

King County Solid Waste Transfer Station  
Capacity Criteria and Standards

Attachment A

2002 3 4 5

Background

Ordinance 14236 adopted the Final 2001 Comprehensive Solid Waste Management Plan (Plan) for King County in October 2001. The ordinance directed the Executive to transmit a motion by July 31, 2002 to adopt a "set of criteria and standards to determine when a county owned and operated transfer station has exceeded its capacity to efficiently serve the needs of its customers".

A literature search of solid waste industry journals and associations found no research on the subject; evidently this is not a question that has been asked before. The rating system described in this report is a new concept that will need to be tested and refined in the field. It will also be submitted to industry publications for peer review. In time, this tool should be able help quantify physical and operational aspects of a transfer station so that decision makers have the information that they need.

The attached motion defines these initial criteria and recommends standards for levels of service at King County owned and operated transfer stations. This report provides background on the development of the criteria and standards and applies those standards to the existing system.

When a transfer station is being designed, it is sized to handle a certain amount of waste brought in by a certain mix of vehicles. Self haulers generate proportionally more traffic for the tonnage brought in. Commercial haulers use larger trucks and require a larger tipping floor area. The size and configuration of the site and structures are based on forecasts of tonnage and traffic twenty years out so that they can accommodate growth. Transfer stations have a long active life; more than half of the King County stations have been in operation for nearly 40 years.

The Solid Waste Association of North America (SWANA), a national organization that serves the solid waste industry, uses the term design capacity and defines it as "the amount of waste that can be managed in a working day (tons/day)". They describe factors that contribute to a facility's design capacity as being vehicle arrival rates and payloads, vehicle unloading times, number of customer unloading positions, trailer loading positions, loading cycle rates and refuse trailer payloads, and storage requirements. Site conditions such as available queuing space also affect capacity.

Transfer Station Capacity Criteria and Standards

In order to judge when a facility has exceeded its capacity, there needs to be an accepted performance measurement scale and a target 'score' on that scale. A level of service scale has been developed to express capacity in its most basic form:

- The number of vehicles that use a station daily and the ability to accommodate those vehicles; and
- The tonnage that those vehicles bring in and the ability to process that amount of waste.

The standards described here were developed to parallel the familiar transportation industry standard of measurement related to capacity of roadways and intersections, Level of Service (LOS) criteria.

Level of Service, as used in roadway and intersection analysis, is a qualitative measure of how a roadway or intersection is performing based on quantitative data. LOS range from a LOS A (best case) to a LOS F (worst case). The Solid Waste Division has taken this format and developed a similar method for expressing the capacity levels of its transfer stations. In the case of transfer stations, 'best case' is not necessarily a LOS A. A station built to serve tonnage and traffic in twenty years typically has a LOS A when it first opens and could be considered to be 'underutilized' in the early years because customers virtually never have to wait.

The most efficient transfer station operation may actually be a LOS C, with a steady flow of vehicles except for occasional peak periods. There are always choices that must be made that balance the level of service against the amount of money that is spent on the facilities.

It needs to be noted that capacity for each station is a function of the vehicle mix (commercial haulers and self-haulers), the tonnage received, and the current operating hours. The capacity can be altered by changing the vehicle mix or the length of the workday, without changing the physical plant. Another non-structural change that would impact how traffic moves through a station is how fees are collected. For instance, by charging all passenger licensed vehicles the minimum charge, instead of weighing them in and out, wait times could be reduced. Currently, sedans are the only type of vehicles that are not weighed in and out.

King County Solid Waste Transfer Station  
Capacity Criteria and Standards

---

Level of Service Criteria for King County Transfer Stations

LOS A - Can easily accommodate vehicle and tonnage throughput all times of the day.  
V/C & T/C < 0.50

LOS B - Able to accommodate vehicle and tonnage throughput at most times of the day.  
V/C & T/C = 0.50 to 1.05

LOS C - Able to accommodate vehicle and tonnage throughput all times of the day,  
except for occasional peak hour times. V/C & T/C = 1.05 to 1.10

LOS D - Beginning to have difficulty accommodating all vehicle and tonnage throughput  
during peak hours. V/C & T/C 1.10 to 1.20

LOS E - Cannot accommodate vehicle OR tonnage (one or the other) throughput without  
off-site impacts or overloading on-site resources. V/C & T/C 1.20 to 1.50

LOS F - Cannot accommodate vehicle and tonnage throughput without off-site impacts  
and overloading of on-site resources. Throughput capacity exceeded most  
hours. V/C & T/C > 1.50

Using formulas based on:

1. The ratio of the actual number of vehicles to the designed vehicle capacity (V/C);  
and
2. The ratio of the actual tons received to designed tonnage capacity (T/C)

**King County Solid Waste Transfer Station  
Capacity Criteria and Standards**

**1160 1**

**Capacity at King County Transfer Stations**

Using criteria similar to those used by SWANA, the following hourly and daily capacities were arrived at for each King County transfer station.

Transfer Station	Hourly Tonnage Capacity	Hourly Vehicle Capacity	Daily Tonnage Capacity	Daily Vehicle Capacity
Algona	52	29	430	290
Bow Lake	60	43	500	430
Enumclaw	47	46	400	460
Factoria	68	47	560	470
First NE	35	38	290	380
Houghton	72	49	600	490
Renton	36	40	300	400
Vashon	22	40	90	197

Based on these capacities, the following levels of service for each transfer station were derived using a quantitative analysis of 2001 customer activity, which was then verified by a qualitative process that factored in actual experience at each site by SWD Operations personnel. Tonnage was measured on weekdays when most of the waste comes in. Vehicle activity levels were measured on weekend days since that is when there are the most customers. Again, LOS A shows excess capacity, LOS C is most efficient (the relationship of service provided to resources used), LOS F shows that the station is operating significantly over capacity.

Transfer Station	Vehicles/Vehicle Capacity		Tonnage/Tonnage Capacity		Overall LOS
	Rating	Score	Rating	Score	
Algona	1.89	F	1.21	E	F
Bow Lake	1.07	C	1.23	E	D
Enumclaw	0.50	A	0.36	A	A
Factoria	0.81	B	0.73	B	B
First NE	1.16	D	0.96	B	C
Houghton	0.96	B	1.34	E	E
Renton	0.84	B	0.93	B	B
Vashon	0.25	A	0.49	A	A

## King County Solid Waste Transfer Station Capacity Criteria and Standards

---

1160 11

The results show that there is a wide range in levels of service, i.e. customer convenience and queues, found at King County transfer stations. LOS D is generally the level at which station capacity becomes a problem in providing an acceptable service level, being that point in which facilities begin to have regular difficulty accommodating all vehicle and tonnage throughput at all times of the day. The stations that fall in this range or below are Algona, Houghton and Bow Lake.

The stations built in the last decade, **Enumclaw** and **Vashon**, clearly provide a high level of service since today they operate below capacity and are rated at LOS A. These stations were constructed with future growth in mind, and there is ample space for current activity at these modern facilities, which enable smooth operation and customer throughput. These stations were built with pre-load compactors and are ready to accommodate waste export. Enumclaw and Vashon also provide opportunities for the public to recycle a broader range of materials.

**Renton**, constructed in the 1960s, operates at a relatively high LOS B. The overall tonnage and vehicles there are among the lowest of the urban area transfer stations. This facility, however, will need to be retrofitted to accommodate future export of waste and to accommodate the larger collection vehicles of today as well as modern waste handling technology. The current plan is to raise the roof and integrate pre-load compaction capability into the existing station.

**Factoria** and **First NE** operate at LOS B and C, respectively. Both of these stations were built in the 1960s. The Factoria site has maximized its ability to accommodate future growth in that all developable property has been utilized at the existing site. The First NE location has adequate room to accommodate future growth in the service area. However, like Renton, both stations need to be retrofitted to accommodate future export of waste and to accommodate the larger collection vehicles as well as modern waste handling technology. Projects are under way to replace the old facilities in the same general location (necessary additional property has been acquired for Factoria).

**Bow Lake** operates at a LOS D. This station was built in 1977, is different in configuration from the 1960s era transfer stations, and is limited in its throughput capacity in that it can load only one trailer at a time. This facility also has no pre-load compaction capability, which is necessary for efficient waste export. A project is planned to remodel and expand the old facility, with additional adjacent property acquisition underway.

**Houghton** operates at a LOS E. This station, built in the 1960s, handles the most tonnage and vehicles of any station in the transfer system. Utilization of available space there has been maximized. Surrounded by single-family homes and a park, there is no room for expansion at this facility. A feasibility study on siting an additional transfer facility to serve residents of northeast King County will be out in early 2003. It could suggest ways to relieve the Houghton facility. In addition, a facility master plan should be completed in 2003 that will assess the site capability to accommodate future growth.

**King County Solid Waste Transfer Station  
Capacity Criteria and Standards**

---

**1160 1**

**Algona** operates at a LOS F. It cannot accommodate vehicle and tonnage throughput without off-site impacts and overloading of on-site resources. Algona was built in the 1960s using the same design as the other stations from that era. Its inability to serve customers effectively is not only because the facility is functionally obsolete, its total site acreage is extremely small and surrounded by steep hillsides, and the queuing lane is short.

There may be cost-effective ways to improve the level of service without changes to the facility. One example is a proposal to open two hours earlier on weekdays at Algona and Bow Lake, primarily to serve the commercial garbage collection trucks. This will spread out the activity at two stations where earlier opening times will not bother the neighbors. Opening early would be a pilot project and would be evaluated before making it permanent. By definition, the capacity would change if a station operates for more hours in the day.

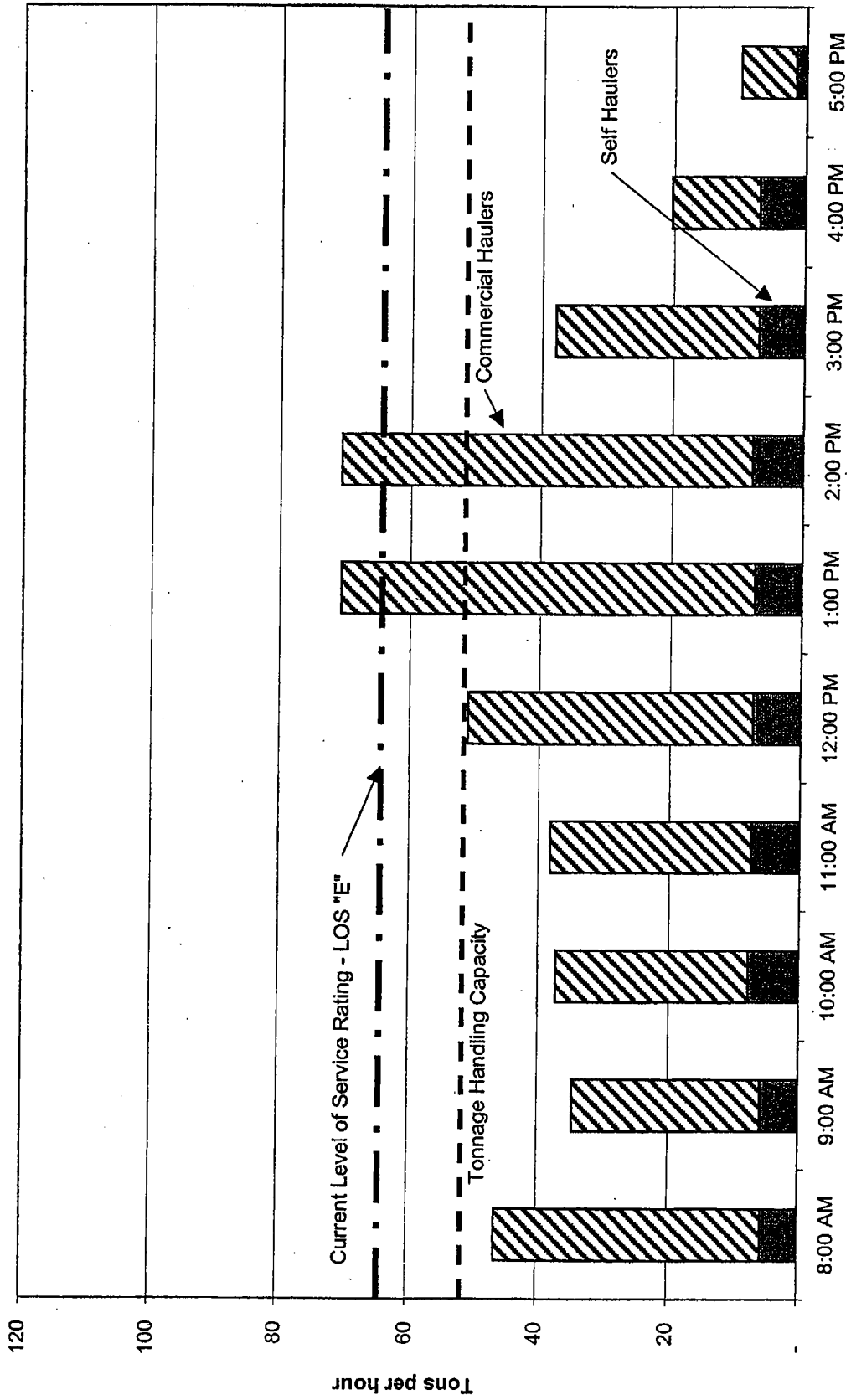
When a station bumps up against the limits of transfer station capacity and the location precludes extending the hours, like at Houghton, you have to either increase the supply of capacity or reduce the demand for it if a higher level of service is desired. In particular, managing self-haul demand may be needed if additional capacity is not created.

In summary, a set of criteria and standards to determine when a county owned and operated transfer station has exceeded its capacity to efficiently serve the needs of its customers has been developed and applied. The criteria and standards will be tested and refined over time and should result in a valuable tool for King County and for other solid waste utilities that serve the public. The motion as drafted uses a level of service scale of LOS A through LOS F as the standard measure how well stations meet their operational requirements. It recommends an initial standard for King County that LOS D is the level at which capacity thresholds have been reached and a station is providing a less than acceptable level of service to customers.

The Appendices to this report contain the following:

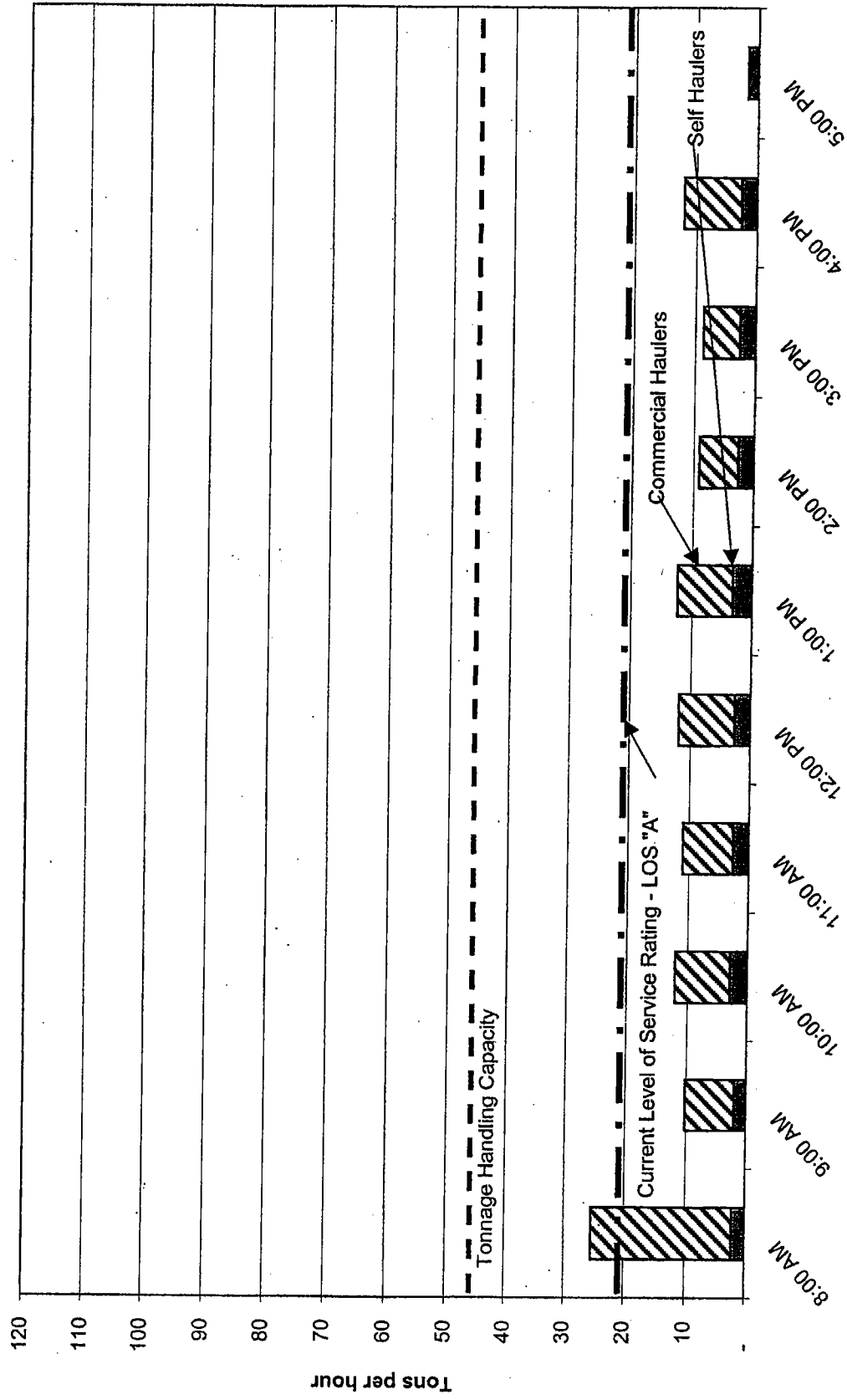
- Appendix A: Charts showing average tons by weekday hour with station capacity and the variance for each King County transfer station.
- Appendix B: Charts showing average number of vehicles by weekend day hour with station capacity and the variance for each King County transfer station.
- Appendix C: Proposed Motion establishing an initial set of criteria and standards to determine when a county owned and operated transfer station has exceeded its capacity to efficiently serve the needs of its customers.

Algona - Average Weekday Tons per Hour



11601

Enumclaw - Average Weekday Tons per Hour

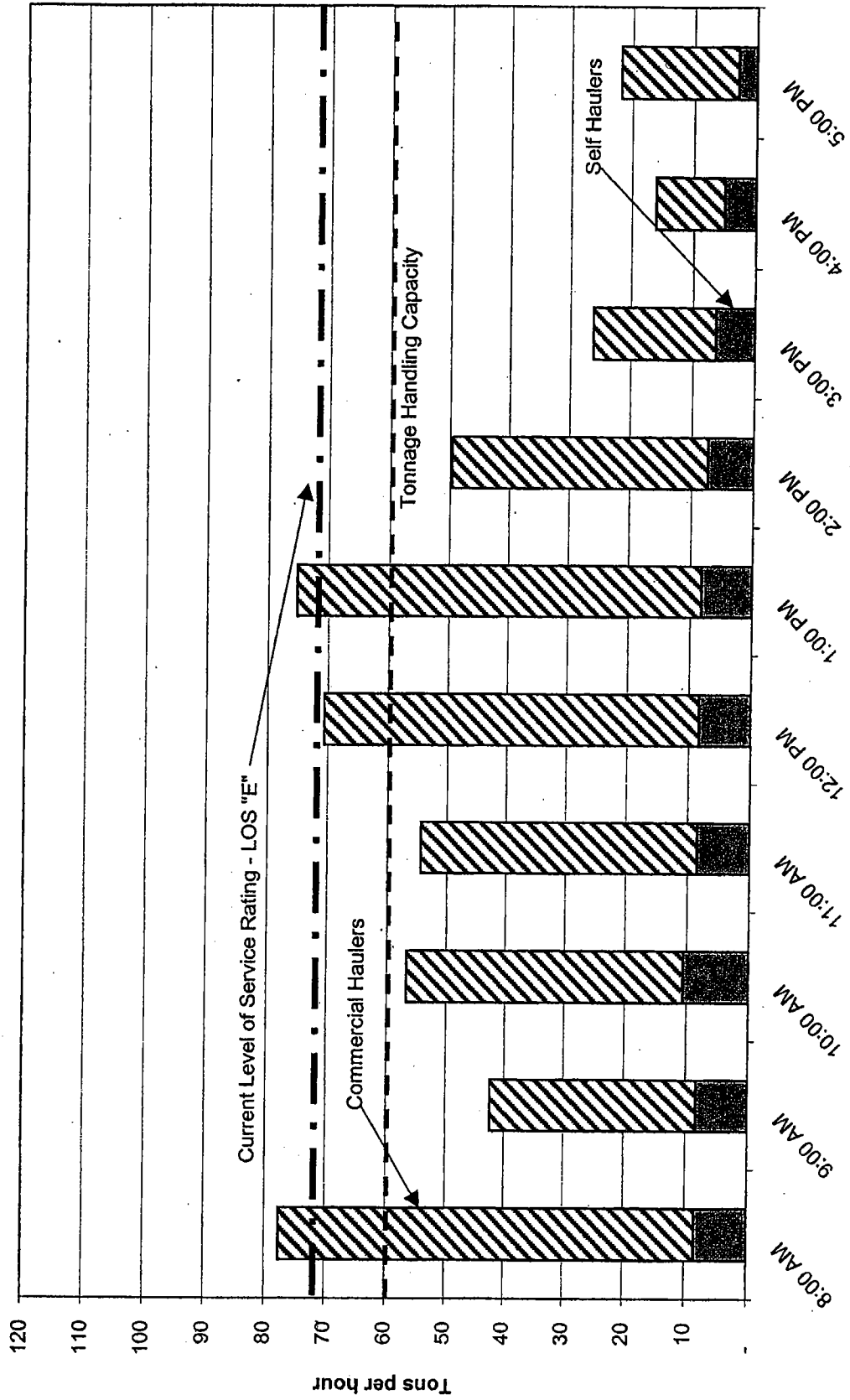


11601

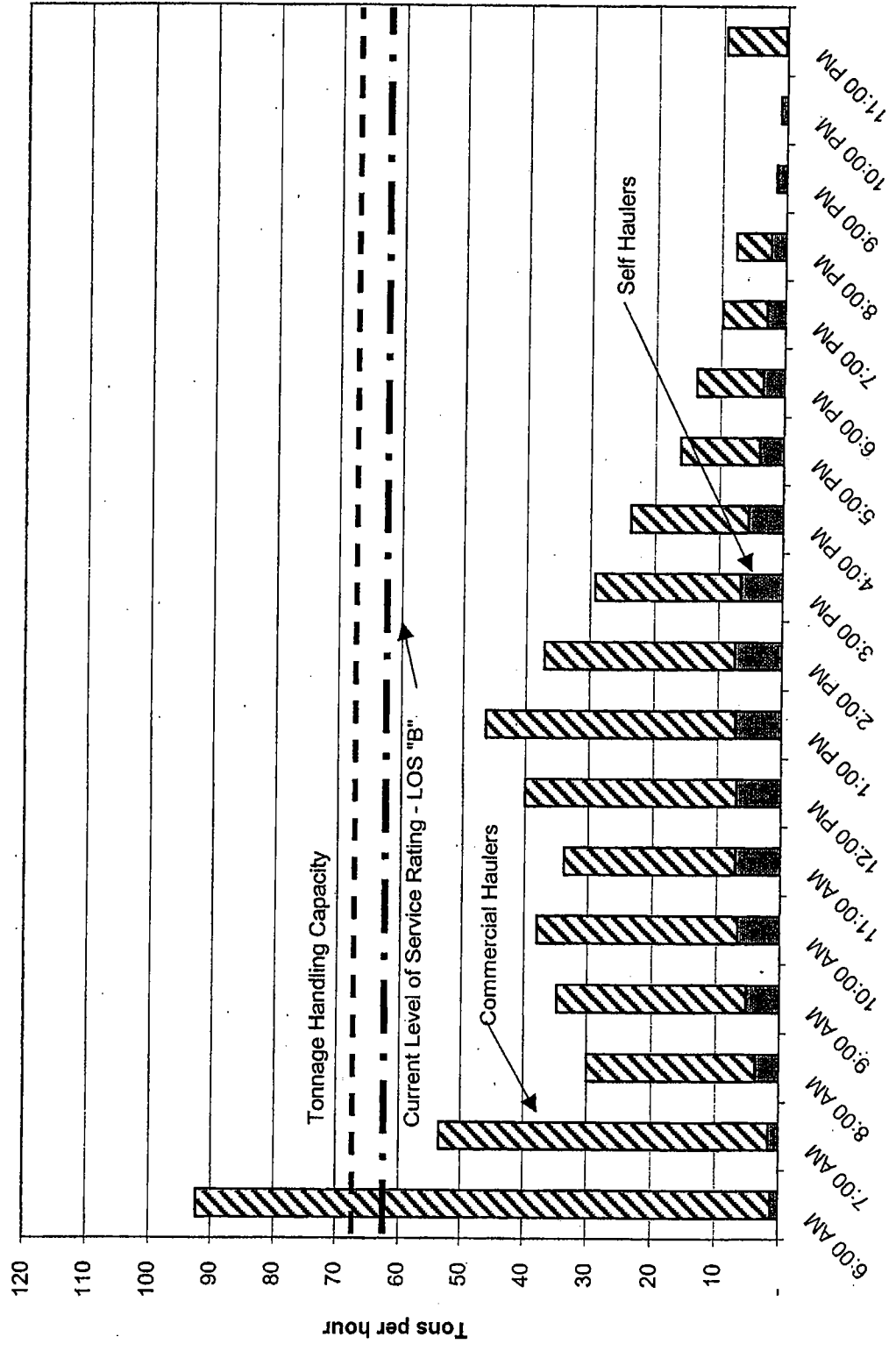


11601

Bow Lake - Average Weekday Tons per Hour

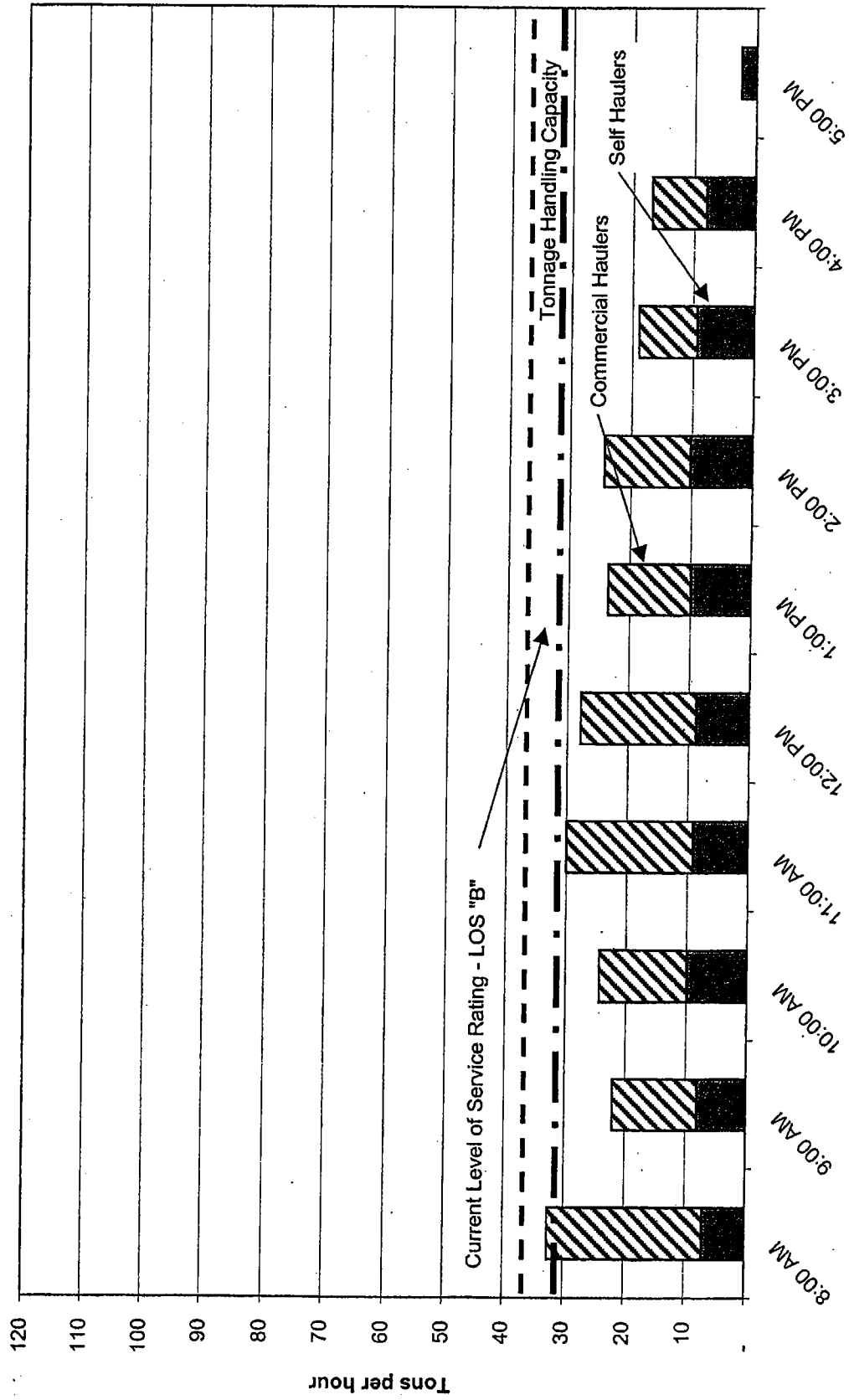


Factoria - Average Weekday Tons per Hour



11601

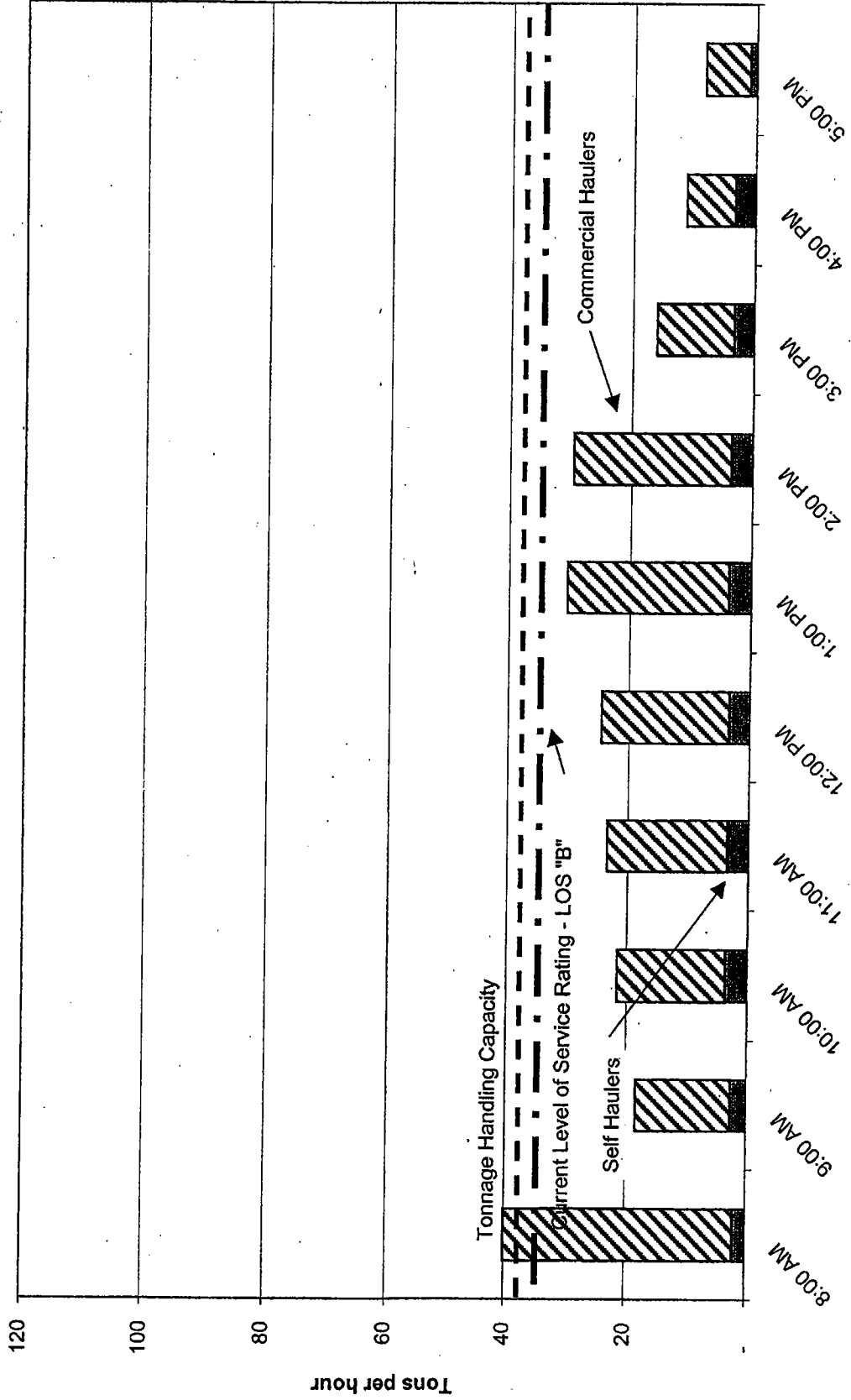
First Northeast - Average Weekday Tons per Hour



11601

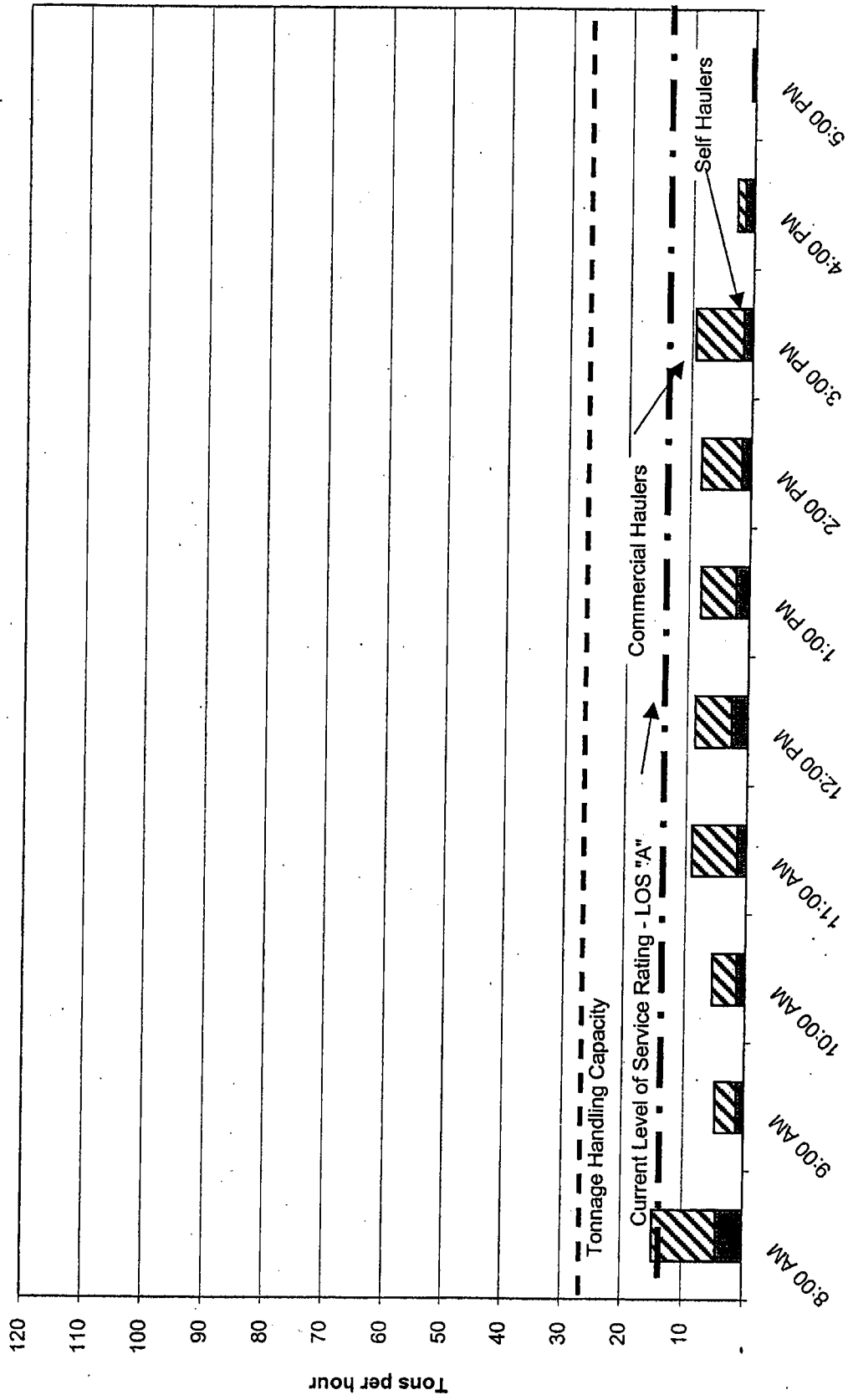
11601

Renton - Average Weekday Tons per Hour



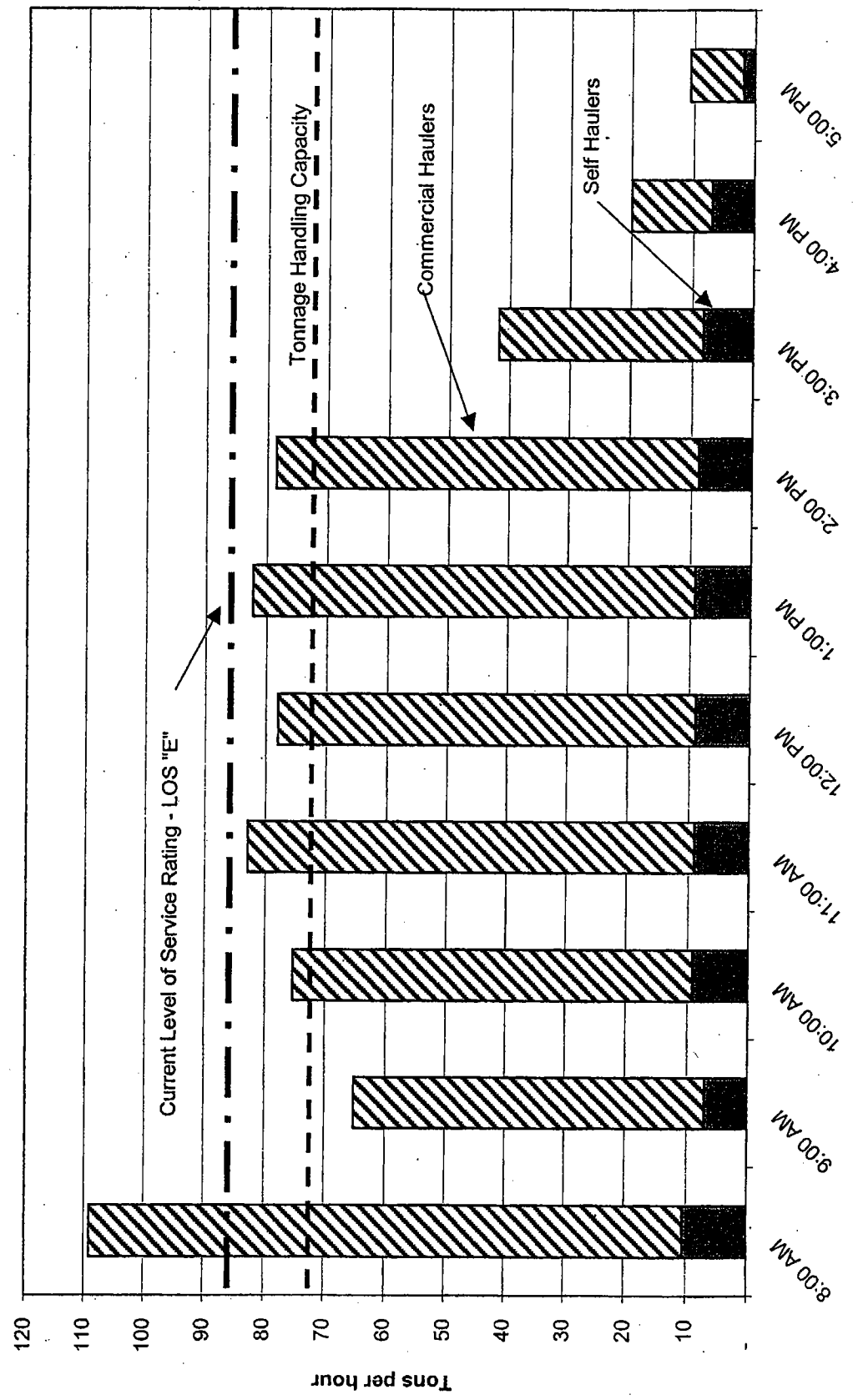
11601

Vashon - Average Weekday Tons per Hour



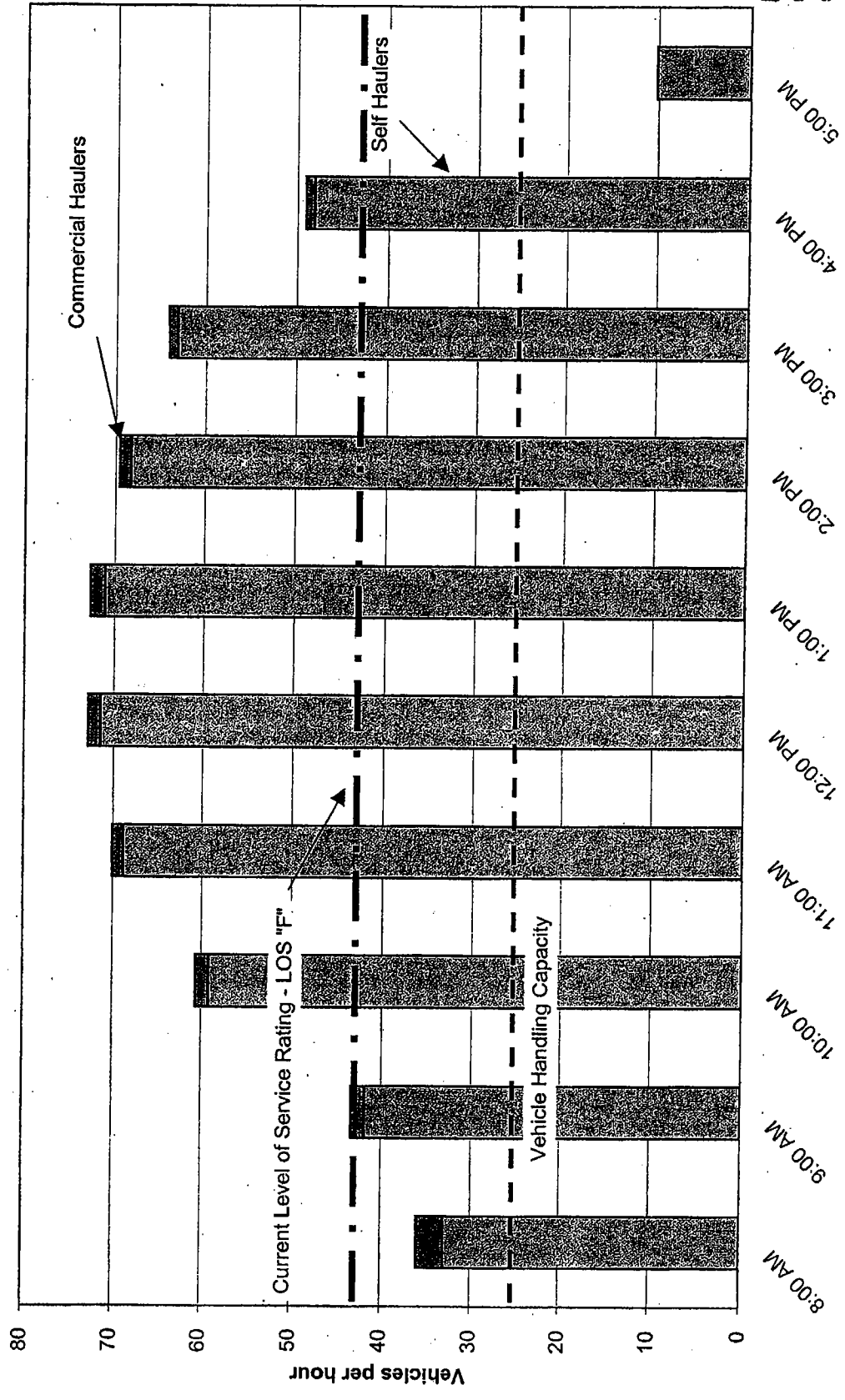
1160 I

Houghton - Average Weekday Tons per Hour

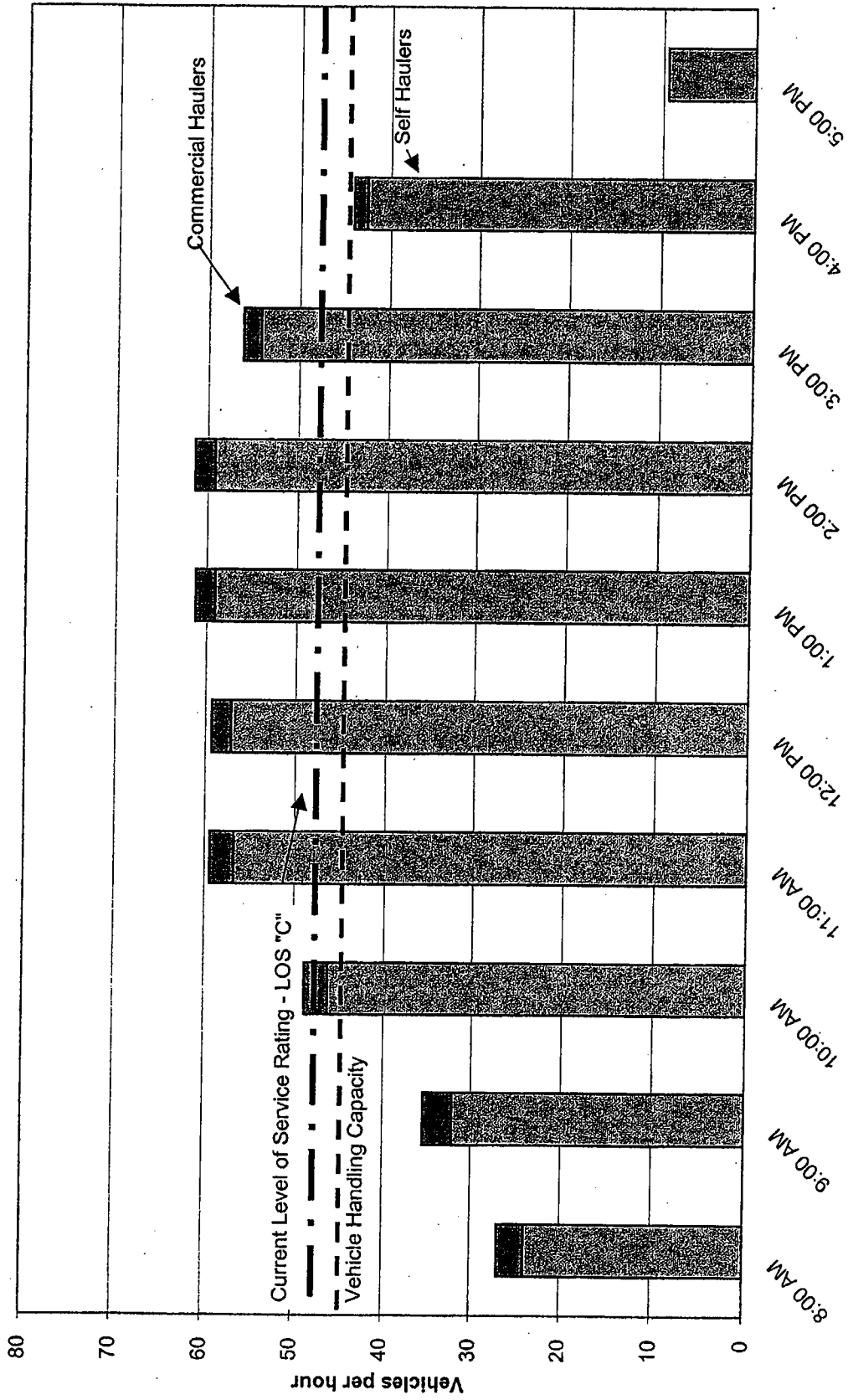


11601

Algona - Average Weekend Vehicles per Hour



Bow Lake - Average Weekend Vehicles per Hour

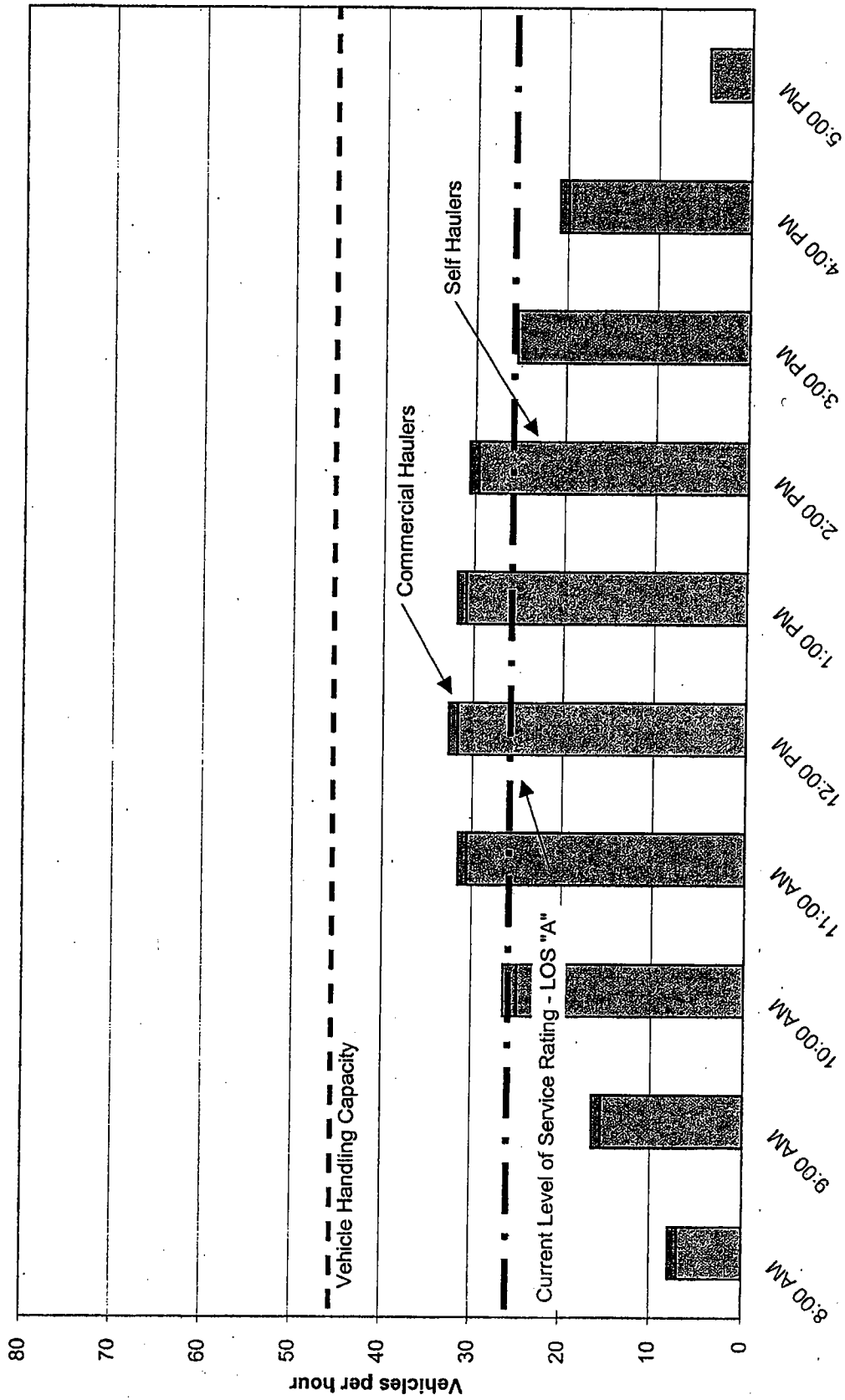


11601



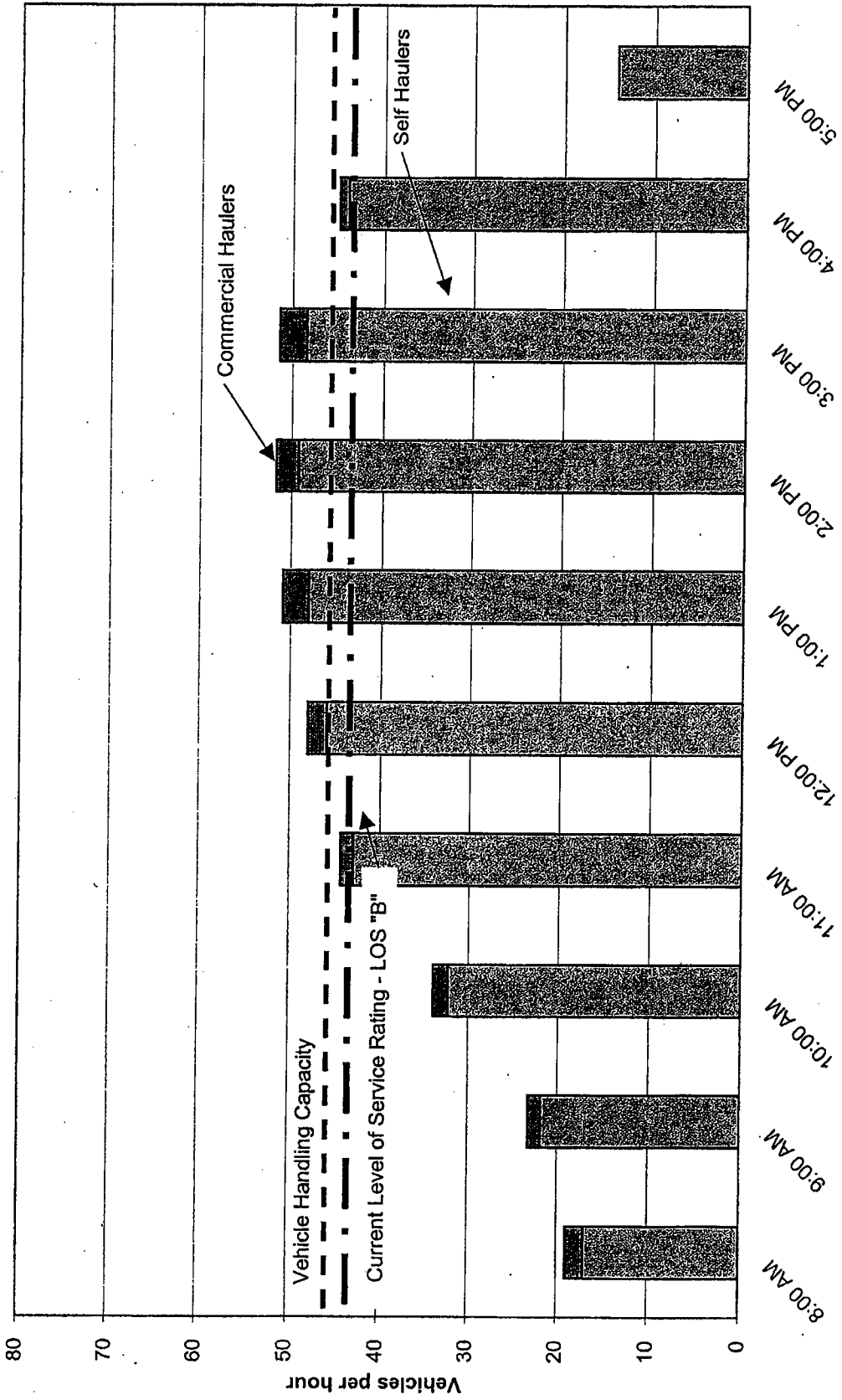
11601

Enumclaw - Average Weekend Vehicles per Hour



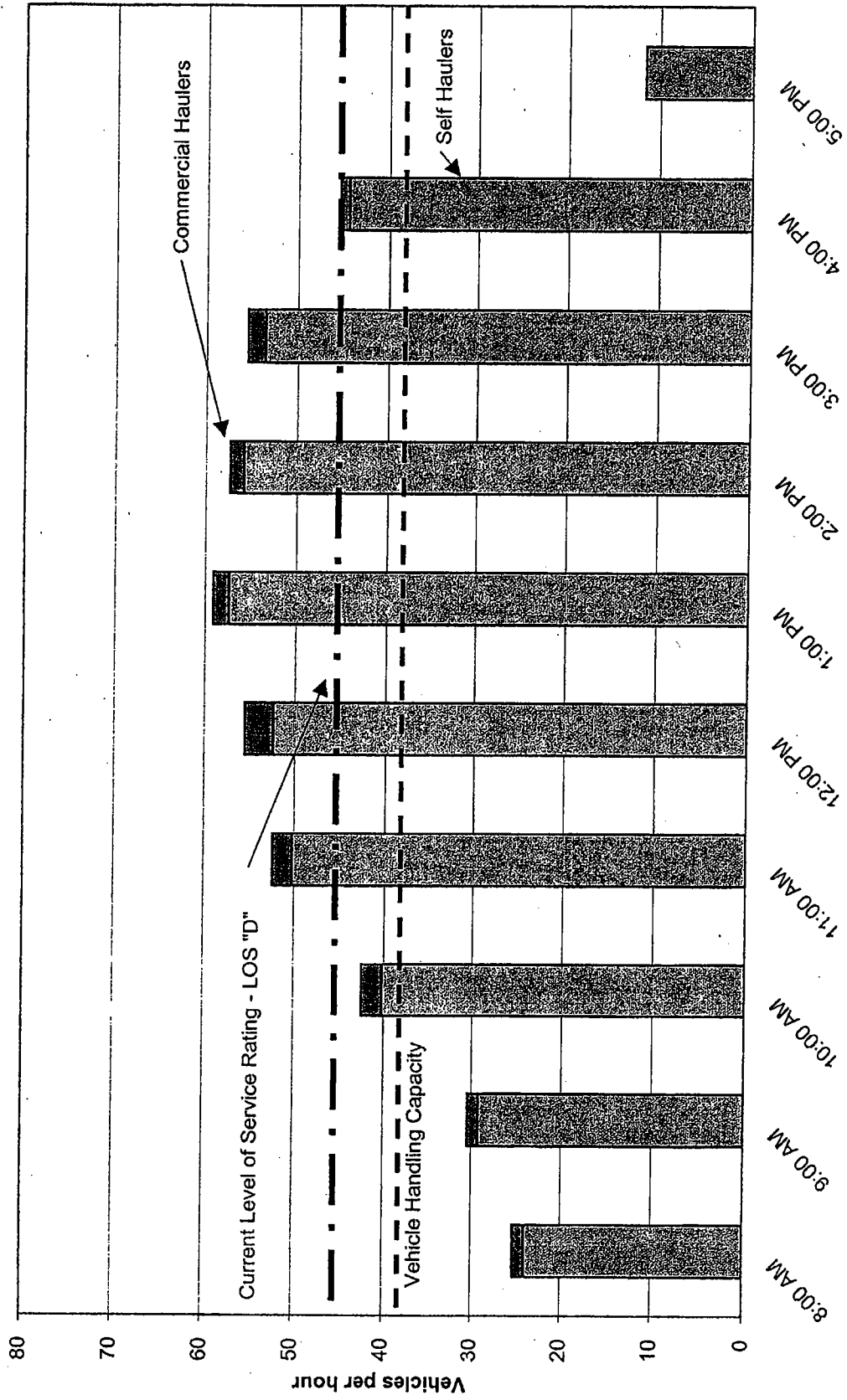
11601

Factoria - Average Weekend Vehicles per Hour



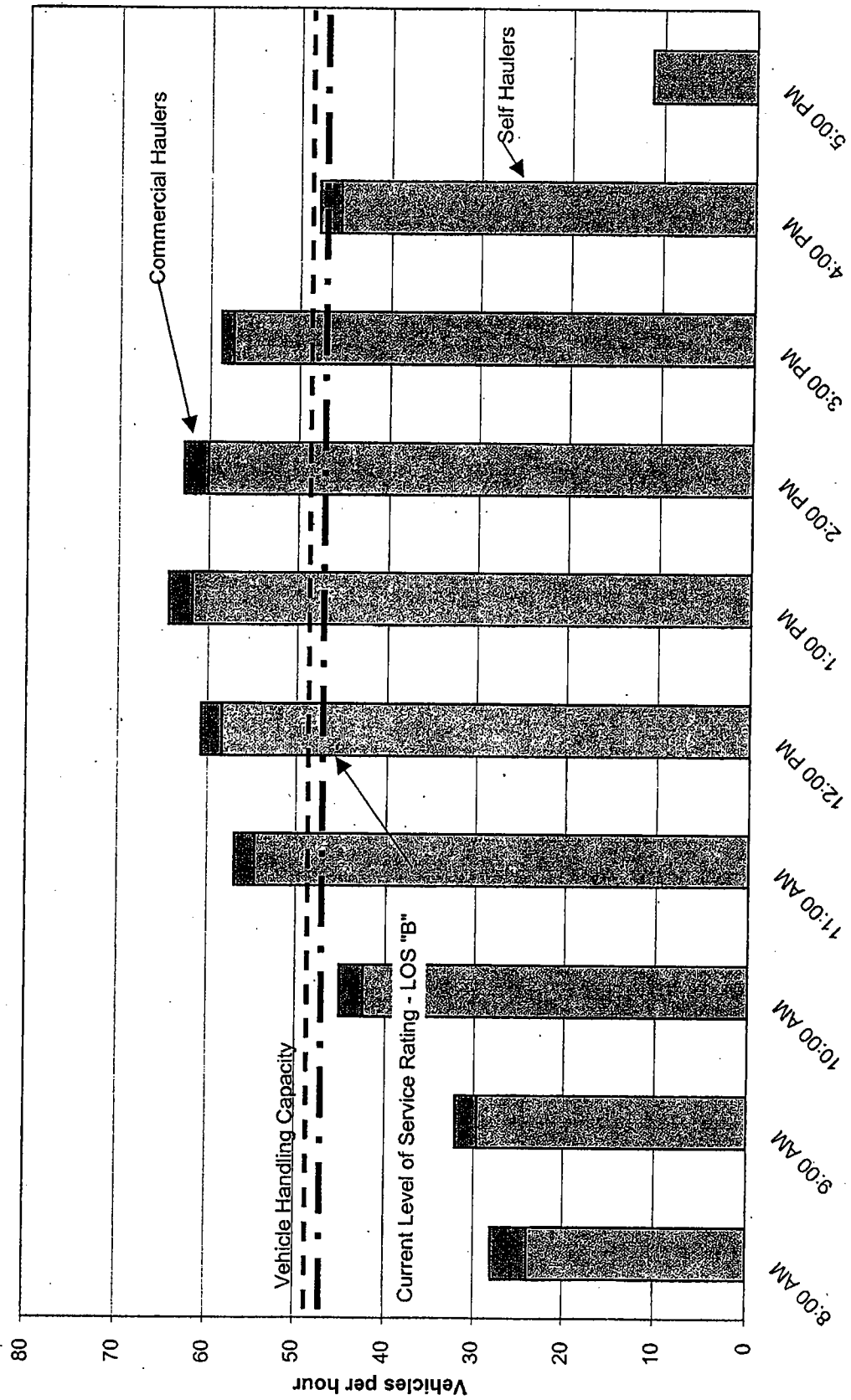
11601

First Northeast - Average Weekend Vehicles per Hour

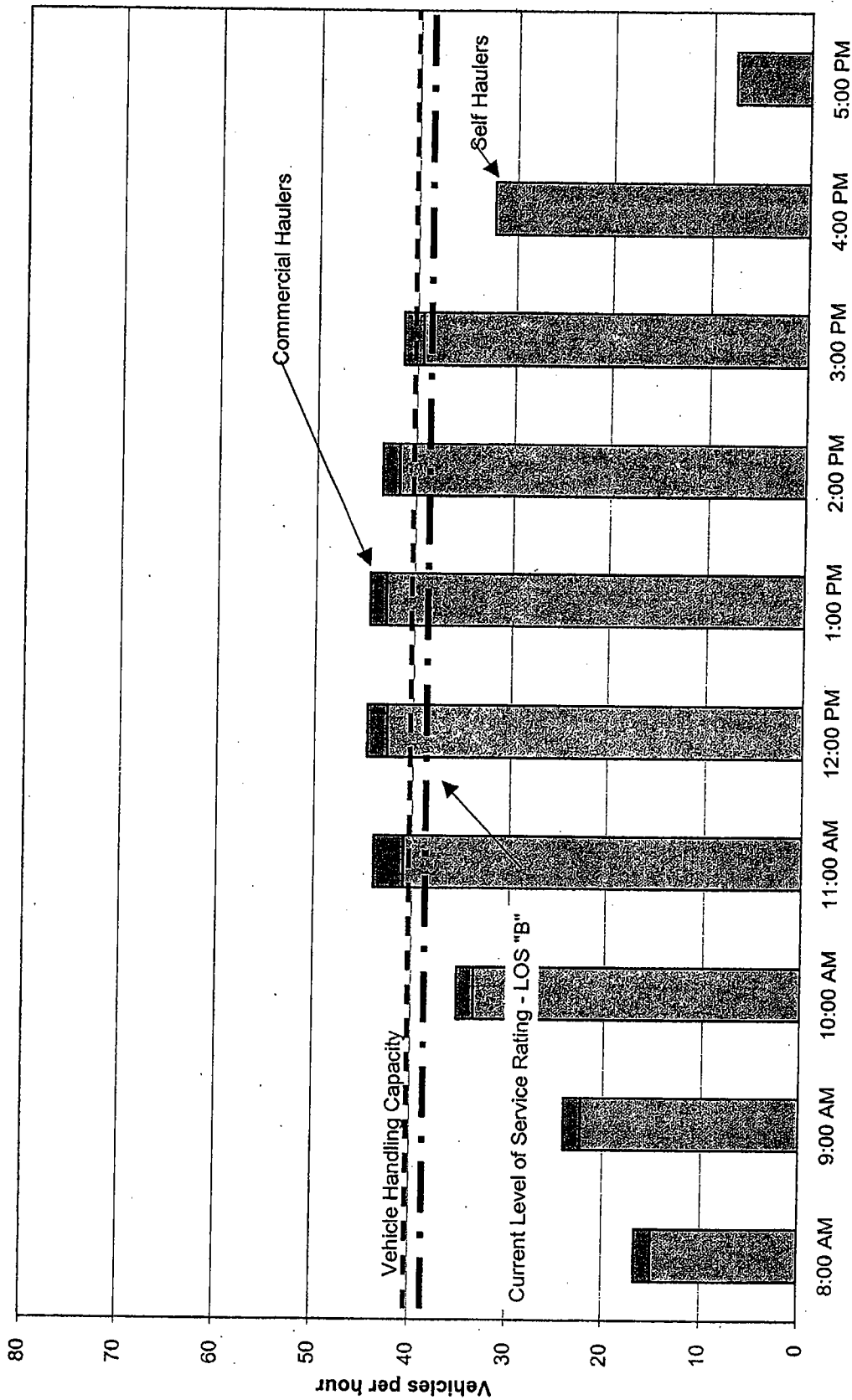


11601

Houghton - Average Weekend Vehicles per Hour

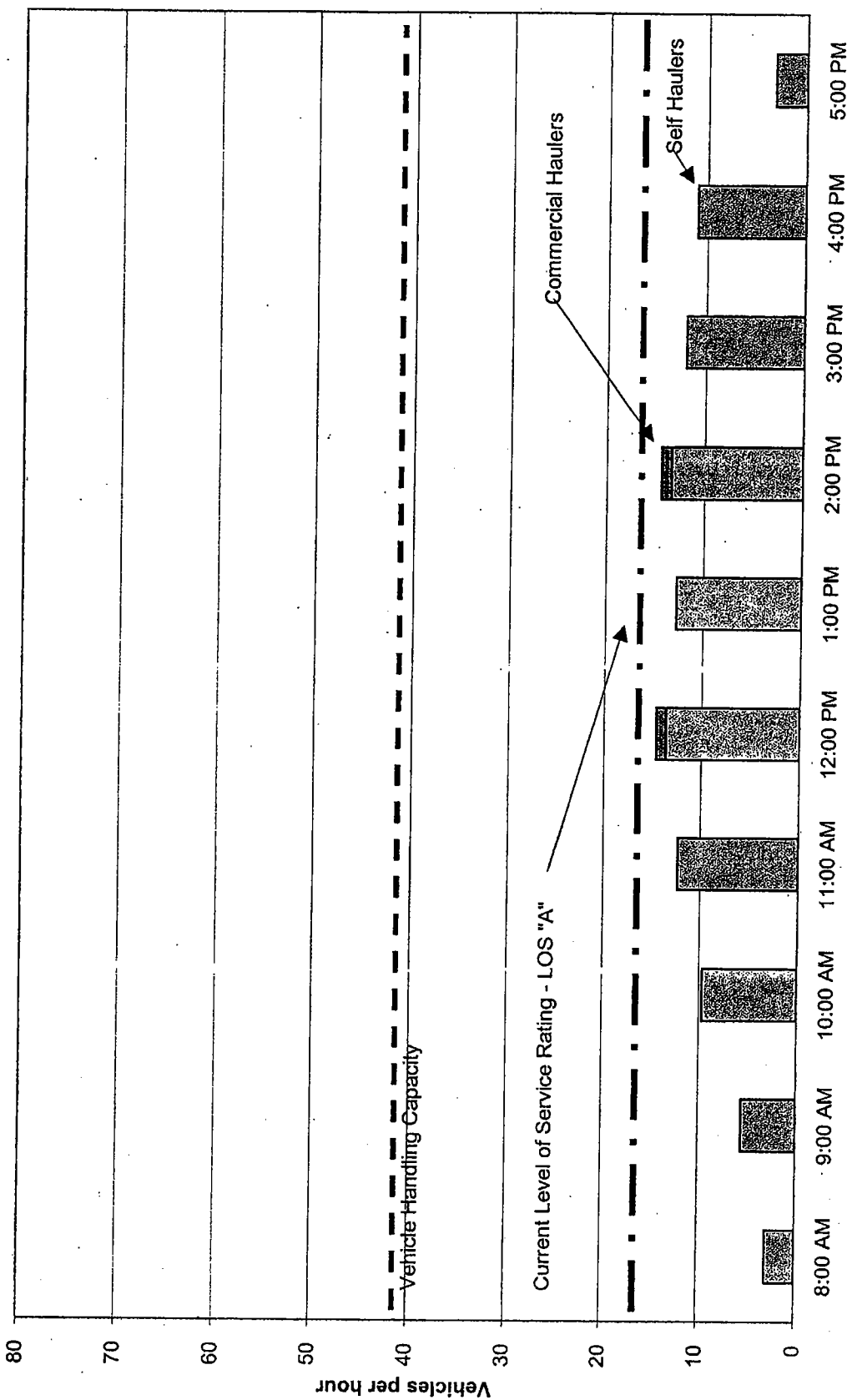


Renton - Average Weekend Vehicles per Hour



11601

Vashon - Average Weekend Vehicles per Hour



11601