

Case Management Orders

The outcome of the joint Federal and State hearing was ultimately resolution of the access issues by Judge Frank and Magistrate Judge Boylan and issuance of Case Management Orders by this Court. The Case Management Orders were similar to those issued as part of the First Judicial District Assignment. One Case Management Order was issued for the implied consent cases assigned, while a second one was issued for all of the criminal cases. The two Case Management Orders were substantially similar but addressed the unique differences between the civil nature of the implied consent cases and the criminal nature of the alcohol-related driving cases.

The Court also retained the use of the Master Case File Numbers, 70-CV-09-19459 for the implied consent cases and 70-CR-09-19749 for the criminal cases, which had been developed for the First Judicial District Assignment. The continued use of these case numbers provided a centralized source for the record of the proceedings occurring in the Statewide Assignment. Continued use of the files generated for the First Judicial District Assignment was a matter of practicality. Many of the counsel, Court Administrators and staff, and other members of the Judicial Branch who also became involved in the Statewide Assignment were aware of those file numbers. Furthermore, the First Judicial District Assignment was subsumed within the Statewide Assignment prior to resolution.¹⁴ This thereby rendered the created files superfluous unless otherwise re-purposed for use in the Statewide Assignment proceedings. The file numbers were therefore re-used.

¹⁴ The First District consolidated Source Code proceeding was terminated on February 17, 2010, by reason of being succeeded by this statewide consolidation.

Designation of Liaison Counsel

To assist the Court and the litigants in organizing the multitude of parties and counsel into a manageable group for hearings and regular contact, the Court appointed Liaison Counsel in this case. These lawyers were volunteers selected from the same four major and identifiable groups and subgroups of litigants appearing before the Court in the First Judicial District action. With their consent, Liaison Counsel were given the same responsibilities as those in the First Judicial District action.

The designation of Liaison Counsel in no way prevented any party or counsel from being involved in any conference, hearing, or other communication with other counsel or the Court. The Case Management Orders specifically provided that "Liaison counsel shall not be deemed to speak for, act for, or bind any particular party absent express authority provided by such party." (Case Management Order filed April 21, 2010, in District Court File Number 70-CV-09-19459, p. 20; Case Management Order filed April 21, 2010, in District Court File Number 70-CR-09-19749, p. 21.) The Case Management Orders further provided that "[a]ll counsel of record shall have an opportunity to present to this Court their respective views and opinions as to matters before this Court." (*Id.*) Generally speaking, however, counsel and the parties relied upon Liaison Counsel to express their positions, viewpoints, and opinions with respect to the issues before the Court.

Procedural Process Implemented to Identify and Manage Cases

Before the Court could address the Source Code issue common to all of the assigned cases, the cases subject to the assignment had to be identified. As previously discussed, there were three identifiable groups of cases which were assigned by Chief

Justice Magnuson for resolution of the Source Code issue: the specifically enumerated cases, all implied consent cases, and criminal cases in which written consent was given. The process for identifying each type of case were similar to one another and to the process originally generated as part of the First Judicial District Assignment, but with enough of a difference to warrant further discussion.

The Supreme Court Assignment Order implemented an additional requirement above and beyond those developed for identifying cases subject to the First Judicial District Assignment. As part of the Statewide Assignment, written consent was required of defendants and prosecutors. This requirement was in addition to what had been set out in the Consent Judgment and Permanent Injunction approved by Judge Frank. The consent was given in writing in all criminal cases in the form attached as Exhibit C hereto. Notably, the defendant, defense counsel, and the prosecution all had to agree to be part of these consolidated proceedings, including agreement with procedures set forth in the Case Management Order. Those consenting were expressly consenting to the appointment of Liaison Counsel and methods of service, inter alia, as provided for in the Case Management Order. Any expert retained by an implied consent petitioner or criminal defendant to review the Source Code had to execute a non-disclosure agreement, and the court ordering production of the Source Code had to issue a protective order. These requirements were also in addition to the practical need to differentiate between cases in which the Source Code issue could properly be raised, those in which a breath test had occurred, and those in which it was not and could never be relevant, such as cases wherein a blood test, urine test, or some other non-breath test method was being used in support of a license revocation or criminal

prosecution.

The group of cases which could be identified in the most straightforward manner was those specifically enumerated by Chief Justice Magnuson in the Supreme Court Assignment Order. These cases were expressly identified and assigned to this Court for resolution of the Source Code issue unless a criminal defendant was represented by a public defender. Court Administration worked with counsel, specifically the public defender's offices, and the parties to determine whether a public defender was assigned to a defendant in each case. If a public defender was assigned to represent a defendant in a given matter, then it was subject to the same requirements, including written consent, as all other criminal matters.

The most complicated group of cases which could be identified was all of the criminal cases not specifically enumerated in the Supreme Court Assignment Order. Such matters were identified and confirmed through a multi-step process. First, defendants made a discovery request for access to the Source Code from the presiding judge in the originating county. The presiding judge independently reviewed the defendant's request for a showing of relevance in accordance with the standards set forth in Underdahl II, 767 N.W.2d at 685-86. If the presiding judge determined an adequate showing of relevance had been made, then the presiding judge would order discovery of the Source Code and issue a protective order. Court Administration would also identify the case as one which may end up assigned to this Court pursuant to the Statewide Assignment Order and begin tracking the case for that purpose. The defendant could then file a non-disclosure agreement executed by the expert retained to review the Source Code and a Written Notice of Consent to Assignment executed by

the prosecutor, defense counsel, and defendant.¹⁵ This Written Notice of Consent to Assignment was a formalized means of complying with the additional requirement imposed by the Supreme Court Assignment Order and provided a means of confirming which matters were assigned. Once this Court had received the Written Notice of Consent to Assignment and Court Administration in the originating county had a record of a protective order, an executed non-disclosure agreement, and the Written Notice of Consent to Assignment, then the matter was added to a master list of individual cases assigned to this Court pursuant to the Supreme Court Assignment Order.

Implied consent cases had to follow a similar process but without the need for a Written Notice of Consent to Assignment. The Supreme Court Assignment Order assigned all implied consent cases in which the Source Code Issue was raised. Such cases were identified by a party requesting discovery of the Source Code. The presiding judge hearing the discovery request had to determine whether such discovery was appropriate and issue a protective order for discovery to occur in accordance with the terms of the Consent Judgment and Permanent Injunction issued by Judge Frank. The requesting petitioner would have to submit a non-disclosure agreement executed by their retained Source Code expert and, following confirmation with a list developed and maintained by the Minnesota Attorney General's Office on behalf of the Commissioner of Public Safety, the matter would be added to a master list of implied consent cases assigned to this Court.¹⁶

¹⁵ Defendants and defense counsel oftentimes submitted a non-disclosure agreement and Written Notice of Consent to Assignment in conjunction with their request for discovery of the Source Code, particularly as the process became widely known and mainstream.

¹⁶ Implied consent petitioners also sometimes submitted an executed non-disclosure agreement in conjunction with their discovery request, particularly as the process became widely known and mainstream.

Two master case lists identifying every individual case subject to the Supreme Court Assignment Order were created from these three processes.¹⁷ Copies of these two lists are attached hereto as appendices and incorporated herein by reference. These are the individual cases which are directly subject to this Order. This does not limit other cases from agreeing to be bound, or actually being bound, by the results reached herein as a method of resolving that particular case. This Court is simply mindful of its responsibilities to protect the record and conduct proceedings in a fair and efficient manner.

Inquiry Pursuant to Rule 104 of the Minnesota Rules of Evidence

Throughout the proceedings of these assigned cases, this Court has made it clear that the inquiry being conducted is pursuant to Rule 104 of the Minnesota Rules of Evidence, which provides that “[p]reliminary questions concerning . . . the admissibility of evidence shall be determined by the court”

The charge posed to this Court by the Statewide Assignment Order was to resolve challenges to the accuracy and reliability of the test results obtained from Intoxilyzer 5000EN instruments based upon alleged defects in the Source Code. The question was whether the Source Code rendered the test results inadmissible because it somehow impacted the validity, accuracy, and reliability of the test results and thereby

¹⁷ As part of the Court's case management, the decision was made to provide a cutoff date for which individual matters would be addressed at the evidentiary hearing ultimately commenced on December 8, 2010. The Court is aware the Supreme Court Assignment Order assigned all future criminal and implied consent matters raising the Source Code Issue in addition to those which were pending at the time the Order was issued. A matter of concern for this Court was the possibility that a criminal or implied consent case involving the Source Code Issue could arise shortly before the scheduled evidentiary hearing and the defendant or petitioner could follow the process to have their matter assigned and then seek a continuance on due process grounds to pursue some different approach than that followed in the matters already assigned. To avoid such an occurrence, a deadline for the addition of individual cases onto the docket for the evidentiary hearing commencing on December 8, 2010, was implemented. To the extent additional criminal or implied consent cases otherwise subject to the Supreme Court Assignment Order have arisen since that date and not been resolved indirectly as a result of these proceedings, the Court has provided further instruction herein.

deprived them of evidentiary value.

As preliminary proceedings pursuant to Rule 104, the outcome reached by this Court is not immediately dispositive of any single case that has been assigned. These proceedings instead provide resolution of a single narrow issue: the admissibility or inadmissibility of results reported by Minnesota's Intoxilyzer 5000EN fleet as a result of the Source Code of the instrument. This is not to say the conclusions reached by this Court may not result in cases being expediently resolved without any or with only minimal involvement of the courts in which these cases originally arose. In light of the conclusions reached herein, petitioners in implied consent proceedings may decide to waive their challenge to the Commissioner's license revocation or criminal defendants may elect to enter a plea or accept a plea agreement which was previously unacceptable. There may also be a small number of cases where the Commissioner is willing to withdraw the license revocation or the prosecutor is willing to dismiss the charges. All of these dispositive actions, however, must take place in the district courts from which the individual cases originally arose.

OPERATION OF SOURCE CODE IN MINNESOTA'S INTOXILYZER 5000EN

The Intoxilyzer 5000EN is a breath testing instrument which measures ethyl alcohol (ETOH), the type of alcohol typically found in alcoholic beverages. To perform this measurement, an Intoxilyzer 5000EN utilizes scientific methods and principles of measurement, hardware components, and software in a single integrated device. The device then also relies upon a very specific testing process. The sole purpose of this process and the device is to reliably obtain accurate and valid measurements of breath alcohol concentration for a subject providing a breath sample. To understand what

impact the operation of the Source Code within the Intoxilyzer 5000 EN has upon results which are typically admitted into evidence, a basic understanding of many of the functions of the instrument is necessary.

Scientific Methods and Principles of Measurement

The Intoxilyzer 5000EN utilizes an analytical method to quantitatively identify ethyl alcohol and other potential interferents and to quantify the concentration of ethyl alcohol present within a breath sample. The specific scientific method utilized is infrared absorption spectroscopy. To produce results which have evidentiary relevance, the Intoxilyzer 5000EN and its testing process must also utilize certain fundamental principles of measurement when seeking to quantify an unknown. These include accuracy, validity, and reliability.¹⁸

Basic Principles of Breath Alcohol Concentration Testing

The principles underlying the science and physiology of alcohol concentration measurement through a person's breath is beyond the scope of these proceedings. Such an inquiry would delve into areas of science and medicine which go far beyond an inquiry into the Source Code's impact upon the reliability of breath alcohol concentration results. Understanding the basics of such concepts, however, is necessary to understand the design of the Intoxilyzer 5000EN, to put into context arguments advanced by the parties in this case regarding those issues that are before the Court, and to provide an understanding for the Court's decision.

¹⁸ The implied consent petitioners and criminal defendants also raised the question of the Intoxilyzer 5000EN's ability to produce reliable results. This Court understands the term "reliable" as used by the implied consent petitioners and defendants to refer to the Intoxilyzer 5000EN's ability to repeatedly produce accurate and valid results for individual tests. The Court does not understand the use of the term "reliable" to be in reference to whether the scientific method of infrared absorption spectroscopy can produce admissible evidence under the "Frye-Mack" standard, a question which is beyond the scope of these proceedings.

The Intoxilyzer 5000EN was designed to operate off of a basic assumption which underlies breath alcohol concentration testing. This basic assumption is that “[t]here is a determinable ratio between the alcohol concentration in the blood (and the brain) and the alcohol concentration found in the breath.” (Ex. 2, Bates p. 29.) The accepted ratio of the equilibrium between alcohol found in the alveolar (deep lung) air compared to that found in blood is 2100 to 1.¹⁹ (Id. at Bates pp. 30 & 118.) This means that in 2100 parts of alveolar air, there is the same alcohol concentration as in one part of blood. (Id. at Bates p. 118). The basic assumption underlying breath alcohol testing requires the testing of alveolar air and is the alcohol concentration the Intoxilyzer 5000EN attempts to measure.

When testing the alcohol concentration of a person’s breath, the desired sample is the alveolar air. As a person expels their breath, they first expel air located within the cavity of their mouth, then their esophagus, and finally their lungs. To reach the alveolar or deep lung air, a test subject must first expel the air in their mouth and esophagus. Once the alveolar air is reached, further exhalation will result in a measured alcohol concentration that gets closer to the equilibrium alcohol concentration of the alveolar air. The Intoxilyzer 5000EN attempts to reach this point of measuring alveolar air to produce its reported results.

In some cases, the measurement of alcohol concentration of alveolar air is

¹⁹ The ratio of the equilibrium between alveolar air and blood of 2100 to 1 is incorporated into the statutory structure of Minnesota’s driving while impaired offenses. Minnesota Statute § 169A.20, subdivisions 1(5), 1a(5), 1b(5), and 1c(5) criminalize driving, operating, or being in physical control of the identified vehicle within two hours of having a measured alcohol concentration of 0.08. Alcohol concentration is defined as having a number of grams of alcohol per 100 milliliters of blood and a number of grams of alcohol per 210 liters of breath. Minn. Stat. § 169A.03, subd. 2(1)-(2). There are 1000 milliliters in 1 liter. Therefore, a number of grams of alcohol in 210 liters of breath is equivalent to a number of grams of alcohol in 210,000 milliliters. Comparing this unit adjusted amount with the number of grams of alcohol per 100 milliliters results in a 2100 to 1 ratio of a number of grams of alcohol in the alveolar air to the same number of grams of alcohol in the blood.

further complicated by the presence of a high alcohol concentration within the mouth and esophagus, something typically referred to as “mouth alcohol.” High concentrations of mouth alcohol can result in an initial measured alcohol concentration which is higher than that found in the test subject’s alveolar air. As the test subject exhales further, the alveolar air begins to displace the air from their mouth and esophagus, and the breath alcohol concentration measurements return to a level typical of those obtained from test subjects who do not have a high mouth alcohol concentration. These concepts of the alveolar air equilibrium alcohol concentration, a typical breath alcohol concentration profile, and mouth alcohol concentration profile can be visually demonstrated as shown in Figure 1.

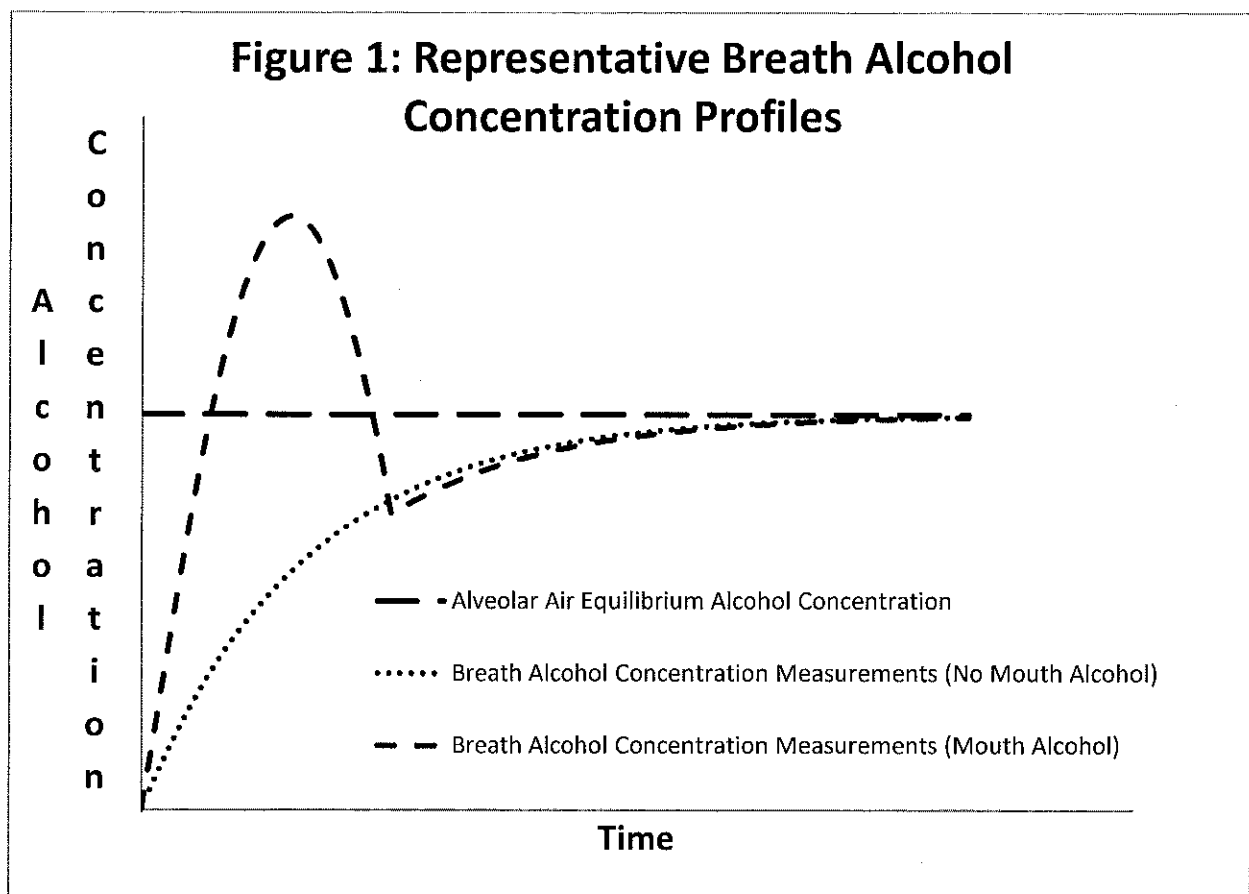


Figure 1²⁰ depicts representative breath alcohol concentration profiles, as described by witnesses from the Bureau of Criminal Apprehension (“BCA”) over the course of a test subject’s exhalation and an Intoxilyzer 5000EN test. The equilibrium alcohol concentration of the air in the test subject’s alveoli, the deep lung air, is depicted in Figure 1 by a straight long dashed line marking a constant alcohol concentration. This equilibrium rate is what the Intoxilyzer 5000EN is attempting to measure over the course of the time allowed to run a breath test. It remains relatively constant over such a time frame.

The dotted line in Figure 1 represents a typical breath alcohol concentration measurement taken when a high concentration of mouth alcohol is not present. This profile depicts an increasing measured breath alcohol concentration which plateaus over time. As the test subject exhales, the mouth and esophagus air are expelled first.

Further exhalation gets to the alveolar air deeper in the lungs, which contains the unknown alcohol concentration that the Intoxilyzer 5000EN seeks to measure. As the air expelled by a test subject comes from deeper within their lungs, the measured alcohol concentration plateaus at or near the alveolar air equilibrium alcohol concentration. It is by measuring the alcohol concentration at such a point of the breath profile that the Intoxilyzer 5000EN seeks to measure the alcohol concentration of the alveolar air and thereby provide a meaningful alcohol concentration result.

The short dashed line depicts the initial alcohol concentration peak resulting from

²⁰ Figure 1 does not include any units or values for either axis, time or alcohol concentration. This is because the curves are representations of typical breath alcohol concentrations and do not depict any particular individual. The value of the alcohol concentration and time in any given case will be dependent upon the test subject providing the sample. This graphic depiction is a rough composite of the multiple similar graphs and testimony presented by various trial witnesses. See, e.g. Exhibits 46,53,56,57,59 and 60. Despite these graphic depictions, there is never a truly ‘flat line’ achieved in subject breath samples.

a high concentration of mouth alcohol. The initial alcohol concentration measurements taken from the beginning of a test subject's exhalation may be higher than the alveolar air equilibrium alcohol concentration when no mouth alcohol was present. As the test continues and the subject's exhalation proceeds, however, the air from the subject's mouth and esophagus are displaced from the instrument's sample chamber by air that originated deep in the subject's lungs. The result is in the measured alcohol concentration decreasing back to a curve similar to that when no mouth alcohol is present. The alcohol concentration would then increase as in the non-mouth alcohol curve until it plateaus at the alveolar air equilibrium alcohol concentration, the desired result.

Infrared Absorption Spectroscopy²¹

Infrared absorption spectroscopy is a scientific method of qualitatively identifying or quantitatively measuring a variety of compounds, including organic gases with low boiling points such as ethyl alcohol. (See Ex. 2, Bates pp. 20, 27; DOUGLAS A. SKOOG ET AL., PRINCIPLES OF INSTRUMENTAL ANALYSIS, 404-405 (Harcourt Brace & Co. 1998) (5th ed.) (hereinafter PRINCIPLES OF INSTRUMENTAL ANALYSIS). Generally speaking, this method works by irradiating a gaseous sample held within a particular temperature range with infrared light. (Ex. 2, Bates p. 20; L.G. WADE, JR., ORGANIC CHEMISTRY, 500-01 (Prentice Hall 1999) (4th ed.) (hereinafter ORGANIC CHEMISTRY).) The atoms and atomic bonds of molecules within the sample absorb the irradiating light at specific frequencies or wavelengths. (*Id.*; ORGANIC CHEMISTRY at 502-03.) The frequencies or wavelengths at which light is absorbed are dependent upon the structure of each

²¹ Historically, there have been numerous methods used for measuring alcohol in breath samples. Infrared absorption breath testing devices have been commercially available since 1972. (Ex. 2, p. 23)

molecule. (Id.; ORGANIC CHEMISTRY at 503-05.) This enables differentiation of one molecule from another, including those with similar structure which could interfere with measurement of ethyl alcohol. Furthermore, the amount of the irradiating light which is absorbed by a specific molecule at a specific frequency or wavelength enables, according to the Beer-Lambert law, a quantification of the specific absorbing molecule. (Id.; PRINCIPLES OF INSTRUMENTAL ANALYSIS at 139-140.)

As a method of testing breath alcohol concentration, infrared absorption spectroscopy has been given a statutory presumption of trustworthiness and reliability in Minnesota. Minn. Stat. § 634.16, cited by Underdahl II, 767 N.W.2d at 685 n. 4. See also Kramer, 706 N.W.2d at 235-36; Rader, 597 N.W.2d at 323-24.

Principles of Measurement

When measuring an unknown sample, the principles of accuracy, validity, and reliability are paramount. Accuracy is how well an analytical instrument produces a close or tight grouping of results. This can be statistically represented, for example, through the use of a standard of deviation around an average. Validity is how well the instrument produces results which reflect the truth of the unknown being measured. Reliability is how well the instrument repeatedly produces accurate and valid results across all of the possible variables, including things like sample variability, environmental factors, and time. Accuracy and reliability can be determined fairly easily. Determining the validity of an instrument, however, can be difficult.

It is impossible to directly determine an analytical instrument's validity with respect to the true value of a subject sample. As noted above, the true value is unknown. Without this information, it is impossible to measure the difference between a

test result and the true value. Scientific measurement works around this problem by using an analogy. Measurement of a known value, often called a “control,” or range of values, often called a “calibration curve,”²² are taken under the same conditions as the subject sample. From this information, the validity can be determined because the difference in the measured value and the true value can be calculated. This rate of difference is then analogized to the measured values obtained when testing the unknown subject sample. The theory is that with everything being the same or nearly the same between the two tests, the calculated validity is also the same.

The Minnesota testing process – DABACABA -- utilized by the Intoxilyzer 5000EN addresses each of these principles to arrive at a result which provides information about the accuracy and validity of each test. The Intoxilyzer 5000EN also has a system in place called COBRA which allows for the collection of test data for every test. From this information, analyses can be conducted to examine aspects of the reliability of the instrument. This basic understanding of the scientific method and measurement principles used by the Intoxilyzer 5000EN provides the context for understanding the hardware and physical processes performed by the instrument to arrive at reported results.

Hardware and Physical Processes

A basic knowledge of the Intoxilyzer 5000EN's hardware and the physical processes it performs is necessary to understand the challenges to the reliability of test results obtained from the Intoxilyzer 5000EN. The physical configuration of the Intoxilyzer 5000EN and the component parts which make up the entire device were

²² The known value or range of known values must also be near or around the expected value of the unknown value.

designed with the intent to accurately, validly, and reliably measure breath alcohol concentration of a human test subject by the infrared absorption spectroscopy method. The hardware present within the instrument combines with the pathways for gasses to follow, which are further oriented into specific test sequences to provide the operator with test results. The implied consent petitioners and criminal defendants have called into question various aspects of the hardware and testing processes in their case. A basic understanding of the hardware, gas pathways, and test sequences is therefore necessary to understand the criticisms of petitioners and defendants as well as this opinion.

Hardware of Intoxilyzer 5000EN

The Intoxilyzer 5000EN has a metal case which operates to assist in shielding the instrument's electronic components from radio frequency interference (RFI). Some of the hardware making up the Intoxilyzer 5000EN instrument can be observed from the exterior of the case, and some can only be observed by removing the case. From the outside of the casing, a breath simulator solution container and the breath sample tube may be observed. An RFI detection antenna and breath tube heater, which are the same wire, are also part of the breath sample tube which can be viewed from the outside of the casing. This combined heater and antenna plugs into the exterior of instrument via an RCA type connection. There is a single monochromatic digital display on the device, and peripherals such as a printer or computer keyboard may be, and typically are, attached to various data ports accessible on the exterior of the instrument. (See Ex. 166 – CFS Report, p. 13 (picture of the exterior of Intoxilyzer 5000EN).)

With the metal casing removed, the internal hardware can be physically

observed. (See Ex. 166– CFS Report, p. 17 (picture of interior of Intoxilyzer 5000EN).) The circuit boards, processors, EPROM, analog-to-digital converters (ADCs), digital-to-analog converters (DACs), wires, and all of the electronic components can be observed. A pressure transducer mounted in the path of the breath sample tube is also visible. This device operates with the processor and clock function of the device to measure pressure over time and thereby make a calculation of the breath volume delivered by a test subject. The sample chamber is also visible. With further disassembly, the infrared light source,²³ infrared filter wheel,²⁴ and infrared detector with its heat dissipation system can be observed. With even further disassembly, the air pump, which moves room air and the breath simulator solution through the instrument, can be seen.

Such are the primary hardware components of the Intoxilyzer 5000EN. With this hardware, the Intoxilyzer 5000EN utilizes three gas pathways to perform its three test sequences.

Gas Paths through Intoxilyzer 5000EN

The Intoxilyzer 5000EN has three physical paths for tested gasses to follow through the various hardware components of the instrument. One path is for breath samples of test subjects. The second path is for what is known as an “air blank.” The final path is for the breath simulator solution. Each of these paths is unique, but they all share the use of some component parts throughout the instrument. Understanding how each path works and its purpose provides a basis for understanding the testing sequences which are run on an Intoxilyzer 5000EN instrument.

²³ See Ex. 166 – CFS Report, p. 119 for a photograph of the light source.

²⁴ See Ex. 166 – CFS Report, pp. 117-18, 120-23 for photographs and technical specifications for the filter wheel and filters. The filter wheel is made up of five separate filters; one reference filter, two filters to measure ethyl alcohol and acetone, and two filters to measure possible interferents.

Air Blank Path

For the air blank path, the Intoxilyzer 5000EN draws room air through the instrument. (Ex. 2, Bates p. 21 (providing explanation and diagram of air blank path). The air pump turns on for eighteen seconds and thereby creates a pressure differential between the room air and the gas within the sample chamber. This causes room air to travel through the breath tube and into the sample chamber. The room air is then expelled through the pump and pump exit. As demonstrated by the path for the air blank, the purpose is to clear the breath tube and sample chamber. The Intoxilyzer 5000EN also uses the operation of this path to set a zero reference point based upon the room air present within the sample chamber. The actual process of setting this zero reference point and verifying the absence of ethyl alcohol or measured interferences within the room air is a Source Code function and is discussed more fully below. The air blank path process does not utilize the breath exhaust, the pressure transducer, the breath simulator solution, or any of the infrared source or detection hardware.

Breath Sample Path

The breath sample path also begins in the breath tube. (Ex. 2, Bates p. 23 (providing diagram of breath sample path). When a test subject provides a breath sample, they blow through the breath tube and into the sample chamber. When operating properly, the breath tube is heated to prevent the test subject's breath from condensing within the breath tube.

As the breath sample passes through the sample chamber, the infrared light source operates. The light from the infrared bulb passes through the test subject's breath and is focused onto a filter wheel, which only allows selected wavelengths or

frequencies of light to pass through. What specific wavelength or frequency of light is permitted through the filter wheel is dependent upon which of the Intoxilyzer 5000EN's five filters has spun into place at that specific instant in time. The permitted light which does pass through a filter is measured by the infrared detector. This measurement is conveyed to the instrument's processors, where the software performs calculations using the infrared detector measurements as they relate to each filter and reference information to calculate the amount of light absorbed by ethyl alcohol molecules within the test subject's breath in the sample chamber. Further calculation leads to the measured result of breath alcohol concentration. Because these calculations are performed by the software of the instrument, which is generated by the Source Code, a more complete discussion of the process is left for another section. The breath sample path does not utilize the air pump, air pump exit, or the breath simulator solution. Ultimately, the breath sample is expelled through the breath exhaust port on the back of the instrument.

Breath Simulator Solution Path

The breath simulator solution path is similar to the air blank path but with a few critical differences. The breath simulator solution path does not utilize the breath tube at all. Instead, the sample is drawn into the sample chamber from the simulator solution container through the simulator inlet. Like the air blank path, the air pump turns on for a specified time creating a pressure differential between the sample chamber and the simulator solution container. This pressure differential causes the simulator solution, a vaporized ethyl alcohol solution with a known concentration, to pass into the sample chamber, through the pump, and return to the simulator solution container. The ethyl

alcohol vapor for the simulator solution is not exhausted like the air blank or a test subject's breath sample because the known concentration of the simulator solution would decrease with each cycle of this path and the scientific value of measuring a known sample would be lost.

As the breath simulator solution is drawn through the sample chamber, measurements are taken of the alcohol concentration. The infrared source shines light through the sample chamber and onto the filters in the filter wheel. Light at the specified frequencies or wavelengths are allowed to pass through to the detector, where the amount of infrared light which was not absorbed by the ethyl alcohol molecules is detected by the detector. These measurements are then transmitted to the instrument's processor, which performs calculations to reach a resulting alcohol concentration of the simulator solution and confirm that the solution is within range of the known value. These calculations are performed according to the software of the instrument, so the specifics are left for another section.

Test Sequences of Intoxilyzer 5000EN

Minnesota's Intoxilyzer 5000ENs are capable of running three test sequences. These test sequences are denoted by the sample paths they utilize: ACA, ABA, or DABACABA. Each of the three sample paths may be used as part of a test sequence. In the test sequence used to obtain an evidentiary breath alcohol concentration of a test subject, DABACABA, all three of the sample paths are used. The other two test sequences only utilize two of the sample paths. In all sequences, the air blank sample path is utilized.

ACA

The ACA test sequence is a simulator test sequence. (Ex. 2, Bates p. 62.) It is comprised of a diagnostic cycle,²⁵ an air blank cycle, a breath simulator solution cycle or control, and another air blank cycle. This test sequence must be run when a new simulator solution is substituted for an old solution. Each breath simulator solution may be used for 31 days or 150 sample sequences, whichever occurs first. The solution must then be changed before any further test subject samples may be run. Operators change the existing solution by physically changing the solution containers and then running the ACA test sequence. As part of the ACA test sequence, the operator has to enter the solution number and the simulated breath alcohol concentration contained on the label for the new simulator solution. If the result obtained by an Intoxilyzer 5000EN for the new simulator solution is not within 0.010 of the value entered, then the instrument will be disabled until a new simulator solution is added.

ABA

The ABA test sequence is an informal, short-form version of the evidentiary test sequence. It is not used to obtain results which are admitted into evidence but is used instead for more informal purposes, including screening for probation or parole violations of a no-use-of-alcohol condition; testing juveniles when the presence of consumed alcohol is important but the actual alcohol concentration is not; and informally demonstrating or testing the instrument's measurement capabilities. This test sequence is of limited use because it does not include a cycle for the breath simulator solution or a second breath sample. Instead, the ABA sequence consists of an internal diagnostic

²⁵ When the Intoxilyzer 5000EN performs an internal diagnostic cycle, it checks the EPROM, RAM sample cell temperature, several items on the processor board, printer, clock, an internal standard, and the status of the simulator solution. (Ex. 2, Bates p. 126.)

cycle, an air blank cycle, a single breath sample cycle,²⁶ and a second air blank cycle. It also relies solely upon a paper record for retention of the results obtained. If the operator elects not to make a printout of the test sequence run, then the results are not retained in the COBRA system or in any other way by the instrument. The ABA sequence, however, is faster than the evidentiary test sequence, DABACABA, and does not utilize the breath simulator solution and therefore does not diminish the 150 sample sequence limit. The ABA sequence is simply a quick and informal means of qualitatively identifying the presence of ethyl alcohol without focusing on the principles of accuracy, validity, or reliability.²⁷ In contrast, the DABACABA sequence does focus on accuracy, validity, and reliability.

DABACABA

The DABACABA sequence is the full breath alcohol concentration test sequence used by operators to obtain test results which are then offered into evidence. Results obtained from this test sequence are also those which are given a statutory presumption of trustworthiness and reliability in Minnesota. See Minn. Stat. § 634.16, cited by Underdahl II, 767 N.W.2d at 685 n. 4; Minn. R. 7502.0430, subp. 1 (requiring two breath samples in the sequence of breath, standard, breath). The DABACABA test sequence consists of an internal diagnostic, an air blank cycle, a breath sample cycle, another air

²⁶ A single breath sample cycle includes a replicated test of the same sample. The DABACABA sequence, in contrast to the ABA sequence, also includes a second full breath sample cycle. This means the DABACABA sequence actually records four alcohol concentration results, two from each breath sample, whereas the ABA sequence only records two alcohol concentration results from one breath sample.

²⁷ This is not to say the ABA sequence does not provide accurate, valid, and reliable results. The sequence itself, however, simply does not include the processes, measurements, or data collection which would allow conclusions to be drawn regarding the accuracy, validity, and reliability of results obtained with this test sequence.

blank cycle, a breath simulator solution or control cycle,²⁸ an air blank cycle, a second breath sample cycle, and a final air blank cycle. It is this test sequence which incorporates processes that allow for conclusions to be drawn regarding accuracy, validity, and reliability.

Testing two separate breath samples from a test subject allows for a scientific conclusion about the accuracy of a test to be drawn from the results obtained. The DABACABA sequence obtains two breath samples from a test subject. Two measurements of each of these samples are taken, for a total of four breath alcohol measurements. By taking two breath samples, the DABACABA sequence generates two independent measurements of the unknown being measured. The variability between these results provides information about the instrument's measurement accuracy across test samples. The variability between the two measurements of each breath sample provides similar but slightly different information. The focus is upon the instrument's measurement accuracy of a single sample. By making these replicate measurements, the DABACABA sequence obtains information which allows a calculation of whether the desired accuracy was obtained.²⁹ The software of Minnesota's Intoxilyzer 5000ENs makes this calculation in reference to a preset limit upon the accuracy in determining whether to report a result. Consequently, further discussion is provided in a subsequent section which specifically addresses the software operation and sample acceptance.

In addition to obtaining information about the accuracy of a test, the DABACABA

²⁸ The breath simulator solution or control cycle is referred to in Minnesota Rule 7502.0430 as a standard.

²⁹ There are obvious conclusions that are instantly drawn by reason of the ability to compare four results obtained very close in time as to accuracy.

sequence also obtains measurements from which validity of a test can be inferred. The testing of the breath simulator solution, also referred to as a “control” or a “standard,” provides a known alcohol concentration against which measurements can be compared. This comparison of a known alcohol concentration against measurements of the known made by the instrument provides information about the validity of the test; specifically, the validity of the testing for the breath simulator solution. By running the testing of the breath simulator solution and test subject breath samples under identical or nearly identical parameters, the inference can be made that the validity for the test subject’s breath samples is the same as the validity for the breath simulator solution.³⁰ The Intoxilyzer 5000EN’s software performs the necessary calculations utilizing this inference and compares the result to a predetermined acceptable limit of variability. The outcome of this comparison then influences sample acceptability and is discussed further in the next section.

Finally, the DABACABA test sequence utilizes a data collection system called COBRA, Computer Online Breath Archiving, to obtain information about the reliability of Minnesota’s Intoxilyzer 5000EN fleet. With the COBRA system, the BCA is able to monitor and perform calculations upon the accuracy and validity data obtained from every test performed on an Intoxilyzer 5000EN in Minnesota for evidentiary purposes. It is this information which is necessary to draw conclusions about the reliability of individual instruments or the Intoxilyzer 5000EN fleet as a whole.

³⁰ As discussed previously, this inference is made because it is impossible to directly determine the validity of measurements made upon an unknown. Without knowledge of the true value, such an analysis cannot be performed. It should be noted that the Minnesota BCA used other inferential methods in validating the Intoxilyzer 5000EN instrument and various software versions for use in Minnesota. These methods include comparison of Intoxilyzer 5000EN measurements to measurements obtained through other methods of analysis like blood or urine testing. Such methods utilize the same inference but rely upon a slightly different assumption, the validity of the alternate testing methods.

The DABACABA test sequence is a scientific measurement process designed to obtain information about the accuracy, validity, and reliability of tests run on Minnesota's Intoxilyzer 5000ENs. The focus in this case, however, is not upon the proprieties of this scientific process or the limits by which acceptable accuracy and validity are determined. The specific issue being addressed in these proceedings is narrower. The present inquiry is limited to how the Source Code of these instruments impacts the accuracy and validity of individual tests and if some portion of the Source Code interacts with the hardware or scientific principles such that a test result is unreliable and inadmissible as evidence. In order to answer such questions, the role of the Source Code in the operation of the Intoxilyzer 5000EN must be explained.

Source Code and Role Served in Intoxilyzer 5000EN

Source code is a human-readable representation of instructions that are performed by a computer. The Source Code for the Intoxilyzer 5000EN is over 1,113 pages of printed material.³¹ It is comprised of C code and Assembly code for the two microprocessors used in the Intoxilyzer 5000EN, the 8051 processor (referred to as the Slave processor), and the Z80 processor (referred to as the Master processor). When this code is compiled or assembled and linked, it is converted into a form which is executable by the microprocessors. It is this converted form which is actually burned on EPROMs that are then installed on the microprocessor circuit boards, from which the processors obtain their instructions in the course of operating the instrument.

The processors execute the instructions contained in the converted Source Code to perform the instrument functions. The Master processor is responsible for the basic

³¹ Of the hardbound copy of the Source Code, about 960 pages are code for the Master processor (Z80), while the remaining approximately 150 pages are for the Slave processor (8051).

instrument operations like buttons, displaying readouts, the printer interface, the hardware interface, sounding a tone indicating a subject should blow into the instrument, and general housekeeping matters. The Slave processor is primarily responsible for receiving the analog output or measurements and performs most of the calculation or data analysis, including a determination of sample acceptance. The aspects of software function performed by the Slave processor are those which are particularly relevant to these proceedings. The interaction of the Slave processor with the Master processor also has some relevance because of the interaction between the Master processor's function and the test subject and the Master processor's responsibility to report the calculated sample measurements.

The existence of dual processors in the Intoxilyzer 5000EN is inherent to its operation. The Master processor (Z80) used in the Intoxilyzer 5000EN is a product that was originally developed in the 1980s. The Slave processor in the Intoxilyzer 5000EN frees up the Master processor to perform the more basic functions of the instrument. To accomplish this goal, the more intensive processor functions are offloaded from the Master processor to the Slave. This appears to be an attempt by CMI to obtain greater functionality from the Intoxilyzer. Regardless of the reason for the dual processors, the software within the instrument that arises from the Source Code is responsible for directing the instrument to perform certain functions in response to input from the operator or test subject. The Source Code for the Master processor is primarily responsible for minor process functions of the instrument, whereas the Source Code for the Slave is primarily responsible for the data collection and analysis, which is the focus of these proceedings.

Air Blank Data Collection and Calculation

As part of the DABACABA test sequence performed by the Intoxilyzer 5000EN, several air blank samples are run through the instrument. An alcohol concentration measurement is taken by the Intoxilyzer 5000EN for each air blank. The purpose of this measurement is to confirm that the sample chamber does not contain alcohol prior to and after the test subject's breath sample and the breath simulator solution sample. If the instrument initially detects that the sample chamber has alcohol inside at the beginning of the air blank cycle and the operation of the air blank cycle does not reduce this measurement to below 0.017, then a purge fail error will be reported and the test cycle will terminate. (Ex. 2, Bates p. 74.) If the instrument detects a 0.000 alcohol concentration during the air blank cycle which then increases to some measureable alcohol concentration, then an ambient fail error will be reported and the test would likewise be stopped. (Ex. 2, Bates p. 69.) This comparative analysis and error reporting of the measurements being made by the Intoxilyzer 5000EN's hardware to a 0.000 reference point is performed by the operative version of the Source Code.

In some circumstances, the Source Code does more than a simple comparative analysis and error code reporting. The Intoxilyzer 5000EN stores a reference point for a 0.000 alcohol concentration. This reference point is obtained by assigning an analog signal received from the infrared detector the digital value of 0.000. Future measurements taken of air blanks are compared to this stored analog signal, and an adjustment of the stored value is made if the air blank results in a measured alcohol concentration between 0.000 and 0.017. For example, if measurement during an air blank cycle results in an alcohol concentration of 0.014, the Source Code would

automatically set this analog signal strength as the new reference by assigning it a digital value of 0.000. Unlike the error codes for measured alcohol concentrations at or above 0.017, this adjustment is made without any record. No message, reported error, or printed test result is generated. The implied consent petitioners and criminal defendants have cited this “silent adjustment” as potential error created by operation of the Source Code. This argument is addressed in greater detail in a later section. However, it is important to note that the calculation performed by the Source Code on the control data provides some assurance that such an adjustment will not impute error into the breath sample results.

Control Data Collection and Calculation

The breath simulator solution, referred to as a “control,” is also measured during the DABACABA test sequence. The Intoxilyzer 5000EN takes measurements as the breath simulator solution is run through the sample chamber. The two results obtained from these measurements are compared to the known alcohol concentration value included with the control solution. This comparison, which is performed by the Intoxilyzer 5000EN software, must result in a difference of less than 0.010. If it does not, then a control fail error will be reported by the Intoxilyzer 5000EN and no test subject results can be obtained. (Ex. 2, Bates p. 70.)

Sample Data Collection

The software or Source Code of the Intoxilyzer 5000EN is also involved in the collection of sample data from the breath sample cycles of the DABACABA sequence. When the DABACABA sequence is run on an Intoxilyzer, the Master processor’s software causes an audible tone to sound and a “Please Blow” instruction to appear

upon the display during the breath test sample cycle of the sequence. This indicates a test subject should blow into the breath tube. As a test subject provides a sample, pressure and alcohol concentration measurements are simultaneously taken and collected by the software for the Slave processor.

The flow rate and total volume of the test subject's breath sample are calculated from pressure measurements made by the pressure transducer and information from the instrument's internal clock. The pressure transducer can measure pressure at a particular point in time. This information is collected and stored by the Intoxilyzer 5000EN's software. At the same time, information from the internal clock is also collected and stored by the Intoxilyzer 5000EN. The pressure and correlated time measurements are used by the software to calculate total volume and flow rate. This calculation involves mathematical computation in accordance with formulas relating pressure, volume, and time to one another. These relationships also involve variables such as temperature, which are controlled by the instrument. The calculated flow rate and total volume values are then used by the Slave processor to perform additional sample acceptance analysis.

Alcohol concentration measurements are also taken and stored by the software for ultimate use in the sample acceptance analysis. Alcohol concentration measurements of up to thirty values are collected and stored at any given time. A mathematical computation is performed upon sets of thirty measurement values to produce an averaged result. As further measurements are taken, the averaged result is updated. Following the first thirty measurements, the software recalculates the averaged result by combining the last twenty-three measurements used to calculate the

prior averaged result with seven new measurements. This cycle of discarding the oldest seven measurements and recalculating the average based upon the most recent thirty measurements continues until a sample is no longer provided. These averaged alcohol concentration measurements are further analyzed by the software of the Slave processor to determine sample acceptance and thereby decide upon a further course of action.

Sample Acceptance Criteria

The Minnesota version of software for the Slave processor of the Intoxilyzer 5000EN utilizes calculated flow rates, calculated volume, the averaged alcohol concentration data, and time measurements to perform a sample acceptance analysis. Five separate criteria must be met within a four-minute timeframe for a test subject's breath sample to be accepted by the Intoxilyzer 5000EN. These criteria include a (1) minimum initial flow rate, (2) minimum continuing flow rate, (3) minimum total volume, (4) consistent slope, and (5) minimum time. Each of these criteria serves a critical purpose and must be met for the instrument to properly provide an accurate and valid breath alcohol concentration measurement. The contents of a test record printed by an Intoxilyzer 5000EN are dependent upon the software's sample acceptance analysis.

Flow Rate

The Master processor software analyzes the calculated flow rates to determine compliance with two of the sample acceptance criteria: the minimum initial flow rate and the continuing flow rate. The Intoxilyzer 5000EN requires a minimum initial flow rate of 0.17 liters per second. Once this value is met, the Master processor's software begins calculating the total volume. A flow rate of 0.15 liters per second must be maintained

while each of the three remaining criteria is met. If the flow rate drops below the threshold of 0.15 liters per second, then the calculation of total volume must begin anew. Such an occurrence also results in an increase of the puff counter value reported on a test record.

Two Source Code Modules operate together to determine whether the pressure being measured meets the minimum initial and minimum continuing flow rate criteria. As a breath sample passes the pressure transducer, analog measurements are taken. The signals representing these measurements are passed through an analog-to-digital converter and then conveyed to the first Source Code Module, which applies a calibration constant and averages the readings.³² The pressure outputs from the first Source Code Module are transmitted to the second Source Code Module, which applies a calibration constant to convert the pressure measurements into a flow rate. The output from this second Source Code Module, in the form of a calculated flow rate, is then used to calculate total volume and determine whether the threshold flow rates are met.

The calculated flow rates are not directly reported by the Intoxilyzer 5000EN. Instead, the instrument reports a puff count value, which is a product of the two flow rate criteria. Once the minimum initial flow rate of 0.17 liters per second is detected, the puff counter will obtain a value of at least one. With each drop in the continuous flow rate below 0.15 liters per second and return back above 0.17 liters per second, the puff

³² The calibration of the pressure transducer and subsequent flow rate and volume calculations are checked by using a medically certified spirometer to pass three air samples of 3 liters each at flow rates of approximately 0.25 liters per second, 0.35 liters per second, and 0.45 liters per second over the pressure transducer. The instrument's measured total volume must be within 5% of 3 liters to pass this certification test. This explanation was provided by Mr. Pulju.

count is increased in value by one.³³ For example, a puff count of four would generally be indicative of four cycles wherein the measured flow rate met the 0.17 liter per second threshold but then fell below the continuous flow rate threshold of 0.15 liters per second before the other sample acceptance criteria were met. Under one set of circumstances, however, the puff count is erroneously reported.

The BCA acknowledges and it is widely recognized that the Intoxilyzer 5000EN's software inexplicably doubles the puff count value under a specific set of circumstances. When a breath sample provided by a test subject fails to meet the slope check criterion but meets the other four sample acceptance criteria, then the calculated puff count value is doubled before it is reported. There is no explanation for this doubling of the calculated puff count value, scientific or otherwise. An error in the Source Code causes the puff count value calculated from the changing flow rate to double. In all other circumstances, the puff count value reported by the instrument accurately reflects the number of instances when the calculated flow rate met or exceeded the minimum initial rate of 0.17 liters per second.

Volume

The third criterion used by the Intoxilyzer 5000EN to determine sample acceptance is a minimum total volume. Once the initial minimum flow rate is met, the Source Code begins calculating a total volume from the calculated flow rate. For a sample to be accepted, the instrument requires the calculated total volume to exceed 1.1 liters. This requirement serves to ensure the desired deeper lung air is being

³³ The operative event for the software to increase the puff count value is the drop in calculated continuous flow rate of 0.15 liters per second, not the rise above an initial flow rate of 0.17 liters per second. Practically speaking, however, a drop in calculated continuous flow below 0.15 liters per second may only occur if the initial flow rate exceeds 0.17 liters per second.

measured by the instrument without making the minimum sample volume criterion too stringent.

The Source Code for the Master processor calculates the total volume. Specifically, the second Source Code Module which calculates the flow rate from the measured pressure also calculates the volume. When the instrument detects that the minimum initial flow rate of 0.17 liters per second has been met, it begins measuring the time interval of the breath or puff. Generally speaking, a flow rate is simply a reflection of volume passing a certain point over a period of time. The Intoxilyzer 5000EN takes advantage of this relationship by combining the time measurement with the calculated flow rate to calculate a total volume. As long as the calculated total volume exceeds 1.1 liters, the minimum total volume criterion will be met and the instrument may accept the BrAC results obtained from the sample.

The 1.1 liter total volume threshold was selected by the BCA. The purpose of a minimum total volume threshold is to ensure it is deeper lung air which is being measured. The volume threshold also helps prevent erroneous measurement of mouth alcohol. The greater the minimum volume threshold, the more likely it is that the measured BrAC is from the test subject's deep lung air and is not a product of alcohol present in their mouth. Ensuring the measured BrAC is from the deep lung air, however, must be balanced against having a minimum volume which can be expelled from the lungs of test subjects. As the required minimum total volume is increased, the ability of some portion of the driving population to provide an acceptable sample will be reduced. Some individuals would simply lack an adequate breath volume in a single puff to meet the threshold. In balancing these considerations, according to one of its

witnesses, the BCA selected 1.1 liters because it was the breath volume criteria used to determine eligibility for a handicap parking permit in Minnesota.

Slope Check

The fourth sample acceptance requirement considered by the Source Code in determining whether to accept or reject a sample is the slope check. The Intoxilyzer 5000EN makes continual measurements of the alcohol concentration of the breath sample in the instrument's sample chamber. Plotting these results on a graph would result in curves similar to the examples shown in Figure 1. The instrument uses a slope check feature to determine when the measured alcohol concentration is reaching a level slope or nearing the equilibrium alcohol concentration. The slope check feature is a product of the Source Code of the instrument's Slave processor.

The Intoxilyzer 5000EN measures the alcohol concentration in the instrument's sample chamber about 40 times per second.³⁴ The Source Code takes these measurements and calculates an average alcohol concentration. The first 30 measurements are averaged to obtain the first averaged alcohol concentration. Subsequent averaged alcohol concentrations are calculated by averaging seven new measurements with the twenty-three immediately preceding measurements. Each successive averaged alcohol concentration data point is therefore a combination of measurements used to calculate the prior data point and new measurements. The result is a moving average of data points that the Source Code uses to calculate a slope

³⁴ The speed of the instrument's measurement of alcohol concentration is a result of the speed of the infrared filter motor. The infrared filter is spun by a motor at a speed of approximately 2,400 revolutions per minute or approximately 40 revolutions per second. The instrument obtains a single alcohol concentration measurement for each revolution.

and determine slope acceptance.³⁵ Due to limitations of the microprocessors and calculation burdens placed upon them by other features of the Source Code, such as interferent detection, the software contained in version 75_240 may reject samples depending on how hard the subject blows.

The Source Code uses the averaged alcohol concentration data points to calculate a slope or percent change from one averaged point to the next. This change in slope must be less than or equal to 7% for an averaged alcohol concentration to be accepted and reported as a result. If the slope is changing by some amount greater than 7%, then the Intoxilyzer 5000EN continues to measure the alcohol concentration and calculate averaged data points. The Source Code will continue to check whether the slope is less than or equal to 7% until a sample is accepted, the minimum continuing flow rate drops below 0.15 liters per second, which would reset the other sample acceptance criteria, or the maximum time limit of four minutes is reached. Samples which never pass the slope check will result in the Intoxilyzer reporting a "Deficient Sample" rather than a BrAC result.

Once an averaged alcohol concentration result is accepted, the Intoxilyzer 5000EN stops taking measurements and ceases the breath sample cycle. This final averaged alcohol concentration is accepted because all of the sample acceptance criteria have been met, and this will be the reported result. The Intoxilyzer 5000EN reports results by generating a printout of the entire test sequence.³⁶ Along with the

³⁵ CMI has developed other methods of calculating average alcohol concentration for other clients, including Norway. The method used by Minnesota's Intoxilyzer 5000EN fleet, however, is that described herein.

³⁶ The Intoxilyzer 5000EN also displays the current averaged alcohol concentration result on a display. Sometimes the Source Code process updating this displayed result is interrupted by the acceptance of an averaged alcohol concentration result and cessation of the breath sample cycle. This may result in the final accepted BrAC result reported on the printout being slightly different than the result last seen on the