Landscape Study of **Field-Portable DUID Screening Products**

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Criminal Justice Testing and Evaluation Consortium
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This report was authored by RTI International's Innovation Advisors—including Rebecca Shute and Tyler Ovington—with support from Molly O'Donovan Dix, Kristina Cooley, Marjorie Baldi, Meghan Camello, and Beth Greenwood as well as RTI's Division for Applied Justice Research—including Jeri Ropero-Miller, Michael Planty, Duren Banks, Camille Gourdet, and Megan Grabenauer.

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The physical and cognitive impairment and chemical screening products detailed in this landscape study are intended to be a good-faith overview, but not an exhaustive list of on- and near-market products. The inclusion of a product or company in this report does not represent NIJ's or CJTEC's approval, recommendation, endorsement, or validation of product claims.

OVERVIEW

Landscape Study of Field-Portable DUID Screening Products

This report offers a "landscape" view of how field-portable screening products may enable law enforcement's efforts to advance justice in the investigation of cases involving driving under the influence of drugs (DUID). It overviews both physical and cognitive screening products to assess impairment, as well as chemical products to screen for the presence of drugs in an individual's oral fluid, breath, or sweat. The document provides law enforcement agencies with a survey of currently available and emerging screening products; additionally, the text highlights key benefits, limitations, and procurement considerations for these products informed by interviews with DUID experts. This report will help readers understand if field-portable DUID screening products can benefit their organization and how to proceed with selecting and implementing such products.

Although this report specifically looks at products that enable the assessment of an individual's impairment through physical, cognitive, and chemical screening approaches, other technologies may provide value in a DUID investigation. These are covered in an upcoming CJTEC landscape study that provides an overview of technologies for observation, documentation, and training for DUID investigations.

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Criminal Justice Testing and Evaluation Consortium (CJTEC)

CJTEC is a program of the National Institute of Justice (NIJ), which uses research-based methodologies to enhance the capabilities of law enforcement, courts, and corrections agencies. As a consortium, CJTEC leverages expertise from varied criminal justice community stakeholders to understand and test technologies and practices in a variety of NIJ's research areas.

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Field-portable screening products may help improve DUID investigations by screening for signs of physical and cognitive impairment or for the presence of drugs and their metabolites.

In situations involving suspected DUID, law enforcement must assess whether an individual is impaired and—if so—whether they are under the influence of drugs. Historically, law enforcement has relied on specialized training programs—including standardized field sobriety tests (SFSTs), Advanced Roadside Impaired Driving Enforcement (ARIDE), and drug recognition expert (DRE) programs—to prepare officers for assessing impairment in DUID investigations. However, as the prevalence of DUID grows, so too does its demand on local law enforcement agencies and their resources. Constrained by scarce resources, many agencies face challenges in addressing the complexities of gathering and presenting reliable and valid evidence to support officer observations made in DUID cases.

Field-portable DUID screening products may help improve DUID investigations and reduce their burden on law enforcement resources. Today, some agencies are piloting and adopting DUID screening products to help law enforcement officers make informed decisions about DUID in a field setting. These products can help law enforcement officers gather accurate information in a timely manner, support their observations of a driver's impairment, and establish probable cause and allow further investigation. Many of these products generate evidence that can be used in court. This information may also be useful in training courses, improving officer confidence when investigating, and testifying in DUID cases.

As shown in **Figure 1**, this report splits available DUID screening products into two categories: (1) physical and cognitive impairment screening and (2) chemical screening products. These products share many benefits and limitations; however, the products play different roles during an investigation and have unique considerations for implementing into practice.

Figure 1: Field-portable DUID screening products may be used to help assess impairment or identify drug use; these products have unique considerations for use in the field, and different roles and impacts.

Physical and Cognitive Impairment Screening Products

Impairment screening products help law enforcement assess whether an individual is impaired (and lacks the capability to operate a vehicle).

- On and near-market products are designed to (1) improve delivery of the SFST, (2) document the SFST, or (3) help predict whether an individual could be impaired based on data collected during the test.
- Products may record and/or measure video; physiological data; or other factors, like horizontal gaze nystagmus (HGN) or response time, to generate evidence and/or predict whether an individual is impaired.
- Evidence capture is a key selling point of these products, and law enforcement are less inclined to opt for products that make impairment predictions for them.

Chemical Screening Products

Chemical screening products detect if drugs are present above a cutoff concentration in an individual's system.

- Products screen for the presence of drugs in oral fluid, sweat, or breath.
- Most screening products on the market are oral fluid-based. These products, along with sweat-based products, typically use lateral flow immunoassay technology with an associated optoelectronic reader to interpret test results.
- Breath-based products, which currently focus on detection of tetrahydrocannabinol (THC), are under development. Development efforts are based on various technologies, such as electrochemical assays, optical fluorescence spectroscopy, and ion mobility spectrometry.

This report provides a landscape of screening products related to (1) physical and cognitive impairment and (2) chemicals—along with the products' key benefits, limitations, and procurement considerations.

This report contains information related to DUID screening products that are on—or are nearly on—the market, as well as research efforts paving the way for future products. However, this report focuses on the considerations an agency should make when determining whether to adopt a DUID screening product. **Figure 2** highlights the key benefits, limitations, and procurement considerations noted from conversations with existing end users of these products and other criminal justice community experts. The procurement questions and adoption guidance—which later sections of this report expand upon—should be considered by agencies when exploring the adoption of DUID screening products.

Figure 2: Field-portable DUID screening products vary in their associated benefits, limitations, and procurement considerations.

Many benefits and limitations are shared across DUID screening products.

Benefits

- Integrate with existing methods, like SFSTs, to help establish probable cause
- Generate evidence during DUID investigation, potentially improving the likelihood of successful adjudication
- Help reach accurate, timely conclusions at the roadside
- Enhance officer training opportunities

Limitations

- Some products cost <$5k upfront, which can be prohibitive for some agencies
- Available products can only augment, not replace, existing DUID investigation practices
- Limited number of products available for procurement
- Products add complexity in the courtroom for already complex DUID cases

Key procurement questions are shared by DUID products.

Procurement

1. Does this product enhance, complement, or substitute existing procedures?
2. Is the product ruggedized for roadside use?
3. What operator skills are required from the officer?
4. How does the product integrate with law enforcement workflows?
5. How will my agency fund procurement?
6. How does the product align with legal considerations?
7. What value (or unintended consequences) does the product bring the prosecution in DUID cases?
8. What training is necessary for consistent and accurate use of the product?
9. Is the product output evidential and admissible in court?

Additional points to consider vary by product type.

		Example agency users ...
Physical and Cognitive Impairment Screening Products	• Understand the limitations of HGN-based test methods. • Consider how the product's performance compares to current SFST methods. • Recognize the potential benefits and drawbacks of products that capture evidence during the investigation. • Consider the versatility of impairment screening products for training opportunities. • Understand that baseline data are needed to improve predictive products.	**Austin Police Department's (APD's) DWI Task Force's** use of Ocular Data Systems' DAX™ Evidence Recorder, a documentation device that records video and audio during an HGN test during Drug Recognition Expert examinations
Chemical Screening Products	• Understand available suppliers and pilot study evidence vary by product type. • Consider which drug classes your agency is looking to screen. • Review product performance with the help of validation studies. • Understand pre-testing procedures required for proper testing. • Consider ease of sample collection. • Consider how average test time may impact investigations. • Engage with vendors to understand possibilities for customizing products. • Understand the confirmatory testing capabilities accessible to your agency. • Identify the value of sample retention capabilities in your jurisdiction.	**The Royal Canadian Mounted Police's (RCMP's)** use of oral fluid screening products in DUID investigations

This report builds on recent efforts to address the complexity of DUID investigations and draws on the opinions of existing users and experts, and information from product developers.

This report builds forward from the National Institute of Justice's (NIJ's) Criminal Justice Requirements and Resources Consortium meeting (and subsequent report), facilitated by RTI International and the RAND Corporation, towards technology-based solutions for DUID investigations. This report aims to consolidate available information regarding field-portable DUID screening products, enabling agencies to better understand the potential benefits and limitations of these products in the context of DUID cases.

Landscape Research Methodology

To conduct this study, CJTEC used an iterative process that included the following steps:

1. Consult with experts, practitioners, and other key stakeholders:
   - Considered the learnings from NIJ's Criminal Justice Requirements and Resources Consortium meeting specific to technology-based needs, solutions, concerns, and lessons learned from implementation efforts
   - Discussed current impairment assessment techniques with experts—including DREs and other law enforcement stakeholders—to understand their viewpoints and the status of adoption for new products that assist in screening for impairment
2. Scan extant literature:
   - Consulted sources, such as National Highway Traffic Safety Administration (NHTSA) literature and other research publications
3. Solicit market input for products:
   - Created a request for information (RFI) on the Federal Register to solicit input from companies and researchers developing products in this field
4. Consolidate and synthesize information:
   - Consolidated research to highlight key findings related to field-portable products capable of screening for impairment during a DUID investigation
   - Synthesized market information and RFI responses to create comparison tools to aid in product evaluation
5. Provide case examples:
   - Provided use-case examples to highlight real-world product selection and adoption

CJTEC would like to remind decision makers considering DUID screening product implementation that these products should be considered with respect to existing agency policies and procedures, which might not directly align with novel solutions.

Glossary

Advanced Roadside Impaired Driving Enforcement (ARIDE)

A 16-hour training course for law enforcement officers to better identify signs of impairment caused by substances beyond alcohol. "[ARIDE] is intended to bridge the gap between the SFST and DRE course and to provide a level of awareness to the participants, both law enforcement and other criminal justice professionals, in the area of drug impairment in the context of traffic safety." (More information about ARIDE training is available on the International Association of Chiefs of Police (IACP) website.)[1]

Drug Recognition Expert (DRE)

An individual who successfully completed the 110–130 hours of training requirements established for certification as a DRE by the IACP and NHTSA. DREs are highly effective officers skilled in the detection and identification of persons impaired by alcohol and/or drugs. DREs are trained to conduct a systematic and standardized 12-step evaluation that considers physical, mental, and medical components. Terms such as "evaluator," "technician," and similar words may be used as a substitute for "expert," depending upon locale or jurisdiction. (More information about DRE training is available on the IACP website.)[2]

Driving Under the Influence of Drugs (DUID)

Any and all offenses involving the operation of vehicles by persons under the influence of drugs (NHTSA).[3]

Driving While Intoxicated (DWI)

Any criminal action related to driving or operating a motor vehicle while "illegal per se" or while impaired by, under the influence of, or intoxicated by alcohol or other drugs. Other terms that may be used and have the same or similar meaning include DUI, OWI, and OUI (NHTSA).[4]

Field-Portable DUID Screening Products

Products (including hardware-based and primarily software products, tests, and other technologies) that are used to support observations of an individual's impairment or presence of drugs or metabolites in their system for DUID investigations in a setting outside of a controlled laboratory, such as the roadside.

Horizontal Gaze Nystagmus (HGN)

An involuntary jerking of the eyes, occurring as the eyes gaze towards the side, which may be indicative of an individual's impairment from alcohol or some other drugs such as central nervous system (CNS) depressants, inhalants, and dissociative anesthetics (NHTSA).[5]

1. Advanced Roadside Impaired Driving Enforcement (ARIDE) Participant Manual (2013). International Association of Chiefs of Police. Accessed from https://www.wsp.wa.gov/breathtest/docs/dre/manuals/ARIDE/2013/ARIDE_student_5-2013.pdf
2. DRE Training (2020). International Association of Chiefs of Police. Accessed from https://www.theiacp.org/dre-training
3. DWI Detection and Standardized Field Sobriety Testing (SFST) Refresher (2015). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/sfst_pm_refresher_manual.pdf
4. Digest of Impaired Driving and Selected Beverage Control Laws (2017). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812394-digest-of-impaired-driving-and-selected-beverage-control-laws.pdf
5. DWI Detection and Standardized Field Sobriety Testing (SFST) Refresher (2015). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/sfst_pm_refresher_manual.pdf

Per Se Laws

Laws that make it illegal to drive with amounts of specified drugs in the body that exceed set limits; relevant drugs vary by jurisdiction, and they may include (but are not limited to) alcohol and tetrahydrocannabinol (THC) (or an associated metabolite) (GHSA).[6]

Preliminary Breath Test (PBT)

A pre-arrest breath test administered during investigation of a possible driving while intoxicated (DWI) violator to preliminarily obtain an indication of the person's blood alcohol concentration (NHTSA).[7]

Probable Cause

More than mere suspicion; facts and circumstances within the officer's knowledge, and of which he or she has reasonably trustworthy information, are sufficient to warrant a person of reasonable caution to believe that an offense has been or is being committed (NHTSA).[8]

Standardized Field Sobriety Test (SFST)

A standardized battery of tests used to obtain validated indicators of impairment based on scientifically validated and controlled laboratory studies. The battery of tests includes HGN, walk and turn, and one leg stand. This battery of tests was developed and validated to determine if an individual has a blood alcohol concentration at or above 0.10 g/dL, and later 0.8 g/dL (NHTSA).[9]

Zero-Tolerance Laws

State laws that make it illegal to drive with any measurable amount of specified drugs in the body (GHSA).[10]

6. Drug Impaired Driving (2020). Governors Highway Safety Association. Accessed from https://www.ghsa.org/state-laws/issues/drug%20impaired%20driving
7. DWI Detection and Standardized Field Sobriety Testing (SFST) Refresher (2015). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/sfst_pm_refresher_manual.pdf
8. DWI Detection and Standardized Field Sobriety Testing (SFST) Refresher (2015). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/sfst_pm_refresher_manual.pdf
9. DWI Detection and Standardized Field Sobriety Testing (SFST) Refresher (2015). National Highway Traffic Safety Administration. Accessed from https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/sfst_pm_refresher_manual.pdf
10. Drug Impaired Driving (2020). Governors Highway Safety Association. Accessed from https://www.ghsa.org/state-laws/issues/drug%20impaired%20driving

Thank you to the various criminal justice community stakeholders and practitioners who provided insights and expertise.

Interviews from subject matter experts and end users helped to frame issues and consider solutions; additionally, these interviews ultimately informed this report in working to deliver key insights for decision makers interested in implementing products and solutions. CJTEC sought feedback from varied stakeholders—including experts in law enforcement, drug recognition, toxicology, policy, and chemistry—to understand the potential value of these solutions and the practical implications of adoption and use.

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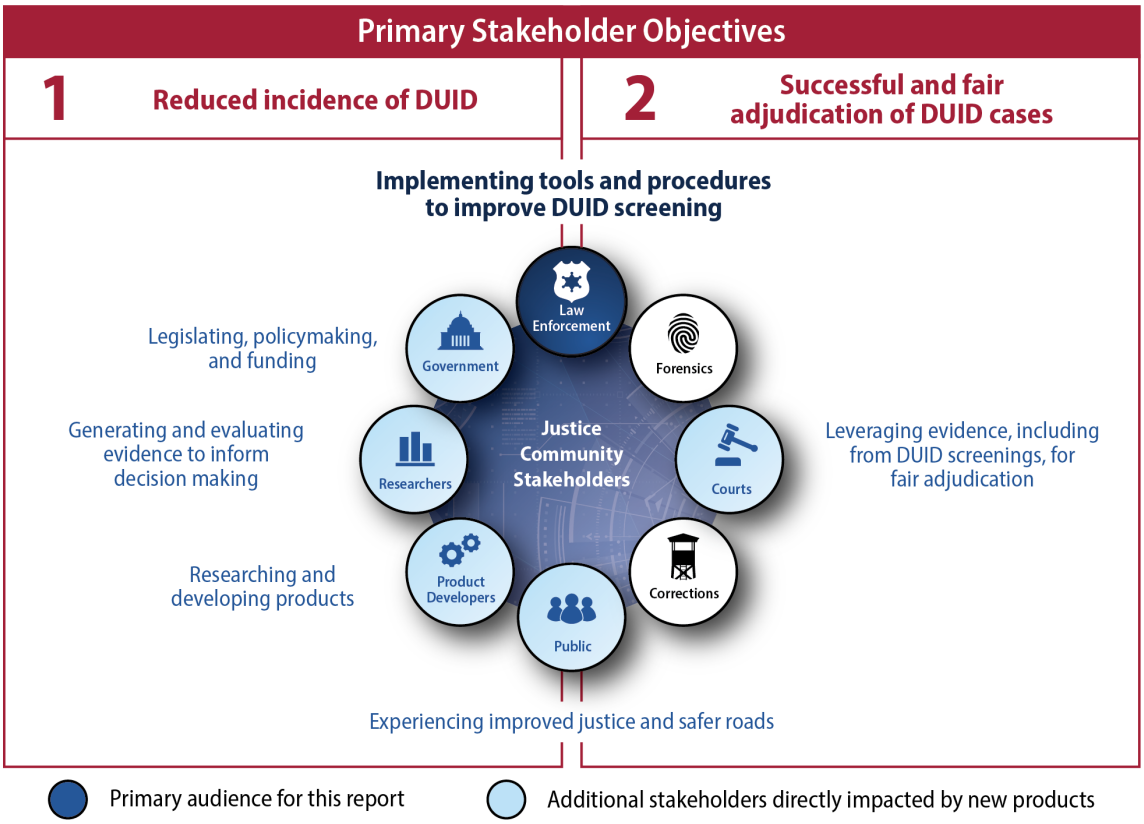
CONTEXT

Addressing DUID is a growing challenge for law enforcement; however, product developers and providers are seeking to address these needs by leveraging emerging technologies and developing innovative products. NIJ's CJTEC produced this report to help agencies understand how DUID screening products may help law enforcement compile enough evidence to support a determination of DUID. Agencies can use this report to understand the benefits and limitations of these products, key factors to consider for procurement, and how the products relate to other criminal justice community stakeholders.

Law enforcement personnel are the primary end users of DUID screening products—and as such, these individuals serve as one of the primary audiences for this report. However, implementation of these products is supported by (and directly impacts) other stakeholders in the community, such as the court systems and citizens, shown in **Figure 3**. Law enforcement should keep the needs and efforts of these stakeholders in mind when considering if, how, and when to implement DUID screening products.

Figure 3: All justice community stakeholders are impacted by DUID. Although this report was developed primarily to help law enforcement better understand the landscape of field-portable DUID screening products, the adoption of such products is supported by and directly impacts other justice community stakeholders.



Understanding the potential benefits and limitations of adopting emerging technologies to address DUID-related challenges is important for the following reasons.

DUID is a significant public health issue in the U.S.

Driving while impaired by any drugs, whether licit or illicit, is a criminal offense. According to the Substance Abuse and Mental Health Services Administration (SAMHSA), roughly 10 million Americans drove under the influence of illicit drugs in 2014.[11] An NHTSA roadside survey designed to learn about prevalence of drug use by drivers found that 20% of weekend nighttime drivers stopped for the study tested positive for potentially impairing drugs (2013–2014).[12]

Unlike established limits for alcohol, there is no clear link between levels of drugs in an individual's system and their impairment.

Unlike alcohol, many drugs are fat soluble or have complex metabolic pathways that can vary from individual to individual based on a wide variety of factors, including individual physiological traits and history of substance use. In turn, the same level of drug may impair one individual while causing negligible impairing effects on another. Some drugs remain in an individual's system for longer than others; for example, although alcohol can be detected in an individual's urine up to 12 hours after ingestion,[13] some drugs—like marijuana—can be detected in urine months after ingestion,[14] and cannot be used to reliably link drug use with the individual's impairment at time of the stop.[15] As such, most states (90% as of 2019) do not have a similar "per se" statute regarding impairment by marijuana or other drugs, unlike in cases of driving under the influence of alcohol, where drivers in most states are considered legally impaired if their blood alcohol concentration is 0.08 percent or higher.[16] National standards implemented for alcohol-impaired driving can be used to establish probable cause to arrest an individual, identify proof through testing, and document evidence that can be used in court; however, a similar standard does not currently exist for DUID.

DUID cases are also complicated by the prevalence of multi-drug use. SAMHSA data indicate that in 2014, 5.9 million (2.4% of individuals surveyed) drove under simultaneous influence of alcohol and drugs in the past year.[17] Officers often do not consider investigating impairment from drug use unless there is a low or zero reading from a preliminary breath test (PBT) for alcohol. Different drugs elicit different physiological responses from the user and present as varied types of impairment. When an individual is impaired by a combination of two or more types of these drugs, it may be difficult for even an officer trained by an ARIDE or a DRE program to determine what substances may be impairing a subject.

11. Driving Under the Influence of Alcohol and Illicit Drugs (2016). SAMHSA(Substance Abuse and Mental Health Service Administration). Accessed from https://www.samhsa.gov/data/sites/default/files/report_2688/ShortReport-2688.html
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16. Drugged Driving/Marijuana Impaired Driving (2019). National Conference of State Legislatures. Accessed from https://www.ncsl.org/research/transportation/drugged-driving-overview.aspx
17. Lipari, R.N., Hughes, A., Bose, J. The CBHSQ Report: Driving Under the Influence of Alcohol and Illicit Drugs (2016). Substance Abuse and Mental Health Services Administration National Survey on Drug Use of Health. Accessed from https://www.samhsa.gov/data/sites/default/files/report_2688/ShortReport-2688.html

Reliably assessing an individual's impairment for DUID cases requires law enforcement agency resources.

Agencies must dedicate a significant amount of resources to control DUID because of the continued legalization of marijuana (recreational and medical) and the burden of the opioid crisis. For a DUID arrest to occur, the arresting officer needs to demonstrate (1) that there is evidence to suggest the individual is potentially impaired and (2) that he or she is likely impaired by a drug (whether licit or illicit). As such, law enforcement officers who initiate contact with a suspect at roadside may seek the expertise of officers trained to recognize and gather evidence of potential DUID.

Today, officers use NHTSA-validated SFSTs, such as HGN, walk and turn, and one leg stand to help assess impairment in an individual. This battery of tests was developed and validated to determine if an individual has a blood alcohol concentration at or above 0.10 g/dL, and later 0.8 g/dL. Beyond basic SFST training, some officers may pursue additional training such as ARIDE and DRE programs. ARIDE and DRE curricula train these specialized law enforcement officers to understand the signs and symptoms of drivers who are impaired by substances other than alcohol. Trainees in these two programs often conduct tests related to drug impairment after an arrest (i.e., when the breath alcohol device reading is low or zero, or when other evidence suggests potential drug-related impairment). Training and accurately executing test procedures are critical to gathering a clear and correct picture to assess impairment in an individual.

DREs, the most highly trained officers in identifying drug-related impairment, and ARIDE officers can play an important role in gathering evidence to support a DUID case; however, these highly skilled officers are limited in number. There were only 8,606 certified DREs in the United States as of 2017, making up a small proportion of total law enforcement officials across state, city, county, and other law enforcement agencies.[18] Officers who suspect DUID may not be able to access a DRE- or an ARIDE-trained officer in a timely fashion.

Technology may enable law enforcement to work more efficiently.

With limited resources for DUID investigations, agencies must pursue ways to increase the impact of existing resources. DUID screening products, both on- and near- market, may help law enforcement investigate DUID cases more efficiently. These products may help establish probable cause, improve documentation, guide decision making, and improve training opportunities. Use of these products is enabled by the support of other stakeholders in the criminal justice community. However, agencies must weigh the impacts of technical, practical, and legal limitations for these products with the benefits these products may offer to DUID investigations.

Understanding the benefits and limitations of various products helps agencies make informed decisions for procurement and adoption.

Acknowledging the technological and legal advantages and limitations of the various on- and near-market field-portable DUID screening products is important for decision makers who are seeking to understand if, when, and how to adopt these products in the context of a specific agency. This report, as well as continued monitoring of how jurisdictions in the U.S. and other countries implement these products, can help agencies make informed procurement and adoption decisions.

18. 2017 Annual Report, IACP Drug Evaluation and Classification Program (2018). International Association of Chiefs of Police. Accessed from https://www.theiacp.org/sites/default/files/all/0-2/2017-DECP-report.pdf

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The following sections provide additional insights related to benefits, limitations, and procurement considerations that are specific to various physical and cognitive impairment screening products and chemical screening products.

Physical and Cognitive Impairment Screening Products

Chemical Screening Products

PRODUCT LANDSCAPE

Field-Portable DUID Screening Products

Today, DUID investigations leverage a battery of NHTSA-approved SFSTs to assess whether an individual may be impaired and may use a breath alcohol test to determine whether alcohol may play a primary role in a driver's impairment. In circumstances in which the driver appears to be impaired and the preliminary breath alcohol test returns a breath alcohol concentration apparently inconsistent with the driver's impairment, a DRE may be brought in to evaluate the individual after the arrest.

The DRE uses a 12-step protocol to assess the following: Is the subject impaired? If yes, to what is the impairment related (e.g., drugs or a medical condition)? If drugs, which drug category or combination of drug categories is likely causing the impairment?

Beyond the initial preliminary breath alcohol test, few additional field-portable testing products have been widely implemented for use in DUID investigations. However, two categories of field-portable products are currently emerging for investigating impairment in the field, as shown in **Figure 4**. This report is organized categorically around (1) physical and cognitive impairment screening products and (2) chemical screening products.[19]

Figure 4: Physical and cognitive impairment screening products are hardware or software to measure physical signs that an operator is unable to adequately operate a vehicle, whereas chemical screening products detect specific drug use. Products featured in this figure represent on- and near-market products from vendors who have responded to CJTEC's RFI on the Federal Register.

19. Although this report details the use of these products in DUID investigations, physical and cognitive impairment and chemical screening technologies may be used in other applications, such as determining whether armed citizens may be under the influence of drugs.

Understanding the key benefits and limitations of DUID screening products is critical to understanding if, when, and how to use them.

DUID screening products may serve as valuable tools to help law enforcement make informed decisions related to DUID at the roadside; however, agencies must weigh benefits against the practical limitations of products when making purchasing and implementation decisions.

Key Benefits of DUID Screening Products

1. **Help establish probable cause:** Test results from the products could help law enforcement identify if the subject is likely impaired and/or under the influence of a drug on the roadside. These results could be used to establish probable cause to arrest.
2. **Document evidence during a DUID stop:** Some of the products can objectively document SFSTs via video and generate test records that may be able to accurately demonstrate the subject's impairment in court, potentially improving outcomes during adjudication.
3. **Help reach informed, timely conclusions:** These products provide law enforcement with data to help them make informed decisions about the potential impairment of stopped drivers in real time. These products can be used as part of an impaired driving investigation, or they can be used by other law enforcement officers to make informed decisions when a specialized officer is unavailable.
4. **Enhance officer training:** These products provide useful functionalities and outputs for officer training. Utilizing these products in training may represent an added value for agencies, especially for those conducting a high volume of training.

Key Limitations of DUID Screening Products

1. **Require a steep financial investment:** Although costs vary, up-front costs for these products can be as high as $5,000 per unit. Beyond up-front costs, there may be costs associated with product training for officers, consumables, maintenance, and data storage. High costs may significantly impact an agency's ability to procure or widely disseminate the products.
2. **Can only augment, not replace, existing practices:** Chemical screening products are limited to performing presumptive screenings; these products do not provide evidentiary testing, nor do they provide evidence of direct impairment. Physical and cognitive impairment screening products may help perform or document SFSTs, but they do not replace them.
3. **Do not offer a wide selection of market-ready technologies:** To date, few products in development have reached the market. Many promising products are not yet commercially available. For those that are available, procurement options are limited to a few vendors—or sometimes even a single vendor.
4. **Courtroom knowledge of devices is limited:** To realize the value of these products in a DUID case, stakeholders—including litigators and law enforcement—must successfully communicate product capabilities and limitations. These cases require effective communication on product
   a. functionality,
   b. use cases in the field,
   c. reliability, and
   d. validity (and any validation tests performed).

Physical and Cognitive Impairment Screening Products

As **Figure 5** illustrates, physical and cognitive impairment screening products are a subset of the field-portable DUID screening products. These tools capture a driver's inability to perform physical or cognitive tasks; using these tools to document information can help law enforcement officers establish that an individual lacks the capability to operate a motor vehicle.

Figure 5: Most physical and cognitive impairment products on the market today are software tools for tablets and smartphones; more sophisticated hardware, including headsets, is rapidly emerging.

Physical and Cognitive Impairment Screening Products

On Market	Hardware	Software		Product Name	Product Description	Comments
●	●			DAX™ Evidence Recorder	DAX is an evidentiary recording device for roadside alcohol and drug impairment investigations, with a full-spectrum night vision lens, 2 switchable white LEDs, and 4 infrared LEDs.	Deployed widely across the United States for DUID use
	●			Battelle Roadside Impairment Sensor	Virtual reality device uses eye-tracking technology to measures symptoms associated with drug classes.	Product still under development
	●			IMMAD-Impairment Measurement Marijuana and Driving	IMMAD uses virtual reality goggles with eye tracking and a Bluetooth response button. IMMAD projects a standardized test of the 40° central/mid-peripheral vision (view through driver's side windshield) into "optical infinity." The driver presses the Bluetooth response whenever they see striped squares.	Field testing in progress
●		●		Real Time Cognitive Evaluation	The evaluation is a tablet-based application that guides users through cognitive tasks and provides a risk rating of impairment.	Research projects with University of Colorado and Rocky Mountain Poison and Drug Safety, University of Boulder Colorado, University of Alberta, and development project with RCMP DRE program
●		●		Pocket Standard Field Sobriety Test	The Pocket Standard Field Sobriety Test guides the officer in collecting the impairment evidence through both the SFST and DRE processes.	Operating pilot program with Edmonton Police Service and RCMP Traffic Services
●		●		DRUID App	DRUID is an app that measures cognitive-motor behaviors to establish whether an individual shows evidence of impaired performance.	Used in law enforcement "Green Lab" in Washington State

Physical and cognitive impairment screening products can provide one or a combination of the following functionalities to law enforcement officers during examinations of individuals:

- **Improve SFST delivery:** These products are implemented as part of SFSTs to improve how these tests are delivered at roadside. For example, modified pen flashlights can track time for officers and signal when to change direction during HGN tests.[20]
- **Generate evidence of impairment during SFST:** These products capture images, video, and/or audio data during investigations for later use, including in legal proceedings or in training classes. For example, a close-range camera can capture evidence of involuntary eye movement during an examination conducted in accordance with SFST guidelines.
- **Identify impairment:** These products measure physiological data and other factors to assess whether an individual is impaired.

On- and near-market products capture and/or assess physical movements and physiological data to aid in impairment determinations. Some of these products focus on detection of HGN. Other products may measure gait patterns, reaction times, or physiological indicators related to blood flow changes that happen during drug impairment. These tests are manifested with various technologies, ranging from simple (e.g., software applications, phone accelerometers, cameras, lights, and timers to better execute and document SFSTs) to complex (e.g., eye tracking and machine learning to document proof of impairment).

20. HGN pen flashlights are impairment screening products available on the market, but they are not detailed in the Product Details section as providers of these products did not respond to the RFI. Refer to Table 3 for examples.

Impairment Screening Product User Profile:
The APD uses the DAX™ Evidence Recorder during DRE examinations.

Detective Mike Jennings serves as the DWI Coordinator for the APD (Austin, Texas)

The APD addresses DUID with its DWI Enforcement Team. This team includes a staff of approximately 25 DREs and has conducted over 1,400 DRE evaluations since 2014. Since 2016, the APD has shared one DAX™ Evidence Recorder. This device is a close-range camera that documents video and audio of HGN and other SFSTs; it is used specifically in post-arrest procedures as part of DRE exams.

The APD has evaluated many types of technologies—including (1) methods to document HGN related to drug use and (2) products to investigate crimes linked to intoxication—such as intoxication manslaughter and intoxication assault—to improve DRE investigations. The agency adopted the DAX™ after encountering the product at an industry conference. Now the APD aims to use the DAX™ in as many of their DRE exams as possible.

The DAX™ is typically kept at the jail, where the on-call DRE can access it whenever needed. One benefit of the DAX™ infrared camera is that the camera allows for a portion of the DRE evaluation to be conducted in the dark to better evaluate the individual's pupils and eye movements. DREs may use the DAX™ at substations, like in the case of juvenile exams. DREs have also used the DAX™ to document evidence in hospitals, where there is typically a lack of additional video evidence (e.g., in-car video).

Advantages

The DAX™ produces good-quality video that captures details that cannot be seen using body cameras and other current documentation technologies. The device operates intuitively with simple controls, so it has been easy for DREs to use. Officers find the direct light feature useful when they need to evaluate pupillary response during evaluations.

The product's documentation abilities have multiple benefits. First, the DAX™ captures what happens during DRE evaluations, which helps to inform juries that expect to see recordings and other evidence in a "post-CSI" era. Detective Jennings often provides instruction to law enforcement personnel outside of the APD regarding DWI, and these instructional sessions often include video from the DAX™.

Challenges

The DAX™ is fairly heavy and bulky to carry, which Detective Jennings noted as a challenge in field settings. The APD has also encountered some problems with the Secure Digital card reader that captures video, but the DAX™ manufacturer quickly resolved the issue. Cost is another primary barrier to scaling up use of the DAX™. Although officers and judges express interest in the DAX™ after seeing a video recorded on the device, the high price point is consistently a challenge for agencies in broad use.

As previously mentioned, the APD keeps their DAX™ at a central location rather than transporting it to the roadside. However, even if they had more DAX™ units, Detective Jennings would prefer to use the DAX™ at the station. Use of technologies in the field—like the DAX™ or even PBTs—can disrupt investigations. Getting potentially intoxicated individuals to cooperate with roadside technologies can be challenging and can lead to safety concerns in a roadside environment.

When considering the potential for future uses of the DAX™ in uncontrolled environments, Detective Jennings wants to understand how courts would handle the information generated by DAX or dash cam footage of DAX™ usage in these environments. He explained that dash cam footage generated while PBTs are used at roadside is not always admissible, which may hold the same for footage from DAX™ outputs. As a result, the jury may end up watching a black screen for those 30 seconds of the investigation. Detective Jennings feels that if a ruling like this were made for the DAX™, such a decision may hinder the DAX™ unit's roadside usage. He suggests working closely with local prosecutors to understand the opportunities and challenges of use in court before purchasing the instruments.

Chemical Screening Products

As **Figure 6** illustrates, chemical screening products are a subset of the field-portable DUID screening products that detect the presence and concentration of drugs in an individual. These products screen oral fluid, exhaled breath, or sweat for the presence of drugs.

Figure 6: On- and near-market products for roadside chemical screening test oral fluid, sweat, and breath. Currently oral fluid screening products make up a majority of on-market products; at the time of publication, no breath-based products have entered the market.

Chemical Screening Products

On Market	Oral	Breath	Sweat	Product Description	Product Description	Comments
●	●			 SoToxa™ Mobile Test System	These products use a colorimetric assay to screen for one or many drugs or drug metabolites. Available drug panels for each product are detailed in Table 4.	Established base of about 2,500 handheld analyzer devices, with key customer segments in the UK, Spain, and Germany for corrections and roadside applications. Its largest law enforcement base has 800 devices servicing its highways.
●	●			 Alcolizer DrugLizer		Currently has over 250 units in service with law enforcement agencies across the globe; piloting with U.S. law enforcement.
●	●			 DrugSIP Mobility Analyzer and ABMC OralStat 2G		Test kit and analyzers sold on the market, with option to use cassette on its own.
●	●			 DrugTest 5000		Dräger has sold multiple thousands of these analyzers and multiple millions of test kits, with a majority of these used for law enforcement applications.
●	●			 Aquilascan II		The device is currently undergoing field evaluations and laboratory testing prior to its full-scale market release.
●	●			 DrugWipe with optional reader (WipeAlyser)		Approximately 2 million DrugWipe tests per year are sold to law enforcement agencies.
		●		 315 Breathalyzer	Electrochemical immunoassay-based breathalyzer for detection of Δ-9-THC	Currently under development
		●		Cannabix THC Breath Analyzer	Detection of Δ-9-THC using field asymmetric waveform ion mobility spectrometry (FAIMS)	Still in development but receiving interest from law enforcement for piloting opportunities
		●		The Hound Marijuana Breathalyzer	THC and alcohol breathalyzer that uses a chemical sensor	Piloting with law enforcement, have performed two clinical trials in partnership with UCSF.
●			●	Intelligent Fingerprinting Drug Screening System	Screens for drugs and metabolites—including opiates, methamphetamine, cocaine, cannabis, benzodiazepines, and buprenorphine—in sweat from fingerprints	Device is being piloted and is on market in places such as Brazil, South Korea, UK, and Poland.
●			●	ACS ALCOHOL COUNTERMEASURE SYSTEMS DrugWipe®A	Detects presence of cannabis, amphetamines, methamphetamines, cocaine, and opiates in saliva, sweat, and surfaces	Approximately 2 million DrugWipe tests per year are sold to law enforcement agencies.

Each type of chemical screening product varies in what it tests:

- **Oral Fluid:** When an individual ingests a drug, that drug and/or its metabolites enter the bloodstream and ultimately are diffused into oral fluid.[21] Depending on how the drug is ingested, those substances also may be present in an individual's mouth. Most of the on-market chemical screening tests are products that determine the presence of drugs in oral fluid; these tests are usually based on lateral flow immunoassay technology. Oral fluid screening products used on the roadside typically rely on single-use, disposable test cassettes. These cassettes can either be interpreted manually—by an end user based on the color change—or "read" by a sensor, such as an optical density sensor, to provide a yes/no test result. These sensors may reduce the impact of human error in interpreting test results compared to interpreting results with the naked eye, and test results can be easily recorded by the instrument. This report specifically highlights oral fluid screening products that an associated portable reader can interpret.

- **Exhaled Breath:** Researchers are working to develop drug detection devices that operate similarly to presumptive breath alcohol devices, which measure the amount of alcohol in an individual's exhaled breath. Licit or Illicit drugs or metabolites may be present in an individual's exhaled breath. Drugs that an individual ingests may diffuse from the bloodstream into the respiratory tract lining fluid and into the lungs.[22] Oral fluid screening products are largely based on similar underlying technologies; however, several approaches to detect nonvolatile organic compounds are being employed to detect drugs in exhaled breath. Although oral fluid screening products are largely based on similar underlying technologies, several approaches are being employed to detect nonvolatile organic drug-related compounds in exhaled breath. These breath-based products use, for example, electrochemical immunoassays, optical fluorescence spectroscopy, and ion mobility spectrometry. At time of publish, most startup companies in this space are looking specifically at detection of Δ-9-THC, the presumed active ingredient in marijuana, in smoked and edible forms; however, no products have been launched as of report publication.

- **Sweat:** Ingested drugs and their metabolites that have entered the bloodstream are eventually passively diffused into sweat.[23] On-market products that can detect the presence of drugs through sweat utilize lateral flow immunoassay technology to detect small quantities of these drugs and metabolites in sweat samples taken from hands or the forehead. The hands as well as the forehead contain a large number of sweat and sebaceous glands. In fact, two currently available screening tests utilize sweat captured in fingerprints to identify the presence of drugs. However, this method is susceptible to contamination through recent handling, and affected by behaviors such as a person's handwashing hygiene habits.[24]

21. Cone, E.J., Huestis, M.A. Interpretation of oral fluid tests for drugs of abuse. Ann N Y Acad Sci. 2017 1098: 51-103. Accessed from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2700061/
22. Trefz, P., Kamysek, S., Sukul, P., Schubert, J.K., Miekisch, W. Drug detection in breath: non-invasive assessment of illicit or pharmaceutical drugs. J Breath Res. 2017, 11(2):024001. Accessed from https://www.ncbi.nlm.nih.gov/pubmed/28220762
23. De Giovanni, N., Fucci, N. The current status of sweat testing for drugs of abuse: a review. Curr Med Chem. 2013, 20(4)545-61. Accessed from https://www.ncbi.nlm.nih.gov/pubmed/23244520
24. Compton, R. (2017, July). Marijuana-Impaired Driving - A Report to Congress. (DOT HS 812 440). Washington, DC: National Highway Traffic Safety Administration. Retrieved from https://rosap.ntl.bts.gov/view/dot/34995

Chemical Screening Product User Profile:

The RCMP are legally allowed to use oral fluid–based devices as a screening method for DUID investigations.

D'Arcy Smith is the Special Advisor for the RCMP's National Traffic Services and a member of the Canadian Society of Forensic Science Drugs and Driving Committee.

In July 2008, legislative changes to the Criminal Code led to the development of a nationwide drug recognition program in Canada; these changes permit a bodily fluid sample (which could include blood, urine, or oral fluid) to be captured if law enforcement meets a legal standard.

The RCMP began to evaluate the viability of a roadside oral fluid testing program for DUID investigations 7–8 years ago. Canada has established per se levels of prohibited concentration of THC within 2 hours of driving: 2 nanograms/milliliter (ng/mL) of blood for a fine, and 5 ng/mL for an indictable offense. As part of the Canadian Society of Forensic Science Drugs and Driving Committee, Mr. Smith evaluated oral fluid screening devices to determine their feasibility for use in roadside DUID stops. Mr. Smith and his colleagues evaluated three of the most popular models at the time—the Dräger DrugTest 5000, the Abbott SoToxa (formerly Alere DDS2), and the Alcohol Countermeasures System/SecureTec DrugWipe 6S. The group conducted blind testing using paired samples to assess how well the devices detected specific drugs in field conditions. The study's test results indicated high sensitivity and specificity for THC, cocaine, methamphetamine, and opioids, with a lower sensitivity for benzodiazepines and amphetamines.[25]

In Canada, two devices are currently approved for THC detection on the roadside—Abbot SoToxa and Dräger's DrugTest 5000; the Dräger product is also approved for use in cocaine detection. These are portable or handheld devices with a reader to prevent introduction of bias through human interpretation and reduce human error by producing a printable test result. Based on results of the evaluation studies, these devices are approved for detection of THC and cocaine only. Although these devices offer other drug tests, the sensitivity and specificity of those drug tests were not robust enough for the Drugs and Driving Committee to recommend use in field-testing settings; for example, issues with the methamphetamine test's cross-reactivity with MDMA (i.e., ecstasy) have so far prevented approval for methamphetamine.

The Canadian Society of Forensic Science Drugs and Driving Committee released a *Drug Screening Equipment—Oral Fluid Standards and Evaluation Procedures* document, which provides legal requirements for instrument setup.[26] A device must be tested against these standards and must receive the committee's recommendation for approval upon successful completion of the tests. A device is then placed on an approved drug screening equipment list, and law enforcement can choose what to purchase from this list.[27] For example, the document sets the cutoff concentration for THC in oral fluid screening devices as 25 ng/mL, much higher than the 2 ng/mL and 5 ng/mL per se limits set for blood. This cutoff concentration was set intentionally; currently, no direct correlations have been found

25. Douglas J. Beirness & D'Arcy R. Smith (2017) An assessment of oral fluid drug screening devices, Canadian Society of Forensic Science Journal, 50:2, 55-63, DOI: 10.1080/00085030.2017.1258212

26. Drug Screening Equipment—Oral Fluid Standards and Evaluation Procedures. Canadian Society of Forensic Science Drugs and Driving Committee (2017). Accessed from https://www.csfs.ca/wp-content/uploads/2017/11/Approval-Standards-for-Drug-Screening-Equipment.pdf

27. Approved Drug Screening Equipment Order (SOR/2018-179). Justice Laws Website. Government of Canada. Accessed from https://laws-lois.justice.gc.ca/eng/regulations/SOR-2018-179/

between blood and oral fluid results, but a positive test for a screening with a high cutoff concentration would likely register a positive blood test result. This measure promotes agreement between the screening and confirmatory tests.

Through his evaluation studies, Mr. Smith noted that both approved oral fluid screening devices have some flexibility in their design, which can improve the integrity of the screening test results and help support their use during an eventual court case. For example, temperature limitations are a reality for oral fluid screening devices in Canada and can be brought up by the defense. Many devices have automatic shutdowns at extreme temperatures to (1) prevent damage to the instrument and (2) avoid insufficient readings. Additionally, these devices can be programmed for regular quality control checks, similar to those of breath alcohol instruments, and they can automatically shut off if the device has not been used for 2 weeks. Designing the quality control programming, such as the program used in portable breath test devices, can make it easier for courts to understand and accept this method of field testing. Mr. Smith noted that because the RCMP can use a national procurement strategy to purchase these devices at a higher volume than that of discrete agencies, the RCMP is able to help dictate parameters that better align to the organization's needs.

RESEARCH LANDSCAPE

Future Products

With the growing challenges of addressing and preventing DUID, technologies to enable DUID screening have become active areas of research. Research that the NIJ and other organizations support could lay the foundation for future products that address DUID challenges. The following section provides a snapshot of illustrative research efforts that are aimed at achieving a better understanding of how to identify an intoxicated individual and correlate this with drug use.

Research focused on physical and cognitive impairment screening

Current methods of physical and cognitive testing focus on capturing and/or assessing indicators of impairment, such as HGN and responses to ocular or cognitive tests. Researchers are currently investigating physiological responses of impaired individuals; research highlights include the following:

- Researchers from Ben-Gurion University in Israel conducted a study that detects intoxication from subtle changes in movement obtained by wearable device sensors. In the study, researchers used Google Glass and the LG G-watch, Microsoft Band, and Samsung Galaxy S4 to collect data from 30 different subjects. The study successfully detected intoxication by using motion differences through validation of results from portable alcohol breath testers used by law enforcement, and the findings show the potential of using phones or wearable devices for investigating impairment.
- Researchers from Massachusetts General Hospital and Harvard are studying to see if a sensor-studded cap can indicate impairment in the brain. The device uses functional infrared spectroscopy to detect changes in blood flow in the skull and underlying tissues (an indication of communication between different parts of the brain).
- Interest in using cameras to measure physiological signals from the human face and body has grown rapidly in the last decade. A remote camera can measure various human vital signs (e.g., heart rate, respiration rate, blood oxygenation saturation, pulse transit time) without skin contact. To monitor these human behaviors, researchers are analyzing human activities through technologies related to high-level visual semantics and human physiological and skin optics.

Research focused on chemical screening

Researchers are working to improve existing products that screen for chemicals in an individual's oral fluid, sweat, and breath; additionally, researchers are investigating possible links between impairment and drug levels in an individual's system. The NIJ supports a portfolio of grants that seek to achieve these goals. The following list summarizes research being performed under some of these grants:

- Researchers at RTI International are making correlations between behavioral/performance evaluations and blood, urine, and oral fluid concentrations of cannabinoids to better understand the link between impairment and

cannabis levels in users' systems. The study also aims to uncover markers of cannabis use that are related to impairment. The project is titled "Differences in Cannabis Impairment and Its Measurement Due to Route of Administration," with grant number 2016-DN-BX-0193.

- Researchers at Florida International University investigated the use of gold nanoparticles in portable oral fluid–based screening devices that detect trace amounts of drugs. This is intended to improve upon the performance of existing immunoassay tests. The project is titled "Aptamer-Based, Exonuclease-Amplified, Paper Device for Point of Collection Screening of Cocaine and Methamphetamine in Oral Fluid," with grant number 2013-DN-BX-K032.
- Researchers at Florida International University have developed aptamer-based sensors to detect classes of synthetic cannabinoids in biological samples; these classes exhibit significant diversity in structure and are difficult to detect via identification of functional groups. The project is titled "Electrochemical and Colorimetric Aptamer-Based Sensors for Rapid On-site Screening of Synthetic Cannabinoids in Seized Substances and Biological Samples," with grant number 2015-R2-CX-0034.
- Researchers at Sam Houston State University are analyzing oral fluid specimens in field collection studies to determine the prevalence of novel psychoactive substances, such as synthetic opioids, and identify important emerging drug trends. The project is titled "Prevalence of Novel Psychoactive Substances in Oral Fluid," with grant number 2017-R2-CX-0019.

In addition to NIJ-supported research, other noteworthy chemical screening research includes the following:

- Researchers from the University of Pittsburgh are currently prototyping a device to measure levels of THC in breath using semiconductor carbon nanotube resistors. The laboratory has developed their prototype using a 3D printer and is currently in the process of testing the prototype.
- Researchers from Washington State University's Department of Chemistry are investigating the use of ion mobility spectrometry for breath-based testing for THC on the roadside.

Criminal Justice Testing and Evaluation Consortium

ADOPTION GUIDANCE

Ask the following key questions when evaluating DUID screening products for procurement.

Agencies must consider various factors when determining if, when, and how to adopt field-portable DUID screening products. This section provides an overview of key considerations; subsequent sections will speak to more detailed considerations for each specific product type.

- **How does your agency want to benefit from the screening product?** Not all DUID screening products are similar in terms of how they work or where they might provide value for agencies. Some products could be used alongside existing SFSTs; some may add new screening procedures at roadside; others could be used in training exercises to help demonstrate signs of impairment. The outputs from the product may be admissible for use in court. Agencies should keep in mind that many available DUID screening products offer substantially different potential benefits, and that directly comparing some products may not make sense.
- **Will the product operate in the conditions of the agency's environment?** Consider how easy the product is to carry and operate in an uncontrolled roadside environment, as well as the likelihood and associated costs of the product breaking at roadside. Warranties and repair services offered by product providers may help mitigate these risks.
- **What operator skills are required?** Some screening products require a skilled operator, such as an officer with ARIDE or DRE training, to operate the product effectively. Other products may capture evidence passively (for later review by experts and the court) or provide live suggestions about steps the officer should take based on data-driven determinations, thereby reducing the need for specialized or prior training to conduct the DUID investigation.
- **How easily does the product integrate with law enforcement workflows?** The duration of the test, steps required of the user, and the extent to which cooperation is required from the individual being tested can all contribute to how difficult the new product may be to introduce for roadside testing. Duration of the test is a particular concern raised by experts interviewed for this report. In tests that last longer than a few minutes, the officer must detain the subject for the duration of the test, no matter how long the test takes. Products that provide rapid test feedback and limit discomfort of the test subject (for example, chemical screening products that collect a small amount of oral fluid) help the officer keep control of the situation on the roadside.

Law Enforcement INSIGHT

Officers already have a lot to do at the roadside. You need to be careful about giving them another task. Some officers are already hesitant to use breath test devices, so another tester on top of that could be a challenge. Less cumbersome device designs can help.

Lieutenant Christian Newlin
Utah Highway Patrol

- **How will my agency fund procurement?** Impairment and chemical screening products may vary widely on price, as shown in **Tables 1, 2,** and **4**. Experts consulted for this report mentioned NHTSA, the Governors Highway Safety Association, the Bureau of Justice Assistance, and private foundations as potential partners to help defray product costs. Depending on the agency's size and budget constraints, purchasing a limited number of units for shared use at a centralized location may be appropriate. Agencies should also work with their Department of General Services to make sure that these products can be supported under state contracts.

- **How does use of this product align with legal considerations?** Agencies looking to use field-portable DUID screening products must ensure that their state laws and regulations permit the use of these products (as well as the outputs of these tests) during a DUID investigation. The Legal Considerations for Use section provides an overview for impairment products; similar considerations for chemical products are also provided later in that section.

- **What value (or unintended consequences) does this product bring to the prosecution of DUID cases?** Depending on their specifications and use, many new DUID products may not have an established precedence for use as evidence in your jurisdiction. If the product generates evidence, consider the likelihood of its admissibility in court, as well as any negative consequences for a DUID case that may result from this evidence being inadmissible. One expert interviewed for this report pointed out that products that enhance documentation of SFST and DRE procedures may also provide the jury with new data, either via video or other recorded data, about how the SFST was performed. The defense may scrutinize these data in court.

- **What training is necessary for consistent and accurate use of the product?** Training helps to ensure quality test results and helps officers confidently and accurately speak in court about the product's use. Some products may require relatively extensive initial training and periodic retraining, whereas others will be closer to plug-and-play products. Agencies should consider if they have the resources to invest in up-front and refresher training associated with adopting the products. Products with operation and quality control workflows, similar to those of PBTs for alcohol, may also be easier for test subjects to understand and for law enforcement to implement successfully. Some products and their providers may offer features or services to reduce the burden of training costs.

Law Enforcement INSIGHT

If we used DAX (a video recorder for use in horizontal gaze nystagmus testing) at the roadside, it could be like when we use PBTs. If the court suppresses DAX usage, it cannot come in (as evidence) during the trial and part of the dash-cam video may be redacted, which could hinder roadside usage of any new technology.

Detective Mike Jennings
APD

Procurement Considerations Specific to Physical and Cognitive Impairment Screening Products

DUID screening products can help officers detect and document impairment during a DUID investigation. Prior to product procurement, consider the following points—in combination with those listed previously—in the context of your agency:

- **Understand the limitations of HGN-based test methods:** Several DUID screening products focus on HGN, either standardizing an officer's delivery of HGN examinations or generating evidence during the exams. Although these products can be useful to law enforcement, they cannot detect the presence of all intoxicants. Of the seven major drug categories, HGN is associated with only three: central nervous system depressants, dissociative anesthetics, and inhalants. Individuals demonstrating HGN may do so due to pre-existing conditions, not due to impairment. Therefore, drug category limitations should be considered during procurement. Agencies should recognize that new HGN-related products enhance existing impairment evaluation methods, but these products do not replace such evaluation methods.

- **Consider how the product's performance compares to current SFST methods:** Experts interviewed for this report consider SFST procedures and DRE examinations to be the most effective current methods for evidentiary observations of impairment indicators. Before adopting products that make predictions about an individual's impairment, the accuracy of these products must be compared to these methods. Even affordable products might not be adopted if they do not provide a reliable and validated assessment of impairment. Due to this challenge, many of these DUID experts believe that products that make recommendations related to an individual's impairment would be difficult to adopt. However, the same experts think products that enhance or capture evidence from human examination methodologies could be useful.

Some hardware and software products that use data to attempt to predict impairment are already on the market, and other products may enter the market in the future. It is important to note that **market entry does not necessarily indicate that a product's claims have been validated or that other law enforcement agencies are using the product**. Before purchasing any screening product, agencies should consider (1) consulting approved product lists, if applicable, for state or local jurisdictions (for example, Canada has an approved products list); (2) requesting information about the vendor's validation studies; and (3) piloting the product prior to launch.

Law Enforcement INSIGHT

I think a new (impairment) technology would always be a supportive technology. It could hedge against human error, but probably not replace human examinations. For example, there are automatic blood pressure cuffs available now, but we don't use them. Not because they're cost prohibitive, but because there is more precision when taking the reading by hand.

Retired Lieutenant, Tom Woodward
Maryland DRE Coordinator

- **Recognize the potential benefits and drawbacks of products that capture evidence during the investigation:** Products that record evidence may add value beyond their primary benefit. For example, although the DAX™ Evidence Recorder is primarily designed to capture HGN through close-up cameras during an officer's examination, the product could also record an individual's speech, movements, and other evidence—such as debris in an individual's mouth or nose. Conversely, a challenge with evidence-documenting products is that the increasing volume and quality of evidence may add complexity in the courtroom. For example, video and audio of an officer performing the SFST and other steps during the investigation may receive heightened scrutiny from the defense. Additionally, once law enforcement establishes that they can generate certain pieces of evidence, the court may come to expect that law enforcement provide such evidence in each case. This expectation may add complexity for law enforcement in the field because the defense and juries may be skeptical of cases in which the prosecutor cannot provide such evidence.
- **Consider the versatility of impairment investigation products for training opportunities:** DRE experts interviewed for this report believe that products such as lighted pens and video recorders could be challenging to implement in the field; however, these experts think the products do add value in training other officers on SFST, ARIDE, and DRE protocols.
- **Understand that baseline data are needed to improve predictive products:** Some products are designed to identify signs of potential impairment by comparing an individual's readings to a set of baseline data. For these products, agencies must understand what available baseline data are provided by the vendor, and their robustness (e.g., number of sample data points). Because of the relatively low development status of predictive products, limited information is available about the burden or issues related to baseline data.

Law Enforcement **INSIGHT**

As we only have one DAX™ camera, we could potentially run into an issue on any DWI case in which the DAX™ camera was not used. Once it's been established that we have a technology we're using on the roadside, and that technology is not used in that case, the argument then becomes that we didn't use the technology because the officer was being untruthful as opposed to its limited availability.

Detective Mike Jennings
APD

Procurement Considerations Specific to Chemical Screening Products

When choosing among oral fluid-based, breath-based, and sweat-based chemical screening products, consider the following points related to technical, operating, and legal factors—in combination with those listed previously—in the context of your agency:

Technical Considerations

- **Number of available suppliers and pilot study evidence vary by product type:** Currently, oral fluid screening products make up the largest portion of the market for field-portable chemical screening products; oral fluid screening products have also been the subject of the most chemical screening pilot programs undertaken by agencies. A few sweat-based products are now on the market, and breath-based tests are the least mature product category. As of this report's publishing, most developers of breath-based products are still working to make their products technologically feasible on the roadside. As a result, few agencies have been able to pilot breath-based products for roadside use. This may change moving forward, but the number of available suppliers and evidence for certain product types should be considered prior to product adoption.

Figure 7: On- and near-market chemical screening products test for the presence of different drug classes. For the chemical screening products featured in the Product Details section of this report, oral fluid products screen for the largest variety of drug classes, though each product may not screen for all types of drug classes.

		DRUG CLASS								
	Product	Opiates	Benzodiazepine	Cannabis	Cocaine	Amphetamine	Methamphetamine	Ketamine	Methadone	Other
Oral Fluid	Abbott/Intoximeters SoToxa	●	●	●	●	●	●			
	Omega Laboratories Alcolizer Druglizer	●	○	●	●	●	●			
	American Bio Medica DrugSIP Mobility Analyzer	●	●	●	●	●	●			○
	Dräger DrugTest 5000	●	○	●	●	●	○	○	○	
	PAS Systems International Aquilascan II	●	●	●	●	●	●			
	Alcohol Countermeasure Systems/Securetec Drugwipe	○	○	○	○	○	○	○	○	○
Breath	SannTek 315 Breathalyzer			●						
	Hound Labs, The Hound Marijuana Breathalyzer			●						
	Cannabix Technologies THC Breathalyzer			●						
Sweat	Intelligent Fingerprint Systems	●	●	●	●	●	●			
	Alcohol Countermeasure Systems/Securetec DrugWipe A	●		●						

● All available panels
○ Selected panels

- **Consider which drug classes your agency is looking to screen:** To date, oral fluid–based products—which are largely immunoassay based—can detect the broadest range of drug classes, whereas breath-based products under development have focused on THC detection applications. **Figure 7** summarizes drug classes that are detected by the near- and on-market chemical screening products identified in this report. Most reader-based screening products offer "panels" so that an officer can test for multiple drugs. This feature could be useful to agencies that operate in jurisdictions where a DUID charge may be filed when one or more established drugs are detected at any level (e.g., jurisdictions that have zero-tolerance laws for Schedule I drugs). These agencies may consider purchasing products with a wider variety of drug tests available so that the agencies can easily adapt to possible changes in DUID laws. Agencies should note that these products are intended to provide a presumptive positive or negative result for at least one drug class at a designated cutoff level. These products typically do not provide a result for a specific type of drug within the drug class; for example, the type of opioid the individual may have ingested. Additionally, drug class lists are not exhaustive. Individuals who appear impaired could have a negative test result because they are impaired by drugs not included in the testing panel. New drugs, such as novel psychoactive substances, often do not have an available chemical screening test yet.

- **Consider a product's cutoff concentrations for drug screening:** During screening product implementation, the cutoff concentration is important to consider. (When this level is exceeded, the product returns a result indicating the presence of a drug above a fixed limit.) If an agency's jurisdiction has a per se rule for a drug, the agency may use a product's cutoff concentration to determine when a confirmatory test should be performed on an individual. If a screening product's cutoff concentration is set to a low value, screens that show up as positive may not always correlate with positive confirmatory testing against per se limits (in blood or oral fluid). Conversely, if a screening product's cutoff concentration is set to a high value, the screens may show up as negative—even though other observations may suggest the individual is impaired by drugs. In this scenario, there may be a higher chance of positive screening test results correlating with positive confirmatory test results. For oral fluid screening products in particular, cutoff concentrations for drug classes vary widely among vendors (and even among test panels from the same vendor). **Table 4** lists these cutoff concentrations.

CJTEC **INSIGHT**

Existing Validation Efforts Related to Oral Fluid Screening Products

Many agencies are evaluating oral fluid devices to determine if these products can detect accurate levels of drugs in field settings. Following are some of these agencies:

Alabama Department of Forensic Sciences evaluated the Dräger DrugTest 5000, Abbott SoToxa (formerly Alere DDS2), and Randox MultiSTAT oral fluid–based drug testing products for potential use in its statewide oral fluid testing program.

The Michigan State Police are currently piloting multiple products for an oral fluid roadside analysis program.

The RCMP has released studies that compare the roadside oral fluid screening product results to confirmatory results using paired samples.

- **Use validation studies to review product performance:** Keep in mind that each test for each drug class may vary in sensitivity and specificity, even different drug classes within the same panel offered by a vendor. For example, the RCMP uses oral fluid screening products to detect THC and cocaine, but RCMP does not currently use these products to detect methamphetamine due to the low sensitivity and specificity of these tests. Multiple independent agencies have already conducted evaluation studies for oral fluid screening products; therefore, refer to these third-party evaluation studies to better understand products' drug detection capabilities at a more detailed level than what the manufacturers provide.

- **Understand pre-testing procedures required for proper testing:** Some products require that subjects do not eat, drink, or smoke for a certain period of time before taking the chemical screening test. This requirement may add time to the test, but the requirement helps to maintain the quality of test results. Although oral fluid and some breath-based products require a pre-test period of continuous observation, this is not necessary for sweat-based tests.

Operation and Usability Considerations

To ensure successful product implementation in roadside testing environments, products must be simple and easy for officers to use. Interviews with end users and industry experts revealed the following considerations for choosing a chemical screening product to support DUID investigation and prosecution:

- **Consider ease of sample collection:** Chemical screening products require a sample from the individual. Experts indicated that the type of matrix tested (e.g., oral fluid, sweat, breath, or blood) can impact the individual's willingness to participate in the test. Likewise, the collection method can impact the time required to capture a sample. Breath-based products, though still in development, may serve as the easiest method of collection because the subject may be more likely to consent to this type of test. Because the public has been accustomed to in-field breath tests for alcohol, the concept is well-established and easy to follow. Oral fluid, on the other hand, may be less familiar and will require depositing the fluid into a collection device. Oral fluid can be a difficult substance to collect, even from a cooperating individual. Collection devices have an absorbent pad that is placed in an individual's mouth; these devices require different minimum volumes of oral fluid for proper testing procedures. Individuals who have ingested marijuana or other drugs often experience a side effect of dry mouth, which limits their ability to provide a sufficient sample for testing. Hydration levels and the subject's health history could affect sample collection as well. Depending on the product type, sweat-based tests can range in their ease of sample collection. These sample collections may require the law enforcement officer to make physical contact with the subject.

- **Consider how average test time may impact investigations:** Shorter test durations can help officers keep control of roadside stops. Oral fluid–based products provide the most rapid field tests currently available, and test results are returned in 1.5–12 minutes. However, if an individual has consumed food or drink at the time of the stop, then the officer must wait at least 10 minutes to test—thereby lengthening the time of the stop. Due to very low drug and metabolite concentrations in breath samples and current technology limitations, breath-based tests take the longest time to run. However, this test duration is expected to improve dramatically as the technology matures.

Legal Considerations for Use

Variations in state laws and regulations may dictate the following:

- If and when certain products can be used in roadside DUID investigations, as well as what protocols law enforcement must follow if the subject refuses testing.
- The legal consequences of chemical test results that indicate the presence of certain drugs above a specific threshold.
- How product-generated results can inform officer decision making.
- Whether separate DUID charges can be brought for non-alcohol-related drug impairment.
- How product-generated evidence can be used in court to support the prosecution of a DUID case.

State laws and regulations may need to be amended to authorize testing bodily fluids with field-portable products specifically and to allow test results as evidence that can be admitted in a DUID case. Widespread and routine adoption of chemical screening products in DUID cases has been limited by (1) the current state of science related to intoxication with specific drugs, (2) a lack of DUID-specific training among some prosecutors, and (3) a lack of clearly established precedent to support the credibility and meaning of these chemical tests in DUID cases. **No current studies directly correlate drug concentration in bodily fluids with impairment (for substances other than alcohol), which may complicate how prosecutors utilize chemical test results in DUID cases.**

Considerations for implementing chemical screening products in the context of relevant laws and regulations include the following:

- **Engage vendors to understand possibilities for customizing products:** The extent to which the product can be customized (and at what cost) can determine how efficiently agencies can deploy the product. The product's ability to easily fit into evidence management procedures (e.g., contents and format of records created), calibration requirements, and states' zero-tolerance laws or per se limits specific to agencies or jurisdictions may impact the product's ability to be customized. This customizability can also significantly improve the product's usability for officers. For example, some manufacturers can customize a product's quality control checks to fit the agency's needs. These quality control checks include automatic shut-offs when the product (1) is being operated in a cold environment or (2) has not been calibrated within a certain time frame. Agencies may institute quality control checks that are analogous to those for PBTs that states use for breath alcohol. Agencies should consider working with the vendor and court system stakeholders to customize products so that they align with their respective laws and regulations.

- **Understand the confirmatory testing capabilities accessible to your agency:** An agency may pursue confirmatory testing based on the results of a chemical screen. When considering procurement, agencies should teview what types of confirmatory tests are being performed by their crime laboratory. Blood is the most common confirmatory test matrix, but there are validated and accepted analytical techniques for oral fluid confirmatory tests in a lab setting.[28] However, at the time of publication, the capability to perform oral fluid confirmatory testing is not common in most forensic laboratories. As such, oral fluid confirmatory tests may not be accessible to many agencies. Note that even if oral fluid confirmatory testing is available, it will likely require capturing an additional bodily fluid sample because field-portable products do not typically allow confirmatory testing of the originally screened specimen. Agencies should bring laboratories into these discussions to understand how screening and confirmatory testing workflows may integrate with each other.

- **Identify the value of a product's sample retention capabilities in your jurisdiction:** Roadside screening can be beneficial because it allows an officer to capture a timely bodily fluid sample that is most representative of the individual's bodily fluid during driving. However, the high cost of chemical screening products can impact how and if products are disseminated into the field, thus making it hard or impossible for each officer to have a screening product in their car. Agencies facing challenges procuring a sufficient number of chemical screening products have some potential alternatives. For example, DREs or other law enforcement personnel may use the chemical screening product after an arrest in a centralized location, such as the station. The screening product may analyze a bodily fluid sample (1) taken at the station or (2) captured by the arresting officer at roadside, if the product design allows for that. (Refer to the callout box for an example of a transportable oral fluid screening cassette.) Agencies must take additional precautions to maintain chain of custody and prevent mishandling when officers collect bodily fluid at the roadside to test later.

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Products that use cassettes to capture and test oral fluid may be able to safely store samples for testing at a centralized facility. For example, cassettes for the Dräger 5000—one of six products detailed in Table 4—can be stored at room temperature for up to 4 hours before testing. This and other product features may have different values to different agencies, depending on the procedures for managing oral fluid samples.

28. Society of Forensic Toxicologists (2018). Oral Fluid Sub-Committee DUID SOFT-AAFS Frequently Asked Questions, available at http://soft-tox.org/files/2018%20OF_FAQ_FINAL.pdf

Criminal Justice Testing and Evaluation Consortium

PRODUCT DETAILS

Note that the following tables and company profiles do not represent a complete list of near- and on-market impairment and chemical screening products or companies producing such products; the inclusion of a product or company in this report does not represent NIJ's or CJTEC's recommendation, endorsement, or validation of product claims.

Physical and Cognitive Impairment Screening Products

Table 1: Physical and cognitive impairment screening products that include primarily hardware components based on detailed product information provided to CJTEC as a response to an RFI in the Federal Register.

	Vendor	Battelle Roadside Impairment Sensor	Ocular Data Systems DAX Evidence Recorder	IMMAD
General	Company/ Vendor Logo	BATTELLE	OCULAR	IMMAD
	Product Photo			
	Product	Battelle Roadside Impairment Sensor	DAX Evidence Recorder	Impairment Measurement Marijuana and Driving (IMMAD)
	Description	Virtual reality device measures symptoms associated with drug classes using eye tracking technology.	DAX is an evidentiary recording device for roadside alcohol and drug impairment investigations, with a full spectrum night vision lens, 2 switchable white LEDs, and 4 IR LEDs	IMMAD uses virtual reality goggles with eye tracking and a Bluetooth response button. It projects a standardized test of the 40° central/mid-peripheral vision (view through driver's side windshield) into "optical infinity." Driver presses the Bluetooth response whenever they see striped squares.
	Outputs	Report output of automated tests related to eye tracking	Close-range video of SFST eye signs (e.g., HGN, VGN, LOC, pupil size); audio records of officer and suspect; other audio/video recording	IMMAD numerically records percent contrast seen, response time, and relationship to an age-matched normative database; results can be printed or transferred to an electronic storage system
	Market Entry Status	In development	On market	Prototype available and field testing in progress
Costs	Base Unit Cost	TBD	$$$	$
	Software Cost	TBD	N/A	$

Table 1 (continued)

	Vendor	Battelle Roadside Impairment Sensor	Ocular Data Systems DAX Evidence Recorder	IMMAD
Physical Specifications	Dimensions (L x W x H)	13.0″ x 10.5″ x 4.5″ (headset)	10″ x 7″ x 8.9″	8.11″ x 3.86″ x 4.72″
	Weight (lbs.)	1.6 (headset)	2.7	0.75
	Primary Construction Materials	Molded Plastic	Not disclosed	Primarily plastic and electronic-based components
	Temperature Range	TBD; base product sold as commercial device	Not disclosed	IMMAD will reliably operate for short periods in extreme temperatures.
Specifications	Ruggedization	TBD; base product sold as commercial device	Not disclosed	Not reinforced to withstand forceful drops or submersion in water.
	Camera Used?	One infrared camera per eye	Yes	In future models, but not current.
	Battery Life	Laptop battery life—multiple options available Base stations require a 12 VDC power source	Li-Polymer battery 13,000 mAH capacity; 4–6 hours operation on single charge	The battery life is that of a standard phone and a standard Bluetooth response unit.
	Display Unit	Dual OLED 3.5″ diagonal display inside headset. Test operator uses laptop to administer test.	480x272 pixels 4.3″ Color TFT-LCD	2.67″ x 5.86″
Operation	Sensor Used to Read Device	Commercially off-the-shelf virtual reality device with integrated eye tracking	HD camera: 1080p 60 frames per second 1920x1080 pixels 16:9 aspect ratio	IMMAD uses small targets 5 degrees in size with variable spatial frequency, variable contrast, and fixed temporal rate of flip. This is what the driver sees and responds to.
	Warm-up Time of Device	None	Not disclosed	Minimal
	Average Response Time of Test	10 minutes, including eye calibration and full test procedure	Not disclosed	3 minutes per eye; total time is 6 minutes.
	Memory Capability of Instrument	Customizable	45 minutes of recording time on included 16 GB card; accepts up to 64 GB card (speed class 10 or better required).	Extensive within the technology but developer expects to utilize existing storage municipality may already use.
	Digital Data Transfer Capabilities	Test records and data via Ethernet, USB, or wireless connection.	Removable SD card	Test records and other data can be transferred to cloud storage, printed in paper form, or transferred electronically to a device.
Resources/Add-ons	Standard Accessories Offered	Headset, base stations, replacement face cushions, cleaning cloth, laptop, power supply	Hard case, line/AC charger and car charger	When commercially sold, it will come with a case that enables ease of use and storage, and with back up batteries.
	Training offered	TBD	Web-conference training free with purchase	TBD
	Technical Support Offered	TBD	Yes	TBD
	Maintenance required	Periodic headset lens cleaning, face cushion replacement	None required	TBD

Table 1 (continued)

	Vendor	Battelle Roadside Impairment Sensor	Ocular Data Systems DAX Evidence Recorder	IMMAD
Resources/Add-ons (Continued)	Warranties offered	TBD	1 year parts, labor, and shipping	TBD
	Frequency of software updates	TBD	None required	TBD
	Last known software release date	The software has not been released for field use.	N/A	TBD
	Steps needed to update software	Download and run the software installer on the laptop.	N/A	TBD
	Operating system required for use	Windows® 7, Windows® 8.1 or later, Windows® 10	N/A	TBD
	Other system requirements for use	Processor: Intel® Core™ i5-4590 or AMD FX™ 8350, equivalent or better. Graphics: NVIDIA® GeForce® GTX 970 or AMD Radeon™ R9 290 equivalent or better. Memory: 4 GB RAM or more Video out: DisplayPort 1.2 or newer USB ports: 1x USB 3.0 or newer port	Computer for MPEG4 video playback	TBD
	Use of web servers or cloud storage by software	None at present	MPEG4 video can be uploaded from computer	TBD
	Licenses required to use software	TBD	None required	TBD

Base Unit Cost	
Unit Cost	Cost Scale (U.S. Dollars)
$	0–1,000
$$	1,001–2,500
$$$	2,501–5,000
$$$$	5,001 +

Software Licensing Cost	
License Cost	Cost Scale (U.S. Dollars)
$	0–250
$$	251–500
$$$	501–750
$$$$	751 +

Table 2: Physical and cognitive impairment screening products that include primarily software components based on detailed product information provided to CJTEC as a response to an RFI in the Federal Register.

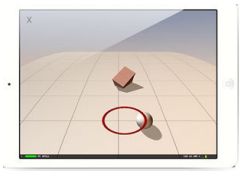
	Vendor	DriveABLE Assessment Centres, Inc. Pocket Standard Field Sobriety Test	DriveABLE Assessment Centres, Inc. Real Time Cognitive Evaluation	DRUIDapp, Inc.
General	Company/ Vendor Logo	DRIVEABLE	DRIVEABLE	DRUID
	Product Photo			
	Product	Pocket Standard Field Sobriety Test	Real Time Cognitive Evaluation	DRUIDapp
	Description	The Pocket Standard Field Sobriety Test guides the officer in collecting the impairment evidence through both the SFST and DRE processes.	The evaluation is a tablet-based application that guides user through cognitive tasks and provides a risk rating of impairment.	DRUID is an app that measures cognitive-motor behaviors to establish whether an individual shows evidence of impaired performance.
	Market Entry Status	On market	On market, participating in a development project with a DRE program	On market
	Type of Impairment-related Technology	Documentation, reporting, and analytics	Impairment investigation	Impairment investigation/assessment
	Availability	Mobile application deployed via Apple App Store and Google Play.	Mobile application deployed via Apple App Store and Google Play.	Mobile application deployed via Apple App Store and Google Play.
Costs	Cost Model	Yearly subscription and case management platform	Yearly enterprise subscription	Non-enterprise version: App Store purchase, $0.99 (U.S.); Enterprise version, SaaS model: Monthly, per-seat license fee under $10—includes the app, technical support, and software updates
	Software Cost	$	Enterprise—**$$$$**, but not a per-user license	Non-enterprise version: $0.99 (U.S.); Enterprise version: Under $10 per month per employee. Annual rates for large enterprises are available upon request.
	0–250 Licenses	$$$	$$$	$$
	251–500 Licenses	$$	$$$	$$
	501–750 Licenses	$$	$$	$$
	751+ Licenses	$	$$	$–$$
	Other Associated Costs	Infrastructure used to support our solutions will be provided by DriveABLE by way of a tailored service level agreement (SLA).	Infrastructure used to support our solutions will be provided by DriveABLE by way of a tailored SLA.	Pricing is for app and enterprise software only, (no hardware).

Table 2 (continued)

	Vendor	DriveABLE Assessment Centres, Inc. Pocket Standard Field Sobriety Test	DriveABLE Assessment Centres, Inc. Real Time Cognitive Evaluation	DRUIDapp, Inc.
Operation	Information Captured by Application/Test Basis	The Pocket Standard Field Sobriety Test is a software application that guides the law enforcement officer in collecting impairment evidence through both the SFST and DRE process. The solution is not just a digitized version of the pen and paper forms but leverages software design to allow the officer to capture the data while maintaining a stronger focus on the person being assessed. The software application ensures complete and accurate capture of all necessary information, which in turn is used to auto-populate the SFST and DRE reports—saving time and improving standardization, accuracy, and elimination of mistakes. The captured data can also be used for data analysis/visualization purposes, which helps authorities obtain a comprehensive understanding of impairment in their respective jurisdictions.	A cognitive screen presented through a software application on a mobile tablet. The screen comprises short cognitive tasks that engage the brain in the same way it would be during the activities of driving or operating in safety-sensitive environments and in turn provides a risk rating of impairment. The tool has been built through 8 years of research, 19 years industry experience, and 127,000 driving and cognitive evaluations. The cognitive screen is cause agnostic, meaning it is focused on establishing a person's ability/risk to drive/operate in a safety-sensitive environment rather than on the substance or medical condition that has caused the impairment.	DRUID is an app that measures cognitive-motor behaviors to establish whether an individual shows evidence of impaired performance. The enterprise console can be provisioned with employee names and emails. All information is encrypted and treated as private data.
	Hardware Required for Use	Tablet and phone-based application (supplied by customer)	Tablet (supplied by customer)	iOS or Android mobile devices supplied by the customer, both phones and tablets
	Sensors Used (If Applicable)	None	None	DRUIDapp uses a multitude of sensors on the mobile device when measuring test performance. All devices running Android or iOS manufactured in the last 5 years have sensors of sufficient quality for DRUIDapp.
	Calibration or Baseline Needed	None	Calibrated through normative data and consistently refined algorithm	5-10 minutes of training are normally required to perform a good quality test. Baselines have been set by calibration at nationally recognized institutions and university impairment testing laboratories.
	Average Response Time of Test	Immediate	Immediate	2 minutes per test
Resources/Add-ons	Training Offered	Training courses provided to DRE & SFST instructors (train the trainer).	Training courses provided to DRE & SFST instructors (train the trainer).	Upon request, DRUIDapp can provide training, and training materials, at costs that depend on the number of trainees.
	Technical Support Offered	First round of support is directed to internal law enforcement technical resources, and the second round is escalated to DriveABLE. For organizations with no internal resources, DriveABLE will provide full technical support through identified associates.	First round of support is directed to internal law enforcement technical resources, and the second round is escalated to DriveABLE. For organizations with no internal resources, DriveABLE will provide full technical support through identified associates.	Technical support will respond to emails in 2 business days (included in annual license fee). Terms for higher levels of support provided on request.

Table 2 (continued)

	Vendor	DriveABLE Assessment Centres, Inc. Pocket Standard Field Sobriety Test	DriveABLE Assessment Centres, Inc. Real Time Cognitive Evaluation	DRUIDapp, Inc.
Software	Frequency of Software Updates	Our Agile development cycle is based on iterations that last 2 weeks. The goal being to have new user functionality built, tested and deployed at each iteration. This does not mean there is a new app version available after each iteration, as changes could be back-end, database, or unrelated to the mobile application. At most, software update frequency would be 2 weeks, but is normally a longer cycle.	Our Agile development cycle is based on iterations that last 2 weeks. The goal being to have new user functionality built, tested and deployed at each iteration. This does not mean there is a new app version available after each iteration, as changes could be back-end, database, or unrelated to the mobile application. At most, software update frequency would be 2 weeks, but is normally a longer cycle.	Quarterly updates are expected for cloud-based software.
	Last Known Software Release Date	December 19, 2019	November 7, 2019	New updates are available monthly.
	Steps Needed to Update Software	Mobile application deployments are handled via iOS and Android app updates.	Mobile application deployments are handled via iOS and Android app updates.	None, for cloud-based customers
	Operating System Required for Use	Applications run on iOS and Android.	Applications run on iOS and Android.	Applications run on iOS and Android. Enterprise console is browser based.
	Other System Requirements for Use	Server-side application code is .Net Core and is hosted on an Azure App Service.	Server-side application code is .Net Core and is hosted on an Azure App Service.	Customers deploying large numbers of dedicated mobile devices may find it helpful to use Mobile Device Management (MDM) tools and services available from a number of vendors. DRUIDapp supports these for large-scale private delivery of mobile applications for larger customers (>500 devices).
	Use of Web Servers or Cloud Storage by Software	N/A	N/A	DRUIDapp includes its cloud costs in the license fee for shared tenancy. For customers requiring dedicated systems, a single tenant option will be available for an additional cost per user.

Software Licensing Cost	
License Cost	**Cost Scale (U.S. Dollars)**
$	0–100
$$	101–200
$$$	201–300
$$$$	301+

Table 3: Additional physical and cognitive impairment screening products that CJTEC identified.*

	HARDWARE					SOFTWARE
Vendor	ToxOptix	Enforcement Innovations	Omiga Inc.	Opthalight Digital Solutions	GuardEx	Worcester Polytechnic Institute
Product Name	X3	HGPen	Visulyzer	DUI Scanner	GX-420	AlcoGait and AlcoWear
Description	Penlight for HGN and DRE evaluations with built-in UV lamp and timer	Penlight for HGN with built-in timer	Headset guides subject through ocular tests and captures video and quantitative data of impairment	Performs and captures eye tests to assess impairment	Automates and captures data from HGN and other impairment tests	AlcoGait is a smartphone sensing app that detects a smartphone user's level of impairment from their walking pattern. AlcoWear detects impairment from a smartwatch by extracting and classifying accelerometer and gyroscope features.
Development Status	On market	On market	In beta testing	In testing/ validation	In pilot testing with law enforcement	In development

** CJTEC was unable to obtain full product information for these impairment screening products prior to publication.*

Chemical Screening Products

Table 4: Product details relating to oral fluid–based chemical screening products based on detailed product information provided to CJTEC as a response to an RFI in the Federal Register.

		Vendor	Abbott SoToxa™ *(Distributing as Intoximeters in U.S.)*	Alcolizer DrugLizer *(Distributing as Omega Laboratories in U.S.)*	American Bio Medica Corporation DrugSIP Mobility Analyzer	Dräger DrugTest 5000	PAS Systems International Aquilascan II	SecureTec DrugWipe *(Distributed by Alcohol Countermeasure Systems)*
General		Company/Vendor Logo	Abbott	OMEGA Laboratories	ABMC AMERICAN BIO MEDICA CORPORATION	Dräger	PAS SYSTEMS INTERNATIONAL ALCOHOL SENSOR SYSTEMS	ACS ALCOHOL COUNTERMEASURE SYSTEMS
		Product Photo						
		Product Name	SoToxa™ Mobile Test System	Alcolizer DrugLizer	DrugSIP Mobility Analyzer—to be used with the ABMC OralStat 2G	DrugTest 5000	Aquilascan II	DrugWipe with optional reader (WipeAlyser)
		Market Entry Status	Available	Available	Available	Available	Near Market	Available
Costs		Base Unit Cost	Upon request	$$	$$$ (Pricing will be determined on a case-by-case basis considering the volume and conditions of the sale (i.e., FOB pricing, etc.)	$$$–$$$$	$$$	$$$
		Cartridge Cost (per test kit)	Upon request	**$$$$**	**$**	**$$$**	**$$**	**$$$$**
		Accessory Cost	Upon request	N/A	Included in purchase	N/A	**$$ - $$$$**	All accessories included with base unit kit
		Training Cost	Upon request	$105 for online training, more as-needed training also available	Included in purchase	N/A	TBD	$$
		Other Associated Costs	Upon request	N/A	N/A	N/A	None	$
		Financing Options	Upon request	N/A	Prepaid or net terms	N/A	Not disclosed	N/A
Reader Information	Physical Specifications	Dimensions	8.75″ x 3.5″ x 2.5″	2.6″ x 1.7″ x 7.72″	7.95″ x 6.02″ x 5.63″	7.9″ x 9.8″ x 8.7″	8.2″ x 3.5″ x 2.2″	9.4″ x 4.3″ x 3.1″
		Weight	1.5 lbs.; cased system is 5.2 lbs.	0.68 lb.	4.08 lbs.	9.9 lbs.	0.97 lb.	1.76 lbs.
		Primary Construction Materials	Polycarbonate acrylonitrile butadiene styrene, thermo-plastic elastomers, spun polyester, and molded styrene.	Impact-resistant plastics, metal, and electronic internals	Metal and methacrylate	Metal, plastic, and rubber	The camera, built-in printer, and 2-D barcode scanner are housed in a plastic casing.	Proprietary
		Battery Life	30–40 tests on a full charge at ambient temperature.	10 hours of continuous use	Not specified	12 complete test cycles, with 4-hour charge time	440 tests (with printing); 600 tests (without printing)	8 hours of continuous use

Table 4 (continued)

		Vendor	Abbott SoToxa™ *(Distributing as Intoximeters in U.S.)*	Alcolizer DrugLizer *(Distributing as Omega Laboratories in U.S.)*	American Bio Medica Corporation DrugSIP Mobility Analyzer	Dräger DrugTest 5000	PAS Systems International Aquilascan II	SecureTec DrugWipe *(Distributed by Alcohol Countermeasure Systems)*
Reader Information (Continued)	Physical Specifications (Continued)	Power Supply	3.2Ah 11.1V lithium battery; Analyzer can be charged via Main power—Input: 100–240V AC 50–60Hz 1.1A | Output: 15V DC 3A); Car Charger—Input 10 to 15 V DC | 15 V DC 3A	Rechargeable lithium ion battery	100–240 V AC/ 50–60 Hz. Battery Charger output voltage 9 V DC. Output current of the battery charger 3, 5 A	Integrated on-board battery; supplemental power using 110 VAC plug or 12 VDC vehicle power plug	7.4V/2000 mAh Rechargeable lithium ion battery	Rechargeable lithium ion battery
		Temperature Range	Operational: 41°F to 95°F (5°C to 35°C) Cartridge: 59°F to 77°F (15°C to 25°C)	23°F to 122°F (-5°C to 50°C)	24.8˚F to 104˚F (-4°C to 40°C)	Operational: 41°F to 104°F (5°C to 40°C) Storage: -4°F to 140°F (-20°C to 60°C)	23°F to 122°F (-5°C to 50°C)	41°F to 104°F (5°C to 40°C)
		Display	LCD color screen, 3.2"	LCD transreflective screen, 2.5"	LCD color display, touch screen, 3.2"	LCD color display, 3.5" with 76,800 pixels	Touchscreen with color display, 4.3"	High-resolution color display, 4.3"
		Ruggedization	Tilt sensor with visual and audible feedback when analyzer is tilted too far during testing. Passed static test, drop test, immunity to radiated electric fields, IP11 protection, vibration test	Shock-absorbing silicone protective cover, impact-resistant plastic; can withstand minor falls	Fireproof case	Rugged rubber bumpers for protected operation, lead acid battery to handle irregular or extended charging cycles, automatic heating or cooling test kits to stable temperature	Ruggedization proven in field trials and lab testing	Splash water protection and dust cover in accordance with IP 54; can withstand vibrations in accordance with IEC 60068-2-64; shock resistance in accordance w/ IEC 60028-2-27
	Operations	Underlying Reader Technology	Digital imaging using advanced image processing algorithms to accurately determine the line intensity on the test cartridge	Optoelectronic sensor and optical filtering system to detect drugs of abuse	Optical reader	Optoelectronic sensors-based technology to read test results	Reader uses 2 megapixel camera and software to provide unbiased interpretation of drug screen results	Optical reader
		Device Warm-Up Time	3 seconds	<1 minute	1–2 minutes	<1 minute	<1 minute	1 minute
		Average Response Time of Test	5 minutes	1.5 minutes	Cassette: 8–10 minutes Reader: 12 minutes	1–4 minutes	<10 minutes	5 minutes
		Reader in Device to Scan Cartridges	QR Reader identifies cartridge type, ID, LOT, and expiry date.	Linear Detector Arrays and Optical Filtering System	QR Reader	Barcode	QR Reader	Yes
		Temperature Control Systems in Instrument	Yes	No	Yes	Yes	Temperature sensor to prohibit test when unit is outside temperature range.	Yes
		Can the test strip be interpreted without a reader?	No	No	No	No	No	Yes
		Built-in printer?	No	No	No	No	Yes	Yes

Table 4 (continued)

		Vendor	**Abbott SoToxa™** ***(Distributing as Intoximeters in U.S.)***	**Alcolizer DrugLizer** ***(Distributing as Omega Laboratories in U.S.)***	**American Bio Medica Corporation DrugSIP Mobility Analyzer**	**Dräger DrugTest 5000**	**PAS Systems International Aquilascan II**	**SecureTec DrugWipe** ***(Distributed by Alcohol Countermeasure Systems)***
Reader Information (Continued)	Operations (Continued)	Memory Capability of Instrument	Over 10,000 test results (last 200 results can be accessed directly on the analyzer)	10,000 test records before synchronizing to AlcoCONNECT System	2,500 tests	500 full test records	100,000 internal test record storage	1,000 tests, expandable with SD memory card
		Data Transfer Capabilities	Can export test results	Bluetooth connectivity, WiFi internet connectivity, or direct connection through USB cable to AlcoCONNECT software	Bluetooth printer, cables for external PC	USB A-B cable connection using companion Diagnostics PC program	Test data: download via USB cable. Results: upload via 3G/WiFi	SD memory card, USB cable
		Maintenance Required	If required, exterior of analyzer and accessories can be wiped with lint-free cloth or damp cloth with mild detergent. Wipe away any spillages immediately.	Units that are damaged or require additional service can be shipped to Omega Laboratories for evaluation and repair by a certified technician.	Annual hardware and reading check for accuracy	Annual preventative maintenance procedures available	Charge should be kept on the batteries	Carry out quality control tests regularly
		Calibration Requirements of Device	Recommended service on yearly basis	Calibration is done through a Druglizer Module exchange system for easy 30-second calibration. These modules are sent directly to the client and can be set up for 6- or 12-month calibration intervals, dependent upon program needs and local laws.	A calibration is not necessary because no element is decalibrated but it is recommended every year to check that hardware and reading is correct.	Calibration occurs inside the test kits. The test kits have lot-specific calibration factors encoded into an optical barcode that is read by the analyzer. Dräger offers an all-positive inert training test kit and all-negative inert training test kit, which can be utilized to periodically demonstrate the performance of the device.	Quality control checks should be performed using the supplied positive/negative quality control cassettes.	WipeAlyser: annual service
Cartridge Information		Test Type	Cartridge is a chromatographic immunoassay (Single-use and disposable that contains dried reagents and liquid buffer)	Cartridge is based on lateral flow immunoassay technology, consists of nitrocellulose test strips	Lateral flow competitive immunoassay utilizing highly specific reactions between antibodies and antigens, with optional reader	Cartridge consists of an oral collection device, plus cassette with lateral-flow strips of nitrocellulose with capture reagents	Lateral flow immunoassay	Lateral flow immunoassay with optional reader
		Integrated Control Line in Test Strip	Yes	No	Yes	Yes	Yes	Yes
		Amount of Sample Needed for Analysis	Volume indicator will show when sufficient oral fluid has been collected	500 µL	2 minutes required for getting sufficient sample	250–280 µL (around 1 minute sample collection)	0.25 mL	10 µL
		Volume Adequacy Indicator	Yes, color based	Yes, color based	Yes, collector sponge extends to clearly visible notch	Yes, color based	Yes, color based	Yes, color based

Table 4 (continued)

	Vendor	Abbott SoToxa™ *(Distributing as Intoximeters in U.S.)*	Alcolizer DrugLizer *(Distributing as Omega Laboratories in U.S.)*		American Bio Medica Corporation DrugSIP Mobility Analyzer	Dräger DrugTest 5000				PAS Systems International Aquilascan II	SecureTec DrugWipe *(Distributed by Alcohol Countermeasure Systems)*			
Cartridge Information (Continued)	Available Drug Panels	6 panel	5 panel	6 panel	6 panel	5 panel	6 panel	7 panel	8 panel	6 panel	5 panel (S505G)	6 panel (S604G)	6 panel (S602G)	2 panel (S270G)
Cutoff concentrations for Drug Classes (ng/mL) in panel	Opiates (OPI)	40	50	50	40	20	20	20	20	40	10	10	10	-
	Benzodiazepines (BENZO)	20	-	Oxazepam 25 Alprazolam 15 Bromazepam 8 Chlordiazepoxide 10 Clonazepam 40 Clorazepate 20 Cibazam 6 Diazepam 15 Estazolam 10 Desalkylflurazepam 8 Flunitrazepam 10 Flurazepam 10 Lorazepam 20 Medazepam 10 Nitrazepam 10 Nordiazepam 6	-	-	15	15	15	10	-	5	-	-
	Cannabis (THC)	25	25	25	40/25	50	50	50	50	25	5	10	20	-
	Cocaine (COC)	30	50	50	20	20	20	20	20	20	10	10	10	-
	Amphetamines (AMP)	50	50	50	50	50	50	50	50	50	80	80	100	-
	Methamphetamines (MAMP)	50	50	50	50	35	-	35	35	50	80	80	100	-
	Ketamine (K)	-	-	-	-	-	-	-	300	-	-	-	25	-
	Methadone (MTD)	-	-	-	-	-	-	20	20	-	-	-	-	30
	Other	-	-	-	PCP - 10	-	-	-	-	-	-	-	-	10*

* Buprenorphine

Table 4 (continued)

	Vendor	**Abbott SoToxa™** ***(Distributing as Intoximeters in U.S.)***	**Alcolizer DrugLizer** ***(Distributing as Omega Laboratories in U.S.)***	**American Bio Medica Corporation DrugSIP Mobility Analyzer**	**Dräger DrugTest 5000**	**PAS Systems International Aquilascan II**	**SecureTec DrugWipe** ***(Distributed by Alcohol Countermeasure Systems)***
Software Information	Last known reader software release date	July 2019 during transition from the DDS2 to SoToxa brand.	October 2019	July 2011	2018	October 2019	November 2019
	Steps needed to update reader software	Update via SD card	Druglizer LE5's operating software offers updates using the AlcoToolbox system and transfers results to AlcoCONNECT portal.	Dependent on update	Use of USB A-B cable and companion Diagnostics program, which permits data transfer from analyzer.	Access to the upgrade can be found under a supervisory password-protected level. Customer can automatically download latest software version when connected to WiFi.	SD card containing update
	Supporting desktop software available?	Yes	Yes	Yes, software application included on CD with DrugSip Mobility. Windows operated.	Yes, Diagnostics PC program	Download to PC software; available to transfer test records from reader to a desktop.	PC program management software included
	Use of web servers or cloud storage by desktop software	N/A	N/A	Yes	N/A	3G and WiFi allow test data to be uploaded to customer's existing data management programs.	N/A
	Licenses required to use desktop software	N/A	N/A	Provided with purchase	License provided to users	N/A	N/A
	Operating system required for use	N/A	Windows 10 or above	N/A	Standard Windows OS	Android 5.1	PC data download available
Resources/Add-ons	Accessories Available for Purchase	Car Charger	LE5 protective cover; Bluetooth printer; hard plastic carrying case; small hard plastic carrying case; large soft shoulder bag; AC charge transit case; attached case	USB connector to the electric red, automobile charger	Standard system is analyzer and test kit; accessories include wireless mobile printer, keyboard, transport case, and training test kits	Carrying case; leather carrying pouch; (2) rechargeable lithium ion batteries; 12V auto adapter for charging; AC wall adapter; battery charger; 5 rolls of printer paper	Carrying bag, user guide, power cord, power supply, USB cable, car charge adapter, USB stick with database software and PDF user guide, 2 rolls of printer paper, 2 styluses, quality control test cassettes (negative and positive)
	Training Offered	In-person training at end-user site/ Intoximeters training facility, or train-the-trainer courses available	Online training through www.alcolizer.com	1-on-1 training and supporting documentation to provide technical support available: web-based training with certification, CD-ROM training, and on-site training.	Initial training and online training free of charge; subsequent end-user and train-the-trainer formats are at a price.	TBD—training program under development	Available

Table 4 (continued)

	Vendor	Abbott SoToxa™ *(Distributing as Intoximeters in U.S.)*	Alcolizer DrugLizer *(Distributing as Omega Laboratories in U.S.)*	American Bio Medica Corporation DrugSIP Mobility Analyzer	Dräger DrugTest 5000	PAS Systems International Aquilascan II	SecureTec DrugWipe *(Distributed by Alcohol Countermeasure Systems)*
Resources/Add-ons (Continued)	Technical Support Offered	Call center available, and field-based regional managers	Training and support offered on-site or remotely	Free access to technical staff including quality control, quality assurance, and Research & Development team. Technical support via toll-free number 24/7/365 (including holidays).	Free technical support—access to application specialists, service technicians, and technical product managers	Free technical support via phone/email and evaluation of unit for repairs. Unit service available at standard labor rate plus parts/shipping.	Available
	Warranties Offered	1-year standard warranty for Mobile Test System	24-month warranty; serviced and repaired instruments have extended 90-day warranty after service	1-year parts and labor at no cost; extended warranties available upon request.	Standard 1-year warranty with total care, preventative care, and extended care agreements available	Standard 1-year warranty included with purchase of device. Additional 1-year warranty available for $299 and 2-year extended warranty for $570.	1-year warranty (WipeAlyser)

Base Unit Cost	
Unit Cost	**Cost Scale (U.S. Dollars)**
$	0–1,000
$$	1,001–2,500
$$$	2,501–5,000
$$$$	5,001 +

Consumables Cost: Per Test	
UNIT Cost	**Cost Scale (U.S. Dollars)**
$	0–10
$$	10.01–15.00
$$$	15.01–20.00
$$$$	20.01 +

Table 5: Additional chemical screening products that CJTEC identified.*

	BREATH-BASED PRODUCTS			SWEAT-BASED PRODUCTS	
Vendor	**Cannabix Technologies**	**Hound Labs**	**Sanntek**	**Intelligent Fingerprinting Systems, Inc**	**Alcohol Countermeasures Systems/ SecureTec Detektions-Systeme AG**
Product Name	THC Breath Analyzer	The Hound Marijuana Breathalyzer	315 Breathalyzer	Intelligent Fingerprinting Drug Screening System: Cartridge and Reader 1,000 analysis unit	DrugWipe A
Description	Detection of Δ-9-THC using FAIMS	THC and alcohol breathalyzer using a chemical sensor	Electrochemical immunoassay-based breathalyzer for detection of Δ-9-THC.	Screens for drugs—including opiates, methamphetamine, cocaine, cannabis, benzodiazepines, and buprenorphine—and metabolites in sweat collected from fingerprints.	Detects presence of cannabis, amphetamines, methamphetamine, cocaine, and opiates in saliva, sweat, and surfaces
Development Status	Still in development but receiving interest from law enforcement for piloting opportunities.	Currently piloting with law enforcement; two clinical trials have been performed in partnership with UCSF	Currently under development	Device is being piloted and is on market	On market

** The companies and products mentioned in Table 5 were identified through CJTEC's secondary research; this research included an assessment of peer-reviewed publications, news articles, and other sources. CJTEC was unable to obtain detailed product information for these products in time for publication.*

COMPANY PROFILES

Abbott

www.abbott.com/
www.alere.com/en/home.html

Product: SoToxa Mobile Test System
Location: Manufacturer and Headquarters: United Kingdom; Intoximeters is based in St. Louis, MO
Category: Chemical Screening
Years in business: Abbott: 130; Intoximeters: 75 years

Abbott is an established global healthcare provider with over 130 years of history of diagnostic firsts changing the world outlook in diseases such as infectious disease, cardiovascular disease, and oncology. In the U.S., Abbott's SoToxa™ Mobile Test System is marketed by Intoximeters. Since 1945, Intoximeters, Inc. has been a leader in the field of breath alcohol testing, continually pioneering and improving upon technology and industry standards.

Customers served: Intoximeters Inc., the leader in the Breath Alcohol detection industry, services law enforcement accounts in every state at the municipal, county, and state levels. Their instruments are relied upon by law enforcement, major workplace testing organizations, and other testing industries in over 90 countries worldwide.

Alcolizer/Omega Laboratories

Distributor: https://www.omegalabs.net
Manufacturer: https://www.alcolizer.com/

Product: Druglizer LE5 Analyzer
Location: Distributor: Mogadore, OH; Manufacturer: HQ Balcatta, Western Australia
Category: Chemical Screening
Years in business: 20 years (Omega), 25 years (Alcolizer)

Omega Laboratories acts as the Master U.S. Distributor for Alcolizer Technology, providing clients with exclusive access to Alcolizer and Druglizer rapid detection devices. Omega is a CAP-certified laboratory and holds FDA 510(k) clearances, performing forensic hair and oral fluid drug testing at our Mogadore headquarters.

Customers served: Alcolizer Technology has over 15,000 LE5 drug and alcohol detection devices actively deployed with law enforcement agencies, school districts, court systems, and in use for employment testing in the mining, manufacturing, and transportation industries, as well as other safety-sensitive groups and employers.

Omega Laboratories, Inc. provides hair and oral fluid testing for drugs of abuse to over 6,000 clients worldwide. Omega Laboratories currently provides services to corporate, government, and court-based clients worldwide, including Fortune 500 companies, hospitals, Third-Party Administrators, and law enforcement agencies across the globe.

Battelle

www.battelle.org

Product: Roadside Impairment Sensor
Location: Columbus, OH
Category: Physical and Cognitive Impairment Detection
Years in Business: 90

Battelle is a nonprofit research and development organization that manages laboratories, designs and manufactures products, and delivers critical services to government agencies, multi-national corporations, and small start-up organizations.

Customers served: The technology is not yet on the market, but intended for DRE officers at fixed sites, DRE officers in mobile applications, and non-DRE officers with remote DRE reach back for report review and assessment.

Dräger

www.draeger.com/en-us_us/Home

Product: DrugTest 5000
Location: HQ Lubeck, Germany
Category: Chemical Screening
Years in business: 130

Dräger features a broad portfolio across numerous medical and safety applications. In the Defense and Security division (which supports Law Enforcement applications) alone, Dräger serves customers in municipal, county, state, and federal agencies. Dräger also supports hospital, industrial, commercial, maritime, mining applications—among others—for private industry.

Customers served: Dräger's DrugTest 5000 is broadly used across the world and is currently in field use or pilot programs by law enforcement agencies and Drug Recognition Expert (DRE)–trained officers in more than a dozen states in the U.S. Although Dräger does not release specific sales figures, worldwide sales of the analyzer are multiple thousands and test kits are multiple millions. The vast majority of these are for law enforcement use. The largest users outside of the United States are Argentina, Australia, Canada, Denmark, Germany, Great Britain, Ireland, Romania, Russia, and Spain

DruidApp Inc

druidapp.com

Product: DRUID application
Location: Cambridge, MA
Category: Physical and Cognitive Impairment Screening
Years in business: 3 years

DRUID is an app that measures cognitive-motor behaviors to establish whether an individual shows evidence of impaired performance. This app is designed to assess tasks including driving, operating heavy machinery, and critical decision making.

Customers served: Currently the app is available for individuals to use through the Apple App Store and Google Play—where we have over 10,000 downloads. We have developed an enterprise version and are currently finalizing a contract with the British Columbia government for a pilot test of DRUID for their Conservation Service Officers who are armed and do a lot of driving. We are also finalizing a contract with North American Palladium mining company to implement a workplace impairment testing program.

American Bio Medica

abmc.com

Products: DrugSIP Analyzer and OralStat 2G
Location: Kinderhook, NY
Category: Chemical Screening
Years in business: 33

American Bio Medica Corporation (ABMC) is a biotechnology company that develops, manufactures, and markets accurate, cost-effective immunoassay test kits, including some of the world's most effective point of collection tests for drugs of abuse. The company and its worldwide distribution network target the workplace, government, corrections, clinical, and educational markets.

Customers served: security forces, roadside security forces, laboratories, pharmacies, universities, hospitals, private companies, doctor's office, and roadside safety.

Ocular Data Systems

ocular datasystems.com

Product: DAX Evidence Recorder
Location: Pasadena, CA
Category: Physical and Cognitive Impairment Screening
Years in Business: 3

Ocular Data Systems is a company that produces impairment detection products in the drug impairment market. Their product DAX allows law enforcement to manually test the eye movements and responses of subjects while capturing live video that can be stored and used as evidence.

Customers served: Law Enforcement

PAS Systems International

pasintl.com

Product: AquilaScan II
Location: Morrisville, NC
Category: Chemical Screening
Years in business: 26

PAS Systems International is a company that produces instruments that detect and measure alcohol concentrations in breath samples or ambient air. The company is currently expanding into the drug detection market with the AquilaScan II Oral Fluid Drug Screener.

Customers served: PAS Systems serves agencies at the federal, state, and county levels as well as private testing companies.

Sanntek Labs, Inc.

www.sannteklabs.com

Product: SannTek 315 Breathalyzer
Location: Kitchener, Ontario
Category: Chemical Screening
Years in business: 2

Sanntek is a company that is currently developing a breathalyzer to detect Δ-9-THC.

Customers served: Not currently on the market, intended for law enforcement

Alcohol Countermeasure Systems

www.securetec.net/en/

Product: WipeAlyser Reader + DrugWipe test cassettes
Location: Etobicoke, ON
Category: Chemical Screening
Years in business: 43

Alcohol Countermeasure Systems is the distributor for SecureTec products in the United States.

SecureTech Detektions-System AG is a company that produces rapid drug screening products in the drug detection market. They specialize in the DrugWipe, which is suitable for detecting traces of drugs on surfaces and in saliva.

Customers served: Federal, state, and local law enforcement agencies. Approximately 2 million tests per year are sold to law enforcement agencies.

IMMAD, LLC

mass.innovationnights.com/products/immad-impairment-measurement-marijuana-and-driving

Product: IMMAD (Impairment Measurement Marijuana and Driving) Device
Location: Quincy, Massachusetts
Category: Physical and Cognitive Impairment Screening
Years in business: 3

The company **IMMAD** provides education, services, and technology for the responsible use of cannabis. IMMAD specializes in technology for roadside use by law enforcement. Other products under development include screening tools for transportation and manufacturing.

Customers served: Law enforcement, transportation, and manufacturing industries

DriveABLE Assessment Centres Inc. (eventually Impiric, Inc.)

www.driveable.com
eventually rebranding to Impiric Inc.
(www.impiric.tech)

Product: The Pocket Standard Field Sobriety Test, RealTime Cognitive Evaluation
Location: Edmonton, Alberta, Canada
Category: Physical and Cognitive Impairment Screening
Years in business: 19 years

DriveABLE is a Canadian company focused on the research, development and commercializing of sustainable, cause-agnostic impairment testing solutions. DriveABLE operates in the law enforcement, workplace safety, medical, and cannabis industries.

Customers served: Licensing authorities, municipalities, private entities, hospital groups, and law enforcement agencies have used the software. DriveABLE is currently operating a pilot program with Edmonton Police Service, and with the RCMP

Criminal Justice Testing and Evaluation Consortium

Resources

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