 – Improper preservation P2 – Improper packing P3 – Improper marking P4 – Improper consolidation PRODUCT QUALITY DEFICIENCIES Q1 – Deficient material (*Applicable to Grant Aid and FMS shipments only*) SHORTAGE OF MATERIAL S1 – Quantity less than that on receipt document S2 – Quantity less that that requested (*Other than unit of issue pack*) S3 – Non-receipt of parcel post shipments ITEM TECHNICAL DATA MARKINGS (*i.e., Name Plates, Log Books, Operating Handbooks, Special Instructions, etc.*) T1 – Missing T2 – Illegible or mutilated T3 – Precautionary operational markings missing T4 – Inspection data missing or incomplete T5 – Serviceability operating data missing or incomplete T6 – Warranty data missing WRONG ITEM (*Identify requested item as a separate copy in Item 9 above*) W1 – Incorrect item received W2 – Unacceptable substitute OTHER DISCREPANCIES Z1 – See remarks	1A – Disposition instructions requested (*Reply on reverse*) 1B – Material being retained (*See remarks*) 1C – Supporting supply documentation requested 1D – Material still required expedite shipment (*Not applicable to FMS*) 1E – Local purchase material to be returned at supplier's expense unless disposition instructions to the contrary are received within 15 days (*Reply on reverse*) (*Not applicable to FMS*) 1F – Replacement shipment requested (*Not applicable to FMS*) 1G – Reshipment not required. Item to be re-requisitioned. 1H – No action required. Information only 1Z – Other action requested (*See remarks*)

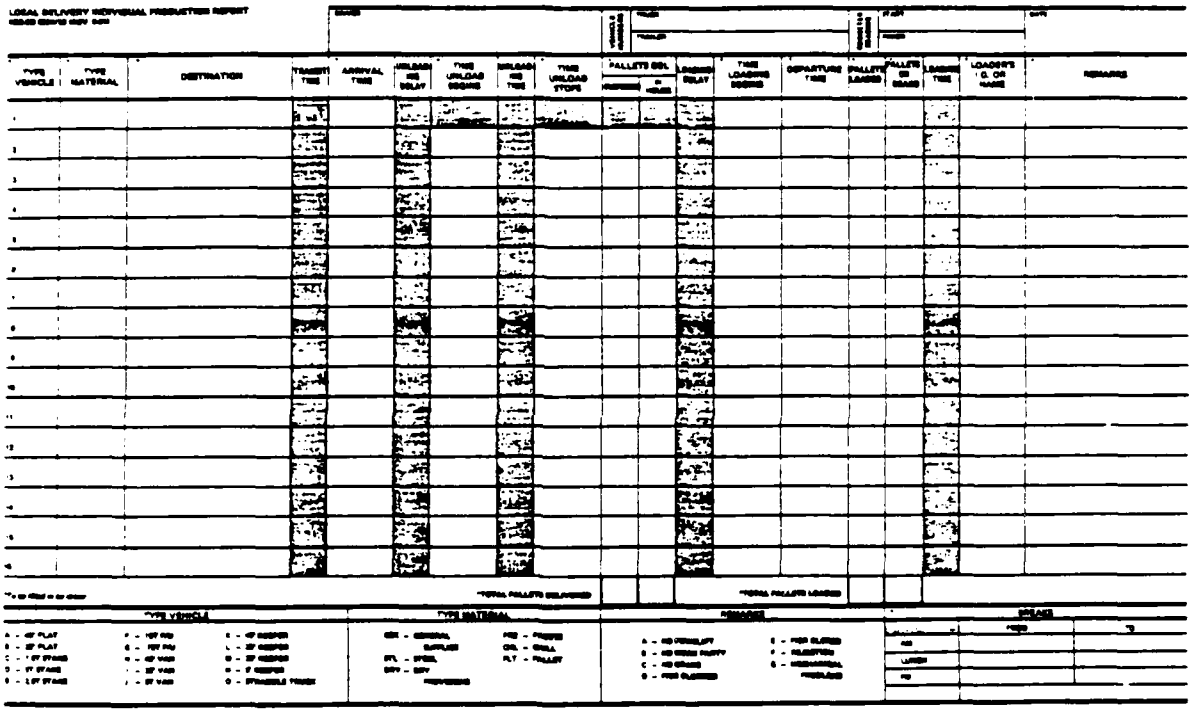
13. FUNDING AND ACCOUNTING DATA

14a. TYPED OR PRINTED NAME, TITLE, AND PHONE NUMBER OF PREPARING OFFICIAL	14b. SIGNATURE

15. DISTRIBUTION ADDRESSEES FOR COPIES

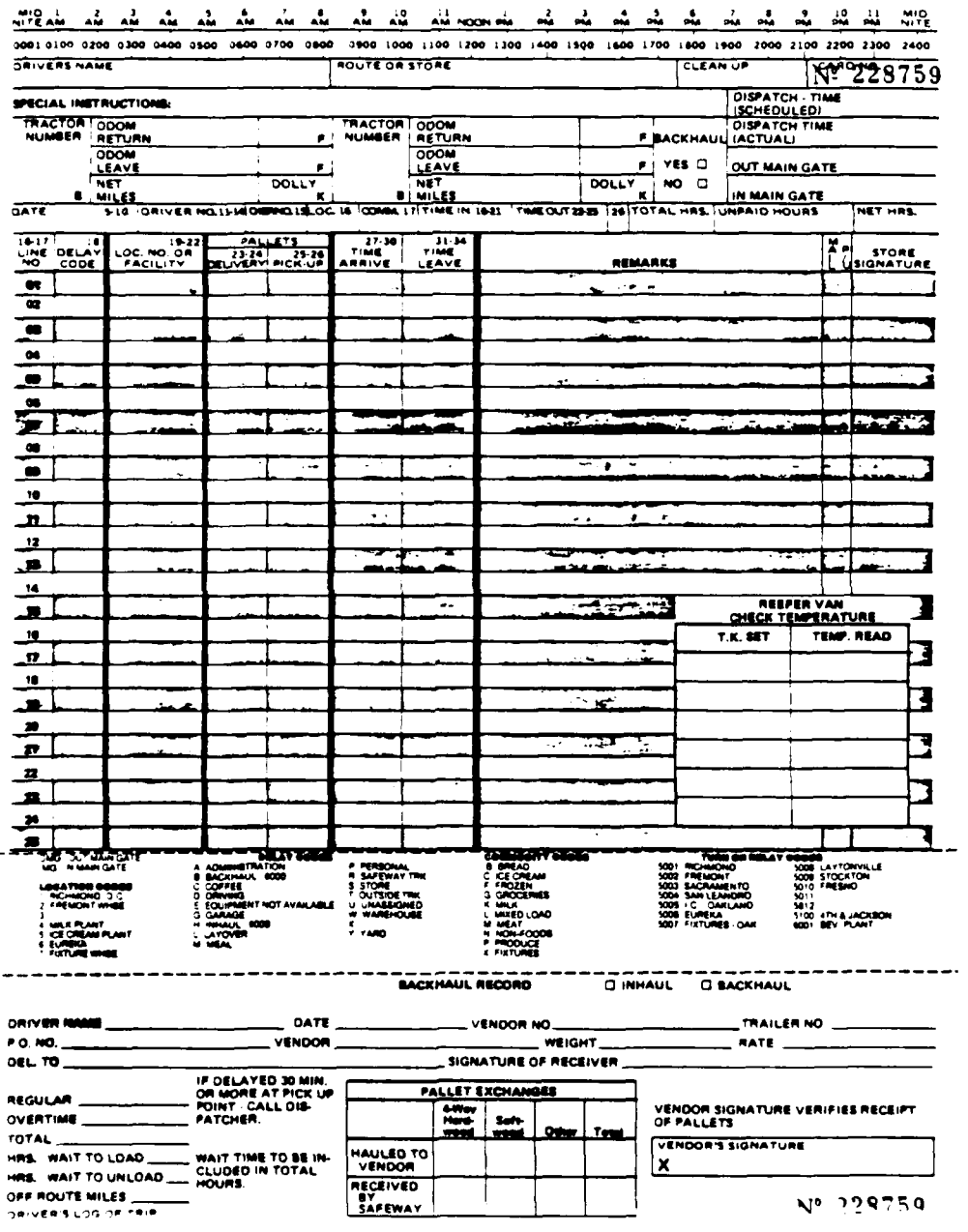
364-101 7540-00-159-4442 (*Previous edition is obsolete.*) STANDARD FORM 364 (REV. 2-88)
Prescribed by GSA FPMR 101-26.8

APPENDIX F
LDIP FORM



APPENDIX G

SAFEWAY DRIVER'S LOG FORM



MID NITE 1 AM 2 AM 3 AM 4 AM 5 AM 6 AM 7 AM 8 AM 9 AM 10 AM 11 AM NOON 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM 11 PM MID NITE

0001 0100 0200 0300 0400 0500 0600 0700 0800 0900 1000 1100 1200 1300 1400 1500 1600 1700 1800 1900 2000 2100 2200 2300 2400

DRIVER'S NAME | ROUTE OR STORE | CLEAN UP | VENDOR NO. 228759

SPECIAL INSTRUCTIONS: | DISPATCH - TIME (SCHEDULED)

TRACTOR NUMBER | ODOM RETURN | F | TRACTOR NUMBER | ODOM RETURN | F | BACKHAUL | DISPATCH TIME (ACTUAL)

ODOM LEAVE | F | ODOM LEAVE | F | YES ☐ | OUT MAIN GATE

B | NET MILES | DOLLY | K | B | NET MILES | DOLLY | K | NO ☐ | IN MAIN GATE

DATE 9-10 | DRIVER NO. 11-14 | CHKRNO 15 | LOC. 16 | COMBA 17 | TIME IN 18-21 | TIME OUT 22-25 | 26 | TOTAL HRS. | UNPAID HOURS | NET HRS.

16-17 LINE NO	18 DELAY CODE	19-22 LOC. NO. OR FACILITY	PALLETS 23-24 DELIVERY	PALLETS 25-26 PICK-UP	27-30 TIME ARRIVE	31-34 TIME LEAVE	REMARKS	M A P	STORE SIGNATURE
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

REEFER VAN CHECK TEMPERATURE

T.K. SET	TEMP. READ

MID 30 MAIN GATE NO. IN MAIN GATE

LOCATIONS 0000
RICHMOND D.C.
2 FREMONT WHSE
3
4 MILK PLANT
5 ICE CREAM PLANT
6 EUREKA
7 FIXTURE WHSE

DELAY CODES
A ADMINISTRATION
B BACKHAUL 0000
C COFFEE
D DRINKING
E EQUIPMENT NOT AVAILABLE
G GARAGE
H INHAUL 0000
L LAYOVER
M MEAL
P PERSONAL
R SAFEWAY TRK
S STORE
T OUTSIDE TRK
U UNASSIGNED
W WAREHOUSE
X
Y YARD

COMMODITY CODES
B BREAD
C ICE CREAM
F FROZEN
G GROCERIES
K MILK
L MIXED LOAD
M MEAT
N NON-FOODS
P PRODUCE
X FIXTURES

TRIPS OR RELAY CODES
5001 RICHMOND
5002 FREMONT
5003 SACRAMENTO
5004 SAN LEANDRO
5005 I.C. OAKLAND
5006 EUREKA
5007 FIXTURES - OAK
5008 LAYTONVILLE
5009 STOCKTON
5010 FRESNO
5011
5012
5100 4TH & JACKSON
6001 BEV. PLANT

BACKHAUL RECORD ☐ INHAUL ☐ BACKHAUL

DRIVER NAME _____ DATE _____ VENDOR NO _____ TRAILER NO _____

P.O. NO. _____ VENDOR _____ WEIGHT _____ RATE _____

DEL. TO _____ SIGNATURE OF RECEIVER _____

REGULAR _____
OVERTIME _____
TOTAL _____
HRS. WAIT TO LOAD _____
HRS. WAIT TO UNLOAD _____
OFF ROUTE MILES _____
DRIVER'S LOG OF TRIP

IF DELAYED 30 MIN. OR MORE AT PICK UP POINT - CALL DISPATCHER.

WAIT TIME TO BE INCLUDED IN TOTAL HOURS.

PALLET EXCHANGES

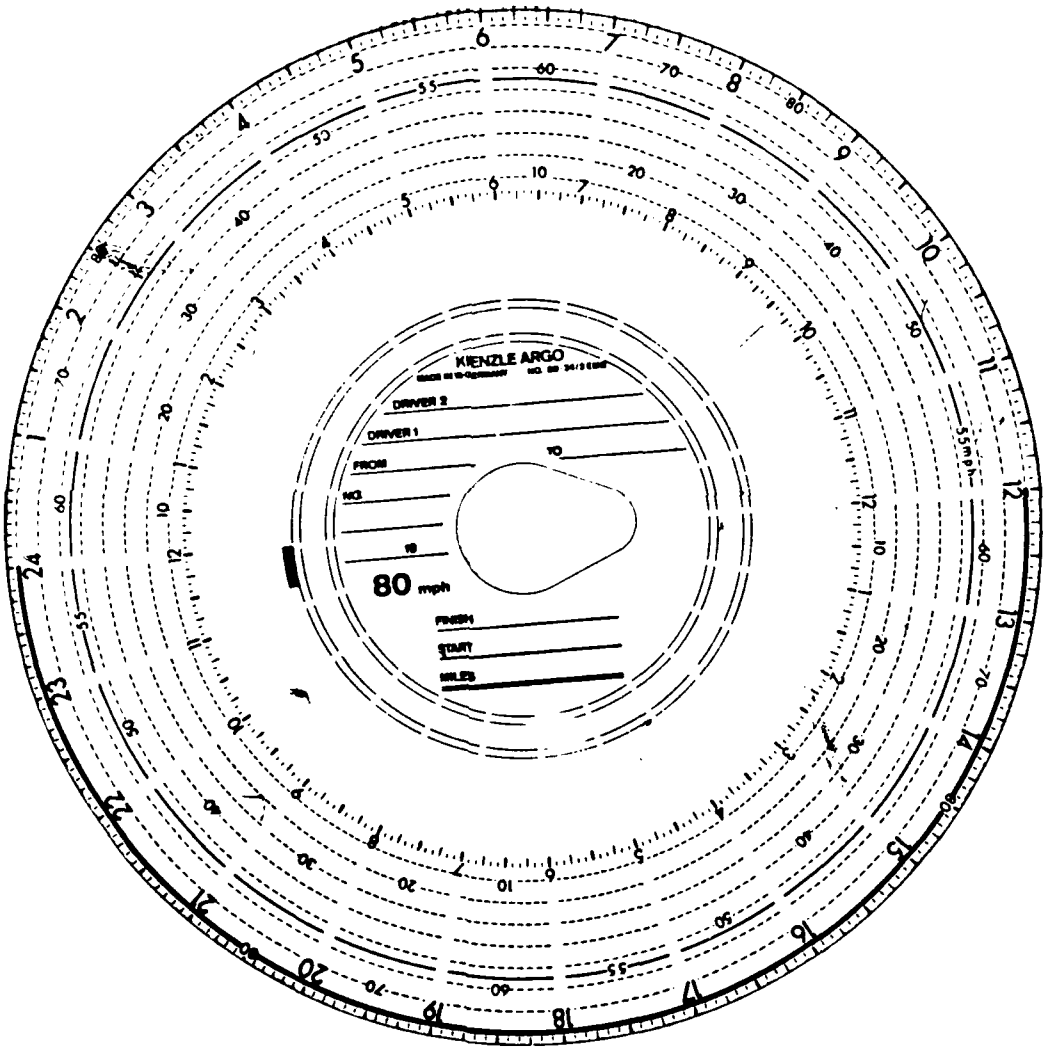
	4-Way Hardwood	Softwood	Other	Total
HAULED TO VENDOR				
RECEIVED BY SAFEWAY				

VENDOR SIGNATURE VERIFIES RECEIPT OF PALLETS

VENDOR'S SIGNATURE
X

N° 228759

APPENDIX H
TACHOGRAPH SPEEDOMETER GRAPH



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