Thirty gasoline samples were measured by purge-and-trap GC/MS and liquid-liquid extraction with GC/FID to illustrate how concentrations of analytes detected by both methods do not always agree. Figure 6 and Table 2 show differences in concentrations for compounds targeted by both methods likely due to different sample preparation. This phenomenon is mitigated with the whole-oil analysis as there is no sample preparation.

**Discussion of Methodology**

It is possible to use total ion chromatograms (TICs) to help identify different samples (e.g. Figure 2). In this case, the data are generated by full scan using an external calibration, so care must be taken not to over-interpret. Due to different response factors of individual hydrocarbons, this approach can be used for distinguishing different types of light- and middle-distillate fuels from each other. This approach may be used to fingerprint light to medium distillates and NAPL samples in environmental forensic applications.

**APPROACH**

Eighteen gasoline and one diesel fuel samples were collected from different service stations in Florida, Ohio, California, and Massachusetts. Aromatic compounds make up the largest fraction in all grades of the gasoline collected in Ohio, whereas isoparaffins make up the largest fraction in all grades from Florida. Depending on the need for and type of forensic approach, ratios of individual compounds can prove useful for distinguishing differences between gasoline from different sources and/or different grades of gasoline. In Figure 5, the mid- and high-grade gasolines exhibit lower ratios of both iso-octane/2,4-dimethylhexane and iso-octane/2,3-dimethylpentane and therefore plot closer to the origin as compared to the low-grade gasolines from the same brand.

**CONCLUSIONS**

**Future Work**

- Standardize GC/MS data against a material with known amounts of hydrocarbons to mitigate the uncertainty due to variable response
- Develop library of whole-oil GC/FID data for light- and middle-distillates for identification of NAPL and other unknown samples in forensic applications
- Assess feasibility of using this method for crude oil samples

**Acknowledgement**

This work was supported by a Battelle research grant.