



# Resource Management and Logistics

Forecasting Growth From Small to Medium Laboratory Operations

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# Learning Objectives

- Define and analyze factors that contribute to healthy, sustainable growth of a laboratory operation
- Survey how long-term laboratory growth impacts productivity trends in day-to-day operations
- Examine laboratory throughput trends that indicate the need to evaluate a shift in resource allocation



# Signature Science: Who We Are

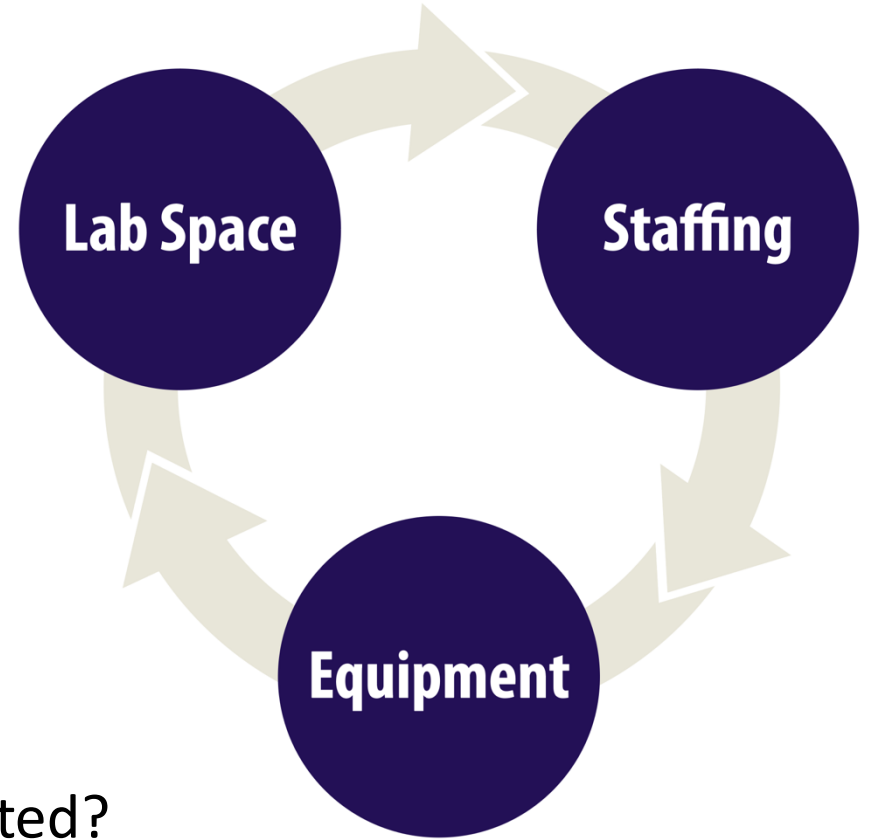
*Scientific consulting and services firm, offering physical, life, forensic, and data science-related technical solutions and technologies*

- WE CONDUCT:
  - Research, Development, Test and Evaluation (RDT&E)
  - Laboratory Operations
  - Systems Design and Integration
  - Software and Algorithm Development
  - Manufacturing / Production
- Entering our 25<sup>th</sup> year
- 220+ employees; 85% cleared
- Support our clients from four offices
- Wholly-owned subsidiary of Southwest Research Institute (SwRI)



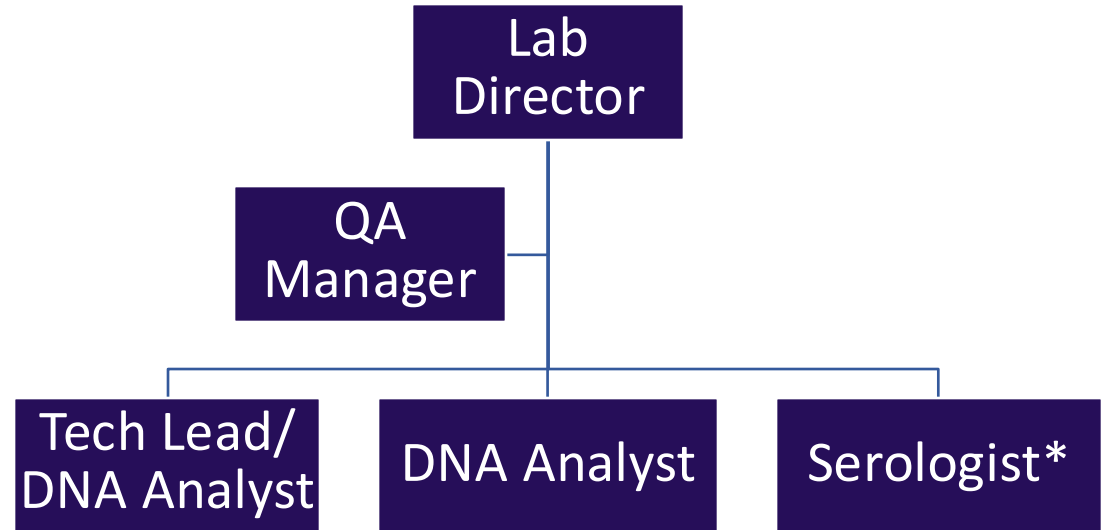
# Laboratory Operations Factors

- Staffing
  - How many people do we need?
  - Who is trained on what method?
- Equipment/Methodology
  - Manual processes vs. automation
  - Instrumentation throughput
- Laboratory Space
  - How many cases are submitted?
  - How many samples from each case will be tested?



# How It Started...

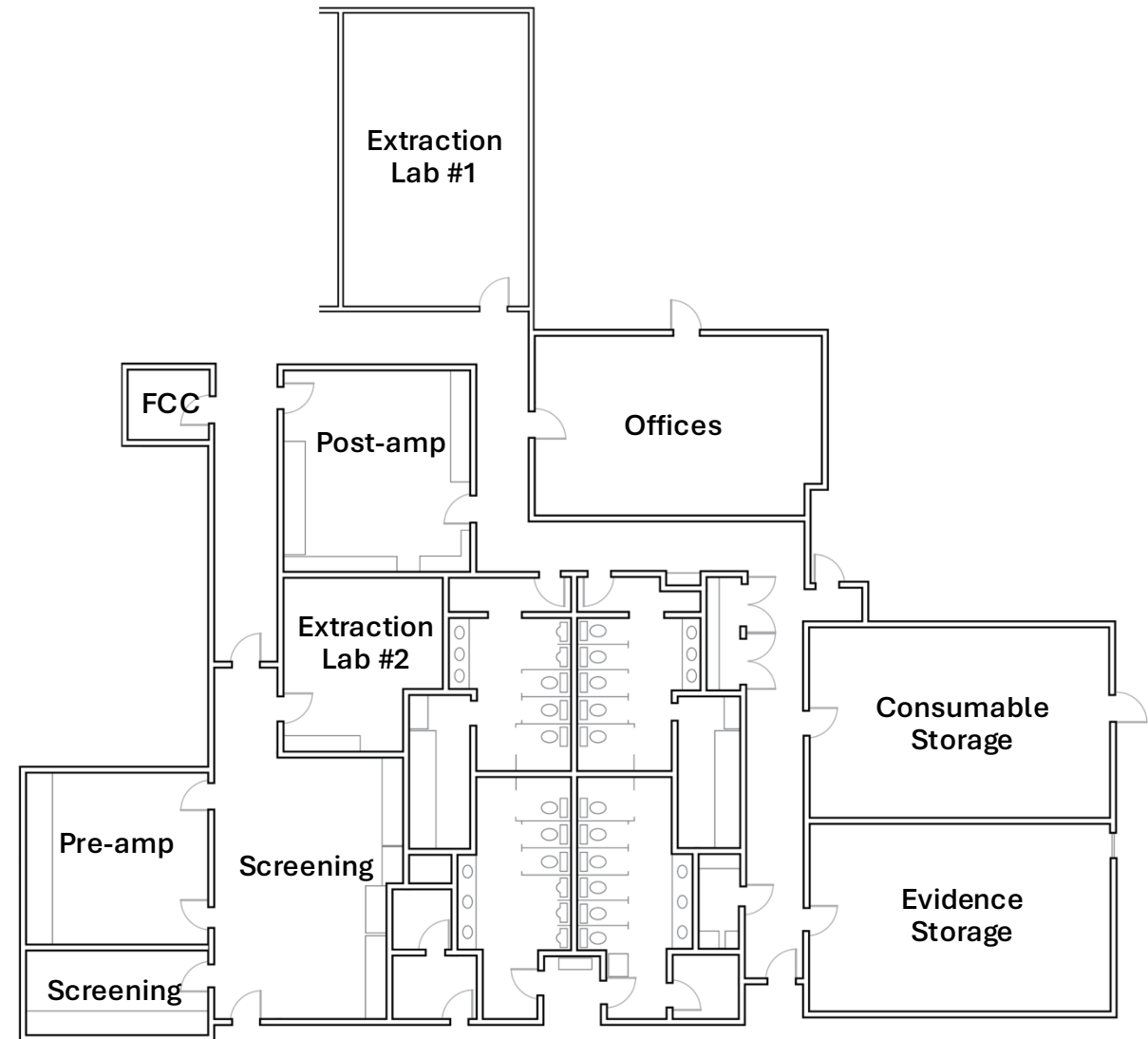
- Accredited in 2013
- First case processed in 2015
- Staffing
  - 2 DNA Analysts, 1 Serologist
- Equipment
  - One low-throughput robot
- Laboratory Space
  - Three small rooms



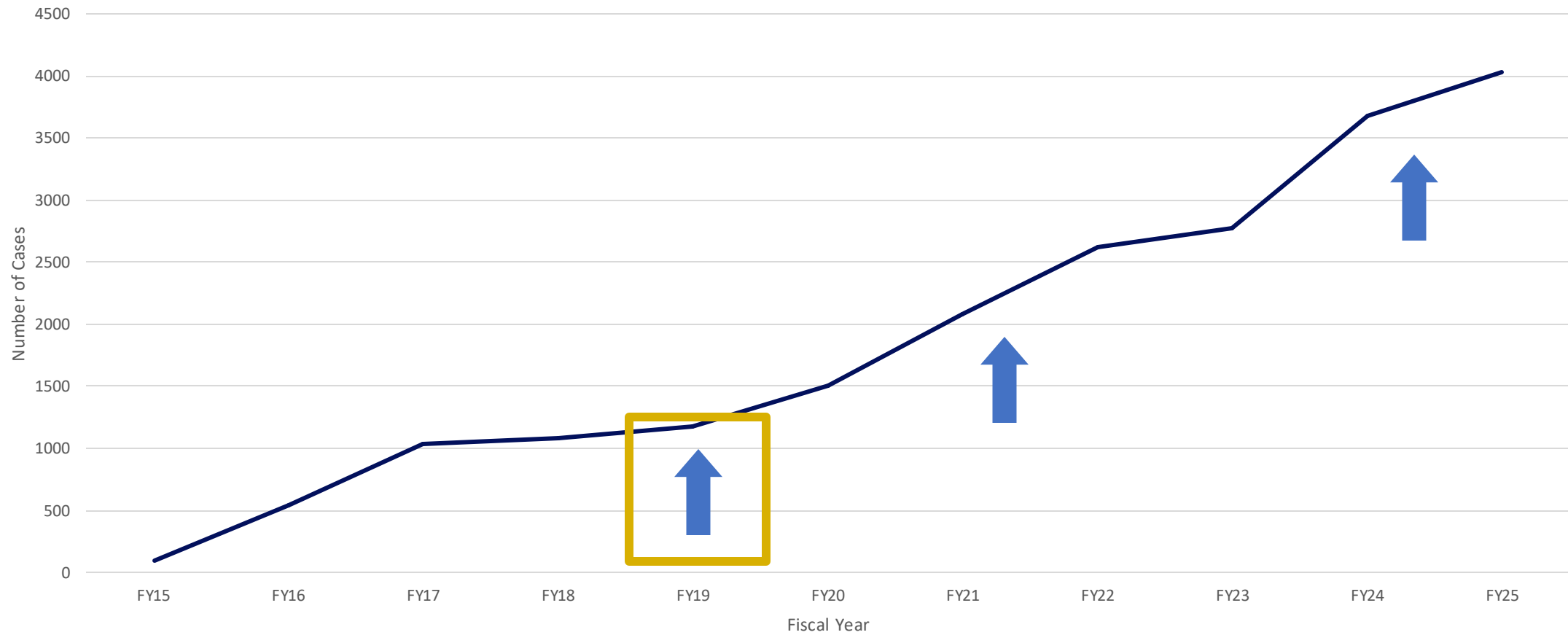
\* Serologists specialize in the ID of body fluids (e.g., blood, semen)

# How It's Going...

- Processed ~4000 cases in FY2025
- Staffing
  - 15 DNA Analysts
  - 10 DNA Technicians
  - Dedicated Evidence Support Team
- Equipment
  - Emphasis on automation
- Laboratory Space
  - Still modest but well organized



# Cases Received By Year



# Key Equipment/Space Acquisition

- 2018-2019: Consistent, steady growth for past 3 years was a good business case for capital investment
- Where is the best place to invest?
  - Staffing: Case submissions did not indicate the immediate need for additional analysts
  - Equipment: Automating processes could increase sample throughput without the need for more analysts
  - Lab Space: Additional lab space was available for use by the forensic practice



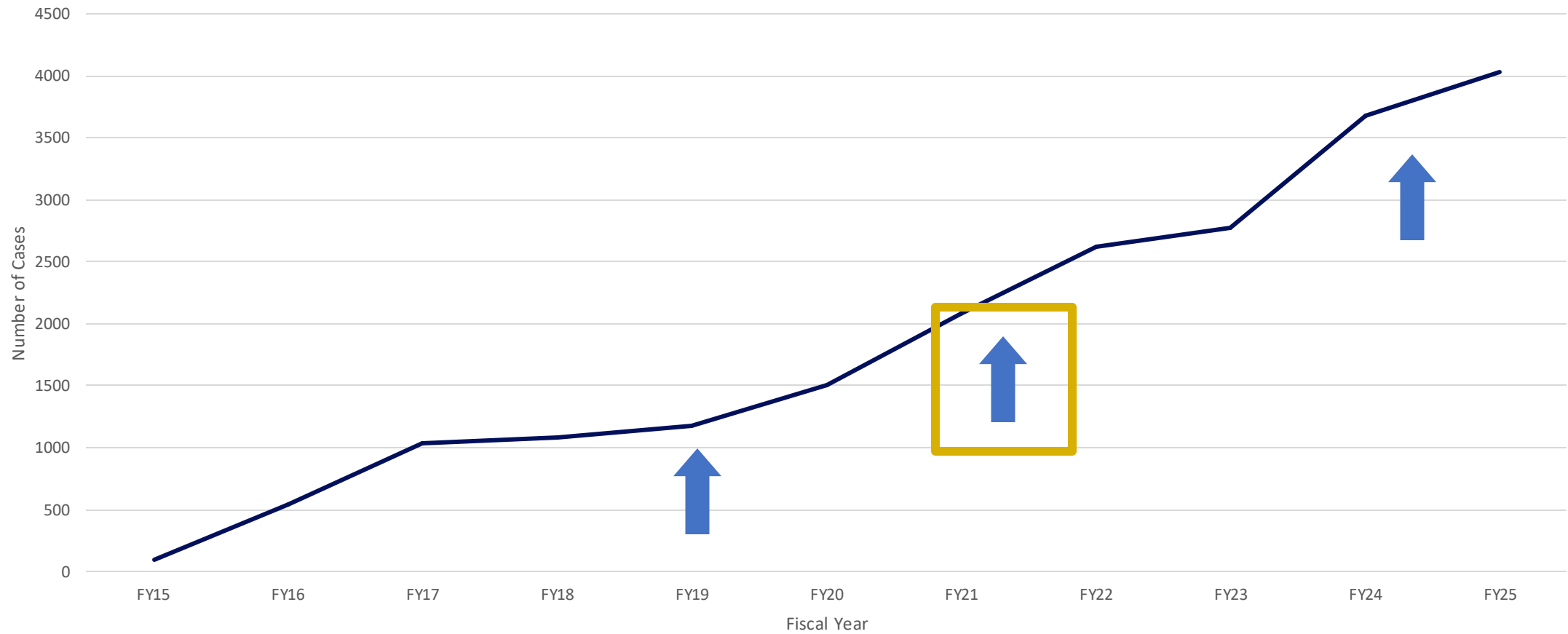
# Key Equipment/Space Acquisition

- Evaluated each step in the DNA testing process to determine which step would benefit the most from automation:
  - Technical advances in the field ready for implementation
  - Extraction is most labor intensive
  - Automation can serve as a good risk mitigation
- Purchase of a fleet of robots to automate the first three steps in the DNA testing process made financial sense and expanded offering to client base

**More samples processed without additional staff!**



# Cases Received By Year



# Key Shift in Staffing

- 2020-2021: In the middle of a phase of rapid growth
  - YoY case count more than doubled between FY2019 and FY2021
  - Staffing numbers largely unchanged but case count was climbing
- Analysts perform all steps of testing/reporting on a 60-day cycle
  - Benefits of increased automation fully realized and even surpassed
  - Signs of staff burnout were apparent
  - All analysts wear multiple hats
  - Option for remote work became a real possibility

Mo/Yr	Analysts	Techs
May 2019	7	1
April 2020	7	1
Dec 2020	7	2
May 2021	8	6

**Transition to a technician-based processing approach initiated!**



# Key Shift in Staffing

- Previous approach to staffing – hire experienced DNA Analysts:
  - Abbreviated training time (probably)
  - Leverage prior experience to help improve/refine processes
  - Small applicant pool
  - Analysts 100% accountable for their cases; no direct oversight/tracking of case processing timeline
- Technician based approach meant big changes:
  - More robust training program needed
  - Much larger applicant pool
  - More direct oversight/better defined laboratory schedule and resource coordination



# Key Shift in Staffing

- Better defined purview for critical overhead laboratory functions
  - QA/QC
  - Validation
  - Training
- More hands on deck was great but it became clear that a better system for monitoring casework progress was needed
  - Lab staff supervisors were charged with overseeing the day-to-day tasking of their team members
  - Remote staff supervisors were charged with monitoring the day-to-day productivity of their team members (e.g., cases written, reviewed)



# Lab Schedule & Productivity Metrics

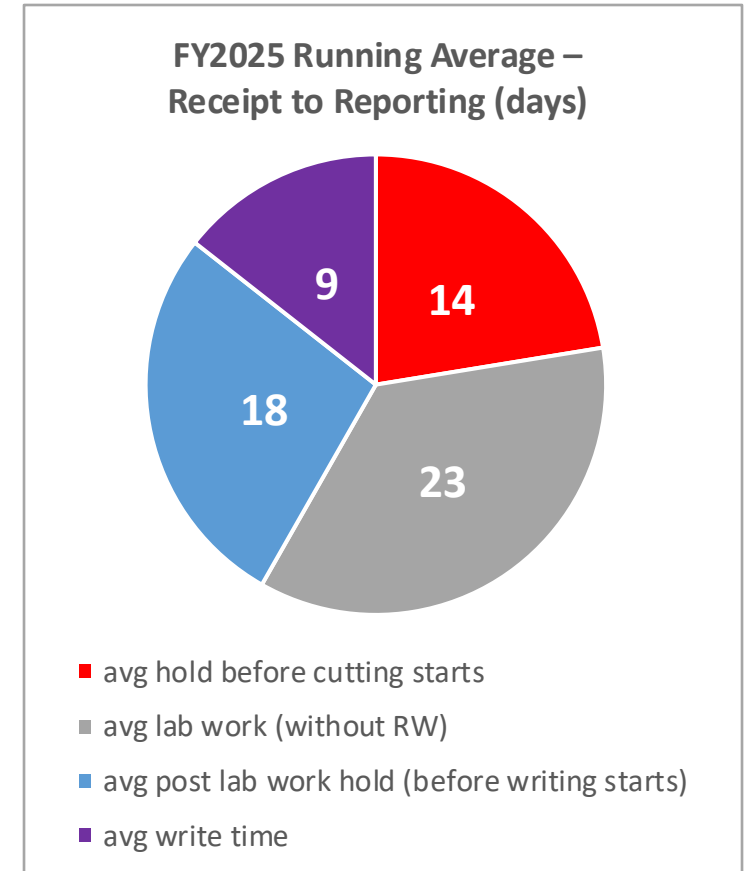
- Lab schedule wish list:
  - No more spread sheets
  - Easy to view in the lab and at your desk
  - Easy for multiple users to modify at the same time
- Web-based platform was identified and implemented with unintended benefits
  - Centralized location to track training, validation, and QA/QC functions
  - Ability to trend sample count and lab processing over time



# Lab Schedule & Productivity Metrics

2025	Avg hold before evidence exam	Avg lab work	Avg post-lab work hold (before reporting)	Avg reporting time
JAN	8	17	23	9
FEB	3	22	22	12
MAR	7	28	15	12
APR	17	21	19	11
MAY	18	27	14	5
JUN	31	20	12	3
JUL	29	18	12	6
AUG	21	18	15	9
SEP	10	21	20	10
OCT	2	25	23	12
NOV	3	30	22	12
DEC	3	33	20	13

FY2025 – 94% of cases were reported on time or early  
 FY2026 to date – 97% of cases reported on time or early



# Key Equipment Acquisition

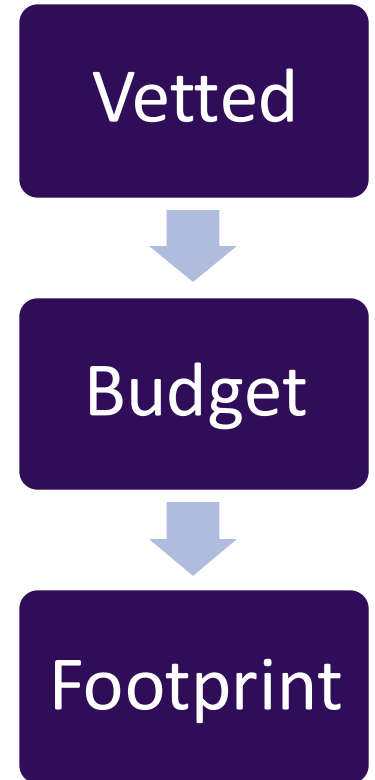
- Investment in original robotics to support male screening workflows proved sustainable
  - Additional redundant robots have been purchased
  - Laboratory footprint remains largely unchanged
- Robots are operated almost every day of the week.  
Have we maximized the workflow potential?
  - Adjust staffing schedules to operate more hours a day – work/life balance
  - Consider larger platform robotics – process more samples with fewer techs



# Key Equipment Acquisition

- Validation Manager charged with field research
  - Which large platforms are vetted/capable of our processes?
  - Which large platforms are in our budget?
  - Which large platforms will fit in our laboratory space?
- Down selection process pointed to two liquid handling platforms
- Given the information, verify this is a worthwhile pursuit

**How much will the process improve?**



# Process Throughput Analysis

Method	Avg Samples/Run	Avg Cases/Run	Time/Run	Operator Time/Run
Current Platform	12 (24 fractions)	2.5*	4 hours	~1 hour
Large Platform A	48 (96 fractions)	10.5*	3 hours	~30min
Large Platform B	86 (172 fractions)	19*	6 hours	~30min

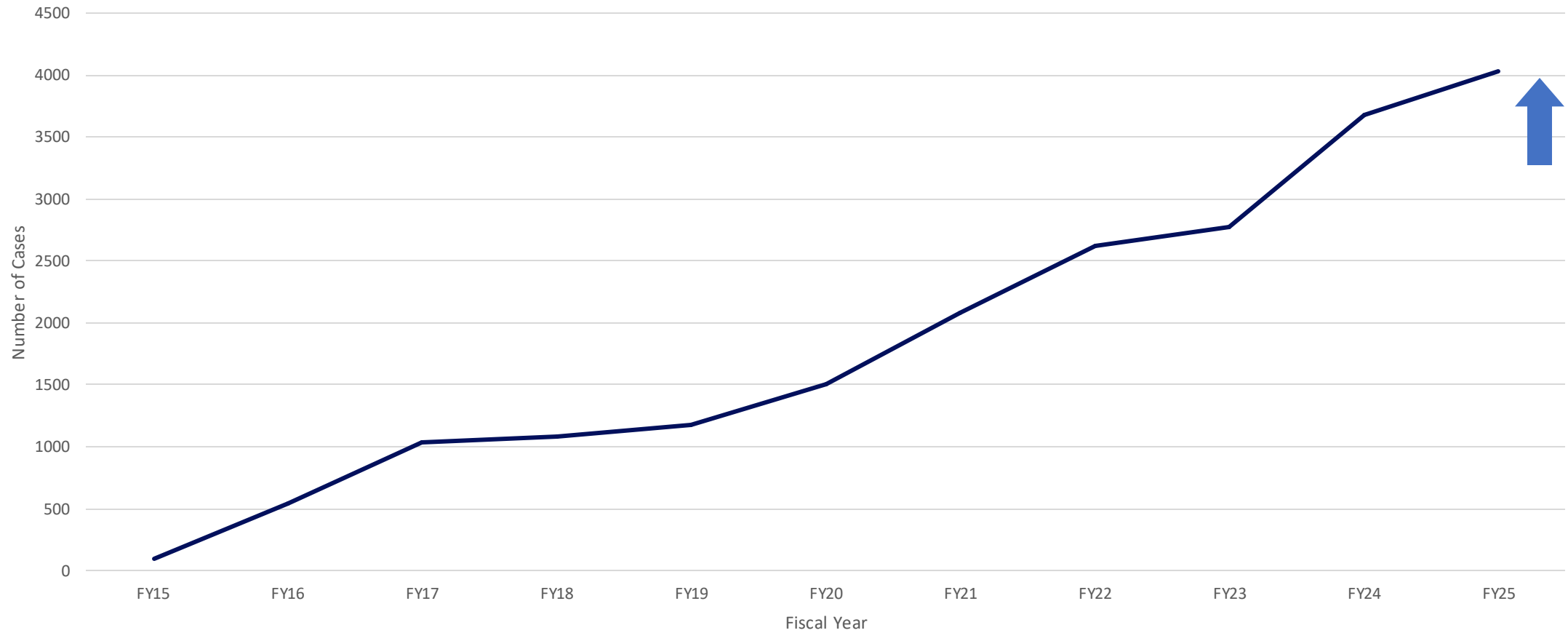
\*Assumes 4.5 samples per case

Method	Runs/Day	Operators	Cases/Day
Current Platform	2	1	5
Large Platform A	2	1	21
Large Platform B	1	1	19

~4x increase in throughput & significant \$\$ savings!



# Cases Received By Year





Questions?

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