MEMORANDUM REPORT

To: (A Manufactuer of Amber LEDs)

Date: 31 March 1994

Subject: **The Outlook for Changeable Message Signs for US Highways**

SUMMARY

INTRODUCTION

This is a summary of market research conducted by Laird Durham in February and March 1993 to determine the size, growth rate, and characteristics of the market for Large Area Displays for traffic applications, and to estimate the share of market which might be captured amber LEDs.

To quantify the research, I collected statistics and forecasts about highway construction and financing from Federal and State agencies. I obtained organizational charts of Federal and State Departments of Transportation (DOTs), obtained specifications and procurement records of highway signs from Federal and State agencies, and obtained copies of applicable Federal legislation. I obtained lists of competitors from the business literature and from State DOTs, and financial information about competitors from the business database.

I conducted more than 30 telephone interviews with Federal and State highway officials, traffic engineering agencies, traffic consultants, and highway sign manufacturers. A report of each of those interviews, and copies of the statistical and descriptive literature have been submitted to you separately.

CONCLUSIONS

1. There were 300-400 Changeable Message Signs (CMS) installed on U.S. highways in 1992, at a value of about $25 million, excluding structures and communications. The use of CMS will grow at a CAGR of 30%-40% over for the next five years, reaching 1,500-2,000 units installed in 1997, worth about $125 million, excluding structures and communications. There is a population potential of 30,000 CMS for U.S. highways.

2. About 20,000 amber LEDs with a luminosity of 2 candela are required for a typical CMS. At a value of 40 cents each, those LEDs would capture as much as 67% of the market for CMS

pixels, which would produce LED sales of $8-$10 million per year in 1997, or $160 million total for a population of 30,000 signs.

3. The customers for CMS are state Departments of Transportation (DOT) and DOT districts within the states, each of which set their own specifications for CMS design and pixel performance. Although Federal funds pay 50% to 80% of the cost of the CMS the states buy, there are no Federal standards or specifications for CMS, nor are Federal standards likely for at least the next three years.

4. CMS are built to specifications by competitive bid. There is little price-elasticity of demand for CMS, but there is cross-elasticity of demand among alternative pixel technologies, such as fiber optics, LEDs, and incandescent bulbs. Many states allow bidding of alternative technologies.

5. Life cycle costs are being used by the state DOTs for CMS bidding, including energy cost and maintenance cost. Some states have required CMS manufacturers to include maximum life cycle costs in submitted bids.

6. There are ten major manufacturers competing for CMS project awards. Their skills are in engineering and assembly in response to unique specifications and design. Few have volume manufacturing capability. Most CMS manufacturers would prefer to buy pixels rather than discrete components, if they could obtain the flexibility and fast response required, and if the cost were close to their cost of assembling the discretes into pixels.