# JOINT LEGISLATIVE BUDGET COMMITTEE

**Wednesday, April 18, 2018**

**9:00 a.m.**

**Senate Appropriations, Room 109**

JLBC

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



JOINT LEGISLATIVE BUDGET COMMITTEE
Wednesday, April 18, 2018
9:00 A.M.
Senate Appropriations, Room 109

MEETING NOTICE

- Call to Order

- Approval of Minutes of January 8, 2018 and February 20, 2018.

- DIRECTOR'S REPORT (if necessary).

1. ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY - Review of Vehicle Emissions Contract Modifications.

2. DEPARTMENT OF CHILD SAFETY
   A. Review of Line Item Transfers.
   *B. Review of FY 2018 Third Quarter Benchmarks.

3. *ARIZONA DEPARTMENT OF ADMINISTRATION - Review of Emergency Telecommunication Services Revolving Fund Expenditure Plan.

4. *ARIZONA DEPARTMENT OF ADMINISTRATION/ARIZONA STATE LOTTERY COMMISSION - Review of Server Migration and Hardware Refresh (Automation Projects Fund).

5. *DEPARTMENT OF ECONOMIC SECURITY - Review of Information Technology Security Plan (Automation Projects Fund).

6. ARIZONA DEPARTMENT OF EDUCATION
   *A. Review of State Aid Correction for Chino Valley Unified.
   *B. Review of Joint Technical Education District Quarterly and Annual Reports.

7. *NORTHERN ARIZONA UNIVERSITY - Review of Expenditure and Performance Report of Nonprofit Biotechnology Research Appropriation.

* Consent Agenda - These items will be considered in one motion and no testimony will be taken.

The Chairman reserves the right to set the order of the agenda.
4/10/18
lm

**People with disabilities may request accommodations such as interpreters, alternative formats, or assistance with physical accessibility. Requests for accommodations must be made with 72 hours prior notice. If you require accommodations, please contact the JLBC Office at (602) 926-5491.**

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

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## MINUTES OF THE MEETING

## JOINT LEGISLATIVE BUDGET COMMITTEE

January 9, 2018

The Chairman called the meeting to order at 3:36 p.m., Tuesday, January 9, 2018, in Senate Appropriations Room 109. The following were present:

| | | |
|---|---|---|
| Members: | Senator Kavanagh, Chairman | Representative Livingston, Acting Vice-Chairman |
| | Senator Cajero Bedford | Representative Allen |
| | Senator Fann | Representative Alston |
| | Senator Farley | Representative Bowers |
| | Senator Farnsworth | Representative Fernandez |
| | Senator Hobbs | Representative Leach |
| | Senator Petersen | |
| Absent: | Senator Yee | Representative Shooter |
| | | Representative Ugenti-Rita |

**APPROVAL OF MINUTES**

Hearing no objections from the members of the Committee to the minutes of December 19, 2017, Chairman John Kavanagh stated that the minutes would stand approved.

**AHCCCS - Review of Capitation Rate Changes for Plan Years 2017 and 2018.**

Mr. Patrick Moran, JLBC Staff, stated that an FY 2018 General Appropriation Act footnote requires the Arizona Health Care Cost Containment System (AHCCCS) and the Department of Economic Security (DES) to submit an expenditure plan to the Joint Legislative Budget Committee for review prior to implementing any changes in capitation rates. On behalf of both agencies, AHCCCS submitted rate changes in both November and December 2017. The JLBC Staff provided options.

Mr. Tom Betlach, Director, AHCCCS, responded to member questions.

(Continued)

*Representative Livingston moved that the Committee give a favorable review of AHCCCS' proposed capitation rate changes, but an unfavorable review of the agency's handling of the timing of the agency's November submission to the Committee, which did not comply with a long-standing requirement that AHCCCS submit capitation rates to the Committee for review prior to implementation.* The motion carried.

**JLBC STAFF - Consider Approval of Index for School Facilities Board Construction Costs.**

Ms. Rebecca Perrera, JLBC Staff, stated that A.R.S. § 15-2041 requires that the cost-per-square-foot factors used in School Facilities Board (SFB) new school construction financing be adjusted annually for construction market considerations based on an index identified or developed by the JLBC as necessary but not less than once each year. The JLBC Staff provided options.

Mr. Paul Bakalis, Executive Director, SFB, responded to member questions and circulated a document. *(Attachment 1).*

*Representative Livingston moved that the Committee approve a 3.12% adjustment in the cost-per-square-foot factors. The adjustment is based on the change in the Rider Levett Bucknall (RLB) Phoenix construction cost index since the cost factors were last adjusted in December 2016. A.R.S. § 15-2041D requires this adjustment to only be applied prospectively.* The motion carried.

**ARIZONA DEPARTMENT OF EDUCATION (ADE) - Review of Additional Empowerment Scholarship Account Administrative Funding.**

Mr. Matt Beienburg, JLBC Staff, stated that an FY 2018 General Appropriation Act footnote requires ADE to submit an expenditure plan to the JLBC for review before spending any of the additional $400,000 appropriated for administration of the Empowerment Scholarship Account program. The JLBC Staff provided options.

Mr. Charles Tack, Assistant Superintendent, ADE, responded to member questions.

*Representative Livingston moved that the Committee give a favorable review to ADE's expenditure plan.* The motion carried.

**ARIZONA DEPARTMENT OF ADMINISTRATION (ADOA) - Review of FY 2018 State Data Center Project (Automation Projects Fund).**

Ms. Rebecca Perrera, JLBC Staff, stated that A.R.S. § 41-714 requires the Committee to review an ADOA expenditure plan for the Automation Projects Fund (APF) prior to the expenditure of monies. ADOA requested review of $3,405,100 in proposed FY 2018 expenditures from the APF for information technology projects related to the State Data Center at the Arizona Strategic Enterprise Technology Office in ADOA. The JLBC Staff provided options.

Ms. Suzan Tasvibi-Tanha, Chief of Managed Services, ADOA-ASET, responded to member questions.

*Representative Livingston moved that the Committee give a favorable review of $3,405,100 in proposed FY 2018 expenditures from the APF for information technology (IT) projects related to the State Data Center (SDC) at the Arizona Strategic Enterprise Technology (ASET) Office in ADOA. As part of its review, the Committee included the following provisions:*

(Continued)

A. *Committee review is contingent on the Legislature making FY 2018 APF funds non-lapsing through FY 2019.*

B. *On or before February 1, 2018, ADOA shall submit to the Committee its proposed plans for 1510 West Adams Street once the State Data Center is relocated.*

C. *On or before February 1, 2018, ADOA shall submit a report to the Committee on the operational savings achieved by relocating the State Data Center to a private facility.*

The motion carried.

Without objection, the meeting adjourned at 4:58 p.m.

Respectfully submitted:

K Paddack

Kristy Paddack, Secretary

Richard Stavneak

Richard Stavneak, Director

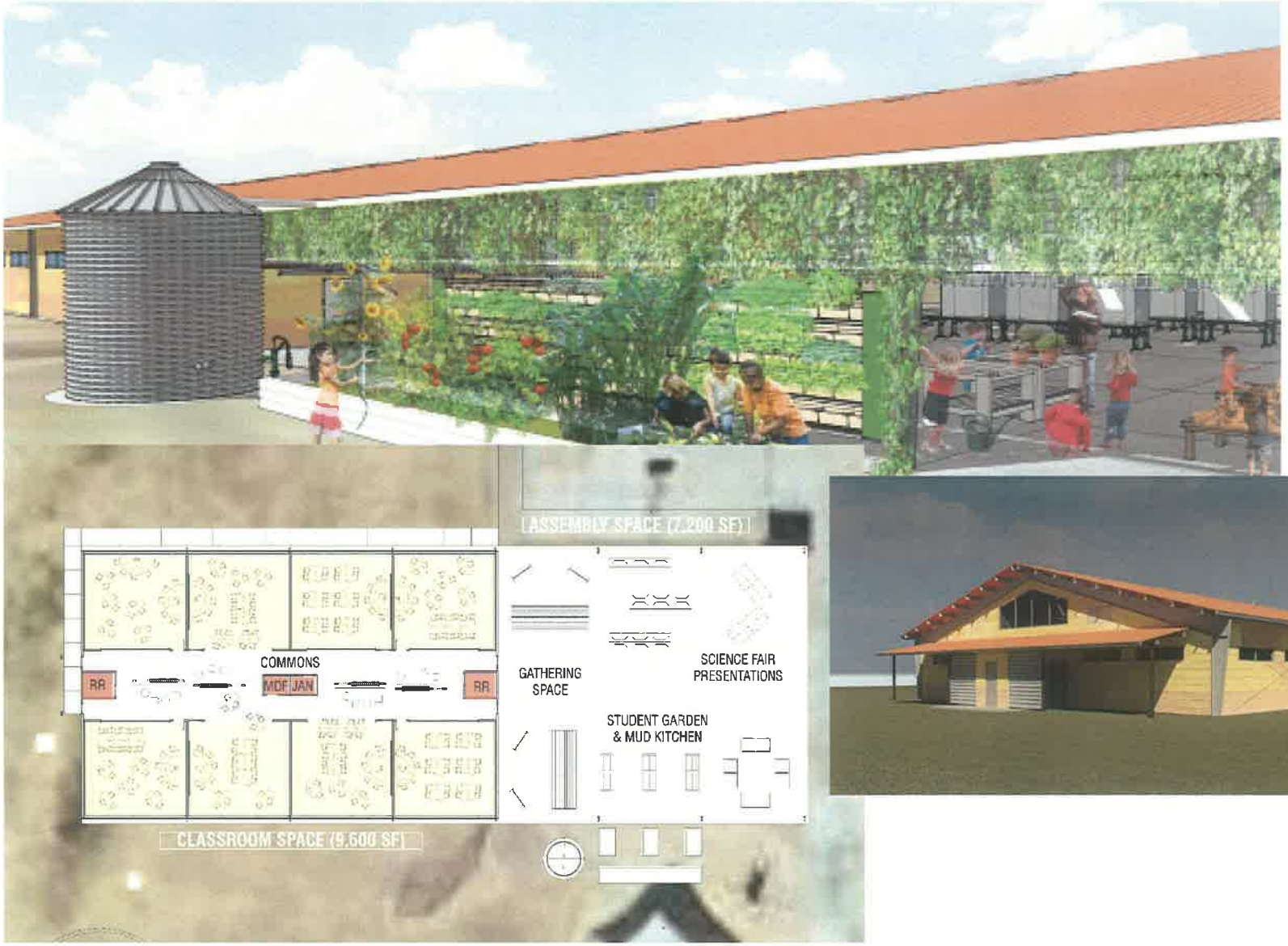
Senator John Kavanagh, Chairman

NOTE: A full audio recording of this meeting is available at the JLBC Staff Office, 1716 W. Adams. A full video recording of this meeting is available at http://www.azleg.gov/jlbc/meeting.htm

Attachment 1

**Benson Unified, Benson Elementary School (K-4)**
January 9, 2018

ARIZONA School Facilities • BOARD •






**Benson Unified, Benson Elementary** received SFB approval for 17,190 square feet (SF) of K-4 space on 12/10/14. The funding formula in effect at the time for an "urban" district was $136.66 per SF *(Benson Unified is in Cochise County, 45 miles east-southeast of Tucson, and technically does not qualify for the 5% rural adjustment factor)*. The current formula amount for urban districts is $142.55 per SF.

The Architect is currently working on an innovative design which includes a portion of square footage that is not enclosed. There is a solid wall on one side and a "living wall' on the adjacent side. The other two sides are open.

ARIZONA
School Facilities
• BOARD •

**Joint Legislative Budget Committee**
*$/SF Analysis and Projections*
*Tuesday, January 9, 2018*
*3:00pm*
*Senate Appropriations Meeting Room 109*

1

**December 14, 2016**

| Grade | Urban | Rural |
|---|---|---|
| K-6 | $142.55 | $149.68 |
| 7-8 | $150.49 | $158.01 |
| 9-12 | $174.25 | $182.96 |
| K-8 | $144.43 | $151.65 |
| 6-8 | $147.84 | $155.23 |
| 5-8 | $146.51 | $153.84 |
| 4-8 | $145.72 | $153.01 |
| 7-9 | $158.41 | $166.33 |
| K-12 | $153.97 | $161.67 |
| 7-12 | $166.33 | $174.65 |
| 6-12 | $162.93 | $171.08 |
| 5-12 | $160.40 | $168.42 |

2

**2018 Construction Cost Index**

| Urban | % Change | Rural | % Change |
|---|---|---|---|
| $151.10 | 6.0% | $158.66 | 6.0% |
| $159.52 | 6.0% | $167.49 | 6.0% |
| $184.71 | 6.0% | $193.94 | 6.0% |
| $153.10 | 6.0% | $160.75 | 6.0% |
| $156.71 | 6.0% | $164.54 | 6.0% |
| $155.30 | 6.0% | $163.07 | 6.0% |
| $154.46 | 6.0% | $162.19 | 6.0% |
| $167.91 | 6.0% | $176.31 | 6.0% |
| $163.21 | 6.0% | $171.37 | 6.0% |
| $176.31 | 6.0% | $185.13 | 6.0% |
| $172.71 | 6.0% | $181.34 | 6.0% |
| $170.02 | 6.0% | $178.53 | 6.0% |

3

**Adjustment for 2012 IBC Codes**

| Urban | % Change | Rural | % Change |
|---|---|---|---|
| $179.61 | 26.0% | $188.60 | 26.0% |
| $189.62 | 26.0% | $199.09 | 26.0% |
| $219.56 | 26.0% | $230.53 | 26.0% |
| $181.98 | 26.0% | $191.08 | 26.0% |
| $186.28 | 26.0% | $195.59 | 26.0% |
| $184.60 | 26.0% | $193.84 | 26.0% |
| $183.61 | 26.0% | $192.79 | 26.0% |
| $199.60 | 26.0% | $209.58 | 26.0% |
| $194.00 | 26.0% | $203.70 | 26.0% |
| $209.58 | 26.0% | $220.06 | 26.0% |
| $205.29 | 26.0% | $215.56 | 26.0% |
| $202.10 | 26.0% | $212.21 | 26.0% |

4

**STEM/STEAM Learning Environments**

| Urban | % Change | Rural | % Change |
|---|---|---|---|
| $230.36 | 61.6% | $241.88 | 61.6% |
| $243.19 | 61.6% | $255.34 | 61.6% |
| $281.59 | 61.6% | $295.66 | 61.6% |
| $233.40 | 61.6% | $245.07 | 61.6% |
| $238.91 | 61.6% | $250.85 | 61.6% |
| $236.76 | 61.6% | $248.61 | 61.6% |
| $235.48 | 61.6% | $247.26 | 61.6% |
| $255.99 | 61.6% | $268.79 | 61.6% |
| $248.82 | 61.6% | $261.26 | 61.6% |
| $268.79 | 61.6% | $282.23 | 61.6% |
| $263.29 | 61.6% | $276.47 | 61.6% |
| $259.21 | 61.6% | $272.17 | 61.6% |

*Note:*

*1. Each of the above Charts 2, 3, and 4 indicate percentage change that is additive to Chart 1. So, Chart 2 is 6% greater than Chart 1; Chart 3 is 26% greater than Chart 1; and Chart 4 is 61.6% greater than Chart 1.*

STATE OF ARIZONA

# Joint Legislative Budget Committee



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## MINUTES OF THE MEETING

## JOINT LEGISLATIVE BUDGET COMMITTEE

February 20, 2018

The Chairman called the meeting to order at 9:06 a.m., Tuesday, February 20, 2018, in Senate Appropriations Room 109. The following were present:

| | | |
|---|---|---|
| Members: | Senator Kavanagh, Chairman | Representative Livingston, Vice-Chairman |
| | Senator Cajero Bedford | Representative Allen |
| | Senator Fann | Representative Alston |
| | Senator Farley | Representative Bowers |
| | Senator Farnsworth | Representative Fernandez |
| | Senator Hobbs | Representative Leach |
| | Senator Petersen | |
| | Senator Yee | |
| Absent: | | Representative Ugenti Rita |

**EXECUTIVE SESSION**

*Representative Bowers moved that the Committee go into Executive Session.* The motion carried.

At 9:06 a.m. the Joint Legislative Budget Committee went into Executive Session.

*Senator Kavanagh moved that the Committee reconvene into open session.* The motion carried.

At 10:15 a.m. the Committee reconvened into open session.

**A. Arizona Department of Administration, Risk Management Services - Consideration of Proposed Settlements under Rule 14.**

*Representative Livingston moved that the Committee approve the recommended settlement proposed by the Attorney General's office in the case of Barron v. State of Arizona.*

(Continued)

The motion carried.

Humphrey et al. v. State of Arizona

*Representative Livingston moved that the Committee intends that post-verdict agreements be approved by the Committee when the state negotiates with the plaintiff on appeal regarding the dollar level of the judgment and have Legislative Council prepare a bill introduction set to require JLBC approval on settlements such as this in the future.*

Mr. Jon Schwartz, Attorney General consultant, responded to member questions.

The motion carried.

Without objection, the meeting adjourned at 10:18 a.m.

Respectfully submitted:

Kristy Paddack, Secretary

Richard Stavneak, Director

Senator John Kavanagh, Chairman

NOTE: A full audio recording of this meeting is available at the JLBC Staff Office, 1716 W. Adams. A full video recording of this meeting is available at http://www.azleg.gov/jlbc/meeting.htm

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

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DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Josh Hope, Fiscal Analyst JH

SUBJECT: Arizona Department of Environmental Quality - Review of Vehicle Emissions Contract Modifications

**Request**

Pursuant to A.R.S. § 49-545, the Arizona Department of Environmental Quality (ADEQ) has requested Committee review of modifications to the existing Vehicle Emissions Inspection (VEI) contract with Gordon Darby Arizona Testing, Inc. ADEQ is seeking retroactive review of contract modifications to:

- Restore the Voluntary Vehicle Repair and Retrofit Program (VVRRP);
- Adjust staffing and scope of work requirements; and
- Prohibit the vendor from participating in a boycott of Israel, in compliance with state statute.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

Under either option, the Committee may consider the following provision:

A. ADEQ shall report to the Committee by May 15, 2018 on how they will revise procedures to ensure timely submissions to the Committee for all JLBC requirements.

(Continued)

**Key Points**

1) ADEQ and Gordon Darby modified the vehicle emissions contract between January 2017 and March 2018 in 3 areas:
   A) Restoring the Voluntary Vehicle Repair and Retrofit Program;
   B) Adjusting staffing and scope of work requirements; and
   C) Complying with international boycott prohibitions.
2) ADEQ did not seek JLBC review prior to implementing the contract amendments.
3) The contract adjustments have a total non-General Fund fiscal impact of $1.0 million.

**Analysis**

Pursuant to federal law, ADEQ has operated a VEI program in the Metropolitan Phoenix and Tucson areas through a contract with a private vendor. A.R.S. § 49-545G states that any proposed modification or amendment to the contract is subject to prior review by the Committee. In this request, ADEQ is seeking retroactive review of contract modifications made between January 2017 and March 2018.

Pursuant to A.R.S. § 49-474.03, Maricopa and Pima Counties are required to operate and administer a VVRRP. The counties are required to coordinate the program with ADEQ and the Arizona Department of Transportation. ADEQ operates the program on the counties' behalf. Moreover, statute allows counties to contract with an independent contractor to develop the program.

Between July 2000 and June 2009, VVRRP received state funding. ADEQ provided grants to Maricopa and Pima Counties for their VVRRPs. The state VVRRP was inactive from FY 2010 through FY 2017 because of legislative fund sweeps from FY 2009 to FY 2012 and in FY 2016. The program was partially resumed by Maricopa County from July 1, 2009 through August 30, 2012 using Federal Funds.

The Voluntary Vehicle Repair and Retrofit Program Fund receives approximately $1.0 million annually from $10 registration fees for diesel vehicles weighing more than 8,500 pounds. As of April 6, 2018, the fund had a balance of $4.1 million.

ADEQ and Gordon Darby have modified the contract in 3 areas:

*Voluntary Vehicle Repair and Retrofit Program*: ADEQ and Gordon Darby amended the contract to restore the VVRRP. Under the direction of Maricopa and Pima Counties, ADEQ restored VVRRP in 2 phases:

- In Phase I, Gordon Darby completed the printing of 3,000 pre-qualification checklists and 3,000 VVRRP applications. ADEQ reimbursed the vendor $3,000 in associated printing costs. The contract allowed ADEQ to reimburse the vendor up to $3,000. The VVRRP Fund paid for these costs.

- Phase II required Gordon Darby to develop software within 6 months of program restoration to be used in emissions test lanes to automate test results and the collection of emissions test data. The contract allowed ADEQ to reimburse Gordon Darby up to $31,250 for software development. The VVRRP Fund will be responsible for these costs.

(Continued)

The VVRRP provides owners of eligible vehicles money to offset the cost of repairs toward passing emissions testing after an initial failure. Program participants pay the first $150 in repairs while ADEQ will pay up to $550 the for the repair of gasoline vehicles or up to $1,000 for the repair of heavy duty diesel vehicles. ADEQ has pre-screened participating repair facilities with a track record of at least a 90% pass rate for first-time post-repair emissions inspections so customers can easily find a repair facility.

The effective date of this amendment was May 25, 2017 and has a cost of $1.0 million annually. All repair expenses are paid from the VVRRP Fund. This amendment has not been fully implemented, because the software development has not yet been completed.

*Staffing and Scope of Work Requirements:* ADEQ and Gordon Darby amended the contract to allow Gordon Darby to open a full-service lane with 1 inspector instead of the previous requirement of 2 inspectors. Gordon Darby may allow an inspector to act as a floater to assist in processing vehicles in multiple full-service lanes. Additionally, the contract gives ADEQ discretion to choose whether or not the contractor is required to display current wait times on its website and at its locations.

ADEQ's rationale for not requiring the vendor to display wait times is that the LED signs at testing stations should be used to display a variety of relevant information. For example, a sign may be used to inform drivers that their vehicle will fail the test if their check engine light is on. Moreover, ADEQ believes the displayed wait times online are not accurate. ADEQ has been working on developing a new formula for calculating wait times. The agency hopes to implement this in its next VEI contract change.

This amendment also makes Gordon Darby liable for any expenses resulting from an erroneous determination that a vehicle qualifies for the VVRRP.

ADEQ has not provided the fiscal impact of this amendment. The effective date of this amendment was March 6, 2018 but has not been fully implemented. ADEQ has indicated that the lane staffing changes will not be implemented by Gordon Darby until after ADEQ provides them with a notice to move forward. ADEQ indicated that the lane staffing changes will not be implemented until after it has concluded further analysis of safety measures and has presented to JLBC.

*Israel Boycott*: ADEQ and Gordon Darby amended the contract to comply with A.R.S. § 35-393.01, which was added by Laws 2016, Chapter 46 and prohibits vendors from participating in a boycott of Israel. The effective date of this amendment was January 20, 2017. This amendment has no fiscal impact. This amendment has been fully implemented.

Future JLBC Reports

ADEQ indicated it has revised internal processes to ensure timely submissions of VEI contract changes to the Committee. ADEQ's new internal procedures for VEI contract changes now include steps that require ADEQ to find out when the next JLBC meeting date is and request JLBC review before a contract can be finalized. The Committee may consider a provision that ADEQ report to the Committee on how they will revise procedures so that all ADEQ items that require a submission to JLBC will be submitted in a timely manner.

JH:kp

# ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Douglas A. Ducey
Governor

Misael Cabrera
Director


March 28, 2018

The Honorable John Kavanagh, Chairman
Joint Legislative Budget Committee
Arizona House of Representatives
1700 West Washington Street
Phoenix, Arizona 85007

Re: Review of Vehicle Emissions Contract Amendment

Dear Representative Kavanagh:

A.R.S. §49-545(G) requires the Arizona Department of Environmental Quality (ADEQ) to seek review of any proposed modification or amendment to the Vehicle Emissions Inspection (VEI) contract to the Joint Legislative Budget Committee (JLBC). ADEQ overlooked this requirement. We sincerely apologize for this oversight. Our internal procedures have been updated to prevent this in the future.

We now seek review of the following amendments which have been executed by ADEQ and Gordon Darby Testing, Inc. (GDAT).

- Amendment 3 was executed to ensure compliance with A.R.S. §35-393.01.
- Amendment 4 executes the implementation of the Voluntary Vehicle Repair Program (VVRP) authorized in A.R.S. §49-474.03. The VVRP provides assistance to repair polluting vehicles and accounts for measureable reductions in harmful air pollutants. By working with Gordon Darby in partnership with Counties, we are able to reduce administrative costs and repair even more cars, thereby further decreasing pollutants being released into the air by vehicles. To date, the VVRP has prevented 23.791 tons of excessive vehicle emissions.
- Amendment 5 is a change related to mandatory staffing in VEI lanes and includes VVRP conforming changes. This will reduce the cost of the VEI program and allow more flexibility for staffing emissions testing stations.

The enclosed modifications display the changes to the Scope of Work within the contract. We are willing to offer any additional information as necessary.

Sincerely,

Misael Cabrera, P.E.
Director

**Main Office**
1110 W. Washington Street • Phoenix, AZ 85007
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**Southern Regional Office**
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# Contract Amendment

AZ DEPARTMENT OF ENVIRONMENTAL QUALITY
1110 W. Washington Street
Phoenix, AZ 85007

CONTRACT NO.: ADEQ14-052318

AMENDMENT NO.: 3



| CONTRACTOR: | STATE AGENCY: |
|---|---|
| Gordon-Darby Arizona Testing, Inc.<br>3001 S. 35th Street, Suite #4<br>Phoenix, AZ 85034 | Arizona Department of Environmental Quality<br>1110 W. Washington Street<br>Phoenix, AZ |
| **TITLE:** Arizona Vehicle Emission Program<br>**CONTACT:** Joe Campanella<br>**PHONE:** (602) 437-8041<br>**EMAIL:** campanella.j@gordon-darby.com | **CONTACT:** Susan Holt<br>**PHONE:** (602) 771-4256<br>**EMAIL:** holt.susan@azdeq.gov |

In accordance with contract terms Amendments, this contract is hereby amended as follows:

1. To ensure compliance with A.R.S. §35-393.01 this amendment must be completed and returned along with any supporting information to assist the State in making its determination of compliance.

As defined by A.R.S. §35-393.01:

1. "Boycott" means engaging in a refusal to deal, terminating business activities or performing other actions that are intended to limit commercial relations with Israel or with persons or entities doing business in Israel or in territories controlled by Israel, if those actions are taken either:
   (a) In compliance with or adherence to calls for a boycott of Israel other than those boycotts to which 50 United States Code section 4607(c) applies.
   (b) In a manner that discriminates on the basis of nationality, national origin or religion and that is not based on a valid business reason.
2. "Company" means a sole proprietorship, organization, association, corporation, partnership, joint venture, limited partnership, limited liability partnership, limited liability company or other entity or business association, and includes a wholly owned subsidiary, majority-owned subsidiary, parent company or affiliate.
3. "Direct holdings" means all publicly traded securities of a company that are held directly by the state treasurer or a retirement system in an actively managed account or fund in which the retirement system owns all shares or interests.
4. "Indirect holdings" means all securities of a company that are held in an account or fund, including a mutual fund, that is managed by one or more persons who are not employed by the state treasurer or a retirement system, if the state treasurer or retirement system owns shares or interests either:
   (a) together with other investors that are not subject to this section.
   (b) that are held in an index fund.
5. "Public entity" means this State, a political subdivision of this STATE or an agency, board, commission or department of this state or a political subdivision of this state.
6. "Public fund" means the state treasurer or a retirement system.
7. "Restricted companies" means companies that boycott Israel.
8. "Retirement system" means a retirement plan or system that is established by or pursuant to title 38.

**All Contractors must select one of the following:**

√ My company **does not** participate in, and agrees not to participate in during the term of the contract a boycott of Israel in accordance with A.R.S. §35-393.01.

_____ My company **does** participate in a boycott of Israel as defined by A.R.S. §35-393.01. :

By submitting this response, Contractor agrees to indemnify and hold the State, its agents and employees, harmless from any claims or causes of action relating to the State's action based upon reliance on the above representations, including the payment of all costs and attorney fees incurred by the State in defending such an action.

All other provisions of the contract shall remain in their entirety.

| This Contract Amendment is not binding against the State of Arizona unless signed by an authorized representative of the Contractor and then accepted in writing by an authorized representative of the State. | |
|---|---|
| CONTRACTOR HEREBY ACKNOWLEDGES RECEIPT AND UNDERSTANDING OF THE ABOVE AMENDMENT. | THE ABOVE REFERENCED CONTRACT AMENDMENT IS HEREBY EXECUTED THIS DATE BY THE STATE. |
| Joseph Cinnamella 01/26/2017<br>SIGNATURE DATE | Susan Holt January 20, 2017<br>SIGNATURE DATE |
| Joseph Cinnamella, Program Manager<br>PRINTED/TYPED NAME AND TITLE | Susan Holt, Senior Procurement Specialist<br>TYPED NAME AND TITLE |

# CONTRACT AMENDMENT

| | | |
|---|---|---|
| CONTRACT NO.:<br>AMENDMENT NO.:<br>TITLE:<br>CONTRACTOR: | ADEQ14-052318<br>4<br>Arizona Vehicle Emission Program<br>Gordon Darby Arizona Testing, Inc. | ADEQ PROCUREMENT<br>1110 W. Washington Street<br>Phoenix, AZ 85007<br>602-771-4776 |

**This contract is hereby amended to add the Voluntary Vehicle Repair Program (VVRP) as authorized by ARS 49- 474.03 to the original Scope Of Work (SOW). The VVRP program will be implemented via two phases:**

**Phase I**

1.0 Phase I will be implemented by Gordon Darby Arizona Testing (GDAT) within 45 days after the last signature of this contract amendment.

2.0 GDAT will complete the printing of the following items required for the VVRP:

a. Pre-Qualification checklists
b. VVRP Applications.

3.0 ADEQ will be responsible for all printing costs. Printing Costs for ADEQ are not expected to exceed $3000.00 annually as outlined below. GDAT will source the printing and secure ADEQ approval for costs exceeding $3000.00 ADEQ will reimburse GDAT for approved printing costs.

| Items | Qty. | Annual Cost |
|---|---|---|
| Pre-Qualification Checklist | 3000 | $1,500.00 |
| VVRP Application | 3000 | $1,500.00 |
| | | |
| Total: | | $3,000.00 |

4.0 **Non On-Board Diagnostic (OBD) Procedures:**

4.1 For vehicles that fail their initial emissions test, GDAT staff may inform the customer of the option to participate in the VVRP.

4.2 GDAT Staff review the Pre-qualification/Approval Checklist with the eligible customers. Customers can verify they meet the registration requirements listed on the Pre-Qualification checklist by signing the bottom of the checklist.

4.3 Once a vehicle is qualified to participate, GDAT staff will provide a list of participating ADEQ-authorized Voluntary Vehicle Repair Program Facilities (VVRPF's). The list of participating VVRPF's will be provided by ADEQ and updated periodically (nominally monthly).

4.4 GDAT Staff will make a copy of the Pre-Qualification/Approval checklist after the applicable information is provided by the customer. GDAT Staff will provide a copy to the customer and retain the original.

4.5 GDAT Staff will enter the vehicle information on to the VVRP Tracking spreadsheet.

4.6 After qualified vehicle repairs have been performed by a VVRPF of the customer's choosing, the vehicle is required to be returned to a GDAT Waiver Facility for re-inspection. The GDAT Waiver Staff will inspect the vehicle and verify the repairs match the repair receipts. GDAT Waiver Staff will also make copies of receipts as reference for possible future reimbursement to the VVRPF.

4.7 Upon completion of step 4.6, the vehicle will be moved to a regular testing lane at a GDAT Waiver Facility, and an applicable tailpipe/opacity test will be performed.

4.8 If the vehicle passes the applicable tail pipe/opacity test, GDAT will transmit the VIR test results to the participating VVRPF via e-mail. If the vehicle fails the applicable tail pipe/opacity test, it will need to have additional repairs made and return for another retest until it has passed.

4.9 Upon passing the inspection, GDAT will be billed by the VVRPF per the approved invoiced repairs, up to the VVRP maximum.

4.10 GDAT will reimburse the VVRPF's for passing inspections, within 7-10 business days, upon receipt of invoice and any other required documentation.

4.11 GDAT will invoice ADEQ on a monthly basis at a rate of $40.00 per every vehicle that passes retest (per 4.6, 4.7 and 4.8 above) and invoice for all vehicle repair reimbursements made to VVRPF's during the previous month.

**5.0 On-Board Diagnostic (OBD) Procedures:**

5.1 For vehicles that fail their initial emissions test, GDAT Staff may inform the customer of the option to participate in the VVRP.

5.2 GDAT Staff review the Pre-qualification/Approval Checklist with the eligible customers. Customers can verify they meet the registration requirements listed on the Pre-Qualification/Approval checklist by signing the bottom of the checklist.

5.3 Once a vehicle is qualified to participate, GDAT Staff will provide a list of participating ADEQ-authorized Voluntary Vehicle Repair Program Facilities (VVRPF's). The list of participating VVRPF's will be provided by ADEQ and updated periodically (nominally monthly).

5.4 GDAT Staff will make a copy of the Pre-Qualification/Approval checklist after the applicable information is provided by the customer. GDAT Staff will provide a copy to the customer and retain the original.

5.5 GDAT Staff will enter the vehicle information on to the VVRP Tracking spreadsheet.

5.6 Customers that agree to participate will be directed to a GDAT Waiver Facility to receive pre-repair tailpipe measurements prior to visiting a participating VVRPF.

5.7 GDAT's Waiver Staff will collect tail pipe measurements from the vehicle and record the measurements for comparison to the post-repair measurements.

5.8 After GDAT Waiver Staff have collected and recorded the pre-repair tailpipe measurements, the customer will be directed to visit one of the participating VVRPF's of the customers choosing. (As described in 5.3.)

5.9 After qualified vehicle repairs have been performed by a VVRPF, the vehicle is required to be returned to a GDAT Waiver Facility for re-inspection. GDAT Waiver Staff will inspect the vehicle and verify the repairs match the repair receipts. GDAT Waiver Staff will also make copies of receipts as reference for possible future reimbursement to the VVRPF.

5.10 GDAT's Waiver Staff will collect and record post-repair tailpipe measurements from the vehicle.

5.11 Upon completion of step 5.10, the vehicle will be moved to a regular testing lane at a GDAT Waiver Facility, and an OBD test will be performed.

5.12 If the vehicle passes the OBD test, GDAT will transmit the VIR test results to the participating VVRPF via e-mail. If the vehicle fails the OBD test, it will need to have additional repairs made and return for another retest until it has passed.

5.13 GDAT will reimburse the VVRPF's for passing inspections, within 7-10 business days, upon receipt of invoice and any other required documentation.

5.14 GDAT will invoice ADEQ on a monthly basis at a rate of $40.00 per every vehicle that passes retest (per 5.9, 5.10, 5.11 and 5.12 above) and invoice for all vehicle repair reimbursements made to VRPF's during the previous month.

**Phase II**

6.0 Within six months of implementing the VVRP, or a mutually agreed upon timeframe with ADEQ if more changes are required than were originally anticipated, GDAT will develop software to be used in emission test lanes to automate test results, and the collection of emission test data.

7.0 The software development for the VVRP will incur a "one time" cost of $31,250.00, or a mutually agreed upon amount with ADEQ if changes are above what was originally assumed, as calculated below:

| Tasks | Hrly Rate | Hours | Total $ |
|---|---|---|---|
| Waiver lane VVRP software modifications | $125.00 | 130 | $16,250.00 |
| Lane software modifications | $125.00 | 40 | $5,000.00 |
| Portal reporting | $125.00 | 40 | $5,000.00 |
| System development testing | $125.00 | 32 | $4,000.00 |
| Software development | $125.00 | 8 | $1,000.00 |
| | | | $31,250.00 |

8.0 Change in scope - As noted in 5.0 and 6.0, any changes to the currently defined automation would be reviewed with ADEQ prior to development of the finalized software.

**9.0 GDAT Waiver Lane Certification Requirements:**

9.1 GDAT Waiver Staff will inspect and verify repairs that have been performed by the participating VVRPF's.

*The required certification criteria to perform the inspection and verification of repairs is as follows:*

9.1.1 GDAT IM-147 certification (Area A).

9.1.2 Completion of a waiver lane certification training class.

9.1.3 Demonstrated proficiency on how to identify valid repair receipts, estimates and completed repairs on all makes and models of vehicles that have failed the Arizona State emissions test.

9.1.4 Passed a Vehicle Emissions Inspection Program waiver lane certification test with a score of 80% or better.

**10.0 Emissions Hotline:**

10.1 GDAT will utilize the Emissions Hotline to both educate and answer basic questions of customer inquiries for the VVRP.

**11.0 VVRP Application and Waiver Inspection Days of Operations:**

11.1 VVRP Applications will be reviewed and accepted Monday through Friday 8:00 AM to 5:00 PM to coincide with ADEQ's days of operations.

11.2 Waiver Pre-repair and Post-repair inspections will be performed Monday through Friday, 8:00 AM through 4:30 PM to coincide with the Waiver lanes operations.

12.0 All other Terms and Conditions of the contract remain unchanged.

| GORDON DARBY ARIZONA TESTING | ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY |
|---|---|
| **The Contractor hereby acknowledges receipt and understanding of the above Amendment.** | **The above referenced contract Amendment is hereby executed this day at Phoenix, Arizona.** |
| Signature of Authorized Individual (Date) 5/24/17 | 25 Day of May 2017 |
| Typed or Printed Name and Title | Teena Zeigler<br>Chief Procurement Officer |

Form approved by CPO, Version 08/17/2015

# CONTRACT AMENDMENT

| | |
|---|---|
| CONTRACT NO.: | ADEQ14-052318 |
| AMENDMENT NO.: | 5 |
| TITLE: | Arizona Vehicle Emission Program |
| CONTRACTOR: | Gordon Darby Arizona Testing, Inc. |

ADEQ PROCUREMENT
1110 W. Washington Street
Phoenix, AZ 85007
602-771-4776

This Amendment No. 5 to the Contract Between the Arizona Department of Environmental Quality ("ADEQ") and Gordon-Darby Arizona Testing,Inc ("GDAT"), for the Vehicle Emissions Inspection Program Contract (the "Contract") is entered into by and between ADEQ and GDAT.

**Whereas,** ADEQ and GDAT desire to make certain changes to the inspection requirements, either upon execution of this amendment or upon future notice by ADEQ to GDAT.

**1. Order of Precedence**

This amendment takes precedence over prior amendments, GDAT's Best and Final Offer (BAFO), and the Request for Proposal (RFP). Where this amendment alters SOW requirements, then references in GDAT's BAFO to addressing those requirements are modified by inference.

**2. Lane Staffing**

This amendment modifies the contract to allow GDAT to open a full-service lane with one inspector. Additionally, GDAT may allow an inspector in position two to act as a floater and assist in processing vehicles in both second positions of adjacent Full-Service lanes. The following conforming changes are made to the BAFO and RFP.

**2.1 Amend RFP Section 2.5.10.1.**

Delete the sentence "All testing shall require at least two employees assigned to that position during the performance of the test, except OBD and gas cap testing."

**2.2 Amend Section 13.2.1.3.1. Amend the second full paragraph in the BAFO on page 13-153.**

The paragraph currently reads - "Each station is fully staffed during expected peak periods. Area A full staffing includes one Station Manager, one Assistant Station Manager, one Technical Advisor, two inspectors per full-service lane with rover inspector(s) to assist where needed. Depending on testing volume, one or two inspectors are staffed for OBD-only lanes"

This amendment modifies the paragraph to read - "Each station is fully staffed during expected peak periods. Full staffing includes one Station Manager, one Assistant Station Manager, one Technical Advisor, one inspector per lane with rover inspector(s) to assist where needed."

**2.3 Amend Section 13.2.1.3.1. Delete the third full paragraph in the BAFO on page 13-153.**

The paragraph currently reads – "Area B full staffing includes one Station Manager, one Assistant Station Manager, one Technical Advisor, two inspectors per full-service lane with rover inspector(s) to assist where needed. Depending on testing volume, one or two inspectors are staffed for OBD-only lanes."

This amendment deletes that paragraph.

**2.4 Amend section 13.2.5.12 on page 13-210 of the BAFO.**

The second full paragraph in this section currently reads – "Each station is fully staffed during expected peak periods. In Area A, full staffing includes one Station Manager, one Assistant Station Manager, one Technical Advisor, two inspectors per full-service lane with rover inspector(s) to assist where needed. Depending on testing volume, one or two inspectors are staffed for OBD-only lanes. In Area B, full staffing includes one Station Manager, one Assistant Station Manager, one Technical Advisor, two inspectors per full-service lane with rover inspector(s) to assist where needed. Depending on testing volume, one or two inspectors are staffed for OBD-only lanes. For completeness, all GDAT operational job classifications (including non-inspection station staff), are listed in Table 13-3."

This amendment modifies the paragraph to read – "Each station is fully staffed during expected peak periods. Full staffing includes one station manager, one assistant station manager, one technical advisor, one inspector per lane with rover inspector(s) to assist where needed. For completeness, all GDAT operational job classifications (including non-inspection station staff), are listed in Table 13-3."

**2.5 Additional "catch all" staffing amendment.**

Both parties agree that when executed, this amendment changes definition of "full staffing" to be the one station manager, one assistant station manager, one technical advisor, and one inspector per lane with rover inspector(s) to assist where needed.

**2.6 Add waiver lane clarification.**

The amendment establishes staffing requirements for the waiver lane. Waiver lane staffing shall consist of two qualified waiver inspectors. Waiver lane staff may assist in the regular test lanes as a rover inspector when they are not processing vehicles in the waiver lane. Waiver qualified inspectors have the priority of assisting customers in the waiver lane.

The requirement of staffing two waiver qualified inspectors in the waiver lane is made with the understanding that staff members may take breaks, miss work with illness, etc. ADEQ understands that there may be times when two inspectors have been scheduled but there is only one physically in the lane.

**3. Wait Time Display.**

**3.1 Amend RFP section 4.2.3.**

The amendment replaces "shall" with "may" in the following sentence: The image feed ~~shall~~ *may* be displayed on the Contractor's wait time monitoring Web site.

**3.2 Amend RFP Section 2.3.10.5.**

This amendment modifies the following sentence as follows: The Contractor shall provide, as a part of the station signage, a programmable electronic information message display, showing ~~current wait time,~~ alternate locations, days and hours of operation and other pertinent messages. *The current wait time shall be displayed at the direction of ADEQ.*

**4. Inspection Fee Deposits.**

4.1 **Amend the following sentence in GDAT's BAFO Section 13.2.5.2.2**

This amendment modifies the following sentence by removing the word "twice": Station management will document the receipts and enter this information into the daily deposit system and make bank deposits of the receipts at least ~~twice~~ daily.

**4.2 Amend the following sentence in GDAT's BAFO Section 13.2.5.45**

This amendment modifies the following sentence by removing the word "twice": We have developed a proven security system for money handling in the program that includes the secure depositing of funds and daily fee reconciliations. As noted in the previous subsection, one aspect of this system is ~~twice~~ daily bank deposits.

**5. Waiver Training.**

ADEQ wishes to transfer primary waiver training to GDAT.

**5.1 Amend RFP Section 2.5.31.4**

The amendment modifies the following sentence by replacing "shall" with "may": Additional training for TAs and Waiver/Referee staff ~~shall~~ *may* be provided by ADEQ.

**5.2 Amend RFP Section 2.3.18.2**

The amendment modifies the following sentence by replacing "will" with "may" in the following sentence: The Contractor shall staff the Waiver/Referee lanes with specially trained technicians who ~~will~~ *may* undergo additional training by ADEQ for the identification and dissolution of waiver issues.

**6. Burden Shifting for Voluntary Vehicle Repair and Retrofit Program(VVRP).**

The relationship between the GDAT and ADEQ in regards to the Voluntary Vehicle Repair and Retrofit program was established in Contract Amendment 4 to Contract No. ADEQ14-052318. The amendment establishes additional terms to that relationship.

**6.1 Responsibility for vehicles that are repaired but don't meet the requirements of the VVRP.**

In order for a vehicle to qualify for the VVRP, it must meet a set of statutory requirements that are memorialized in the Pre-Qualification Checklist. These requirements are reproduced here for convenience.

1. Vehicle is functionally operational.
2. Vehicle is titled in the State of Arizona.
3. Vehicle has taken and failed an emissions inspection test as required.
4. Vehicle has been registered during the immediately preceding 12 months and has not been unregistered for more than 60 days.
5. Vehicle being repaired is at least 12 years older than current calendar year.
6. Vehicle is required to take the emissions inspection test:
    1. Pass the equipment portion; and
    2. Fail the emissions (tailpipe) portion.
7. The owner shall apply to the program not more than 60 days after failing the test.
8. The emission control system has not been:
    1. Tampered with;
    2. Removed or disabled, in whole or in part.
9. The vehicle will be taken to a participating repair facility:
    1. A list of repair facilities will be given out after vehicle is qualified;
    2. OBD vehicles will get list after pre-repair emissions test at a waiver lane.
10. If qualified, the owner of the vehicle agrees to participate in the program.

This amendment establishes a course of performance between GDAT and ADEQ. In the event that GDAT makes an erroneous determination that a vehicle will qualify for the VVRP, GDAT agrees to pay the state's portion of the vehicle repairs and hold ADEQ, Maricopa County, and Pima County harmless for any injuries, damages, claims, costs, and expenses arising out the erroneously admitted vehicles participation in the VVRP. This amendment applies only to erroneous determinations of vehicle eligibility for the VVRP. If GDAT makes a correct determination, but the customer does not complete the requirements to receive reimbursement, the customer shall be responsible for the full cost of repairs.

| GORDON DARBY ARIZONA TESTING | ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY |
|---|---|
| The Contractor hereby acknowledges receipt and understanding of the above Amendment. | The above referenced contract Amendment is hereby executed this day at Phoenix, Arizona. |
| Joseph Campanella<br>Signature of Authorized Individual | |
| (Date) March 06, 2018 | 6th Day of March 2018 |
| Typed or Printed Name and Title<br>Joseph Campanella, Program Manager | Dale Daniels<br>Senior Procurement Officer |

2A

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Patrick Moran, Senior Fiscal Analyst PM

SUBJECT: Department of Child Safety - Review of Line Item Transfers

**Request**

Pursuant to footnotes in the FY 2017 General Appropriation Act (Laws 2016, Chapter 117) and the FY 2018 General Appropriation Act (Laws 2017, Chapter 305), the Department of Child Safety (DCS) is requesting Committee review for the following line item transfers:

General Fund (FY 2018)
- $7,680,000 into the Adoption Services line item.
- $(6,500,000) out of the Foster Care Placement line item.
- $(680,000) out of the Independent Living line item.
- $(500,000) out of the Permanent Guardianship line item.

Expenditure Authority (FY 2018)
- $1,500,000 into the In-Home Mitigation line item.
- $(1,500,000) out of the Out-of-Home Support Services line item.

Expenditure Authority (FY 2017)
- $100,000 into the Emergency and Residential Placement line item.
- $(100,000) out of the Foster Care Placement line item.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

(Continued)

**Key Points**

1) DCS is requesting a $7.7 million General Fund transfer into the Adoption Services line item in FY 2018 to address higher-than-budgeted caseload growth in FY 2018 and offset costs of growth in FY 2019.
2) Most of the transfer would be financed from reductions in Foster Home Placement expenditures associated with declining out-of-home caseloads.
3) The department is also requesting an Expenditure Authority transfer of $1.5 million into In-Home mitigation from Out-of-Home Support Services to use federal IV-E waiver dollars on in-home services.

**Analysis**

General Fund Transfers

The Adoption Services line provides funding for ongoing subsidies, one-time legal expenses, and home recruitment expenses associated with children exiting out-of-home care for permanent adoptive families. The enacted FY 2018 budget included $78.0 million from the General Fund ($245.5 million Total Funds) for Adoption Services. DCS is forecasting that actual costs in FY 2018 will be $82.0 million from the General Fund ($251.1 million Total Funds) due to 10.8% year-to-date caseload growth, resulting in a net General Fund shortfall of $(4.0) million and a Total Funds shortfall of $(5.6) million.

DCS is requesting Committee review of a $7.7 million General Fund transfer into the Adoption Services line item to address the shortfall. This amount would eliminate the $(4.0) million General Fund shortfall, and would allow DCS to reduce its expenditures of one-time cash balances from federal adoption incentive payments by $(3.7) million in FY 2018. The $3.7 million balance would then be available to reduce the costs of caseload growth in the Adoption program in FY 2019.

As shown in *Table 1,* the $7.7 million transfer into adoption would be financed from transfers out of Foster Care Placement ($6.5 million), Independent Living Maintenance ($680,000), and Permanent Guardianship ($500,000). Each of these lines has General Fund surpluses due to lower-than-budgeted caseloads. Foster Care Placement, which funds subsidies to licensed foster families, and Independent Living Maintenance, which provides subsidies to children living independently that have or are expected to turn 18 while in state custody, have each had year-to-date caseload declines of (8.2)%. Permanent Guardianship caseloads are 2.3% above last year, but are still below the budgeted amount due to prior year surpluses.

**Table 1**

**DCS FY 2018 General Fund Transfers**

| | FY 2018 Appropriation | Proposed April Transfers | Final FY 2018 Appropriation |
|---|---|---|---|
| Foster Care Placement | $ 30,187,500 | $ (6,500,000) | $ 23,687,500 |
| Independent Living Maintenance | 2,969,300 | (680,000) | 2,289,300 |
| Adoption Services | 77,965,800 | 7,680,000 | 85,645,800 |
| Permanent Guardianship | 10,573,900 | (500,000) | 10,073,900 |
| **Total** | **$ 121,696,500** | **$ -** | **$ 121,696,500** |

(Continued)

Expenditure Authority Transfers

DCS is requesting Committee review to transfer Expenditure Authority of $1.5 million into In-Home Mitigation from the Out-of-Home Support Services line item. This transfer will permit DCS to expend IV-E waiver monies on additional in-home support services.

DCS is also requesting review to retroactively transfer $100,000 of Expenditure Authority funds to Emergency and Residential Placement from Foster Care Placement for a technical adjustment associated with federal IV-E funds in FY 2017. The department is transferring monies for FY 2017 after the fiscal year has ended primarily because the department incurred costs in FY 2017 that in some cases are not claimed until months after the end of the fiscal year. The department reports that it typically takes close to a year to fully close out all claims from the prior fiscal year.

PM:kp

DEPARTMENT OF CHILD SAFETY
STATE OF ARIZONA

*Arizona Department of Child Safety*

**Douglas A. Ducey**
Governor

**Gregory McKay**
Director

March 28, 2018


The Honorable David Livingston
Chairman, Joint Legislative Budget Committee
1700 West Washington
Phoenix, Arizona 85007

Re: Appropriation Transfer Request

Dear Representative Livingston:

The Department requests to be placed on the Joint Legislative Budget Committee agenda for both the General Fund and Expenditure Authority appropriation transfer requests below:

*Summary of Requested Appropriation Transfers for FY18*

| Special Line Item | General Fund (in $1,000) | Expenditure Authority (in $1,000) |
|---|---|---|
| Adoption Services | $7,680.0 | |
| Permanent Guardianship | ($500.0) | |
| Independent Living | (680.0) | |
| Foster Care | ($6,500.0) | |
| In Home Mitigation | $0.0 | $1,500.0 |
| Out-of-Home Services | $0.0 | ($1,500.0) |
| **TOTAL** | **$ 0.0** | **$0.0** |

*Summary of Requested Appropriation Transfers for FY17*

| Special Line Item | General Fund (in $1,000) | Expenditure Authority (in $1,000) |
|---|---|---|
| Emergency & Residential Placement | $0.0 | $100.00 |
| Foster Care | $0.0 | ($100.00) |
| **TOTAL** | **$ 0.0** | **$0.0** |

*General Fund Appropriation Requests – FY18*

Pursuant to Laws 2017, First Regular Session, Chapter 305, Section 19, the amount appropriated for any line item may not be transferred to another line item or the operating budget unless the transfer is review by the joint legislative budget committee. The Department requests that the committee review the following General Fund (GF) transfer requests:

- Adoption Services: The Department requests a total of $7.680 Million GF to be transferred from Foster Care, Independent Living Maintenance and Permanent Guardianship line items into Adoption Services line item.

| Special Line Item | General Fund (in $1,000) |
|---|---|
| Adoption Services | $7,680.0 |
| Permanent Guardianship | ($500.0) |
| Independent Living | (680.0) |
| Foster Care | ($6,500.0) |

*Expenditure Authority Appropriation Requests – FY18*

Pursuant to Laws 2017, First Regular Session, Chapter 305, Section 19, the amount appropriated for any line item may not be transferred to another line item or the operating budget unless the transfer is review by the joint legislative budget committee. The Department requests that the committee review the following Expenditure Authority (EA) transfer requests:

- Prevention Services: The Department requests a total of $1.5 Million EA to transferred from Out of Home Services to In-Home Mitigation line item.

| Special Line Item | Expenditure Authority (in $1,000) |
|---|---|
| In-Home Mitigation | $ 1,500.0 |
| Out-of-Home Services | ($1,500.0) |
| **TOTAL** | **$ 0.0** |

*Expenditure Authority Appropriation Requests – FY17*

Pursuant to Laws 2016, Second Regular Session, Chapter 117, Section 24, the amount appropriated for any line item may not be transferred to another line item or the operating budget unless the transfer is review by the joint legislative budget committee. The Department requests that the committee review the following Expenditure Authority (EA) transfer requests:

- Emergency & Residential Placement: The Department requests a total of $100 Thousand EA to transferred from Foster Care to Emergency & Residential Placement line item.

| Special Line Item | Expenditure Authority (in $1,000) |
|---|---|
| Emergency & Residential Placement | $100.00 |
| Foster Care | ($100.00) |
| **TOTAL** | **$ 0.0** |

Sincerely,

For Director McKay

Gregory McKay
Director

Enclosure

cc: John Kavanagh, Arizona State Senate
Matthew Gress Office of Strategic Planning and Budgeting
Richard Stavneak, Joint Legislative Budget Committee
Patrick Moran, Joint Legislative Budget Committee
Sarah Pirzada, Office of Strategic Planning and Budgeting

2B

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Patrick Moran, Senior Fiscal Analyst PM

SUBJECT: Department of Child Safety - Review of FY 2018 Third Quarter Benchmarks

**Request**

The FY 2018 General Appropriation Act (Laws 2017, Chapter 305) requires the Department of Child Safety (DCS) to submit for Committee review a report of quarterly benchmarks for assessing progress made in increasing the department's number of FTE Positions, meeting caseload standards for caseworkers, reducing the number of backlog cases and open reports, and reducing the number of children in out-of-home care.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

**Key Points**

1) DCS has filled 1,316 out of 1,406 funded direct line staff positions (caseworkers and hotline).
2) The department continues to meet its benchmarks for the backlog (less than 1,000 cases) and open reports (less than 8,000).
3) DCS has met the Out-of-Home population benchmark (15,139 children as of January).
4) Caseworker workload continues to be above the caseload standard.

(Continued)

**Analysis**

A FY 2018 General Appropriation Act footnote requires DCS to report on caseworker hiring, caseworker workload, the backlog, the number of open reports, and the number of children in out-of-home care at the end of each quarter.

Filled FTE Positions

*Table 1* outlines DCS' progress in hiring caseworkers by quarter. DCS is funded for 1,406 caseworkers. Compared to last quarter, the total number of direct line staff declined from 1,321 to 1,316, for a net decrease of (5) positions, while the number of case-carrying caseworkers increased by 50 positions. Compared to June, the decline in direct line staff is (29) positions, while the number of case-carrying caseworkers has increased by 32.

The original 1,406 caseworker benchmark presumed 1,190 of these positions would be case-carrying. To achieve the 1,190 hiring level, DCS would need to increase the number of case-carrying caseworkers by 86 positions.

**Table 1**

**Progress in Hiring Caseworkers by Quarter**

| Direct Line Staff Type | Benchmark | June 2017 | Sept. 2017 | Dec. 2017 | March 2018 |
|---|---|---|---|---|---|
| Case-Carrying Caseworkers | 1,190 | 1,072 | 1,038 | 1,054 | 1,104 |
| Caseworkers in Training | 140 | 202 | 227 | 202 | 147 |
| Hotline Staff | 76 | 71 | 68 | 65 | 65 |
| **Total** | **1,406** | **1,345** | **1,333** | **1,321** | **1,316** |

Reducing the Backlog and Open Reports

In June 2014, DCS set benchmarks for reducing the backlog. At the time, there were 13,024 backlog cases. The backlog is defined as non-active cases for which documentation has not been entered into the child welfare automated system for at least 60 days and for which services have not been authorized for at least 60 days. DCS is to have no more than 1,000 backlog cases. DCS' benchmark is also to have fewer than 8,000 open reports, which are either under investigation or awaiting closure by a supervisor. *Table 2* outlines DCS' progress in reducing the backlog and open reports by quarter. As of the third quarter of FY 2018, DCS had 176 backlog cases and 6,087 open reports, continuing to meet both benchmarks.

**Table 2**

**Progress in Reducing the Backlog and Open Reports by Quarter**

| Backlog Cases and Open Reports | Benchmark | June 2017 | Sept. 2017 | Dec. 2017 | March 2018 |
|---|---|---|---|---|---|
| Total Backlog Cases | 1,000 | 354 | 212 | 265 | 176 |
| Total Open Reports | 8,000 | 5,644 | 6,444 | 6,621 | 6,087 |

Out-of-Home Children

DCS' benchmark is to reduce the out-of-home population by (2)% each quarter relative to the out-of-home population as of December 31, 2016. Meeting the benchmark in each quarter would result in an out-of-home population of 15,191 by June 30, 2018. By January 2018, the out-of-home population had already declined to 15,139, below the June 2018 benchmark.

(Continued)

**Table 3**

**Progress in Reducing the Out-of-Home Population**

| | June 2017 | Sept. 2017 | Dec. 2017 | Jan. 2018 | March 2018 | June 2018 |
|---|---|---|---|---|---|---|
| Actual | 16,635 | 15,867 | 15,117 | 15,139 | -- | -- |
| Benchmark 1/ | 16,470 | 16,141 | 15,818 | -- | 15,501 | 15,191 |

1/ Benchmark population represents (2)% quarterly reduction from December 2016 Out-of-Home population of 17,149.

Caseload Standard

DCS established revised caseload goals during the May 2014 Special Session for case-carrying caseworkers. These goals include the following number of cases per worker: 13 for investigations, 33 for in-home cases, and 20 for out-of-home cases. The FY 2018 General Appropriation Act requires DCS to report the caseload for each DCS field office. Estimated caseworker caseload for individual offices can be found on page 6 of DCS' attached submission.

The department previously estimated that, as of December 2017, DCS would need 1,185 caseworkers to meet the caseload standard, but only had 1,030 positions filled at that time, or (155) fewer positions than was required by the standard.

PM:kp

*Arizona Department of Child Safety*

**Douglas A. Ducey**
Governor

**Gregory McKay**
Director


March 30, 2018

The Honorable David Livingston
Chairman, Joint Legislative Budget Committee
Arizona House of Representatives
1700 West Washington
Phoenix, Arizona 85007

Re: Department of Child Safety Quarterly Benchmark Progress Report

Dear Chairman Livingston:

Pursuant to Laws 2016, 2nd Regular Session, Chapter 8, Section 24, the Department submits its report on the progress made increasing the number of filled FTE positions, meeting the caseload standard and reducing the number of backlog cases and out-of-home children for the third quarter of FY 2018.

If you have any questions, please contact our office at (602) 255-2500.

Sincerely,

Gregory McKay
Director

Enclosure

cc: Richard Stavneak, Director, Joint Legislative Budget Committee
Senator John Kavanagh, Chairman, Joint Legislative Budget Committee
Matt Gress, Director, Governor's Office and Strategic Planning and Budgeting
Patrick Moran, Joint Legislative Budget Committee
Sarah Pirzada, Governor's Office and Strategic Planning and Budgeting

# DEPARTMENT OF CHILD SAFETY

**Quarterly Progress Report**
**(Filling FTE Positions and Reducing the Backlog)**
**March 2018**

## PROGRESS MADE IN INCREASING THE NUMBER OF FILLED FTE POSITIONS

The Department of Child Safety (DCS) maintains continuous efforts to reduce turnover in order to sustain sufficient staff resources that provide quality services to the children and families it serves. In state fiscal year 2018 (FY18), one of the Department's strategic objectives is to develop and retain a highly effective workforce that engages the child welfare partners to serve children.

DCS identified several key actions in FY17 and FY18, which were implemented, including realignment of pay structure and job classification for the DCS Specialists, improvements to CORE training curriculum and improving the onboarding experience of all new DCS employees. These enhancements also include the development of general management and leadership skills for supervisors and managers and plans to provide coaching of all case carrying staff and supervisors.

HR recruiters are now carefully reviewing whether an applicant's locale is in close proximity to the office for which they are applying. This will help reduce resignations and transfer requests since previous applicants were assigned without any regard to distance between their home and office of employment.

Learning and Development (formerly known as Child Welfare Training Institute) revised their CORE training schedules to allow DCS Specialists to attend CORE training the day after New Employee Orientation. This eliminated the previous incidences of new hires waiting to attend CORE and being sent to their field office without training.

Learning and Development and HR are partnering to develop a structured learning plan for DCS Specialists when they are in attendance at their assigned office during the seven week CORE training. The new learning plan will require the supervisor to validate completed training.

The stipend student program continues to be successful in hiring. In May 2018, DCS anticipates placing 60 social work graduates in the Maricopa and Pima geographic locations with a two-year employment commitment. In CY 2018, DCS will conduct an analysis of students who have remained with the Department beyond their commitment to develop retention strategies.

HR continues to conduct routine planning and information sharing meetings between Executive management, the Regional Program Administrators and HR Managers to help ensure initiatives are communicated clearly, carried out with accountability and to remain informed about the needs and challenges experienced at local DCS offices.

DCS Human Resources (HR) implemented improvements to its database that tracks DCS Specialist candidates in order to automate certain HR reports by office at all phases of the process. This will enable HR to better identify and assign candidates to local offices. Additionally, HR streamlined the DCS Specialist recruitment application process to have candidates bring their pre-employment paperwork to the interview, which reduced the time it took to send a resume to a hiring manager for consideration from over two weeks to less than 24 hours. This also allows hiring managers to be more selective for retention purposes.

The Department has been sustaining its active recruitment process to fill all Child Safety Specialist positions. As of February 2018, the Department had filled 1,305 (93%) of the 1,406 funded positions. DCS funds 232 supervisor positions, 97% of which are filled. The breakdown of funded supervisor positions by Region and the Hotline are as follows: Hotline-14, Central-69, Pima-50, Northern-23, Southeast-9, Southwest-64 and the Placement Unit-3. The Department is actively recruiting to fill the vacant supervisor positions, which will further reduce the DCS Specialist to supervisor ratio, which is 1:5.8 as of February 2018.

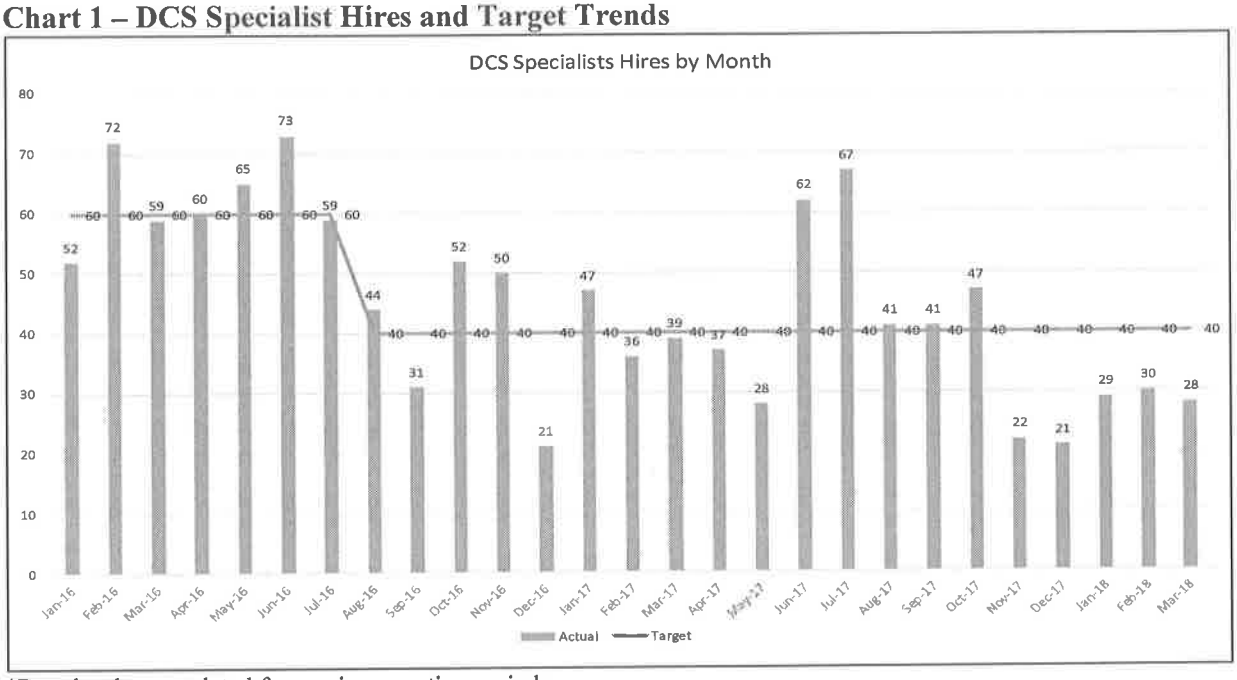
To support DCS Specialists, Supervisors, case aides and other front line staff experiencing secondary trauma, DCS developed and is now implementing a peer-to-peer support program. This program seeks to enhance a healthy workforce, provide staff a safe and supportive environment when coping with the experiences inherent in child welfare and help address burnout staff may experience.

DCS HR continues to strive to achieve a goal of 40 new hires per month; contacting all applicants immediately upon receipt of the initial application, sending recruitment packets via email to speed up the transmission of information, conducting follow up emails or phone calls to applications to obtain missing or incomplete information, scheduling the new hire interview immediately upon receipt of the complete application, and adding an additional staff member to assist in completing background reference checks. To ensure continuous quality assurance, DCS HR implemented consistent monitoring of the number of new hires that leave DCS within the first year to allow future analysis of this information.

The Department continues utilizing the Predictive Index (PI) Behavior Assessment for DCS Specialists candidates since November 2016 as a pilot to establish behavioral requirements for the DCS Specialist position. This helps improve the selection process, identification of the most suitable candidates and improve retention over time. The PI is a reliable resource for predicting performance potential in new hires.

The Department continues its efforts to minimize the overall attrition of all DCS employees. Chart 1 shows the number of DCS Specialist hires for CY 2016 through CY 2018 to date, along with hiring targets. These targets were established against historically observed attrition rates.

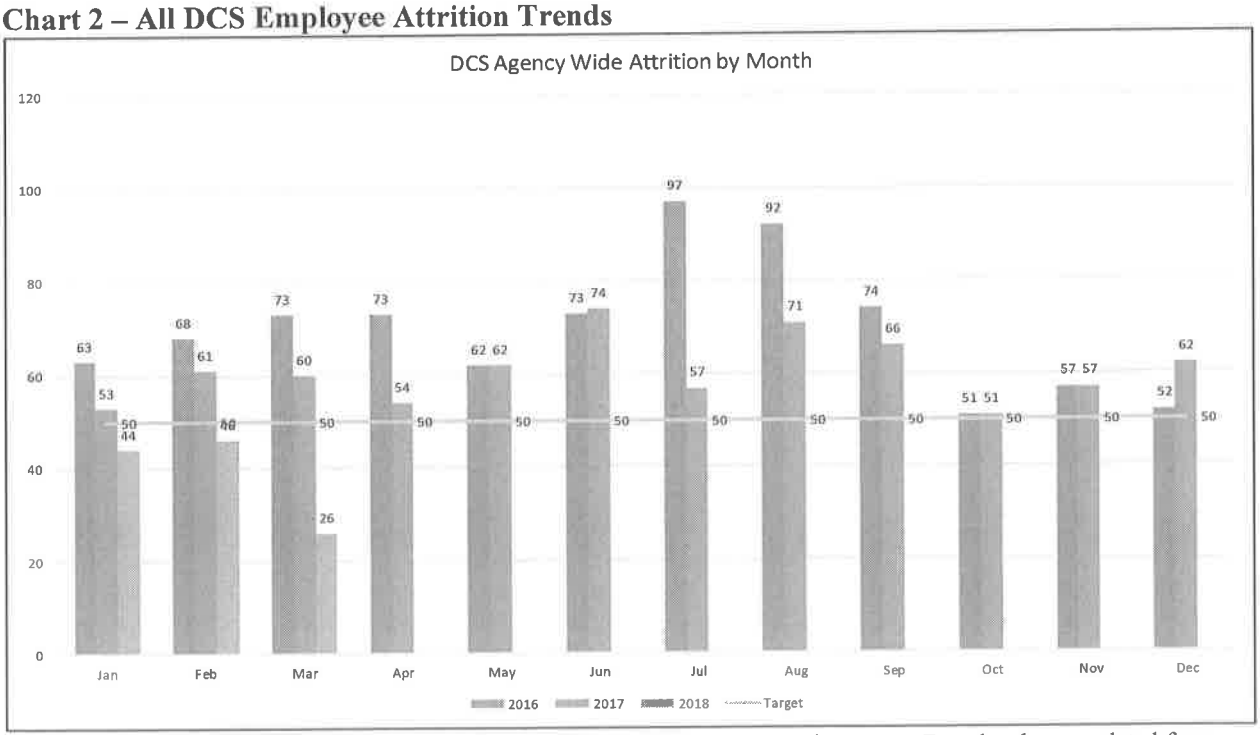
## Chart 1 – DCS Specialist Hires and Target Trends




*Data has been updated from prior reporting periods.

Chart 2 shows the Department's significant improvements in reducing turnover for all DCS employees for CY 2016 through CY 2018 to date.

## Chart 2 – All DCS Employee Attrition Trends




*DCS Employee Attrition for March 2018 will be updated in the next quarterly report. Data has been updated from prior reporting periods.

## PROGRESS MAINTAINING INACTIVE CASES AND IMPROVING CASELOADS

During all of FY17 and continuing into the third quarter of FY18, the Department's historical activities and initiatives across the state to reduce the backlog continued in its effort to maintain the backlog well below the legislatively required benchmark of 1,000. Additionally, the Department reduced the number of open reports from 13,477 in September of 2016 to 6,087 in March 2018. In March 2017, the Department experienced a stabilization in the number of open reports where it has remained between 5,600 and 6,600 for the past twelve months.

Additionally, the DCS HR continues its efforts to hire and place Specialists at a rate equal to or greater than departures from the Department. As a result of the sustained staffing levels, reduced number of backlog inactive cases, total open reports, and foster care population, the overall caseloads for DCS investigators continue to decline across most offices (see Table 2).

In March 2017, DCS fell below the legislatively required benchmark of 1,000 backlog cases. From a peak of 16,014 in January of 2015, the Department now has only 176 backlog cases as of March 26, 2018, representing a 99 percent decrease. To avoid a return to higher numbers of backlog cases, the Department uses performance management and other elements of the management system to maintain caseload levels. Across the state, sustainment measures include the implementation of performance management metrics to monitor and control the total number of open reports and the percentage of those reports that are overdue for investigation completion and closure, and the implementation of leader standard work to ensure routine follow-up.

Although completed, DCS used selected assistance work teams and Regional action plans, while leveraging provider partnerships and maintaining weekly performance huddle calls to maintain progress and performance accountability. As a result of these efforts, the Department achieved the benchmark of less than 13,000 open reports six months ahead of the established target date. From a peak of 33,245 open reports in April 2015, the Department reduced that to only 6,087 as in March 2018, representing an 82 percent reduction (see Table 1).

## PROGRESS MADE REDUCING THE OUT-OF-HOME POPULATION

As a result of the emphasis on backlog elimination and increased family engagement, the Department has observed a continuous reduction in the out-of-home foster care population. The Department continues to realize progress in the third quarter of SFY 2018, reducing the out-of-home foster care population by 3.8 percent (605 children) from the previous quarter (see Table 1). The progress made since the baseline period of March 31, 2016 is a 16.7 percent reduction (3,004 children).

By slowing the entry rate and sustaining performance for children exiting care, the Department has been able to maintain a reduction of the foster care population. The reduction in the number of children entering out-of-home care can be attributed to several factors. These include, but are not limited to, the additional standardized process tools including supervisory administrative and case progress review checklists, as well as standardized safety discussions guides and training staff to better engage a family's network to identify in-home options in order to maintain children safely in the home. Improved response times also contributes to the reduction of children entering care

as this enables Child Safety Specialists to make decisions that will help support families, provide services in a timely manner and avoid entry into care.

Through the continued application of monthly clinical staffings on reunification cases using a standardized process, ongoing workers have been able to maintain the rate of children exiting care. Through these standard process activities, paired with the continued to use of cursory case reviews and Fostering Sustainable Connections (the Title IV-E Waiver demonstration project), the Department seeks to continue realizing safe and sustainable out-of-home care population reductions.

**Table 1 – Benchmark Performance**

| | | Q1FY17 | Q2FY17 | Q3FY17 | Q4FY17 | Q1FY18 | Q2FY18 | Q3FY18 | Q4FY18 |
|---|---|---|---|---|---|---|---|---|---|
| Backlog Cases | | | | | | | | | |
| | *Benchmark (less than)* | 10,000 | 7,000 | 4,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| | *Actual* | 4,790 | 2,854 | 746 | 354 | 212 | 265 | 176 | |
| Backlog Case by disposition | | | | | | | | | |
| | *Investigation Phase* | 4,554 | 2,671 | 633 | 222 | 125 | 165 | 84 | |
| | *In-Home Cases* | 222 | 160 | 99 | 111 | 77 | 89 | 84 | |
| | *Out-of-Home Cases* | 14 | 23 | 14 | 21 | 10 | 11 | 8 | |
| Number of Open Reports | | | | | | | | | |
| | *Benchmark (less than)* | --- | --- | --- | 13,000 | 13,000 | 13,000 | 13,000 | 13,000 |
| | *Actual* | 13,477 | 9,611 | 6,610 | 5,644 | 6,444 | 6,621 | 6,087 | |
| Number of Out-of-Home Children | | | | | | | | | |
| | *Benchmark (less than)* | --- | 17,500 | 17,150 | 16,807 | 16,471 | 16,142 | 15,819 | 15,503 |
| | *Benchmark (% reduction)* | | | 2% | 2% | 2% | 2% | 2% | 2% |
| | *Actual* | 18,183 | 17,936 | 17,174 | 16,917 | 16,316 | 15,744 | 15,139 | |

***Footnotes***

- Number of open reports is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Number of inactive cases is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Out-of-home population figures are directly from the 20th of the Month Tigger which is a lagging 60 day metric.

**Table 2 – Headcount and Caseload Performance**

| | | | March 31, 2016 Baseline | | | Quarter 2 FY 2018 | | | | | | | Quarter 3 FY 2018 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Workload | | | FTE | | Workload | | | | | FTE | | Workload | | | | |
| Region | Section # | Section name | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigators | Case managers | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigation (reports per worker) | In Home (cases per worker) | Out of Home (children per worker) | Investigators | Case managers | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigation (reports per worker) | In Home (cases per worker) | Out of Home (children per worker) |
| 10 - Central | 0, 1 | Apache Junction/Kearney | 576 | 0 | 601 | 14 | 14 | 208 | --- | 567 | 15 | 0 | 40 | 14 | 14 | 167 | --- | 525 | 12 | 0 | 38 |
| | 2 | Casa Grande/Coolidge | 834 | 0 | 688 | 17 | 17 | 277 | --- | 576 | 17 | 0 | 35 | 15 | 15 | 296 | --- | 529 | 20 | 0 | 35 |
| | 3 | Osborn | 1005 | 0 | 542 | 17 | 17 | 167 | --- | 668 | 11 | 0 | 39 | 21 | 21 | 158 | --- | 710 | 8 | 0 | 34 |
| | 4 | In Home | 17 | 495 | 111 | --- | 37 | 21 | 425 | 10 | 1 | 11 | 0 | | 36 | 15 | 382 | 21 | 0 | 11 | 1 |
| | 5 | Mesa | 1423 | 0 | 615 | 15 | 15 | 259 | --- | 572 | 17 | 0 | 38 | 14 | 14 | 244 | --- | 519 | 17 | 0 | 36 |
| | 6 | Gilbert | 1236 | 0 | 824 | 16 | 16 | 249 | --- | 535 | 16 | 0 | 34 | 17 | 17 | 264 | --- | 497 | 15 | 0 | 29 |
| | 7 | Tempe | 1786 | 0 | 913 | 19 | 19 | 314 | --- | 543 | 16 | 0 | 28 | 20 | 20 | 241 | --- | 512 | 12 | 0 | 25 |
| | 8 | South Mountain | 1493 | 0 | 663 | 16 | 16 | 206 | --- | 668 | 13 | 0 | 41 | 17 | 17 | 211 | --- | 618 | 13 | 0 | 37 |
| | 9 | North Central | 1522 | 0 | 775 | 15 | 15 | 323 | --- | 426 | 22 | 0 | 29 | 17 | 17 | 184 | --- | 401 | 11 | 0 | 24 |
| | 10 | 19th Avenue | 2 | 0 | 1520 | | 39 | 0 | --- | 1576 | 0 | 0 | 40 | | 38 | 0 | --- | 1585 | 0 | 0 | 42 |
| 20- Pima | 1 | East Broadway | 980 | 49 | 342 | 18 | 24 | 127 | 39 | 258 | 7 | 2 | 11 | 17 | 22 | 201 | 37 | 243 | 12 | 2 | 11 |
| | 2 | Wetmore | 227 | 27 | 398 | 13 | 24 | 146 | 37 | 396 | 12 | 2 | 16 | 11 | 21 | 115 | 36 | 381 | 11 | 2 | 18 |
| | 3 | Country Club | 132 | 18 | 370 | 11 | 22 | 118 | 74 | 349 | 11 | 3 | 16 | 12 | 23 | 116 | 61 | 323 | 10 | 3 | 14 |
| | 4 | Wetmore | 126 | 19 | 313 | 11 | 22 | 151 | 27 | 252 | 13 | 1 | 11 | 21 | 20 | 182 | 18 | 166 | 17 | 1 | 8 |
| | 5 | Madera A | 599 | 39 | 164 | 8 | 16 | 163 | 0 | 197 | 19 | 0 | 12 | 8 | 16 | 124 | 0 | 206 | 15 | 0 | 13 |
| | 6, 0 | AHIT/Adoptions* | 7 | 0 | 555 | 0 | 34 | 0 | 0 | 791 | 0 | 0 | 23 | 0 | 34 | 0 | 0 | 672 | 0 | 0 | 20 |
| | 7 | 22nd/Alvernon | 326 | 53 | 379 | 11 | 21 | 126 | 34 | 283 | 12 | 2 | 14 | 11 | 22 | 116 | 40 | 251 | 10 | 2 | 11 |
| | 9 | Madera B | 174 | 15 | 312 | 9 | 18 | 139 | 53 | 231 | 15 | 3 | 13 | 10 | 19 | 103 | 42 | 213 | 10 | 2 | 11 |
| | 10 | Alvernon | 82 | 0 | 340 | 5 | 0 | 51 | 0 | 0 | 10 | 0 | 0 | 5 | 0 | 27 | 0 | 78 | 5 | 0 | 0 |
| 30- Northern | 1 | Prescott/Prescott Valley | 266 | --- | 398 | 14 | 14 | 228 | 40 | 235 | 16 | 3 | 16 | 14 | 14 | 236 | 15 | 207 | 17 | 1 | 15 |
| | 2 | St. Johns/Winslow/Show low | 127 | --- | 188 | 8 | 8 | 73 | 7 | 361 | 9 | 1 | 47 | 8 | 8 | 71 | 12 | 341 | 9 | 2 | 44 |
| | 3 | Flagstaff/Page/Cottonwood/Fredonia | 200 | --- | 220 | 8 | 8 | 120 | 15 | 141 | 15 | 2 | 17 | 9 | 9 | 121 | 48 | 140 | 13 | 5 | 15 |
| | 4 | Bullhead City/Lake Havasu | 176 | --- | 399 | 8 | 8 | 83 | 25 | 311 | 11 | 3 | 40 | 11 | 11 | 95 | 50 | 310 | 9 | 5 | 29 |
| | 5, 00 | Kingman | 198 | --- | 132 | 9 | 9 | 93 | 20 | 242 | 11 | 2 | 28 | 9 | 9 | 104 | 17 | 233 | 12 | 2 | 27 |
| 40- Southeast | 1 | Benson, Douglas, Nogales, SV | 254 | 30 | 245 | 5 | 8 | 181 | 12 | 112 | 39 | 0 | 14 | 6 | 12 | 195 | 7 | 105 | 32 | 1 | 9 |
| | 2 | SV, Safford | 645 | 34 | 169 | 4 | 9 | 47 | 13 | 250 | 11 | 0 | 28 | 4 | 7 | 64 | 14 | 239 | 18 | 2 | 34 |
| | 3 | Globe, Payson | 383 | 14 | 119 | 3 | 8 | 69 | 21 | 76 | 25 | 0 | 9 | 3 | 5 | 47 | 7 | 68 | 17 | 1 | 13 |
| 50- Southwest | 0, 1 | CHILDHELP Advocacy | 483 | 0 | 4 | 0 | 0 | 0 | --- | 2 | 0 | 0 | 0 | --- | 0 | 0 | --- | 1 | 0 | 0 | 0 |
| | 3 | In Home | 44 | --- | 101 | --- | 45 | 31 | 368 | 16 | 1 | 8 | 0 | --- | 44 | 25 | 399 | 7 | 1 | 9 | 0 |
| | 4 | Thunderbird | 937 | 0 | C | 19 | 19 | 252 | --- | 544 | 14 | 0 | 29 | 19 | 19 | 248 | --- | 541 | 13 | 0 | 29 |
| | 5 | Peoria | 1999 | 0 | 839 | 18 | 18 | 309 | --- | 513 | 18 | 0 | 29 | 18 | 18 | 293 | --- | 498 | 17 | 0 | 28 |
| | 6 | Glendale/Durango | 1558 | 0 | 584 | 19 | 19 | 390 | --- | 535 | 20 | 0 | 28 | 22 | 22 | 353 | --- | 513 | 16 | 0 | 24 |
| | 7 | Avondale/Advocacy | 614 | 0 | 804 | 18 | 18 | 253 | --- | 623 | 14 | 0 | 35 | 18 | 18 | 145 | --- | 665 | 8 | 0 | 38 |
| | 8 | Adoptions | 0 | 0 | 1667 | --- | 41 | 2 | --- | 1532 | 0 | 0 | 37 | --- | 40 | 2 | --- | 1467 | 0 | 0 | 37 |
| | 9 | Yuma, Parker, Summerton | 347 | 0 | 418 | 17 | 17 | 127 | --- | 408 | 7 | 0 | 24 | 17 | 17 | 116 | --- | 401 | 7 | 0 | 24 |
| | 12 | West 101 | 953 | 0 | 670 | 17 | 17 | 295 | --- | 596 | 17 | 0 | 35 | 17 | 17 | 310 | --- | 518 | 19 | 0 | 31 |
| | 13 | Pinnacle Peak | 597 | 0 | 713 | 14 | 14 | 189 | --- | 399 | 13 | 0 | 28 | 16 | 16 | 132 | --- | 401 | 9 | 0 | 26 |
| 9, 105 - Other | various | OCWI and Various | 370 | | 48 | | | 816 | | 40 | | | | | | 766 | | 34 | | | |
| | | Totals | 22698 | 793 | 18143 | | | 6621 | 1210 | 15834 | | | | | | 6087 | 1185 | 15139 | | | |

Footnotes

- FTE reporting for March 31,2016: The process of reporting FTE, in particular the specific section assignment of trainees, was not yet established in March 2016. As a result, the FTE counts for that period are not available since they do not match the information on the total number of filled FTE positions as is required by the monthly hiring report.
- Number of open reports is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Trainees are accounted for in FTE figures in each section with an equal distribution of 20% caseload.
- Out-of-home population figures are directly from the Monthly Out-of-Home Care run on the 20th of the month which is a lagging 60 day metric.
- In Home cases are based on a handcount of cases activitly managed in each respective Region. March 2016 values for Northern Region are not available given that the Region counted the number of children and not the number of cases.
- In Home case figures were not handcounted in Soutwest Region in March 2016. The handcount only included total child count.
- In Home cases assignments differ Regionally. Central and Southwest Regions employ specific in home units who manage in home cases only while Northen, Pima and Southeast Regions have mixed units that may carry in home or out of home cases.
- FTE assignments to investigations or case management are based on assignment of 50% investigative and 50% ongoing in Central, Northern and Southwest Regions. Pima and Southeast Regions employ a distribution of 34% Investigations and 66% ongoing.

DEPARTMENT OF CHILD SAFETY
STATE OF ARIZONA

*Arizona Department of Child Safety*

**Douglas A. Ducey**
Governor

**Gregory McKay**
Director



January 9, 2018

The Honorable David Livingston
Chairman, Joint Legislative Budget Committee
Arizona House of Representatives
1700 West Washington
Phoenix, Arizona 85007

Re: Department of Child Safety Quarterly Benchmark Progress Report

Dear Chairman Livingston:

Pursuant to Laws 2016, 2nd Regular Session, Chapter 8, Section 24, the Department submitted its report on the progress made increasing the number of filled FTE positions, meeting the caseload standard and reducing the number of backlog cases and out-of-home children for the second quarter of FY 2018 on January 2, 2018. An error was noted in out-of-home children in for Section 6 in the Pima Region in Chart 3. This was corrected and is being resubmitted for your consideration.

If you have any questions, please contact our office at (602) 255-2500.

Sincerely,

For Gregory McKay

Gregory McKay
Director

Enclosure

cc: Richard Stavneak, Director, Joint Legislative Budget Committee
Senator Debbie Lesko, Chairman, Joint Legislative Budget Committee
Matt Gress, Director, Governor's Office and Strategic Planning and Budgeting
Patrick Moran, Joint Legislative Budget Committee
Sarah Pirzada, Governor's Office and Strategic Planning and Budgeting

# DEPARTMENT OF CHILD SAFETY

**Quarterly Progress Report**
**(Filling FTE Positions and Reducing the Backlog)**
**December 2017 (updated January 2018)**

## PROGRESS MADE IN INCREASING THE NUMBER OF FILLED FTE POSITIONS

The Department continues its efforts to reduce turnover in order to sustain sufficient staff resources that provide quality services to the children and families it serves. In fiscal year 2018, the Department identified a strategic priority to develop and retain a highly effective workforce that engages the child welfare partners to serve children. Additionally, DCS developed a strategic objective to improve employee retention. Several key actions were identified and have been implemented, including realignment of pay structure and job classification for the DCS Specialists; improvements to CORE training curriculum and improving the onboarding experience of all new DCS employees. These enhancements also include coaching of all case carrying staff and supervisors, and the development of general management and leadership skills for supervisors and managers.

DCS Human Resources (HR) conducts routine planning and information sharing meetings between Executive management, the Regional Program Administrators and HR Managers to help ensure initiatives are communicated clearly, carried out with accountability and to remain informed about the needs and challenges experienced at local DCS offices. Additionally, recruitment and retention data is tracked and reviewed bi-monthly. Action plans are developed when areas of concern are identified through this tracking process.

The Department has been sustaining its active recruitment process to fill all Child Safety Specialist positions. As of November 2017, the Department had filled 1,329 (95%) of the 1,406 funded positions. DCS funds 231 supervisor positions, 95% of which are filled. The breakdown of funded supervisor positions by Region and the Hotline are as follows: Hotline-13, Central-70, Pima-51, Northern-23, Southeast-9, and Southwest-65. The Department is actively recruiting to fill the vacant supervisor positions, which will further reduce the DCS Specialist to supervisor ratio.

To support DCS Specialists, Supervisors, case aides and other front line staff experiencing secondary trauma, DCS has developed and is now implementing a peer-to-peer support program. This program seeks to enhance a healthy workforce, provide staff a safe and supportive environment when coping with the experiences inherent in child welfare and help address burnout staff may experience. To provide additional support, the Departments established a position in Human Resources as a business partner to the Deputy Director of Field Operations to focus on retention initiatives effective October 2017.

DCS HR continues to strive to achieve a goal of 40 new hires per month; contacting all applicants immediately upon receipt of the initial application, sending recruitment packets via email to speed up the transmission of information, conducting follow up emails or phone calls to applications to obtain missing or incomplete information, scheduling the new hire interview immediately upon

receipt of the complete application, and adding an additional staff member to assist in completing background reference checks. To ensure continuous quality assurance, DCS HR implemented consistent monitoring of the number of new hires that leave DCS within the first year to allow future analysis of this information.

The Department has been utilizing the Predictive Index (PI) Behavior Assessment for DCS Specialists candidates to establish behavioral requirements for the DCS Specialist position. In addition to using it as a recruitment tool to hire the best-fit candidates, Supervisors will be using it as a tool to determine what their subordinate's individual needs are in terms of supervision to improve on job performance. This will improve the selection process, identification of the most suitable candidates and retention over time. In March 2017, all candidates for the DCS Specialist position began receiving a link to complete the PI. The Predictive Index is available, upon request of the hiring supervisor/manager, for all job classifications. Additionally, the recruitment process will require the preview of a video, which depicts a typical day in the life of a DCS Specialist. This helps to ensure alignment of applicants' expectations with the requirements of the job.

DCS Management Systems for employee retention activities included a Kaizen event in October 2017 to improve the selection and interview process for DCS Specialists. This resulted in new interview questions and written exercises that are more realistic to the position. The new materials will be piloted in Central Region offices beginning January 2018.

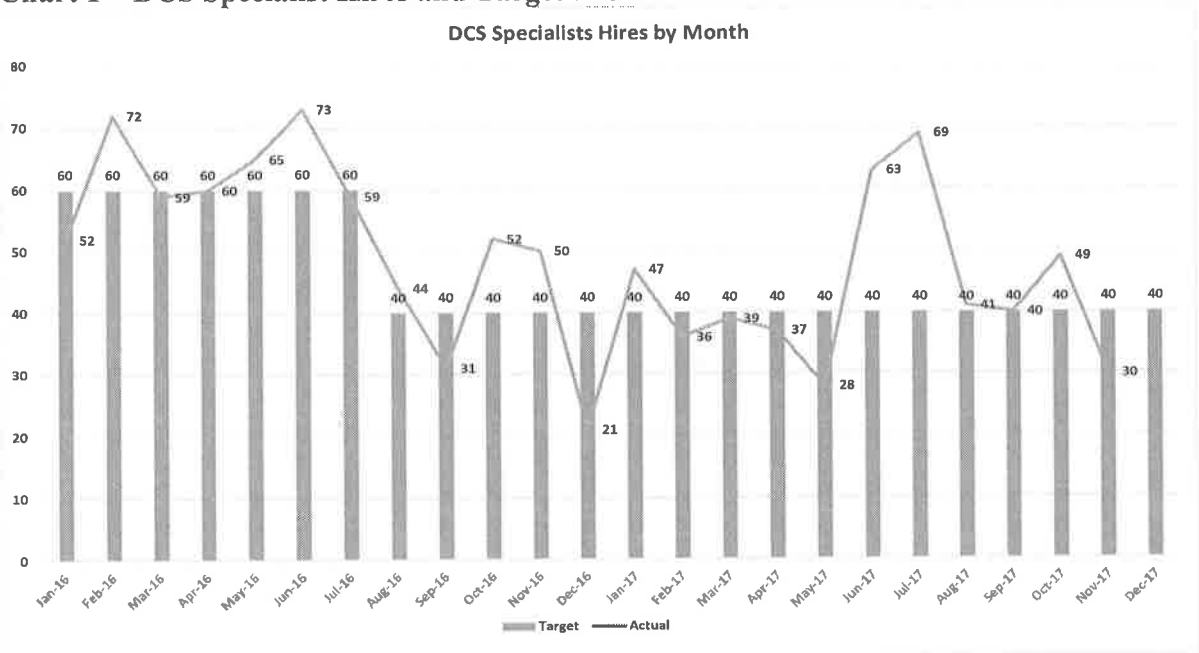
Also beginning in January 2018, recruitment job postings will be announced by office location, instead of Region. Office supervisors will be responsible for hiring their own specialists, instead of a centralized mass hiring. This will allow the candidate to interview in the office location for which he/she will be working and the selection will be done by the actual hiring supervisor in that office for improved investment by both supervisor and prospective Specialist.

DCS HR and the Learning and Development unit will be working to develop a leadership training program for supervisors which will positively impact management and supervision of DCS Specialists.

In December 2017, DCS HR implemented a new exit survey tool developed by the Arizona Department of Administration and refined the process for capturing and reviewing the data to better understand why a DCS Specialist leaves employment with the Department. An analysis of the data will help DCS HR implement new retention countermeasures as issues are identified.

The Department continues its efforts to minimize the overall attrition of all DCS employees. Chart 1 shows the number DCS Specialist hires for CY 2016 and 2017 to date along with hiring targets established against attrition rates historically observed.

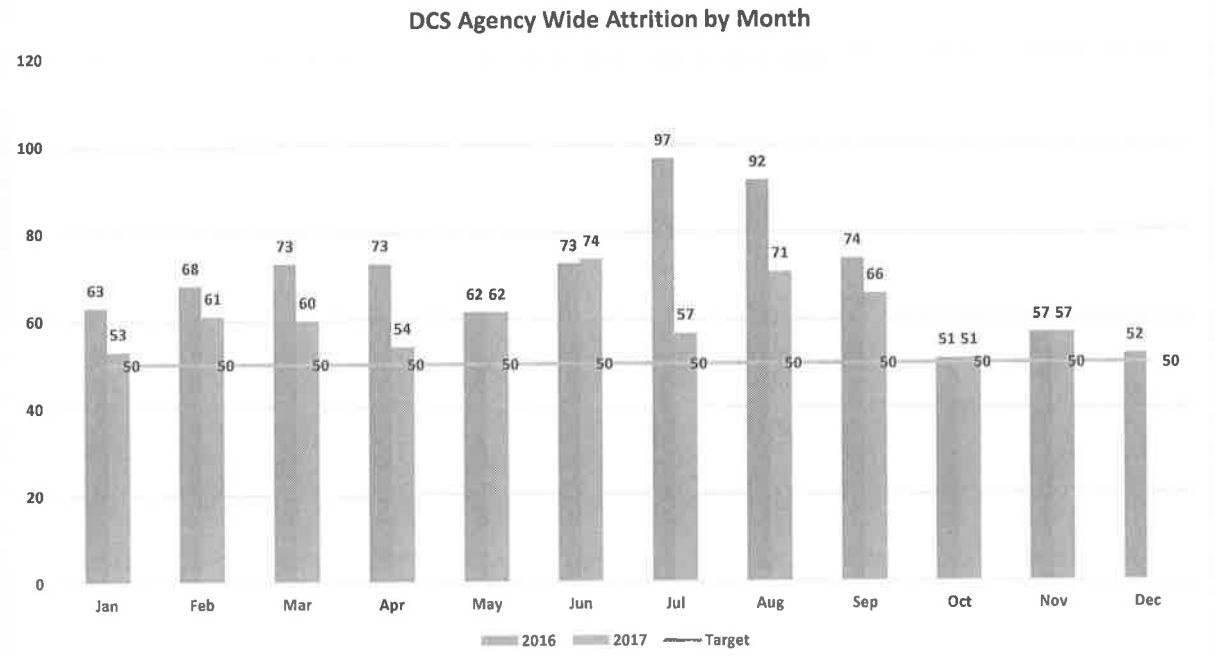
## Chart 1 – DCS Specialist Hires and Target Trends




*Data has been updated from prior reporting periods.

Chart 2 shows the Department's significant improvements in reducing turnover for all DCS employees for CY 2016 and CY 2017.

## Chart 2 – All DCS Employee Attrition Trends




*DCS Employee Turnover is not available for the month of December at the time this report was due and will be updated in the next quarterly report. Data has been updated from prior reporting periods.

## PROGRESS MAINTAINING INACTIVE CASES AND IMPROVING CASELOADS

During FY 2017 and continuing into the second quarter of FY 2018, the Department's historical activities and initiatives across the state to reduce the backlog continued in its effort to maintain the backlog well below the legislatively required benchmark of 1,000. Additionally, the Department has reduced the number of open reports from 9,611 in December of 2016 to 6,621 in December 2017.

Additionally, the DCS HR continues its efforts to hire and place Specialists at a rate equal to or greater than departures from the Department. As a result of the sustained staffing levels, reduced number of backlog inactive cases and total open reports, and reduced foster care population, the overall caseloads for DCS investigators have reduced this quarter (see Table 2). It is important to note that the Department realigned several units in the Central and Southwest Regions.

In March 2017, DCS fell below the legislatively required benchmark of 1,000 backlog cases. From a peak of 16,014 in January of 2015, the Department now has only 265 backlog cases as of December 18, 2017, representing a 98 percent decrease. To avoid a return to higher numbers of backlog cases, the Department uses performance management and other elements of the management system to maintain caseload levels since March 2017 when it hit the legislative benchmark. Across the state, sustainment measures include the implementation of performance management metrics to monitor and control the total number of open reports and the percentage of those reports that are overdue, and the implementation of leader standard work to ensure routine follow-up. Additionally, focusing on achieving report closure in 60 days will prevent future backlog growth.

Although completed, DCS used Regional action plans, while leveraging provider partnerships and maintaining weekly performance huddle calls to maintain progress and performance accountability. As a result of these efforts, the Department achieved the benchmark of less than 13,000 open reports six months ahead of the established target date. From a peak of 33,245 open reports in April 2015, the Department has reduced that to only 6,621 open reports as of December 22, 2017 representing an 80 percent reduction (see Table 1).

## PROGRESS MADE REDUCING THE OUT-OF-HOME POPULATION

As a result of the emphasis on backlog elimination and increased family engagement, the Department has achieved a reduction in the out-of-home foster care population. The Department continues to realize progress in the second quarter of SFY 2018, reducing the out-of-home foster care population by 3.5 percent (572 children) from the previous quarter (see Table 1). The progress made since the baseline period of March 31, 2016 is a 13.2 percent reduction (2,399 children). The reduction of the foster care population can be attributed to several key factors: slowing of the entry rate and sustained performance in children exiting care.

The reduction in the number of children entering the out-of-home care can be attributed to several factors. These include, but are not limited to, the additional standardized process tools including supervisory administrative and case progress review checklists, as well as standardized safety discussions guides. Improved response times also contributes to the reduction of children entering

care as this enables Child Safety Specialists to make decisions that will help support families, provide services in a timely manner and avoid entry into care.

Through the continued application of monthly clinical staffings on reunification cases using a standardized process, ongoing workers have been able to maintain the rate of children exiting care. Through these standard process activities, paired with the continued use of cursory case reviews and Fostering Sustainable Connections (the Title IV-E Waiver demonstration project), the Department seeks to continue realizing safe and sustainable out-of-home care population reductions.

**Table 1 – Benchmark Performance**

| | | Q1FY17 | Q2FY17 | Q3FY17 | Q4FY17 | Q1FY18 | Q2FY18 | Q3FY18 | Q4FY18 |
|---|---|---|---|---|---|---|---|---|---|
| Backlog Cases | | | | | | | | | |
| | *Benchmark (less than)* | 10,000 | 7,000 | 4,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| | *Actual* | 4,790 | 2,854 | 746 | 354 | 212 | 265 | | |
| Backlog Case by disposition | | | | | | | | | |
| | *Investigation Phase* | 4,554 | 2,671 | 633 | 222 | 125 | 165 | | |
| | *In-Home Cases* | 222 | 160 | 99 | 111 | 77 | 89 | | |
| | *Out-of-Home Cases* | 14 | 23 | 14 | 21 | 10 | 11 | | |
| Number of Open Reports | | | | | | | | | |
| | *Benchmark (less than)* | --- | --- | --- | 13,000 | 13,000 | 13,000 | 13,000 | 13,000 |
| | *Actual* | 13,477 | 9,611 | 6,610 | 5,644 | 6,444 | 6,621 | | |
| Number of Out-of-Home Children | | | | | | | | | |
| | *Benchmark (less than)* | --- | 17,500 | 17,150 | 16,807 | 16,471 | 16,142 | 15,819 | 15,503 |
| | *Benchmark (% reduction)* | | | 2% | 2% | 2% | 2% | 2% | 2% |
| | *Actual* | 18,183 | 17,936 | 17,174 | 16,917 | 16,316 | 15,744 | | |

***Footnotes***

- Number of open reports is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Number of inactive cases is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Out-of-home population figures are directly from the 20th of the Month Tigger which is a lagging 60 day metric.

**Table 2 – Headcount and Caseload Performance**

| | | | March 31, 2016 Baseline | | | Quarter 1 FY 2018 | | | | | | | Quarter 2 FY 2018 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Workload | | | FTE | | Workload | | | | | | FTE | | Workload | | | | |
| Region | Section # | Section name | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigators | Case managers | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigation (reports per worker) | In Home (cases per worker) | Out of Home (children per worker) | Investigators | Case managers | # of open reports (investigations) | # of In home cases | # of Out-of-Home Children | Investigation (reports per worker) | In Home (cases per worker) | Out of Home (children per worker) |
| 10 - Central | 0, 1 | Apache Junction/Kearney | 576 | 0 | 601 | 14 | 14 | 177 | | 617 | 12 | 0 | 43 | 14 | 14 | 208 | | 567 | 15 | 0 | 40 |
| | 2 | Casa Grande/Coolidge | 834 | 0 | 888 | 17 | 17 | 196 | | 606 | 12 | 0 | 36 | 17 | 17 | 277 | | 576 | 17 | 0 | 35 |
| | 3 | Osborn | 1005 | 0 | 842 | 16 | 16 | 141 | | 603 | 9 | 0 | 38 | 17 | 17 | 187 | | 668 | 11 | 0 | 39 |
| | 4 | In Home | 17 | 495 | 111 | 0 | 31 | 30 | 453 | 8 | 1 | 15 | 0 | | 37 | 21 | 425 | 10 | 1 | 11 | 0 |
| | 5 | Mesa | 1423 | 0 | 615 | 17 | 17 | 195 | | 606 | 12 | 0 | 36 | 15 | 15 | 259 | | 572 | 17 | 0 | 38 |
| | 6 | Gilbert | 1236 | 0 | 824 | 17 | 17 | 218 | | 557 | 13 | 0 | 33 | 16 | 16 | 249 | | 535 | 16 | 0 | 34 |
| | 7 | Temple | 1786 | 0 | 913 | 19 | 19 | 308 | | 603 | 16 | 0 | 32 | 19 | 19 | 314 | | 543 | 16 | 0 | 28 |
| | 8 | South Mountain | 1493 | 0 | 663 | 19 | 19 | 206 | | 694 | 11 | 0 | 37 | 16 | 16 | 206 | | 668 | 13 | 0 | 41 |
| | 9 | North Central | 1522 | 0 | 775 | 14 | 14 | 303 | | 487 | 21 | 0 | 34 | 15 | 15 | 323 | | 426 | 22 | 0 | 29 |
| | 10 | 19th Avenue | 2 | 0 | 1520 | 0 | 38 | 0 | | 1548 | 0 | 0 | 41 | | 39 | 0 | | 1576 | 0 | 0 | 40 |
| 20-Pima | 1 | East Broadway | 980 | 49 | 342 | 18 | 23 | 210 | 37 | 787 | 12 | 2 | 12 | 18 | 24 | 127 | 39 | 258 | 7 | 2 | 11 |
| | 2 | Westmore | 227 | 27 | 398 | 11 | 22 | 177 | 32 | 407 | 15 | 1 | 18 | 13 | 24 | 146 | 37 | 396 | 12 | 2 | 16 |
| | 3 | Country Club | 132 | 18 | 370 | 10 | 19 | 100 | 54 | 329 | 10 | 3 | 17 | 11 | 22 | 118 | 74 | 349 | 11 | 3 | 16 |
| | 4 | Wetmore | 126 | 19 | 313 | 12 | 23 | 135 | 23 | 275 | 12 | 1 | 12 | 11 | 22 | 151 | 27 | 252 | 13 | 1 | 11 |
| | 5 | Madera A | 599 | 39 | 164 | 11 | 22 | 128 | 0 | 253 | 11 | 0 | 12 | 8 | 16 | 162 | 0 | 197 | 19 | 0 | 12 |
| | 6, 0 | AHIT/Adoptions* | 7 | 0 | 555 | 4 | 0 | 6 | 0 | 682 | 2 | 0 | 0 | 0 | 34 | 0 | 0 | 701 | 0 | 0 | 21 |
| | 7 | 22nd/Alvernon | 326 | 53 | 379 | 10 | 19 | 106 | 26 | 328 | 11 | 1 | 17 | 11 | 21 | 126 | 34 | 283 | 12 | 2 | 14 |
| | 9 | Madera B | 174 | 15 | 312 | 10 | 20 | 111 | 47 | 229 | 11 | 2 | 12 | 8 | 18 | 139 | 53 | 231 | 15 | 3 | 13 |
| | 10 | Alvernon | 82 | 0 | 340 | 10 | 18 | 41 | 0 | 69 | 4 | 0 | 4 | 5 | 0 | 51 | 0 | 0 | 10 | 0 | 0 |
| 30- Northern | 1 | Prescott/Prescott Valley | 266 | — | 398 | 12 | 12 | 248 | 44 | 242 | 21 | --- | 21 | 14 | 14 | 228 | 40 | 235 | 16 | 3 | 16 |
| | 2 | St. Johns/Winslow/Show low | 127 | — | 188 | 6 | 9 | 78 | 8 | 325 | 14 | — | 36 | 8 | 8 | 73 | 7 | 361 | 9 | 1 | 47 |
| | 3 | Flagstaff/Page/Cottonwood/Fredonia | 200 | — | 320 | 8 | 8 | 116 | 13 | 151 | 14 | — | 18 | 8 | 8 | 120 | 15 | 141 | 15 | 2 | 17 |
| | 4 | Bullhead City/Lake Havasu | 176 | — | 399 | 7 | 12 | 136 | 32 | 303 | 19 | — | 25 | 8 | 8 | 82 | 25 | 311 | 11 | 3 | 40 |
| | 5, 00 | Kingman | 198 | — | 132 | 11 | 11 | 106 | 31 | 313 | 10 | — | 30 | 9 | 9 | 93 | 20 | 242 | 11 | 2 | 28 |
| 40- Southeast | 1 | Benson, Douglas, Nogales, SV | 254 | 30 | 245 | 6 | 6 | 163 | 13 | 112 | 27 | 2 | 19 | 5 | 8 | 181 | 12 | 112 | 39 | 0 | 14 |
| | 2 | SV, Safford | 645 | 34 | 169 | 5 | 9 | 62 | 14 | 263 | 13 | 2 | 29 | 4 | 9 | 47 | 13 | 250 | 11 | 0 | 28 |
| | 3 | Globe, Payson | 383 | 14 | 119 | 4 | 8 | 59 | 5 | 96 | 14 | 1 | 12 | 3 | 8 | 69 | 21 | 76 | 25 | 0 | 9 |
| 50- Southwest | 0, 1 | CHILDHELP Advocacy | 483 | 0 | 4 | 0 | 0 | 1 | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 2 | 0 | 0 | 0 |
| | 3 | In Home | 44 | — | 101 | 0 | 49 | 38 | 449 | 23 | 1 | 14 | 4 | | 45 | 31 | 368 | 16 | 1 | 8 | 0 |
| | 4 | Thunderbird | 937 | 0 | C | 18 | 18 | 257 | | 560 | 14 | 0 | 30 | 19 | 19 | 252 | | 544 | 14 | 0 | 29 |
| | 5 | Peoria | 1999 | 0 | 839 | 17 | 17 | 287 | | 543 | 17 | 0 | 33 | 18 | 18 | 309 | | 513 | 18 | 0 | 29 |
| | 6 | Glendale/Durango | 1558 | 0 | 584 | 20 | 20 | 424 | | 636 | 21 | 0 | 32 | 19 | 19 | 390 | | 535 | 20 | 0 | 28 |
| | 7 | Avondale/Advocacy | 614 | 0 | 804 | 19 | 19 | 211 | | 558 | 11 | 0 | 30 | 18 | 18 | 253 | | 523 | 14 | 0 | 35 |
| | 8 | Adoptions | 0 | 0 | 1667 | 0 | 39 | 0 | | 1572 | 0 | 0 | 40 | | 41 | 2 | | 1532 | 0 | 0 | 37 |
| | 9 | Yuma, Parker, Summerton | 347 | 0 | 418 | 15 | 15 | 160 | | 420 | 11 | 0 | 29 | 17 | 17 | 127 | | 408 | 7 | 0 | 24 |
| | 12 | West 101 | 953 | 0 | 670 | 17 | 17 | 320 | | 559 | 19 | 0 | 33 | 17 | 17 | 295 | | 596 | 17 | 0 | 35 |
| | 13 | Pinnacle Peak | 597 | 0 | 713 | 16 | 16 | 201 | | 384 | 13 | 0 | 24 | 14 | 14 | 189 | | 399 | 13 | 0 | 28 |
| 9, 105 - Other | various | Various | 370 | | 48 | | | 788 | | 48 | | | | | | 816 | | 40 | | | |
| | | Totals | 22698 | 793 | 18143 | | | 6444 | 1281 | 16316 | | | | | | 6621 | 1210 | 15744 | | | |

Footnotes

- FTE reporting for March 31, 2016: The process of reporting FTE, in particular the specific section assignment of trainees, was not yet established in March 2016. As a result, the FTE counts for that period are not available since they do not match the information on the total number of filled FTE positions as is required by the monthly hiring report
- Number of open reports is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Number of inactive cases is the actual figure as of the Monday before the legislatively required reporting period based on the automated report run.
- Trainees are accounted for in FTE figures in each section with an equal distribution of 20% caseload.
- Out-of-home population figures are directly from the 20th of the Month Tigger which is a lagging 60 day metric.
- In Home cases are based on a hand count of cases actively managed in each respective region. March values for Northern Region are not available given that the region counted the number of children and not the number of cases.
- In Home case figures were not hand counted in Southwest Region in March 2016. The hand count only included total child count.
- In Home cases assignments differ regionally. Central and Southwest Regions employ specific in home units who manage in home cases only while Northern, Pima and Southeast Regions have mixed units that may carry in home or out of home cases.
- FTE assignments to investigations or case management are based on assignment of 50% investigative and 50% ongoing in Central, Northern and Southwest Regions. Pima and Southeast Regions employ a distribution of 34% Investigations and 66% ongoing.
- Southwest Region Section 3 manages both in home cases and permanency planning units. The workload distribution is based on one unit of Permanency Planning Specialist and the remaining Specialist assigned to In Home.

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Rebecca Perrera, Senior Fiscal Analyst

SUBJECT: Arizona Department of Administration - Review of Emergency Telecommunication Services Revolving Fund Expenditure Plan

**Request**

Laws 1998, 4th Special Session, Chapter 6 requires the Arizona Department of Administration (ADOA) to submit the wireless services portion of its Emergency Telecommunications Services Revolving Fund (ETSF) expenditure plan to the Committee for review. ADOA oversees and provides support to the communities of the state as they enhance their 911 emergency telecommunications systems. In practice, the department submits its complete expenditure plan annually, although expenditures on wire services are not subject to Committee review.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

**Key Points**

1) In FY 2018, ADOA expects to distribute $18.0 million from ETSF. Of the $18.0 million, $8.6 million is for wireless services. In addition, $8.5 million is for proposed wire services expenditures, and $900,000 is for administrative costs.
2) The wireless distribution includes $3,037,000 for text-to-911 messaging. Total statewide implementation costs will total approximately $16.0 million.
3) Over the past 5 years, expenditures averaged $16.4 million annually.

(Continued)

**Analysis**

ADOA works with county/city 911 administrators to distribute monies from ETSF for Federal Communications Commission (FCC) compliant telecommunications equipment, software, carrier services, and maintenance. The counties and cities are responsible for implementing the improvements to their 911 system. ADOA is responsible for providing centralized oversight in developing project schedules to consider the greatest needs, especially in rural areas, and for maximizing regional efficiencies and local readiness. While ADOA prefers that each county complete implementation phases as a whole, the department does make allowances for cities or areas that are behind or ahead of the county schedule. Localities must provide and fully fund their own personnel, utilities, and facilities. ADOA also requires communities to submit Wireless 911 Service Plans to the agency for its approval.

Emergency 911 Wireless Service Status

In 1996, the FCC ordered the enhancement of wireless 911 services, which included being able to identify the specific location of the caller. This capacity is now available statewide with the exception of the Navajo Nation, the Hopi Tribe, and the San Carlos Tribe. These locations have not yet completed 911 service plans for funding consideration. ADOA has an outreach program to work with tribes to address development issues.

Of the $8.6 million wireless portion of the ETSF expenditure plan, $5.6 million would primarily fund the operation and maintenance across the state of these wireless 911 networks including equipment costs. The ETSF does not fund certain costs to operate the 911 centers such as dispatcher salaries. The remaining $3.0 million would fund Next Generation 911 Managed Services *(see below)*.

Funding Mechanism

A.R.S. § 42-5252 authorizes a $0.20 per month tax on each wire and wireless telecommunication service account. In addition to the tax on wire and wireless phone accounts, A.R.S § 42-5402 authorizes a prepaid wireless telecommunications 911 excise tax equal to 0.8% of the gross income derived from the retail sale of prepaid wireless telecommunications services. Although Arizona statute now requires a tax on prepaid wireless accounts, there is still no requirement that recent technology, such as internet-based phones and OnStar, pay 911 taxes.

The revenue generated from these taxes is deposited into the Emergency Telecommunications Services Revolving Fund. ADOA estimates that revenues will be $17.9 million in FY 2018 and remain near that level through FY 2022.

FY 2018 ETSF Expenditure Plan

Localities submit copies of their invoices for emergency telecommunications services and equipment to ADOA, who subsequently distributes funds to these areas based on need. In FY 2018, ADOA expects to distribute $18.0 million from the ETSF. Of the $18.0 million, $8.5 million is for wire services, $8.6 million is for wireless services, and $890,500 is for administrative costs.

*Table 1* summarizes the actual ETSF distribution during the past 2 fiscal years and projected distribution during the current fiscal year.

(Continued)

Table 1

**ADOA Emergency Telecommunications Services Revolving Fund**
**FY 2016 – 2018 Expenditure Plan**

| | Actual FY 2016 | Actual FY 2017 | Projected FY 2018 |
|---|---|---|---|
| **Revenues** | | | |
| Balance Forward | 2,375,300 | 5,173,900 | 7,960,400 |
| Tax Revenue | 17,695,100 | 18,530,300 | 17,810,700 |
| Interest Income | 39,600 | 85,100 | 94,200 |
| **Funds Available** | **20,110,000** | **23,789,300** | **25,865,300** |
| **Expenditures** | | | |
| Wireless Services | | | |
| Phase I Wireless | 26,100 | 0 | 0 |
| Phase II Wireless | 3,677,300 | 3,666,600 | 5,594,700 |
| Text-to-911 Messaging | 1,948,200 | 40,900 | 3,037,000 |
| **Wireless Services Subtotal** | **5,651,600** | **3,707,500** | **8,631,700** |
| Wire Services | 8,417,500 | 11,233,000 | 8,504,800 |
| Wireless Services | 5,651,600 | 3,707,500 | 8,631,700 |
| Administration | 867,000 | 888,400 | 890,500 |
| **ETSF Expenditure Plan Total** | **14,936,100** | **15,828,900** | **18,027,000** |
| Fund Balance | 5,173,900 | 7,960,400 | 7,838,300 |

*Table 2* includes further detail on planned wireless services expenditure in FY 2018.

Table 2

**FY 2018 Phase II Wireless Services Expenditure Plan**

| | Total |
|---|---|
| Cochise County | $ 182,500 |
| Coconino County | 162,000 |
| Colorado City | 1,600 |
| Gila County | 5,000 |
| Gila River Tribal | 3,200 |
| Graham County | 42,600 |
| Greenlee County | 8,200 |
| La Paz County | 15,000 |
| Maricopa County | 4,249,800 |
| Mohave County | 39,300 |
| Pima County | 587,500 |
| Pinal County | 31,100 |
| Santa Cruz County | 14,300 |
| Winslow | 34,800 |
| Yavapai County | 199,300 |
| Yuma County | 18,500 |
| **TOTAL** | **$5,594,700** |

Next Generation 911

The FCC is beginning to implement Next Generation 911 (NG911), which would allow text-to-911 messaging. The FCC has required wireless carriers to develop the capability to deliver 911 text messages to local dispatchers.

(Continued)

One primary barrier to implementation is the ability of the Public Safety Answering Points (PSAPs) to accept text messaging and other data-based messaging medias. The National Emergency Management Association estimates it will cost states at least $12 billion to upgrade to NG911. The estimated cost to Arizona is unknown. According to the National Conference of State Legislatures, counties in at least 19 states have implemented NG911 and 3 states offer the service statewide.

In FY 2017, ADOA approved a proposal by a network carrier, CenturyLink, to implement a network with 911 text messaging. The network carrier upgraded the network to transmit 911 text messaging. The network carrier also agreed to replace the PSAPs' computer equipment. Under the managed service contract, local jurisdictions pay a "per-dispatcher seat" fee of approximately $2,200 a month to the carrier for the NG911 network and equipment. As of the end of calendar year 2017, ADOA reports that 26 PSAPs have transitioned to the NG911 Network. An additional 23 are expected to transition in 2018. Assuming all 600 dispatcher seats in the state were under NG911 Network carrier, the total annual cost to the local jurisdictions would be $16.0 million.

In addition, Lake Havasu and Maricopa County have implemented text-to-911.

RP:kp

**Douglas A. Ducey**
**Governor**

**Craig C. Brown**
**Director**

ARIZONA DEPARTMENT OF ADMINISTRATION

OFFICE OF THE DIRECTOR

100 NORTH FIFTEENTH AVENUE • SUITE 401
PHOENIX, ARIZONA 85007

(602) 542-1500

December 13, 2017


The Honorable David Livingston, Acting Chairman
Joint Legislative Budget Committee
Arizona House of Representatives
1700 West Washington Street
Phoenix, AZ 85007

The Honorable Debbie Lesko, Vice Chairman
Joint Legislative Budget Committee
Arizona Senate
1700 West Washington Street
Phoenix, AZ 85007

Dear Representative Livingston and Senator Lesko:

As stipulated in Laws 1998, 4th Special Session, Chapter 6, Section 5 – Emergency telecommunications fund: report of expenditure plans, the Department of Administration shall report its expenditure plans to the Joint Legislative Budget Committee for review. In fulfillment of this requirement, we are enclosing:

- The Wireless Program Report for fiscal year 2017
- The status of Arizona 9-1-1 and the estimated costs for Wireless Phase II
- The 9-1-1 financial forecast for fiscal years 2018 through 2022 incorporating the fund balance transfers to the General Fund during FY2003, FY2004, FY2009, FY2010, FY2011, FY2012, FY2013 and FY2014
- FY2018 Wireless Program Plan
- Arizona GIS Standards Compliant Map
- Arizona Wireless 9-1-1 Deployment Map

Please note that although the financial forecast does not indicate a deficit, it should be noted that there are current limitations in the funding of 9-1-1 statewide. These limitations continue to occur despite anticipated additional revenues generated through Laws 2012, 2nd Regular Session, Chapter 198, Prepaid Wireless Telecommunications E9-1-1 Excise Tax, which was implemented January 1, 2014. With additional Wireless Phase II

deployments and a transition to an IP Enabled Network, costs will continue to increase. Should a shortfall materialize, it could prevent the full implementation of the wireless program, equipment upgrades for Public Safety Answering Points and the transition to an IP Enabled Network. As a result, costs could be shifted to the 9-1-1 Systems throughout the State.

Should you have any questions, please contact me at 602-542-1500 or Barbara Jaeger, the State 9-1-1 Administrator at 602-542-0911.

Sincerely

Craig Brown
Craig Brown (Dec 13, 2017)

Craig C. Brown
Director

cc: Mr. Richard Stavneak, Director, JLBC
Ms. Rebecca Perrera, Fiscal Analyst, JLBC
Mr. Matthew Gress, Director, OSPB
Mr. Ashley Beason, Budget Analyst, OSPB
Mr. Derik Leavitt, Assistant Director, Budget & Resource Planning ADOA
Mr. Morgan Reed, Assistant Director ASET, CIO, ADOA
Ms. Suzan Tasvibe-Tanha, ASET, Chief of Managed Services ADOA

Arizona Department of Administration
State 9-1-1 Office
Wireless Program Report
Fiscal Year 2017

The State 9-1-1 program was established, through legislation in 1985, to provide a funding mechanism for the deployment and on-going costs of providing 9-1-1 services in Arizona.

Under A.R.S. Title 43, Article 6, Telecommunications Services Excise Tax, a tax is levied for each activated wireline, including Voice over Internet Protocol (VoIP) access, wireless service account and pre-paid wireless for the purpose of financing emergency telecommunications services (9-1-1). Current law reduced the tax from thirty-seven cents per month to twenty-eight cents per month in July 1, 2006. The tax was further reduced to twenty cents per month as of July 1, 2007.

During the Fiftieth Legislature, second regular session, HB 2094 – Prepaid Wireless Telecommunications E9-1-1 Excise Tax was passed and signed into law on April 5, 2012. The tax was implemented in January 2014 and for FY2017 collected $1.7 million dollars.

The funds collected are administered by the Arizona Department of Administration under A.R.S. § 41-704 and rules have been established that govern the allowable expenditures and funding eligibility requirements by communities and political subdivisions in the State.

Components eligible for funding include necessary and/or appropriate network, equipment and maintenance to handle the processing of 9-1-1 emergency calls. Of the revenue generated, the program statutorily distributes 95% of the fund for 9-1-1 call service delivery of wireline, wireless and voice over IP services. An amount not to exceed 3% of the annual revenue is used by the Arizona Department of Administration for program oversight expenditures. An additional amount of 2% is distributed to the 9-1-1 System Coordinators for the Local Network Management of Contracts.

Accounting methodology is in place to track all expenditures by community and/or 9-1-1 system. In July 2007, the Department of Revenue transitioned their processes to collecting the tax as one entity, with the identity code of 911, no longer breaking out the wireline and traditional wireless revenue. The pre-paid wireless revenue is collected with the Department of Revenue identity code of 912.

All Public Safety Answering Point (PSAP) equipment used to answer and handle 9-1-1 calls are budgeted under wireline expenditures, although it should be understood that the equipment is used to answer all wireline, wireless and VoIP 9-1-1 calls. Mapping equipment for Wireless Phase II is broken out and budgeted under Wireless Phase II equipment.

The Statewide System Project plan covering each 9-1-1 System for FY2017 has been updated and is included in this document. Due to limited funding availability, deployment of Wireless Phase II is limited to only those carriers that do not seek wireless carrier costs.

The number of 911 calls placed by people using wireless phones has significantly increased in recent years. The Federal Communications Commission (FCC) estimates that about 70 percent of 911 calls are placed from wireless phones. The FCC has also established Wireless Phase II rules which requires wireless service providers to provide more precise location information to PSAPs; specifically, the latitude and longitude of the caller. This information must be accurate to within 50 to 300 meters depending upon the type of location technology used.

The wireless program criteria established for rollouts, stipulate that Enhanced 9-1-1 (voice, telephone number and address) has been completed for either an entire county or significant portions of a county. Each county or system must complete a Wireless 9-1-1 Service Plan, utilizing the format specified in the State guidelines and appoint a single point of contact for each county or area. The Geographic Information System (GIS) data must be completed and meet the same 95% accuracy rate as established for Enhanced Wireline 9-1-1. All sites currently have equipment mapping components that depicts the location of the caller. Initial calls are received as Wireless Phase I, showing the tower location and then a rebid is initiated to narrow the call to an x/y coordinate.

**Wireless Deployment**

FY2017 closed out the deployment of Wireless Phase II in Arizona. With the exception, of one or two self-funded PSAPs, all PSAPs funded by the Emergency Telecommunication Revolving Fund have deployed Wireless Phase II. The two major regions in the state, Maricopa and Pima completed their Phase II deployments in 2003, constituting approximately 80% of the state's population. Wireless Phase II has been completed in Apache County, Navajo County, Cochise County, Coconino County, Gila County, Graham County, Greenlee County, La Paz County, Mohave County, Pinal County, Santa Cruz County, Yavapai County, Yuma County, and the Gila River Tribal Community along with the City of Winslow. There is still limited funding and cost recovery is still included in statute, therefore, those systems that were deployed during FY15 – FY17, did not include carriers that still continued to seek cost recovery.

During FY2017, $51,200 was expended from the $1 million dollar Public Safety Answering Point (PSAP) Readiness Fund Grant to complete GIS Process Improvement, GIS Data Development and Data Validation Geographic Information Systems (GIS) work. The grant was awarded to the State on October 7, 2004 by The Wireless E-911: The PSAP Readiness Fund. At the close of FY17, the fund was exhausted and alternative funding sources will need to be leveraged to do any additional GIS work. To date, those funds furthered the deployment of Wireless Phase II for nine counties and one municipality. Additional funds were received from the Arizona Department of Land under the State Broadband Initiative (SBI) Grant for the GIS work in Apache County, Navajo County and La Paz County. Page 10 shows those Arizona areas which are GIS Standards Compliant.

During FY2014, a project was completed to ensure that 9-1-1 location data between the Frontier 9-1-1 network platform and the CenturyLink 9-1-1 network platform could be passed seamlessly. In FY2015, deployment of Wireless Phase II in Coconino County and La Paz County was completed without those carriers that continued to seek cost recovery. During FY16, another project was completed to provide the same location data transfer capabilities for calls originating in Apache County and Navajo County. This allows for voice and data calls to be transferred to the Arizona Department of Public Safety (DPS) PSAP in Flagstaff.

With the completion of the projects listed above, Wireless Phase II is available statewide, except for the Navajo Nation, Hopi Tribe and the San Carlos Tribe. Page 11 depicts the status of Wireless Phase II deployments.

**Wireless Expenditures**

The FY2017 expenditures for Wireless Phase II are outlined in the table to the right. No funds were allocated to the Navajo Nation, Hopi Tribe or San Carlos Tribe since they have not completed a 9-1-1 Service Plan for funding eligibility.

FY2017 wireless budget, depicted in the table on the following page, includes the expenditures for systems currently Wireless Phase II.

Expenditures include network components, wireless carrier costs, selective router costs and necessary additional equipment for receiving Phase II mapping data. Equipment call answering equipment is included in the wireline expenditures.

| System | FY17 Expenditures | PI/PII |
|---|---|---|
| Cochise County | $ 211,337 | PII |
| Coconino County | $ 146,340 | PII |
| Colorado City | $ 1,516 | PII |
| Gila County | $ 30,630 | PII |
| Gila River Tribal | $ 10,190 | PII |
| Graham County | $ 41,295 | PII |
| Greenlee County | $ 12,603 | PII |
| La Paz County | $ 13,220 | PII |
| Maricopa Region | $ 1,448,019 | PII |
| Mohave County | $ 42,259 | PII |
| Navajo/Apache County | $ - | PII |
| Pima County | $ 957,618 | PII |
| Pinal County | $ 306,776 | PII |
| Santa Cruz County | $ 63,720 | PII |
| Winslow | $ 34,036 | PII |
| Yavapai County | $ 254,438 | PII |
| Yuma County | $ 92,590 | PII |
| | | |
| | **$ 3,666,586** | |

Additional expenditures budgeted for FY2017 includes ongoing costs associated with the MPLS networks for the Enterprise Mapping System. With significant county boundary issues identified, this system allows updated GIS data to be distributed to the 9-1-1 centers within their county or share the data with other counties. These costs are already being expended in the Cochise County, Maricopa Region, Mohave County, Pima County, Pinal County and Yavapai County.

When new map data is available, that data can be distributed via MPLS networks allowing updated information to be published more efficiently. Due to insufficient revenue, there are no longer funds available for new deployment and support of Enterprise Mapping Systems for 9-1-1. Therefore, the Enterprise Mapping System with the Wireless Phase II implementations in Coconino County, La Paz County, Navajo County, Apache County and Yuma County is not available at this time.

Also, with the deployment of Wireless Phase II in Apache, Coconino, Gila, Greenlee, La Paz, Navajo and Yuma Counties only one trunk group was installed rather than separate wireline and wireless trunk groups. Additionally, requests for Wireless Phase II, funded out of the Emergency Telecommunication Services, will only be sent to those wireless carriers that do not seek to recover carrier costs. 9-1-1 calls will still be delivered to the PSAP but with only one group of voice trunks.

| System | FY18 Budget | PI/PII |
|---|---|---|
| Cochise County | $ 182,548 | PII |
| Coconino County | $ 162,000 | PII |
| Colorado City | $ 1,560 | PII |
| Gila County | $ 4,980 | PII |
| Gila River Tribal | $ 3,150 | PII |
| Graham County | $ 42,600 | PII |
| Greenlee County | $ 8,250 | PII |
| La Paz | $ 15,000 | PII |
| Maricopa Region | $ 4,249,764 | PII |
| Mohave County | $ 39,276 | PII |
| Navajo Co/Apache Co | $ - | PII |
| Pima County | $ 587,540 | PII |
| Pinal County | $ 31,110 | PII |
| Santa Cruz County | $ 14,350 | PII |
| Winslow | $ 34,800 | PII |
| Yavapai County | $ 199,294 | PII |
| Yuma County | $ 18,480 | PII |
| | | |
| | **$ 5,594,702** | |

Prior to FY2012, separate network trunk groups were installed to be assured that 9-1-1 calls from wireless devices would not adversely affect the delivery of wireline calls. The cost for wireline trunks falls under a separate network tariff and therefore has minimal additional costs. The cost for network trunks used specifically for wireless calls are distance sensitive from the selective router location and range from $150.00 to $900.00 per month, per trunk which is significantly higher. Therefore, any future deployments or changes to an existing network design, will have only one network trunk group that will carry both wireline and wireless calls to the Public Safety Answering Point (PSAP). When the initial Wireless Phase II projects were implemented, there was concern that the wireless 9-1-1 calls can potentially overwhelm the system. That is no longer the case with customers moving away from wireline technology.

Also, as defined in State statute, the wireless carriers are entitled to seek full cost recovery for all components associated with the delivery of Wireless Phase II service. Based on the projected revenue stream, it is evident that the program can no longer support full cost recovery. However, at present, all but three of the wireless carriers voluntarily do not seek cost recovery. Instead, they consider it a cost of doing business. During FY2017, cost recovery costs for four counties with existing services was $804,000.

Should a 9-1-1 system make the determination that they want to move toward a full deployment, they will be financially responsible for the added costs. Those counties included Apache, Coconino, Gila, Greenlee, La Paz, Navajo and Yuma. Primary carriers that did not seek cost recovery were deployed in those counties during the implementation.

With an emphasis toward Homeland Security, the 9-1-1 program continues to fund the Telecommunications Service Priority (TSP) provisioning which was added in FY2007. This federal program is designed to ensure elevated network restoration to anyone who registers and pays for the service. In the event of a national disaster requiring federal intervention for network continuity, the service will ensure that Arizona's 9-1-1 systems will be restored in a timely manner. With the move toward the Operational Managed Services Model, TSP will become a standard component of the per seat cost within the CenturyLink NG9-1-1 network and will reduce the costs for approximately 49 PSAPs.

All network components including 9-1-1 circuits, Automatic Location Identification circuits, emergency backup circuits and circuits that run to all selective routers have been included in the service package.

**Statewide Wireless Phase II Status**

The information in the chart titled FY2017 Wireless Program Plan on Page 9 outlines the statewide status and implementations for Wireless Phase II. Additionally, these figures were obtained through the cooperative effort of the Local Exchange Carriers and the Wireless Carriers.

Again, it should be noted that since FY2012 and subsequent years, limited funding has dictated that some policy changes were necessary, which include the following; 1) Wireless Phase II implementations are only being requested of those carriers that do not seek cost recovery; 2) 9-1-1 wireless calls will be delivered on only one trunk group and; 3) the deployment of additional Enterprise Mapping Systems have been suspended; 4) no additional call answering positions will be approved; and 5) no new PSAPs will be approved.

Enterprise Mapping will be made available to those systems that currently do not have access, during the CenturyLink Next Generation 9-1-1 Managed Services deployment.

It should be noted that three Tribal Nations have not been included, in the estimates at this time. The Navajo Nation, Hopi Tribe and San Carlos Tribe either have not submitted 9-1-1 Service Plans for funding consideration, or considered combining their efforts with an adjacent county.

During FY2017, both the Navajo Nation and the San Carlos Tribe began exploring the requirements necessary for providing Enhance 9-1-1 and Wireless Enhanced 9-1-1 access for their citizens as they fall under the classification as underfunded areas.

The State 9-1-1 Office has an outreach program in place designed to work with localities, to help them to address deployment issues.

**Revenue – FY2018 Projections**

Since 2006, there has been almost a 44.24% reduction in revenue. This can be attributed to the reduction in the tax from $.37 in FY2006, to $.28 in FY2007 and to $.20 in FY2008. In FY2006, the annual revenue collected was $30,186,088 while in FY2017 the annual revenue collected was $18,615,384, which included $85,061 in interest.

The projected annual revenue for FY2017 would not under normal circumstances meet the annual expenditures for continued service of the 9-1-1 program in Arizona. In response, approvals for certain PSAP equipment upgrades have been denied due to limited funding. Equipment is upgraded only if funds are available. The priority today is sustaining the 9-1-1 network components and the ongoing maintenance on the PSAP equipment and moving to a Managed Services NG9-1-1 platform. The projected revenue for FY2018 of $17.8 million, which includes interest income from the prior funds available, is less than originally anticipated due to the State Legislature's fund transfer of $25.1 million dollars in FY2009, $8.6 million dollars in FY2010, $2.5 million dollars in FY2011 and $2.2 million dollars for FY2012 from the 9-1-1 Program Fund to the State's General Fund. Since FY2002, $53 million dollars of 9-1-1 Program funds have been transferred to the State's General Fund. Since 2008, the State has been required to report those transfers to the Federal Communications Commission (FCC) to be included in their report to Congress. These transfers have also affected the ability for the State 9-1-1 program to be eligible to receive federal grants.

The budget for FY2018 did not anticipate any fund transfers, but equipment upgrades have still been deferred and Next Generation (NG) 9-1-1 Managed Services projects should begin to stabilize the continued needs for capital expenditures.

The 9-1-1 Excise Tax revenue for FY2017 closed at $18.6 million dollars, a 4.97% increase in revenue over FY2016 when coupled with the reduced interest and a full year of revenue for pre-paid wireless. The increased revenue includes wireline, wireless and VoIP providers and can be attributed primarily to $1,891,788 in new revenue from pre-paid wireless that went into effect January 1, 2014. The Department of Revenue forecasted $2 million in annual revenue from the pre-paid wireless charge, but realistically, the collection for FY2017 was $1.7 million dollars.

The fiscal year-end report for FY2017 indicated that the total number of customers for wireline, wireless, VoIP and Prepaid Wireless generated $18,530,303. Revenue figures for FY2017 show a decrease to $17,810,659 which includes an annualized forecast of pre-paid wireless charges but not interest. During FY2017, revenue was collected for 13 full months, which was why the Government Accounting Office is showing a substantial increase in revenue. FY2018, will only have 12 months of revenue and that model is being continued which is why there may be a projected decrease in revenue.

| | FY16 Actual @$.20/prepaid | FY17 Actual @$.20/prepaid | FY18 Projected @$.20/prepaid |
|---|---|---|---|
| | | | |
| Excise Tax | $ 17,695,126 | $ 18,530,303 | $ 17,810,659 |
| Interest | $ 39,552 | $ 85,081 | $ 94,197 |
| | | | |
| | 17,734,678 | 18,615,384 | 17,904,856 |
| % | | 4.97% | -3.82% |

The Cellular Telephone Industry Association (CTIA) estimates that approximately 35.0% of the wireless phones in service can be attributed to prepaid services.

In preparing the 9-1-1 Proposed Expenditures through FY2022, even though the projections show stability, there are limitations to the services that can be provided to the PSAPs such as additional equipment needs to accommodate growth, equipment replacement, funding of logging records, non-deployment of wireless carriers that seek cost recovery and added components such as Text to 9-1-1.

This means the program may only be able to support the legacy network components and maintenance components for the 9-1-1 Systems, and not equipment upgrades. The effect of aging of 9-1-1 PSAP equipment has become a reality and the costs may have to be undertaken by the PSAPs in the future. Moving toward a Managed Services solution may provide a more equitable distribution of funds.

The current administrative distribution is 5%, which includes 3% for State Administrative costs and 2% for Local Management of Contracts. The two percent for Local Management of Contracts is distributed to the 9-1-1 System Coordinators, with rules in place to define authorized expenditures.

The State 9-1-1 Office has four full time staff members, which is all the program revenue can support. These individuals not only have fiscal oversight, but work closely with the communities to deploy and support 9-1-1.

**The Future of Wireline and Wireless 9-1-1**

The 9-1-1 Project Plan addresses the need to transition to more robust and versatile wireline and wireless networks in coming years. The IP enabled network or Next Generation 9-1-1 (NG9-1-1) networks are being deployed today in many areas in the country. Industry standards have been developed although several alternative solutions are being deployed. The move toward a data network that provides ubiquitous wireline and wireless 9-1-1 service will ensure that calls can be routed anywhere without current boundary restrictions. New networks, with increased bandwidth will provide the ability to carry more location data, as well as receive telematics calls and utilize text messaging, as well as video streaming in future years. The current analog network, which has been in place for forty years, is unable to handle technology advanced solutions.

During FY2009, a collaborative effort between the State, CenturyLink, Intrado Public Safety (West) and Plant 9-1-1 Systems (Airbus DS) was developed to design and implement a NG9-1-1 trial in Arizona. It was determined that Gila County would be an ideal test bed for this project. Gila County has some unique geographic and telecommunications boundaries which create call delivery challenges. The installation of this NG9-1-1 network included installation of soft switches which would have allowed for reliable and time sensitive transfer of calls. The four PSAPs in Gila County were changed out to a Positron Viper system designed specifically to transition to NG technology. During the trial, testing included digital network features for text messaging, video streaming, IP ALI (Automatic Location Identification), interconnection with the legacy networks, feature functionality, and meshing and redundancy. This project was successfully completed during FY2010 at a cost of $2.7 million and should be noted that throughout this transition, all legacy network components will require continued support. It should be noted that although testing components included text messaging and video streaming, those elements would not have been in production following the trial. Due to insufficient funding, the project was suspended immediately following a successful trial.

In an effort, to explore alternatives, the State 9-1-1 Office asked CenturyLink, the primary 9-1-1 network and 9-1-1 equipment provider in Arizona, to provide a network design and offering for hosted 9-1-1 managed services. The requirements put forth to the Local Exchange Carrier stipulated that the State no longer desired huge capital outlays for equipment and requirements should include transitioning the network for NG9-1-1. This would allow a uniform annual expense including equipment, network and maintenance. The goal was to find a solution to provide all components of NG9-1-1, in concert with keeping up equipment needs without requiring additional revenue.

It was also noted that in an effort to distribute the funds equitably, with implementation of a new managed service network and equipment model, that a uniform per seat cost would be allocated to PSAPs for each approved answering position in the State. This model utilizes a formula that takes into consideration the total amount of revenue collected and the number of 9-1-1 call answering positions currently eligible for funding. There is no margin available for additional positions or other needs.

During FY2017, CenturyLink undertook the deployment of a Managed Services platform which would include a new Next Generation 9-1-1 Network, PSAP call answering equipment and maintenance for a five-year term through a service agreement vehicle. The network was completed in December 2016 and PSAPs in the CenturyLink territory started moving toward the new model in March 2017. By the end of the FY2017, seven PSAPs had been deployed on the NG9-1-1 network through the Managed Services offering. It is anticipated that 26 PSAPs will be transitioned by the end of the calendar year 2017 and an additional 23 is scheduled to be completed during calendar year 2018.

The remainder of the PSAPs are in the Maricopa Region and Frontier Communications territories and they are working on plans to deploy Next Generation 9-1-1 solutions understanding that there is limited funding available.

The 9-1-1 system was designed to ensure that in an emergency, citizens have one reliable number to call for public safety assistance. The State 9-1-1 program strives to ensure that this goal is met in the most efficient and cost effective manner possible.

Text to 9-1-1 has also been a consideration for PSAPs in the State of Arizona. During FY2017, Lake Havasu deployed a network based Text to 9-1-1 solution. Their focus was on the Deaf and Hard of Hearing Community. In May 2017, Maricopa Region announced that they were deploying Text to 9-1-1 to the PSAPs in Maricopa County. The funding for this effort is coming from the Maricopa Association of Governments in support of their members. Deployment is scheduled to commence in Spring 2018. The two solutions listed above are web based applications and not integrated with the 9-1-1 network.

The Federal Communications Commission has established guidelines for the deployment of Text to 9-1-1. They have also stipulated that the decision to deploy the technology is assigned to the individual PSAPs.

**Summary**

The 9-1-1 Program has been in place since 1985 and up until recent years, sufficient funding has allowed for progress in moving from Basic 9-1-1 (voice only), through Enhanced 9-1-1 (voice, telephone number and address information), to 9-1-1 Wireless Phase I and II.

Documents included in this report outline the 9-1-1 Wireless Phase II expenditures for FY2017, as well as the Wireless Phase II budget for FY2018.

The table on page five identifies the implementation costs for deployments of 9-1-1 Wireless Phase II.

The Actual and Proposed Expenditures on Page 8 provides a financial history of the program from FY2013 through FY2022 anticipated expenditures.

The two maps on Pages 10 and 11 respectively, identify that the communities maintain a high level of GIS accuracy for call service delivery and that the deployment of Wireless Phase II is completed throughout the state, with the exception of the Navajo Nation, Hopi Tribe and San Carlos Tribe.

# FY13 - FY22 Actual and Proposed Expenditures

**Includes Cost Recovery for Wireless Phase I and Phase II**

**Assumes No Change in Tax Rates.**

**As of July, 2017**

**Includes Wireline and Wireless Excise Taxes at a Flat Rate of $.20 for FY 2013-FY 2022**

**Includes PrePay Wireless Taxes as of 1-1-2014 (FY 2014-FY 2022)**

| | Actual FY13 | Actual FY14 | Actual FY15 | Actual FY16 | Actual FY17 | Budgeted FY18 | Budgeted FY19 | Budgeted FY20 | Budgeted FY21 | Budgeted FY22 |
|---|---|---|---|---|---|---|---|---|---|---|
| Administration | $ 449,027 | $ 521,929 | $ 486,364 | $ 509,197 | $ 517,076 | $ 534,320 | $ 534,320 | $ 534,320 | $ 534,320 | $ 534,320 |
| PSAP Network Management | $ 330,935 | $ 342,036 | $ 353,181 | $ 357,865 | $ 371,390 | $ 356,213 | $ 356,213 | $ 356,213 | $ 356,213 | $ 356,213 |
| Sub-Total | $ 779,962 | $ 863,965 | $ 839,545 | $ 867,062 | $ 888,466 | $ 890,533 | $ 890,533 | $ 890,533 | $ 890,533 | $ 890,533 |
| Wireline - (Existing Network Technology) (PCA33200)* | $ 10,132,525 | $ 11,197,703 | $ 13,381,409 | $ 8,417,557 | $ 11,233,012 | $ 8,504,805 | $ 8,452,295 | $ 7,865,928 | $ 256,512 | $ 256,512 |
| Next Generation 9-1-1 Managed Services | $ - | $ - | $ - | $ 1,948,171 | $40,871 | $3,037,000 | $6,260,920 | $7,205,000 | $16,055,800 | $16,055,800 |
| Phase I Wireless - (Includes Cost Recovery) (PCA 33310) | $ 32,693 | $ 32,454 | $ 35,700 | $ 26,070 | $ - | $ - | $ - | $ - | $ - | $ - |
| Phase II Wireless - (Includes Cost Recovery) (PCA 33320) | $ 4,203,918 | $ 5,435,295 | $ 4,194,181 | $ 3,677,258 | $ 3,666,587 | $ 5,594,702 | $ 3,143,140 | $ 3,077,484 | $ 2,077,380 | $ 2,077,380 |
| Mapping & Address Support | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| **TOTAL PROGRAM COSTS** | $ 15,149,098 | $ 17,529,417 | $ 18,450,835 | $ 14,936,118 | $ 15,828,936 | $ 18,027,040 | $ 18,746,888 | $ 19,038,945 | $ 19,280,225 | $ 19,280,225 |
| **FUNDS FROM PRIOR** | $ 2,129,584 | $ 3,436,766 | $ 2,933,375 | $ 2,375,328 | $ 5,173,888 | $ 7,960,336 | $ 7,838,152 | $ 6,996,120 | $ 5,862,031 | $ 4,486,662 |
| PREPAY WIRELESS TAX | $ - | $ 631,547 | $ 1,891,140 | $ 1,840,984 | $ 1,727,130 | $ 1,744,471 | $ 1,744,471 | $ 1,744,471 | $ 1,744,471 | $ 1,744,471 |
| EXCISE TAX | $ 16,425,768 | $ 16,477,855 | $ 15,959,537 | $ 15,854,142 | $ 16,803,173 | $ 16,066,188 | $ 16,066,188 | $ 16,066,188 | $ 16,066,188 | $ 16,066,188 |
| INTEREST INCOME | $ 30,512 | $ 40,924 | $ 42,111 | $ 39,552 | $ 85,081 | $ 94,197 | $ 94,197 | $ 94,197 | $ 94,197 | $ 94,197 |
| **Total Collections** | $ 16,456,280 | $ 17,150,326 | $ 17,892,788 | $ 17,734,678 | $ 18,615,384 | $ 17,904,856 | $ 17,904,856 | $ 17,904,856 | $ 17,904,856 | $ 17,904,856 |
| **TOTAL FUNDS** | $ 18,585,864 | $ 20,587,092 | $ 20,826,163 | $ 20,110,006 | $ 23,789,272 | $ 25,865,192 | $ 25,743,008 | $ 24,900,976 | $ 23,766,887 | $ 22,391,518 |
| PRIOR PERIOD ADJ OR PROJECT CARRY-FORWARD | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - | $ - |
| TRANSFER TO GENERAL FUND | $ - | $ 124,300 | | | | | | | | |
| EXPENDITURES | $ 15,149,098 | $ 17,529,417 | $ 18,450,835 | $ 14,936,118 | $ 15,828,936 | $ 18,027,040 | $ 18,746,888 | $ 19,038,945 | $ 19,280,225 | $ 19,280,225 |
| FUNDS FORWARD | $ 3,436,766 | $ 2,933,375 | $ 2,375,328 | $ 5,173,888 | $ 7,960,336 | $ 7,838,152 | $ 6,996,120 | $ 5,862,031 | $ 4,486,662 | $ 3,111,293 |
| Wireless Tax Rate | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 | $ 0.20 |

*** Includes Conditional Capital Requests**

** Transition to robust IP enabled network in FY17

No Wireless Phase I Costs Beginning FY17

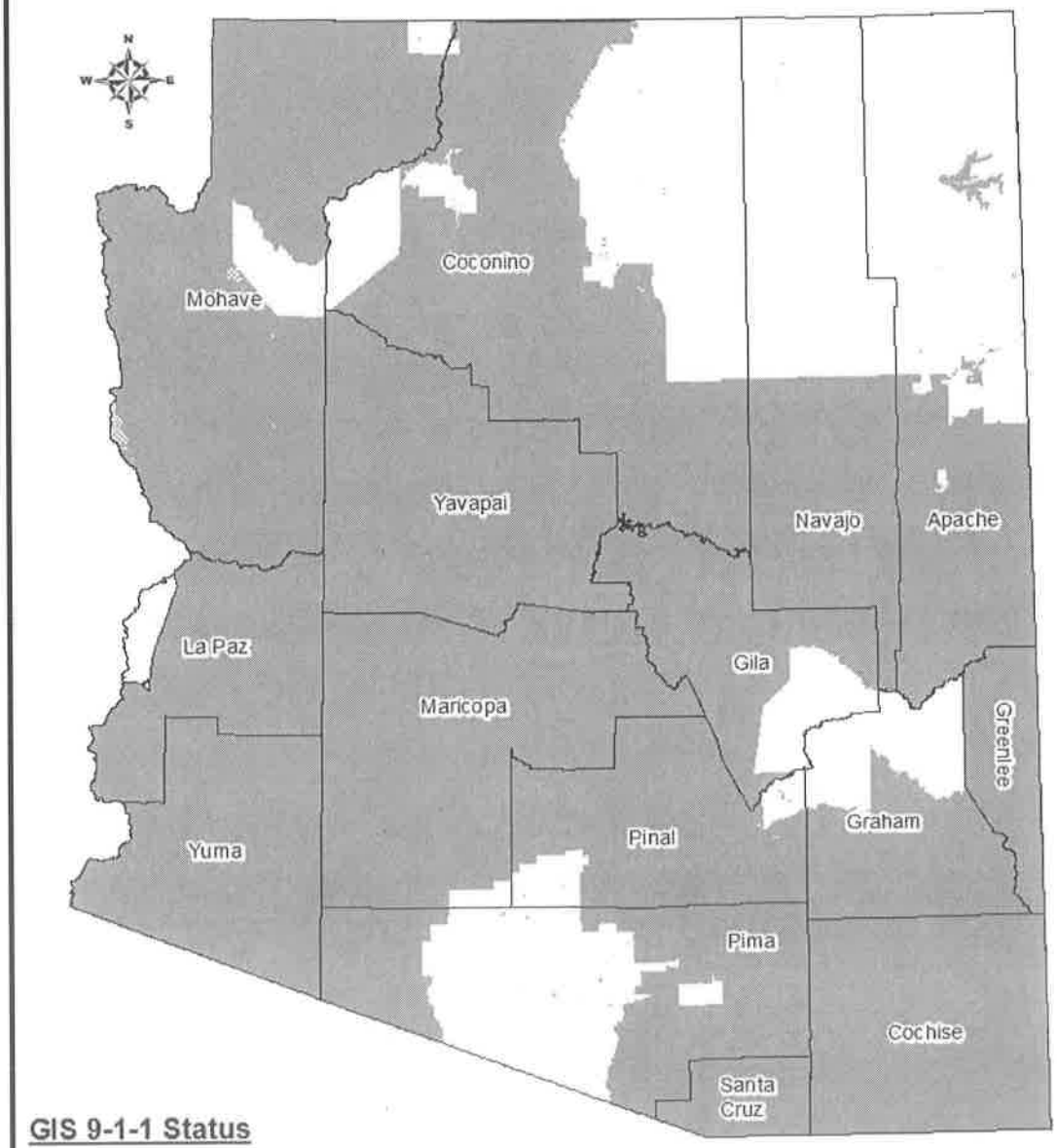
## FY2018 Wireless Program Plan

| 9-1-1 System | Basic | E/ANI | E9-1-1 | Phase II | Program Plan FY15 |
|---|---|---|---|---|---|
| | | | | | |
| Cochise County | | | | X | |
| Colorado City | | | | X | |
| Coconino County | | | | X | Phase II No Cost Recovery Carriers |
| Gila County | | | | X | Phase II No Cost Recovery Carriers |
| Gila River Tribal Property | | | | X | |
| Graham County | | | | X | |
| Greenlee County | | | | X | Phase II No Cost Recovery Carriers |
| La Paz County | | | | X | Phase II No Cost Recovery Carriers |
| Maricopa Region | | | | X | |
| Mohave County | | | | X | |
| Navajo Reservation | | | | | Service Plan for Tuba City Submitted |
| Northeastern Ariz. Users Assn. (Navajo/Apache Co) | | | | X | Phase II No Cost Recovery Carriers |
| Page | | | | X | |
| Pinal County | | | | X | |
| Prescott | | | | X | |
| Pima County | | | | X | |
| Santa Cruz Co | | | | X | |
| Winslow | | | | X | |
| Yavapai Region | | | | X | |
| Yuma County | | | | X | Phase II No Cost Recovery Carriers |

| | | | |
|---|---|---|---|
| | None | | E9-1-1 |
| | Basic | | WPI |
| | E w/ANI | | WPII |
| | | | WPII No Cost Recovery Carriers |

updated: 10/12/2017

# Arizona 9-1-1 GIS Standards Compliant



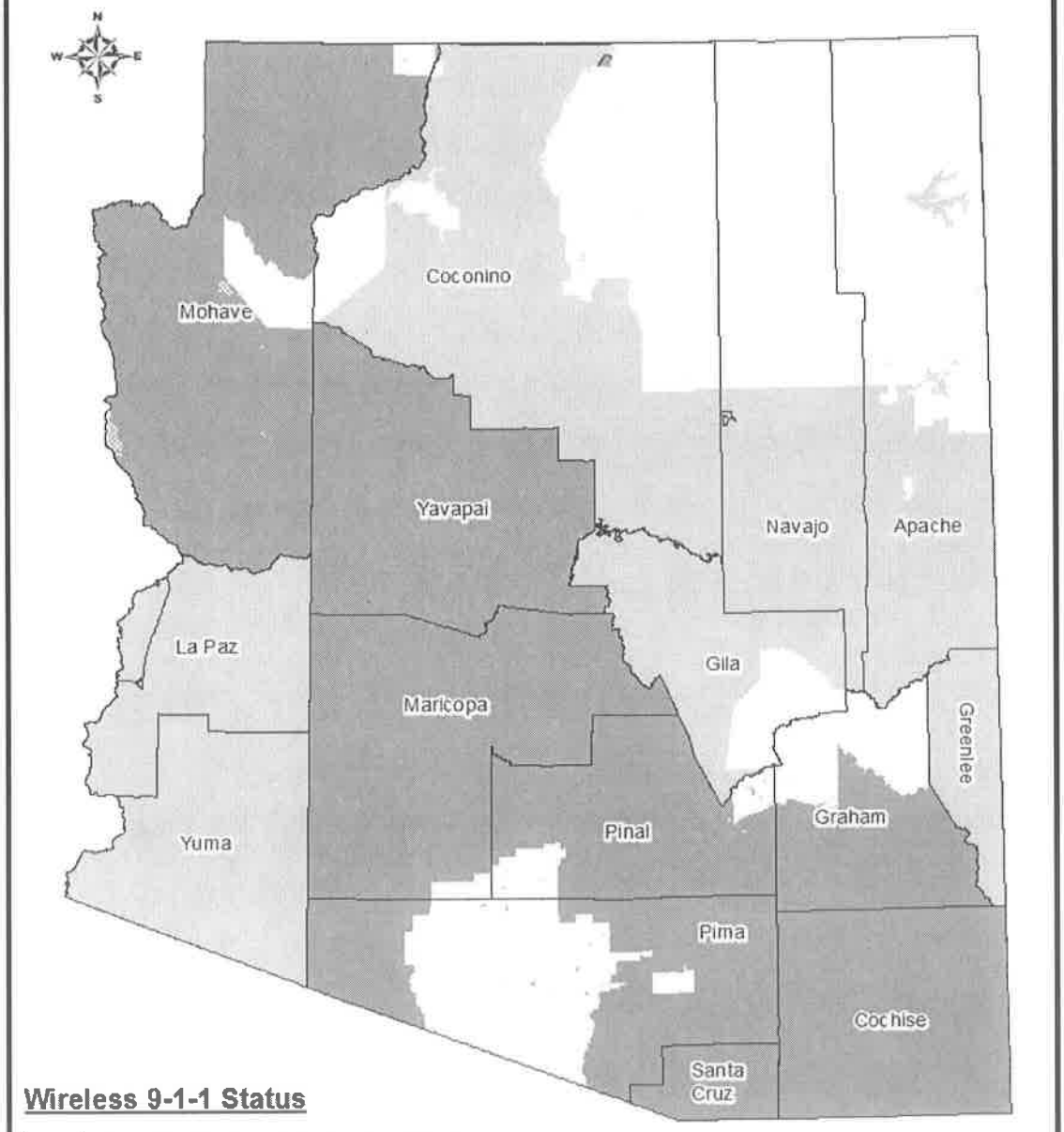

**GIS 9-1-1 Status**

**Standards Compliant**

**Non Participant Arizona 9-1-1**

Map as of August 2015
Created by Sandra Dyre
(sandra.dyre@azdoa.gov)

# Arizona Wireless 9-1-1 Status




**Wireless 9-1-1 Status**

- Non Participant Arizona 9-1-1
- Modified Phase II
- Full Phase II

Map as of June 2016
Created by Sandra Dyre
(sandra.dyre@azdoa.gov)

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Jeremy Gunderson, Fiscal Analyst

SUBJECT: Arizona Department of Administration/Arizona State Lottery Commission - Review of Server Migration and Hardware Refresh (Automation Projects Fund).

**Request**

Pursuant to A.R.S. § 41-714, the Arizona State Lottery Commission (the Lottery) has requested that the Committee Review $597,400 in proposed FY 2018 expenditures from the Automation Projects Fund (APF) for an Information Technology (IT) server migration project and a hardware refresh.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

Under either option, the Committee may also consider the following provisions:

A. Committee review does not commit the Legislature to any ongoing funding.

B. Prior to the expenditure of any monies, the Lottery shall submit a Project Investment Justification (PIJ) to the Arizona Department of Administration Arizona Strategic Enterprise Technology office for review and approval.

(Continued)

**Key Points**

1) The Lottery is requesting review of $597,400 of their $3.5 million APF appropriation for server migration, a hardware refresh and new video conference equipment.
2) The Lottery plans to use $472,400 to migrate servers to a cloud environment and to the state I/O data center.
3) The Lottery plans to use $125,000 to purchase new computer hardware and video conferencing equipment.

**Analysis**

Background

The Lottery creates and sells various lottery games, and participates in multi-state games such as Powerball and Mega Millions. These multi-state games are overseen by the Multi-State Lottery Association (MUSL).

The FY 2018 General Appropriation Act (Laws 2017, Chapter 305) appropriated $3.5 million from the APF to replace Lottery's IT System. At the September 2017 meeting, the Committee gave a favorable review of $2.9 million of the $3.5 million APF appropriation for Lottery to contract with a vendor for professional services and to purchase software to replace its mainframe IT system. The Lottery is in the process of implementing those purchases.

The Lottery is now requesting review of the remaining $597,400 to migrate their existing servers to a vendor-supported cloud environment, as well as the purchase of new tablet devices and conference room equipment.

Server Migration

The Lottery plans to spend $472,400 to replace and migrate its servers using 2 separate solutions. The agency plans to split its server capacity between a cloud environment and the state I/O data center. After initially planning to replace old servers and host them in the Lottery's data center, the agency will use an existing state contract with Amazon Web Services to lease servers from the vendor. According to the Lottery, this solution will save money and create efficiencies since the Lottery will no longer be required to provide onsite maintenance to physical server devices, and will help the agency align with the state's IT Initiative. This portion of the project includes $232,800 of the $472,400.

The server migration plan also includes $239,600 to replace and relocate 3 servers to the state I/O data center facility. These 3 servers contain data used for multi-state draw games, and cannot be placed in a cloud environment according to MUSL requirements, which operate the games. Ongoing operational costs from both solutions will be paid from the Lottery's operating budget, and the Lottery does not expect these operational costs to be significantly different from current costs to operate their current servers.

Hardware Refresh

The Lottery spending plan includes $90,000 for 27 laptop and docking stations at a cost of $2,294 per unit, 27 new computers at a cost of $825 per unit, and 30 monitors at a cost of $188 per unit. The new laptops will be used by sales and investigative personnel to allow them to more easily conduct business outside of the office. The computers and monitors will be used to replace aging hardware.

(Continued)

Video Conferencing Equipment

The Lottery also plans to spend $35,000 to upgrade the video conference cameras in 2 conference rooms at the Lottery's main Phoenix office. The project plan also includes $9,400 per year for subscription costs related to the new video conference equipment. These costs will be paid from the Lottery's operating budget and are not included as part of the APF monies.

JG:kp

**Douglas A. Ducey**
*Governor*

**Gregory R. Edgar**
*Executive Director*

March 20, 2018


The Honorable John Kavanagh, Chairman
Joint Legislative Budget Committee
Arizona State Senate
1700 W. Washington Street
Phoenix, Arizona 85007

The Honorable David Livingston, Vice-Chairman
Joint Legislative Budget Committee
Arizona House of Representatives
1700 W. Washington Street
Phoenix, Arizona 85007

Dear Senator Kavanagh and Representative Livingston:

In accordance with Arizona Revised Statutes 41-714, the Arizona Lottery requests placement on the April 2018 agenda to review remaining funding for the Lottery's Automation Projects Fund (APF) project. Monies to support the expenditure plan have already been appropriated to the APF.

The attached document provides additional detail regarding the proposed project.

Sincerely,

Gregory R. Edgar
Executive Director

Enclosures

cc: Richard Stavneak, Director, JLBC
Matthew Gress, Director, OSPB
Jeremy Gunderson, JLBC Staff
Fletcher Montzingo, OSPB Staff

**Agency: Arizona Lottery**
**Project: Digital Transformation**

## Background

The Arizona Lottery (Lottery) received approval from JLBC in September 2017 to proceed with its digital transformation project totaling $3.4 million. JLBC approved a partial funding draw in the amount of $2.9 million at the September meeting for initial implementation and configuration costs. This request addresses the remaining allocation of $597,400 for the hardware component of the project.

## Proposal

The Lottery proposes the following expenditure plan for the remaining $597,400 in APF funds, which addresses the hardware element of the project.

- Server Migration - $472,400. The Lottery's existing in-house servers will be migrated to three offsite locations to leverage their capabilities and ensure business requirements are met, including those of the Multi-State Lottery (MUSL). Based on system and business requirements, we will either migrate to a vendor-hosted environment, Amazon Web Services (website/data analytics), or IO data center (MUSL-required integrity control systems) to ensure redundancy while creating efficiencies. This will ultimately create long-term efficiencies by reducing the Lottery's need to maintain backup power systems and connectivity.

- Endpoint Devices - $90,000. This item includes the purchase of computer equipment to replace outdated equipment currently in use. Equipment will be comprised of endpoint devices consistent with employee business needs. For example, tablets for all sales personnel who primarily conduct business with retailers outside the office and for investigative personnel to conduct field compliance/investigative work. This will improve productivity and flexibility in conducting business operations and interface more cohesively with the capabilities of the new system.

- Conference Room Upgrades - $35,000. This project involves hardware upgrades for the Lottery's three main conference rooms. The Lottery has offices in both Phoenix and Tucson and conducts business with retailers throughout the state. Upgrades to the conference rooms will reduce travel and improve operational efficiency by facilitating meetings with our Territory Managers at remote locations.

Implementation for the entire project is in progress, but the hardware component is scheduled to begin in April 2018.

## Principal Benefits

Once digital transformation is complete, the Lottery anticipates considerable improvement in efficiencies due to the elimination of time-consuming tasks tied to outdated technology. Benefits include:

- Reduced failures and increased system uptime on mission-critical systems.
- Increased speed of decision-making and product development.
- A retailer and customer centric business model that will result in increased revenues and beneficiary transfers.
- Improved and consistent information flow requiring less rework.
- A new architecture that will add real-time connectivity, allowing for timely reporting and enhanced security.

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2017

TO: Members of the Joint Legislative Budget Committee

FROM: Chris Gustafson, Senior Fiscal Analyst

SUBJECT: Department of Economic Security - Review of Information Technology Security Plan (Automation Projects Fund)

**Request**

Pursuant to A.R.S. § 41-714, the JLBC is required to review expenditure plans from the Automated Projects Fund (APF). The Department of Economic Security (DES) has requested that the Committee review $1,101,100 in proposed expenditures for information technology security.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review

2. An unfavorable review.

**Key Points**

1) The Auditor General released a report in April 2017 that raised concerns about the information technology security of the Department of Economic Security.
2) DES proposes spending $1.1 million to address security in 4 areas reviewed by the Auditor General: employee access, data security, external access and email threats.
3) DES will not spend the remaining $987,400 of the total $2.2 million of appropriation.

(Continued)

**Analysis**

Background

The APF consists of monies appropriated by the Legislature and administered by the Arizona Department of Administration (ADOA). Monies in the fund are to be used to implement, upgrade, or maintain automation Information Technology (IT) projects for any state agency. Pursuant to A.R.S. § 41-714, before expending monies from the fund, an agency must submit an expenditure plan to the JLBC for review. All IT projects over $25,000 are reviewed by the Arizona Strategic Enterprise Technology (ASET) office through the Project Investment Justification (PIJ) process.

The FY 2016 General Appropriation Act appropriated $936,400 from the APF for DES IT security projects. In addition, the FY 2017 General Appropriation Act appropriated another $1,294,700 from the APF for DES IT security projects. The combined $2.2 million of APF monies are available through FY 2018.

Security System Report

The FY 2018 General Appropriation Act required DES to submit a report to the Committee on the status of their IT security system as a response to the April 2017 Auditor General report that found several security weaknesses and vulnerabilities. These weaknesses included the ability to obtain backdoor network access through phishing emails, former employees of DES being able to access the network, and the ability to access large parts of the DES network despite current security measures. DES submitted a report on December 1, 2017, but has amended its report to reflect current project requests.

In its most recent follow up from March 2018, the Auditor General found DES was in the process of implementing 22 recommendations from the report and had not implemented 8 recommendations. The department states that they believe their submission will address the issues identified in the Auditor General report. ADOA did not determine whether the submission would address these issues.

Current Request

At its April 7, 2016 meeting, the Committee favorably reviewed DES' plan to use $487,800 for a Network Access Control (NAC), which uses software to handle the initial request for network access and to determine if the access is authorized. The Committee approved an additional $222,400 at its September 21, 2016 meeting for the same project. DES has spent $142,600 on this project and is now asking the remaining $567,600 be reverted towards the current submission.

DES is proposing an expenditure plan totaling $1,101,100 for IT security enhancements to implement some of the recommendations from the Auditor General's report. Additionally, DES has identified $734,100 from federal and non-appropriated funds to pay for additional expenses.

The remaining recommendations were implemented using technologies and software already licensed to the state through ADOA.

Below is an outline of DES' proposed projects:

1) Secure access and sign-in software - DES seeks $533,700 from APF to purchase software for secure employee access to DES data on any smartphone, tablet, or computer. Additionally, this would allow DES clients to gain secure access of their platform through a single secure log in system.

(Continued)

2) Data security tools - DES seeks $341,900 to purchase various software components that address server vulnerabilities through software to screen electronic communications for threats, monitor the location of state issued devices, and protect servers by isolating compromised servers from the rest of the mainframe.

3) External access security - DES is requesting $216,000 for software that will identify the risks and vulnerabilities to databases that can be accessed by the public.

4) Screening e-mail threats - DES is seeking $40,500 for software to identify spam and phishing emails and remove them before an individual can open it.

Including monies previously spent on other projects, the APF funding DES has requested totals $1,243,700 compared to a total allocation of $2,231,100 from the FY 2016 and FY 2017 appropriations. DES believes that the funding should be sufficient for their security needs and has no plans to submit the additional $987,400 for review. With no requests, the funds will lapse at the end of FY 2018.

CG:kp

DEPARTMENT OF ECONOMIC SECURITY
*Your Partner For A Stronger Arizona*

Douglas A. Ducey
Governor

Michael Trailor
Director

MAR 23 2018


The Honorable John Kavanagh, Chairman 2018
Joint Legislative Budget Committee
Arizona State Senate
1700 West Washington Street
Phoenix, Arizona 85007

The Honorable David Livingston, Vice Chairman 2018
Joint Legislative Budget Committee
Arizona House of Representatives
1700 West Washington Street
Phoenix, Arizona 85007

Dear Senator Kavanagh and Representative Livingston,

The Arizona Department of Economic Security (ADES) requests to be placed on the Joint Legislative Budget Committee's (JLBC) next agenda for the review of the Information Technology Security System Status per Laws 2017, Chapter 305, Section 115:

> For the funding for the department of economic security's information technology security project, any remaining balances on June 30, 2017 in the automation projects fund established by section 41-714, Arizona Revised Statutes, from monies appropriated in fiscal year 2015-2016 for the information technology security project at the department of economic security are appropriated to the department of administration in fiscal year 2017-2018 for the same purposes specified in fiscal year 2015-2016. The department of administration shall report in its quarterly report to the joint legislative budget committee any fiscal year 2017-2018 expenditure of remaining balances from fiscal year 2015-2016 from the automation projects fund.

ADES is one of the largest agencies in the State of Arizona, serving more than 2.8 million individuals, families, and businesses each year. As part of the administration of services, the ADES Division of Technology Services maintains a complex information technology infrastructure comprised of networks, 106 Information Technology application systems, databases, internal and external communications systems, and end-user devices. This information technology infrastructure contains a wide array of sensitive and confidential information including personally identifiable information of Arizona residents. Within this environment there are numerous, sophisticated threats that represent significant legal and financial liabilities for ADES.

Current state and federal laws require that ADES protect and secure sensitive and confidential information entrusted to the Department. These laws stipulate that state agencies have adequate security controls in place to protect the data received from clients against unauthorized use, inspection, or disclosure (IRC 6103(p)). State agencies are also required to regularly perform a thorough analysis of information technology systems to identify potential risks and vulnerabilities (A.R.S. § 41-3507, HIPAA 164.308 (ii) (A)). When assessments reveal risks and vulnerabilities exist, state agencies are required to implement security measures, adopt risk mitigation strategies, and develop methods and procedures to reduce risks and vulnerabilities to a reasonable and appropriate level (HIPAA 164.308 (ii) (B)). Pursuant to these state and

federal laws, ADES has an obligation to modify current security controls and adequately protect client and business information.

To address known vulnerabilities that significantly increase the potential for a breach, ADES has received a total of $2.2M of Automation Projects Fund monies to fund the purchase of necessary information technology security products to safeguard the ADES networks, application systems, and end-user devices. The department should also note that several components of the proposed projects have been prioritized as a result of the most recent audit of the Department by the Office of the Auditor General. These include the IT Security tools, Nessus, Splunk, and Phishing Service as well as the application security scanning tool, RiskSense. ADES is proposing to use $1.1M in this fiscal year for four projects designed to prevent vulnerabilities posed by internal and external threats and to address the need for information and data tracking to permit faster incident response to security events.

| Application | Description | First Year Automation Projects Fund | First Year Other Funds Cost Estimate[1] | Total Project Cost Estimate[2] |
|---|---|---|---|---|
| Data Security Tools | Several technologies to enhance ADES ability to secure confidential information processed, transmitted, and stored on its automated systems | $310,944 | $207,296 | $1,038,927 |
| Application Security Scanning | RiskSense testing finds vulnerabilities in outward-facing applications. With vulnerabilities identified, the vendor will provide a report that will help ADES programming staff to make changes in their code to remove the vulnerabilities. | $216,000 | $144,000 | $360,000 |
| Workspace One | Workspace One will allow us to deliver secure access to cloud, mobile, web, mainframe and Windows apps on any smartphone, tablet, thin client, PC, or laptop through a single catalog and a consumer-simple single sign-on (SSO) experience. | $533,672 | $355,781 | $1,048,943 |
| AADP & ATP Implementation | The Advanced Threat Protection (ATP) product offers a first line support to keep unsafe links from making it into the ADES email system. Azure Active Directory Premium (AADP) allows ADES to impement extra multi-factor authentication procedures that keep our systems safe and secure. | $40,513 | $27,009 | $473,024 |
| **Total** | | $1,101,129 | $734,086 | $2,920,894 |

[1] Funds include federal funding, and other non-General Fund monies.
[2] Total project estimates include full implementation costs.

If you have any questions, please contact Wesley Fletcher, Financial Services Administrator, at (602) 542-6080.

Sincerely,

for MT

Michael Trailor
Director

Attachment

cc: Director Richard Stavneak, Joint Legislative Budget Committee
Director Matthew Gress, Governor's Office of Strategic Planning and Budgeting
President Steve Yarbrough, Arizona State Senate
Speaker J.D. Mesnard, Arizona House of Representatitves
Director Holly Henley, Arizona State Library, Archives and Public Records


# Status of the Department of Economic Security

# Information Technology Security System

**Background**

In December 2015, the Department of Economic Security (DES) began to evaluate Information Technology (IT) security standards from the National Institute of Standards and Technologies Special Publication 800-53 (Pub 800-53), the Internal Revenue Service Publication 1075 (Pub 1075), and the Arizona Department of Administration's (ADOA) 34 required policies or procedures. A detailed plan was subsequently established to implement projects designed to bring the agency into full compliance with these standards and current industry best practices.

The first major project within the plan was Network Access Control (NAC). This project segmented the Department's network to ensure network access for each division is limited to the data and systems necessary for that division's work. This was an extremely complex endeavor requiring upgrades to the technology infrastructure prior to implementation. The project, utilizing Automation Projects Funds (APF), began in January 2016 and was finalized in August 2017.

NAC Major Milestones:

- Final Project Justification submitted to Arizona Strategic Enterprise Technology (ASET) on 2/8/2016.
- Joint Legislative Budget Committee (JLBC) approved the project at their meeting on 4/7/2016, with a funding level of $487,000.
- DES immediately began work on the project, completing the statement of work with CenturyLink on 4/15/2016.
- Phase I of the project was completed on 7/1/2016.
- On 9/7/2016, DES applied for Phase II of Network Access Control, at an estimated additional cost of $278,000, extending the expiration of the Project Investment Justification (PIJ) to June 2017.
- Phase II completed on schedule and within the estimated cost parameters.
- By August 2017, NAC was successfully implemented in the DES production environment. NAC has accomplished the goal of achieving network access control and network segmentation, dramatically increasing the security of the agency's internal network access security controls.
- DES identified and replaced several network switches apart from the AZNet network to be compatible with NAC. Those switches connect several hospitals to the DES network and are maintained by DES staff.

Over the last two years, two events brought additional information that allowed the agency to make alterations to the plan. In February 2016, the Internal Revenue Service conducted scheduled audits of three programs at DES. Between late 2016 and April 2017, the Arizona Auditor General conducted a performance audit of the agency's IT Security function as part of the DES Sunset Review. The reports issued after these four audits have assisted the agency in prioritizing and expanding its IT Security Improvement Plan.

During the first quarter of calendar year 2017, ASET announced the procurement of several enterprise-wide security products. DES has fully implemented ten of the products to date.

In the second quarter of calendar year 2018, DES intends to finish implementation of its Information Security Improvement Plan and has created a request for additional APF monies for that purpose.

**Continued Implementation of the Agency IT Security Plan**

DES operates 106 Information Technology applications, most of which process extremely sensitive information from either Arizona residents or the Federal Government. This request for investment is for several tools which will serve to harden the Department's network and allow its applications to operate in a secure environment. This investment complements the efforts of the Arizona Department of Administration to deploy a common set of security tools to reduce the cost to secure networks.

This effort will:

- Strengthen the Department's security boundary to external threat
- Address gaps in securing the significant vulnerability of an insider threat
- Better track and secure the proliferation of mobile devices as well as the thousands of internal and external users of the network
- More efficiently assess and react to new vulnerabilities posed by hackers
- Leverage cutting edge technology in securing the virtual environment

Insider threats are considered by most security experts to be the most challenging vulnerability facing organizations. Hackers, faced with increasingly secure technology, are reaching out to computer users in the form of phishing emails and social engineering phone calls to elicit information from the user. While some mitigation is possible with technology, the key to countering this threat is effective user education beyond annual computer security training. Wombat's anti-phishing software uses behavior management which tests user behavior and, depending upon the user's response, escalates the level and intensity of training until the user becomes fully compliant with the security policy. This includes testing, reporting, metrics collection, and reinforced training.

A well-engineered system of firewalls protecting the core operating infrastructure from the Internet and business partners is an essential component of separating the Department's core from the threat of untrusted networks. The firewalls provide the separation from trusted, partially trusted, and untrusted environments. Each new version of firewall technology leverages advancements in intrusion protection. DES' firewalls have not been upgraded in 7 years, leaving the network open to new intrusion techniques. Cisco ASA firewalls will ensure that the network remains up and that critical protection does not stop working.

DES receives thousands of e-mails every day, some of which may have harmful links inside them. While current firewalls can detect obvious threats, Advanced Threat Protection can complement this by searching emails that get through the firewall for malicious links before they can reach any DES staff.

Multi-factor authentication has become the standard across web-based services, and Azure Active Directory Premium can bring that level of security to the DES network ensuring that individuals lacking adequate credentials will not be able to access the network.

Vulnerability detection, visualization, response, and remediation are key components of securing confidential information. Most security experts believe that no network is 100% secure from intrusion. The key to preventing an information breach is early detection and rapid mitigation. Vulnerability scanners like Nessus and security event visualization tools are key elements of this capability.

Modern logging tools generate hundreds of millions of security events daily. Without software such as Splunk to consume, correlate, aggregate, and filter those events, key security information is lost. Tools like Splunk effectively manage this information and rapidly provide the right information to the right responder effectively protecting the Department's information.

Resilient, uninstall-resistant endpoint software like Absolute for tracking, inventory, and automated repair of encryption and patching agents is critical to keeping the other tools in the security portfolio healthy, which is critical to an effective security program.

Application scanning services from RiskSense allow DES to identify possible vulnerabilities in outward-facing applications which allows DES programming staff to remove vulnerabilities.

Workspace One allows secure access to data across a multitude of devices ensuring that data is transferred both safely and in an adequate timeframe.

This initiative will provide the products needed to address the Department's network vulnerabilities that have been identified by external audits and internal assessments and provide the tools needed to secure the sensitive information entrusted to the department.

| Application | Description | First Year Automation Projects Fund | First Year Other Funds Cost Estimate[1] | Total Project Cost Estimate[2] |
|---|---|---|---|---|
| Data Security Tools | Several technologies to enhance DES ability to secure confidential information processed, transmitted, and stored on its automated systems | $310,944 | $207,296 | $1,038,927 |
| Application Security Scanning | RiskSense testing finds vulnerabilities in outward-facing applications. With vulnerabilities identified, the vendor will provide a report that will help DES programming staff to make changes in their code to remove the vulnerabilities. | $216,000 | $144,000 | $360,000 |
| Workspace One | Workspace One will allow us to deliver secure access to cloud, mobile, web, mainframe and Windows apps on any smartphone, tablet, thin client, PC, or laptop through a single | $533,672 | $355,781 | $1,179,926 |

| | | | | |
|---|---|---|---|---|
| | catalog and a consumer-simple single sign-on (SSO) experience. | | | |
| AADP & ATP Implementation | The Advanced Threat Protection (ATP) product offers a first line support to keep unsafe links from making it into the DES email system. Azure Active Directory Premium (AADP) allows DES to implement extra multi-factor authentication procedures that keep our systems safe and secure. | $40,513 | $27,009 | $473,024 |
| **Total** | | $1,101,129 | $734,086 | $3,051,877 |

[1] Funds include federal funding, and other non-General Fund monies.

[2] Total project estimates include full implementation costs.

6A

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Steve Schimpp, Deputy Director SS

SUBJECT: Arizona Department of Education - Review of State Aid Correction for Chino Valley Unified

**Request**

Pursuant to A.R.S. § 15-915B, the Arizona Department of Education (ADE) requests favorable review of its plan to provide the Chino Valley Unified School District (CVUSD) with $143,500 in corrected state aid funding due to a settlement in Arizona Tax Court regarding property taxes paid in prior years by Drake Cement, LLC.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of the request.

2. An unfavorable review of the request.

**Key Points**

1) Drake Cement, LLC, in the Chino Valley Unified School District, recently won a property tax appeal in Arizona Tax Court.
2) As a result, the district must refund $143,500 in K-12 QTR and SETR taxes that it received from the company for FY 2017.
3) A.R.S. § 15-901B requires the state to reimburse the district for the refund, subject to JLBC review.

(Continued)

**Analysis**

Subject to review by the JLBC, A.R.S. § 15-915B requires ADE to reimburse a school district for K-12 "local share" taxes that it must refund to a taxpayer due to an Arizona Tax Court ruling that reduces the taxpayer's assessed property value for prior fiscal years. In that regard, Arizona Tax Court recently ruled that property owned by Drake Cement, LLC, was overvalued for taxation purposes for FY 2017.

As a result, the CVUSD must refund $143,500 in QTR and SETR taxes that the property owner paid to it for FY 2017. ADE therefore requests Committee review of its plan to provide CVUSD with $143,500 in corrected state aid to reimburse it for monies that it must refund.

The $143,500 refund would correct CVUSD's net state aid for FY 2017 to what it would have been if the property owner had paid correct QTR and SETR taxes originally.

SSc:kp

# State of Arizona
# Department of Education

## School Finance


TO: John Kavanagh, Chairman
Joint Legislative Budget Committee

FROM: Lyle Friesen, Deputy Associate Superintendent of School Finance

DATE: 2/5/2018

SUBJECT: Correction of State Aid 15-915(B)

Chino Valley Unified School District has requested state aid corrections for prior fiscal years. Pursuant to A.R.S §15-915(B), review by the JLBC is required.

A.R.S. §15-915 B: *Subject to the review by the joint legislative budget committee, the superintendent of public instruction shall adjust state aid for a school district in the current year if the governing board of a school district requests the recalculation of state aid for a prior year due to a change in assessed valuation that occurred as the result of a judgment in accordance with section 42-16213.*

The Yavapai County Superior Court has issued stipulated judgements in favor of Drake Cement, LLC. in regard to the tax year 2016 assessed valuation of property owned by them. Thus, School Finance has determined that an additional $143,481.15 for FY17 state aid is needed. Subject to the Joint Legislative Budget Committee's review, this amount will be distributed with FY18 state aid funding to Chino Valley Unified School District.

If you have any further questions, please contact Lyle Friesen, School Finance Director at 602-542-8250 or Lyle.Friesen@azed.gov.

Thank you.

cc: Richard Stavneak, Director of Joint Legislative Budget Committee
Steve Schimpp, Analyst of Joint Legislative Budget Committee

6B

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Steve Schimpp, Deputy Director SS

SUBJECT: Arizona Department of Education - Review of Joint Technical Education District Quarterly and Annual Reports

**Request**

The Arizona Department of Education (ADE) requests Committee review of its most recent quarterly report on JTED program and courses pursuant to Laws 2016, Chapter 4. It also requests review of its annual Joint Technical Education District (JTED) report for FY 2017, as required by A.R.S. § 15-393.01.

**Recommendation**

The Committee has at least the following 2 options:

1. A favorable review of the reports.

2. An unfavorable review of the reports.

**Key Points**

1) ADE has reviewed 711 local JTED programs to date (193 during the past quarter).
2) All but 4 were approved for continued state funding.
3) Non-compliant programs typically lacked a properly certified teacher.
4) The remaining 1,300+ local programs will be reviewed by December 31, 2018.
5) 129,887 students (21,013 average daily membership (ADM)) enrolled in JTED programs during the 2016-2017 school year.

(Continued)

**Analysis**

Laws 2016, Chapter 4, Section 6 added new requirements for JTED programs and courses and requires ADE to review existing JTED programs and courses to see if they remain eligible for Basic State Aid (BSA) funding under the new requirements. JTED programs or courses that do not meet the new requirements are not eligible for continued BSA funding. Chapter 4 requires ADE to submit quarterly reports to the Committee through December 31, 2018 for review on its progress and the subsequent approval or rejection of currently-eligible JTED programs and courses.

Additionally, A.R.S. § 15-393.01 requires ADE to submit an annual report to the JLBC on or before December 31 including the enrollment, location and cost of each JTED course and program.

Quarterly Reports

ADE previously submitted quarterly reports to the Committee for JTED reviews conducted between April 1, 2016 and September 30, 2017. Those reviews covered 66 of 73 state-level JTED programs and 518 of 2,200+ local level programs. The remaining 7 state-level programs did not have any enrolled students, so could not be reviewed. The remaining 1,700 (approximately) local-level programs were not visited by December 31, 2017, but ADE planned to do so by December 31, 2018 (the Chapter 4 deadline for completing JTED program reviews).

Of the 66 state-level programs reviewed prior to September 30, 2017:

- 58 are eligible for continued BSA funding
- 7 are ineligible
- 1 is on hold and has not been reviewed (the Food Products and Processing Systems program)

No local-level programs were found to be ineligible for continued BSA funding prior to September 30, 2017.

ADE reviewed an additional 193 local level programs (711 cumulatively) between October 1, 2017 and December 31, 2017. No additional state level programs were reviewed during that time.

Of the 711 local level programs reviewed to date, only 4 were found to be ineligible for BSA funding. Those programs typically are ineligible because they lack a properly-certified teacher *(see Table 1).*

**Table 1**

**Ineligible Local Level JTED Programs**

| Program | District/School | JTED | Deficiency |
|---|---|---|---|
| Air Force JROTC | Peoria USD/Cactus HS | West-MEC | Certified Teacher & misc. |
| Medical Assisting Services | Peoria USD/Peoria HS | West-MEC | Certified Teacher (closed) |
| Automotive Technologies | Peoria USD/Ironwood HS | West-MEC | Assessments |
| Music and Audio Production | Antelope Union/Antelope Union HS | STEDY | Certified Teacher & misc. |

(Continued)

Reviews of JTED programs and courses are now based on modified statutory requirements established by Laws 2017, Chapter 279 *(see Appendix 1)*. Chapter 279 no longer requires a JTED program to lead to industry-based certification or licensure if not available, which could make it easier for some JTED programs and courses to remain eligible for BSA funding under Chapter 4.

Annual Report

ADE's annual JTED report provides enrollment, location and cost data for each JTED program offered in the state. ADE reports detailed data for individual JTEDs in electronic format rather than in the hard copy portion of the report due to the volume of data involved. Appendices 2-4, however, show sample data pages from the electronic files.

Appendix 2 shows that 39,366 students (7,288 ADM) attended the East Valley Institute of Technology (EVIT), for example, in FY 2017, including satellite sites at its member districts. JTED ADM typically is less than JTED enrollment because most students attend JTEDs part-time and 9th Graders are excluded from JTED ADM counts.

Appendix 3 shows that the Coconino County JTED, for example, spent $28,800 on Bioscience and $176,900 on all programs collectively at its central campus for FY 2017.

Appendix 4 shows that all 10 students who enrolled in the Business Management program at the Coconino County JTED central campus in FY 2016, for example, also enrolled in the second year of the program in FY 2017 and 100% passed the second-year course.

ADE reports that in school year 2016-2017 a total of 129,887 students enrolled in JTED courses in one of the 14 districts. The total student enrollment resulted in an ADM of 21,013. The largest district in terms of enrollment was the East Valley Institute of Technology (EVIT) with a reported enrollment of 39,366 students. The smallest district was Valley Academy for Career and Technical Education (VACTE) with 247 enrolled students.

JTEDs and school districts collectively offer more than 2,200 CTE programs and more than 6,000 CTE courses.

Next Steps

ADE will continue to review all remaining JTED programs and courses by December 31, 2018 to ensure their eligibility for continued BSA funding. The results of these reviews will be included in subsequent quarterly reports.

SSc:kp
Attachments

**Criteria for Evaluating JTED Programs**
(A.R.S. §15-391, paragraph 5)

15-391. Definitions

In this article, unless the context otherwise requires:

5. "Joint technical education district program" means a sequence of courses that is offered by a joint technical education district and that meets all of the following requirements:

(a) Is taught by an instructor who is certified to teach career and technical education by the state board of education or by a postsecondary educational institution.

(b) Requires an assessment that demonstrates the level of skills, knowledge and competencies necessary to be successful in the designated vocation or industry or an assessment necessary for certification, if appropriate, or for career readiness and entry-level employment, in and acceptance by that vocation or industry. Any assessment adopted pursuant to this subdivision shall require a passing score of at least sixty percent.

(c) Requires specialized equipment and specialized materials in order to provide instruction to students that exceeds the cost of a standard educational course.

(d) Requires a majority of instructional time to be conducted in a laboratory environment, field-based environment or work-based learning environment, and requires career and technical student organization participation, except for community college courses.

(e) Demonstrates alignment through a curriculum, instructional model and course sequence to meet the standards of a career and technical education preparatory program as determined by the career and technical education division of the department of education.

(f) Has a defined pathway to career and postsecondary education in a specific vocation or industry as determined by the career and technical education division of the department of education.

(g) Is approved by the career and technical education division of the department of education based only on the requirements prescribed in this paragraph after the submission of all required documentation.

(h) Is certified by the joint technical education district governing board to have met all the requirements prescribed in this article.

(i) Is offered only to students in grades nine, ten, eleven and twelve.

(j) Fills a high-need vocational or industry need as determined by the career and technical education division of the department of education.

(k) Requires a single or stackable credential as described in subdivision (l) of this paragraph or a skill that will allow a student to obtain work as described in subdivision (l) of this paragraph on graduation before receiving an associate degree or baccalaureate degree.

(l) Leads to certification or licensure, if available, or to career readiness and entry-level employment where relevant certification or licensure does not exist in that industry, in the designated vocation or industry that has been verified and accepted by that vocation or industry and that qualifies the person for employment. If there is no certification or licensure that is accepted by the vocation or industry, or if business practicalities do not require certification or licensure, completion of the program must qualify the student for at least entry-level employment.

(m) Requires instruction and instructional materials in courses that are substantially different from and exceed the scope of standard instruction and that include vocational skills, competencies and knowledge to be successful in the designated joint technical education district program vocation or industry.

(n) An industry or vocation has agreed to provide financial or technical support to the joint technical education district for a specific joint technical education district program. For the purposes of this subdivision, "financial support" includes in-kind contributions and donations.

(o) A joint technical education district has demonstrated a need for extra funding in order to provide the joint technical education district program.

State of Arizona
Department of Education
Office of Diane M. Douglas
Superintendent of Public Instruction


February 13, 2018

Mr. Richard Stavneak, Director
Joint Legislative Budget Committee
1716 West Adams Street
Phoenix, AZ 85007

Mr. Stavneak:

Pursuant to Arizona Revised Statutes (A.R.S.) § 15-393.01(C), the Arizona Department of Education Career and Technical Education Section has prepared the attached report with supporting documents on the enclosed disc. The report summarizes data submitted by Arizona's 14 Joint Technical Education Districts for school year 2016-2017. If you have any questions regarding the information provided, please feel free to contact me at the email below. You may also contact Marilyn Gardner, CTE Director of Fiscal, Grants & Accountability at Marilyn.Gardner@azed.gov.

Sincerely,

Cathie Raymond

Cathie Raymond, State CTE Director
Deputy Associate Superintendent
Career and Technical Education
High Academic Standards for Students Division
Arizona Department of Education
1535 W. Jefferson, Bin 42
Phoenix, AZ 85250
Cathie.Raymond@azed.gov

cc: Steve Schimpp

| EVIT- East Valley Institute of Technology | 2016-2017 40th Day 10-12 Grade CTE Student ADM By Location | 2016-2017 40th Day 9-12 Grade CTE Student *Count By Location |
|---|---|---|
| Central Campus | 2,525.78 | 3,181.00 |
| Leased Central Campus | 117.90 | 528.00 |
| Chandler Unified School District | 974.76 | 5,029.00 |
| Fountain Hills | 48.28 | 240.00 |
| Gilbert Unified School District | 907.06 | 6259.00 |
| Higley Unified School District | 245.15 | 1,773.00 |
| J.O. Combs Unified School District | 156.91 | 875.00 |
| Mesa Unified School District | 1,237.98 | 8,647.00 |
| Queen Creek Unified School District | 163.63 | 1212.00 |
| Scottsdale Unified School District | 265.04 | 2455 |
| Tempe Union High School District | 645.90 | 9,167.00 |
| | | |
| **JTED Central Campus and Satellites Total** | **7,288.40** | **39,366.00** |

Appendix 2

| | Name | CTD | FORM B<br>2016-2017<br>JTED Program Cost<br>CENTRAL DISTRICT SUMMARY FORM |
|---|---|---|---|
| JTED District | CAVIAT- Coconino Assn for Vocations, Industry, and Tech | 030801 | |

| Program Number (CIP) | USFR Chart of Accounts Program Code | ADE Program Title | Program Cost | ALL Funds | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Direct Costs | | | | | | Allocated Indirect Costs (from all object codes) |
| | | | | Salaries 61XX | ERE 62XX | Purchased Services 63XX, 64XX, 65XX (excluding 6450) | Supplies 66XX (including Textbooks & Inst Aids) | Property 6450, 67XX, 6832, 6842 (including Land & Bldg, Equipment purchases and leases) | Other 68XX (excluding 6832 & 6842) | |
| 41.0100.00 | 312 | Bioscience | $ 28,790.96 | $ 26,772.50 | $ 2,018.46 | | | | | |
| 52.0200.00 | 313 | Business Management and Administrative Services | $ 13,967.81 | | | $ 11,740.81 | $ 2,227.00 | | | |
| 46.0400.20 | 318 | Construction Technologies | $ 14,258.96 | | | $ 11,985.54 | $ 2,273.42 | | | |
| 51.0900.30 | 329 | Emergency Medical Services | $ 29,116.19 | $ 10,390.00 | $ 794.84 | $ 15,269.26 | $ 2,662.09 | | | |
| 52.1900.20 | 333 | Fashion Design and Merchandising | $ 26,554.48 | $ 22,855.00 | $ 1,748.42 | $ 282.00 | $ 1,669.06 | | | |
| 51.0707.00 | 338 | Health Information Technology | $ 22,900.93 | $ 21,205.00 | $ 1,622.18 | | $ 73.75 | | | |
| 51.3900.00 | 354 | Nursing Services | $ 40,273.44 | | | $ 35,130.19 | $ 5,143.25 | | | |
| **CENTRAL CAMPUS COST TOTAL** | | | **$175,862.77** | **$ 81,222.50** | **$ 6,183.90** | **$ 74,407.80** | **$ 14,048.57** | **$ -** | **$ -** | **$ -** |

Appendix 3

| Coconino Association for Vocational, Industry & Technology | Location | Program Name | A) Number of students who were enrolled in the first course of a JTED eligible program during the 2015-2016 school year (indicate number for each program below): | B) Number of students from 2015-2016 group who were also enrolled in the second course of the JTED eligible program by the 2016-2017 school year (indicate number for each program below): | Percentage B/A | C) Number of students from 2015-2016 group who complete (pass) the second course of the JTED eligible program by the 2016-2017 school year (indicate number for each program below): | Percentage C/B |
|---|---|---|---|---|---|---|---|
| | CCC Central Campus | Business Management & Administrative Services | 10 | 10 | 100.00% | 10 | 100.00% |
| | | Construction Technologies | 7 | 5 | 71.43% | 5 | 100.00% |
| | | Emergency Medical Services | 0 | 0 | | 0 | 0.00% |
| | | Law | 1 | 1 | 100.00% | 1 | 100.00% |
| | | Nursing Services | 12 | 12 | 100.00% | 12 | 100.00% |
| | Flagstaff Central Campus | Bioscience | 0 | 0 | | 0 | 0.00% |
| | | Fashion Design & Merchandising | 6 | 5 | 83.33% | 5 | 100.00% |
| | | Health Information Technology | 24 | 19 | 79.17% | 19 | 100.00% |
| | Fredonia Central Campus | Emergency Medical Services | 10 | 10 | 100.00% | 10 | 100.00% |
| | Williams Central Campus | Bioscience | 23 | 23 | 100.00% | 23 | 100.00% |
| | | Medical Assisting Services | 22 | 14 | 63.64% | 14 | 100.00% |
| | | | 115 | 99 | | 99 | |

Appendix 4

STATE OF ARIZONA

# Joint Legislative Budget Committee



1716 WEST ADAMS
PHOENIX, ARIZONA 85007

(602) 926-5491

azleg.gov



DATE: April 11, 2018

TO: Members of the Joint Legislative Budget Committee

FROM: Sam Beres, Fiscal Analyst SB

SUBJECT: Northern Arizona University - Review of Expenditure and Performance Report of Nonprofit Biotechnology Research Appropriation

**Request**

The FY 2015 General Appropriation Act (Laws 2014, Chapter 18, Section 132) appropriates $3,000,000 each year from FY 2015 to FY 2019 to Northern Arizona University (NAU) to grant to a nonprofit biomedical research entity. The act requires NAU to provide a report to the Joint Legislative Budget Committee (JLBC) for its review on the expenditures and performance of the grant recipient by February 1 of each year.

**Committee Options**

The Committee has at least the following 2 options:

1. A favorable review of NAU's biomedical research report.

2. An unfavorable review of NAU's biomedical research report.

**Key Points**

1) NAU receives $3.0 million per year from the General Fund through FY 2019, which it then grants to the Translational Genomics Research Institute (TGen) for its unrestricted use.
2) The majority of this funding ($1.7 million) was used on research capital in 2017, which is used to support projects funded by other grants.
3) In 2017, TGen reports receiving 22 grants, publishing 128 academic articles, and being awarded 12 patents.

(Continued)

**Analysis**

The FY 2015 budget requires that NAU contract with a nonprofit biomedical research entity for a $3 million annual grant over a 5-year period (FY 2015 - FY 2019). The grantee is required to report to NAU annually on the following information:

1. The type and amount of expenditures from all state sources of monies.
2. A description of each grant received as well as the positions and locations of positions solely or partly funded by the state.
3. Performance measures, including outcomes related to use of state monies, progress made toward the achievement of each outcome, reportable inventions or discoveries made and publication related to research funded by state monies.

The grantee is the Translational Genomics Research Institute, also known as TGen. TGen is a nonprofit organization which studies the genetic components of diseases to develop diagnostics, prognostics and therapies for cancer, neurological disorders, diabetes and other complex medical conditions. TGen staff are located in their Phoenix headquarters as well as offices in Scottsdale and Flagstaff.

All Sources of State Monies

In addition to the $3 million NAU appropriation, TGen also receives $2 million from the Department of Health Services (DHS) from the Tobacco Tax and Health Care Fund - Health Research Account.

The state funding provides unrestricted financial support for TGen's operations. TGen reports that the state monies are used to supplement research grants, whether by covering indirect costs not funded by awards amounts, or by allowing TGen to match project costs in accordance with grant program criteria. The report lists 11 grant funded projects that are supported in part by state funds.

The expenditures of the TGen monies from NAU in 2017 are summarized in *Table 1.* The majority of the funding from NAU was spent on research capital.

**Table 1**

**CY 2017 Expenditures of NAU Funding**

| Expenditure Category | Expenditures |
|---|---|
| Research Supplies | $ 190,000 |
| Research Outside Services | 292,000 |
| Research Capital | 1,723,000 |
| Research Equipment Service Maintenance | 395,000 |
| Proposal Development | 100,000 |
| Project Management | 100,000 |
| Technical Infrastructure | 100,000 |
| Education | 100,000 |
| **Total** | **3,000,000** |

Grants and Full-Time Positions

In 2017, TGen submitted 96 grant applications to various entities totaling $62 million. Of that amount, TGen was awarded 22 grants totaling $4.9 million. *(Please see the NAU report attached to this memo for the list of grant awards.)* As described above, TGen reports that these projects and others are supported in part by the underlying technology funded by state appropriations.

(Continued)

TGen reports that in 2017, 25 new FTE Positions were created with salaries and benefits totaling $3.0 million. In addition, student salaries totaled $312,600. The majority of the funding for these positions comes from non-state sources and grants. The grant from NAU supports 2 FTE Positions. TGen reports that all employees are Arizona residents.

Performance Measures

TGen's 2017 report highlights the following progress and outcomes of its research initiatives:

- A study led by TGen scientists identified a compound which could be used to help treat glioblastoma, which is the most common form of brain cancer.
- TGen researchers identified a genomic mutation in a 6-year-old boy that affects a protein that is key to brain development.
- A 3-year study of the Arizona State University (ASU) football program allowed researchers to create a large dataset helpful in diagnosing medical conditions such as concussions.
- A team of researchers collaborating with other medical-research entities identified a protein that, if inhibited, could be an approach to treating an uncommon type of melanoma.
- In a study jointly led by TGen and ASU, researchers investigated a gene associated with Alzheimer's disease.
- Through a study into nerve growth factors associated with pancreatic cancer, TGen researchers generated findings which may lead to potential drugs that could reduce pain for pancreatic cancer patients.
- Working jointly with the University of California San Francisco, TGen researchers investigated methods for combatting drug-resistance mutations of tuberculosis.

In addition to these research projects, TGen reports that it contributed to the publication of 128 academic articles in various journals, which includes at least 18 articles that were partially supported by technology provided through state funds. TGen researchers presented at 18 conferences throughout the year, including at the annual meeting of the American Association for Cancer Research in Washington, D.C.

TGen lists 12 patents issued in 2017, as well as 29 other patent applications filed, resulting from projects funded by external sponsors and supported by the technologies provided for by state funding. The attached pages from the TGen report provide a list of these patents, as well as the organization's 2017 scientific publications.

SB:kp

NORTHERN ARIZONA UNIVERSITY

Office of the Vice President for Research

Northern Arizona University
PO Box 4087
Flagstaff, AZ 86011-4087

928-523-4340
928-523-1075 fax
www.research.nau.edu


February 2, 2018

Director Richard Stavneak
Joint Legislative Budget Committee
1716 W. Adams
Phoenix, AZ 85007

Director Stavneak:

In accordance with Laws 2014, Chapter 18, Section 132, enclosed please find the annual expenditure and performance report provided to Northern Arizona University (NAU) by the Translational Genomics Research Institute (TGen). The report details the grant activity and performance measures as related to state funding for fiscal year 2017.

As demonstrated in the attached report, the $3 million state investment in TGen has leveraged external funding that supports essential research activities. These grants include dollars to support research on such topics as tuberculosis, Alzheimer's disease, and pancreatic cancer.

NAU appreciates its partnership with TGen and looks forward to the continued individual success of the organization as well as the continued success of our partnership. Our relationship exemplifies the importance of the biosciences to NAU and Arizona's economy. We are gratified that the state recognizes our ongoing relationship and sees the benefits that derive from scientific discoveries.

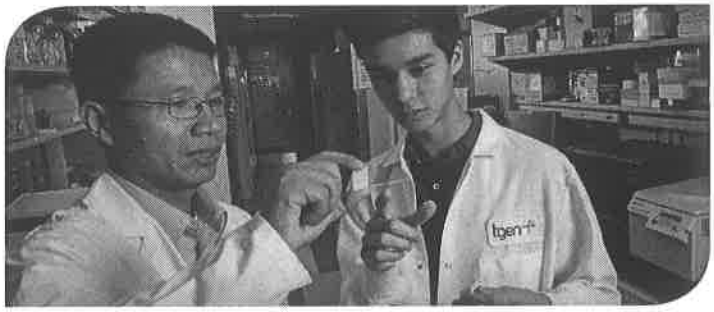
Do not hesitate to contact me if you have any questions regarding the attached report or NAU's partnership with TGen and the state as they relate to these grant monies.

Sincerely,

NORTHERN ARIZONA UNIVERSITY

David Schultz, Vice President for Research
Professor of Physics & Astronomy

cc: Sam Beres, Fiscal Analyst



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AN AFFILIATE OF City of Hope.

# Summary of 2017 Activities

# Summary of 2017 Activities

During 2017, TGen pursued the goal of H82703, Fifty-first Legislature, Second Regular Session, Chapter 18, Section 132, as adopted by the Arizona Legislature pursuant to the FY2014-2015 budget and signed by the Governor on April 11, 2014 to support a non-profit medical research institute in Arizona that specializes in biotechnology and that collaborates with universities, hospitals, biotechnology and other health science research centers.

# Expenditures From all State Sources of Monies

| | Second Half FY 17<br>January 17 - June 17 | First Half FY 17<br>July 17 - December 17 | TOTAL |
|---|---|---|---|
| **NAU / State of Arizona Grant** | | | |
| Research Supplies | $40,000 | $150,000 | $190,000 |
| Research Outside Services | $100,000 | $192,000 | $292,000 |
| Research Capital | $1,000,000 | $723,000 | $1,723,000 |
| Research Equipment Service Maint | $160,000 | $235,000 | $395,000 |
| Proposal Development | $50,000 | $50,000 | $100,000 |
| Project Management | $50,000 | $50,000 | $100,000 |
| Technical Infrastructure | $50,000 | $50,000 | $100,000 |
| Education | $50,000 | $50,000 | $100,000 |
| **TOTALS** | **$1,500,000** | **$1,500,000** | **$3,000,000** |

| **Capital Equipment Detail** | | | | |
|---|---|---|---|---|
| Panasonic freezer, -80 : Model # MDF-U76VC-PA | 47960 | $10,403 | | |
| Blue Pippin Size Selection system | 48959 | $6,872 | | |
| SW, LIPIDSEARCH 4.1 SINGLE-USER HRAM | 49959 | $14,850 | | |
| NovaSeq 6000 Sequencing System | 50959 | $994,850 | | |
| 50961 - Quant Studio 7 Flex - Fast Real-Time Well 384 | 50961 | | $74,396 | |
| SY-415-1001, NextSeq 500 sequencing system | 52959 | | $252,000 | |
| -80 Freezer | 54959 | | $11,149 | |
| Odyssey Fc Imaging System Basic w/Computer | 54960 | | $34,085 | |
| RediShip Xstream Hood & Spill Stopper 115V | 54961 | | $14,256 | |
| -80 Freezer 88600D Series | 58449 | | $21,668 | |
| Freezer, Upright; Isotemp; -86 deg. C | 58451 | | $8,135 | |
| Meso Quickplex SQ 120 | 58450 | | $49,500 | |
| 78CF GLASS DOOR LAB REFRIGERATOR | 58959 | | $8,874 | |
| Peptide separation and sample injection into mass spectrometers | TBD | | $249,025 | |
| **TOTALS** | | **$1,026,975** | **$723,088** | |

| **Other State Funding** | | | |
|---|---|---|---|
| Personnel Services | $66,128 | $60,326 | $126,454 |
| Professional & Outside Services (Consultants) | $840,653 | $851,053 | $1,691,705 |
| Equipment | $0 | $0 | $0 |
| Facilities and Administrative | $90,678 | $91,162 | $181,840 |
| **TOTALS** | **$997,459** | **$1,002,541** | **$2,000,000** |

## Grant Support

In additional to philanthropic donations and research contracts, grant funding is an important funding source for research. In 2017, TGen investigators submitted 96 grants totaling $62M (See Appendix A for complete listing). During this period, TGen was awarded 22 grants, totaling $4.9M. The projects outlined below, in addition to many others, are supported in part under the $3M per year in general funds appropriation as distributed by Northern Arizona University, as well as the $2M per year in tobacco tax funding received from the Arizona Department of Health Services.

a. Three-year grant from UNC and NIH totaling $618,879 to Dr. Michael Berens to study the credentialing of murine models for Glioblastoma drug development.

b. Two-year grant from the Critical Path Institute totaling $600,000 to Dr. David Engelthaler to study tuberculosis through sequencing.

c. One-year grant from Ohio State University and NIH totaling $245,334 to Dr. Jeff Trent to study canine melanoma and osteosarcoma.

d. Three-year grant from the Department of Defense totaling $661,015 to Dr. Vinodh Narayanan to study the phenotypic variability in Tuverous Sclerosis Complex (TSC).

e. Three-year grant from the Stand Up to Cancer and Merck Pharmaceuticals totaling $658,268 to Dr. Daniel Von Hoff for targeting VDR to make pancreatic cancer competent for immunotherapy.

f. Five-year grant from the Banner Health Research Institute and NIH totaling $113,365 to Dr. Matt Huentelman to conduct a study in Alzheimer's Disease.

g. One-year grant from the Centers for Disease Control totaling $109;504 to Dr. David Engelthaler to conduct a study on homologous and non-homologous recombination in outbreak analysis.

h. Two-year grant from City of Hope and the Sidell Kagan Foundation to Dr. Kendall Jensen totaling $300,000 to advance prevention of Alzheimer's disease.

i. Four-year grant from the Defense Threat Reduction Agency and Northern Arizona University totaling $919,694 to Dr. David Engelthaler to identify and characterize antimicrobial susceptibility markers in Burholderia Pseudomallei.

j. Two-year grant from the Chad Zuckerberg Initiative and Silicon Valley Community Foundation totaling $183,239 to Dr. Jonathan Keats to develop robust methods to process solid tissues for single cell RNA sequencing.

k. One-year grant from the Doris Duke Foundation and UCSF totaling $51,575 to Dr. David Engelthaler to develop novel methods for monitoring long-term drug exposure and resistance amplification during treatment of multidrug resistant tuberculosis.


## Outcomes and Progress

In 2017, TGen advanced a series of innovative research initiatives that yielded numerous scientific discoveries (a good number with potential clinical application), established national and international collaborations, and led new and exciting clinical trials with promising results. Notable are:

- A study led by scientists at TGen identified "a potent inhibitory compound" in the elusive hunt for an improved treatment against glioblastoma, the most common and deadly type of adult brain cancer. Aurintricarboxylic Acid (ATA) is a chemical compound that in laboratory tests was shown to block the chemical cascade that otherwise allows glioblastoma cells to invade normal brain tissue and resist both chemo and radiation therapy. The findings of this study could represent a breakthrough in our efforts to find an effective long-term treatment against glioblastoma multiforme (GBM). The published results appeared in the scientific journal *Oncotarget*.

- Researchers at TGen identified a genomic mutation that causes physical abnormalities and developmental delays in children. Whole genome sequencing analysis of a six-year-old boy revealed a novel mutation that affects a protein known as CASK, which is key to brain development and the signals transmitted by brain cells, or neurons. Identifying this new CASK mutation adds to the scientific understanding of how these multifaceted disorders occur, and provides insight into how they might be treated in the future. The results appeared in the *American Journal of Medical Genetics*. The child involved in this study was seen at TGen's Center for Rare Childhood Disorders, which helps families identify the genetic source of their children's medical symptoms.

- A three-year study of the Arizona State University football program allowed researchers at TGen to create the largest dataset to date of extracellular small RNAs, which are potential biomarkers for diagnosing medical conditions, including concussions. The study amassed a collection of biomarkers from the ASU student-athletes' biofluids: blood, urine and saliva. A portion of that information will be used with data from helmet sensors that recorded the number, intensity and direction of head impacts during games and practices from the 2013-16 football teams. TGen researchers are using that combined data to potentially develop new diagnostic and therapeutic tools. Details of the dataset were published in *Scientific Reports*, an online open-access journal of the Nature Publishing Group. Because the data is being published in an open access journal, they are available to aid other researchers studying how to develop tests for the detection and extent of injuries involving everything from automobile accidents to battlefield explosions.

- In early April, a team of researchers reported a significant genetic association linked to an aggressive form of melanoma in a study published in the journal *Genome Research*. Acral lentiginous melanoma, or ALM, is an uncommon type of melanoma that typically occurs on the palms and soles and is often difficult to treat. Led by investigators at TGen – in collaboration with Vanderbilt University Medical Center, Memorial Sloan Kettering Cancer Center, and Mayo Clinic - researchers identified a protein target that opens a window into the disease and may aid in diagnosis and, one day, lead to improved treatments. The researchers sequenced samples from 34 patients with ALM and found significant evidence that inhibiting a protein called TERT may be "an effective approach" to destroying ALM cells. The findings provide insight into the role TERT plays in the formation of ALM, and reveal preliminary evidence that inhibiting TERT has a deadly effect on ALM cancer cells. In laboratory experiments, more than 75 percent of ALM cancer cells were affected, following 72 hours of exposure to a drug that inhibits TERT.

- Researchers led by Arizona State University (ASU) and TGen identified altered expression of a gene called ANK1, which only recently has been associated with memory robbing Alzheimer's disease, in specific cells in the brain. Using an extremely precise method of isolating cells called "laser capture microdissection," researchers looked at three specific cell types - microglia, astrocytes and neurons - in the brain tissue of individuals with a pathological diagnosis of Alzheimer's disease, and compared them to brain samples from healthy individuals and those with Parkinson's disease. Following sequencing of each of these cell types, the ASU-TGen led team found that altered ANK1 expression originates in microglia, a type of immune cell found in the brain and central nervous system. Although previous genetic and epigenetic-wide association studies had shown a significant association between ANK1 and AD, they were unable to identify the class of cells that may be responsible for such association because of the use of brain homogenates. The results provide evidence that microglia are the source of the previously observed differential expression patterns in the ANK1 gene in Alzheimer's disease. The study appeared in the scientific journal *PLOS ONE*.

- A study detailing how blocking nerve growth factor keeps pancreatic cancer cells from invading surrounding nerves may lead to potential drug targets to reduce pain in pancreatic cancer patients. TGen researchers have found that the nerve growth factor (NGF), a neurotrophic factor, and its receptor TRKA are associated with perineural invasion (PNI), which is the ability of pancreatic cancer cells to invade surrounding nerves. Blocking the NGF signaling through inhibitors of NGF and TRKA reduces the potential of pancreatic cancer cells to migrate towards the surrounding nerves. The study results appeared in *PLOS ONE*.

- Two studies led by TGen and the University of California San Francisco (UCSF) document how a new advanced genetic sequencing approach can help thwart the growing worldwide threat posed by drug-resistant mutations of tuberculosis (TB). While TB has declined in the U.S. and other developed nations, the infectious lung bacteria remains a major public health threat throughout developing nations, estimated to infect a third of the world's population. The threat of TB is increasing in some places as mutant versions of the disease become more and more resistant to current drug treatments. Drug-resistance occurs when the wrong antibiotics are prescribed at the wrong time. This new approach is designed to not only help doctors better treat patients, but to help slow or stop the global threat of multi-drug resistant TB. One of the TGen-UCSF studies - Cryptic Micro-heteroresistance Explains M. tuberculosis Phenotypic Resistance - published June 14 in the American Journal of Respiratory and Critical Care Medicine, concludes that using "a targeted next generation sequencing (NGS) approach ... dramatically reduces sequencing error." Such error, inherent in DNA sequencing systems, would otherwise prevent the ability to detect very small, hidden populations of drug-resistant bacteria growing in the lung. In both studies, the TGen-UCSF team used Single Molecule-Overlapping Reads (SMOR) technology - invented at TGen - which precisely identifies variants of TB, even in cases where an older technology, known as Sanger sequencing, found no drug-resistant mutations.

# Clinical Trials

The Virginia G. Piper Cancer Center (VGPCC) Clinical Trials Program at HonorHealth provides a direct clinical research site for TGen. TGen Physician-in-Chief, Daniel Von Hoff, M.D., F.A.C.P., serves as Chief Scientific Officer. Program clinicians focus on clinical trials with targeted agents and genomics-based individualized therapy. Their initial focus on cancer allows the unique opportunity for TGen to transition its laboratory-based research to patient care centered on individualized therapy. Program staff currently working on the Phase I clinical trials.

Clinically, we continue to launch innovative programs that expand the boundaries of science and medicine. Current initiatives include:

1. Multiple clinical trials underway to investigate new chemical agents for a variety of tumor types in different cancers.

2. Incorporation of modern tools to identify patients' genomic characteristics that could lead to a more targeted approach.

# Patents and Licenses

During 2017, TGen filed the patent applications on TGen-generated research. The list below reflects patent applications resulting from projects funded by external sponsors, but supported by underlying technology provided for by State of Arizona funding via the $3M per year in general funds appropriation as distributed by Northern Arizona University, as well as the $2M per year in tobacco tax funding received from the Arizona Department of Health Services.

# 2017 Issued Patents

| Issue Date | Tech Id | Title | App Type | Country | Status | Patent No. |
|---|---|---|---|---|---|---|
| 01/03/17 | 110428-155US | Therapeutic Combination For Cancer Treatment | Nationalized PCT | United States | Issued | 9,532,984 |
| 03/07/17 | 080723-073CON1 | Methods and Kits to Identify Invasive Glioblastoma | Continuation | United States | Issued | 9,587,239 |
| 04/04/17 | 130130-189US | Hybridoma Clones and Monoclonal Antibodies to Fibroblast Growth Factor 4 | Nationalized PCT | United States | Issued | 9,611,319 |
| 04/11/17 | 131107-215US | Compounds for Cognitive Enhancement and Methods of Use Thereof | Nationalized PCT | United States | Issued | 9,617,214 |
| 05/02/17 | 140513-223US1 | Genetic Signature of Vulnerability to Inhibitors of Base Excision Repair [BER] in Cancer | Nationalized PCT | United States | Issued | 9,637,798 |
| 05/30/17 | 111019-165US | A System And Method Of Genomic Profiling | Nationalized PCT | United States | Issued | 9,663,826 |
| 08/22/17 | 111104-169US | Hybridoma Clones, Monoclonal Antibodies, and Methods of Use | Nationalized PCT | United States | Issued | 9,738,717 |
| 08/29/17 | 131021-213US | Systems and Methods for Diagnosing and Treating Cancer | Utility | United States | Issued | 9,745,634 |
| 09/05/17 | 121214-188US | Targeted Therapies for Cancer (Mayo ref: 2014-404) | Nationalized PCT | United States | Issued | 9,750,741 |
| 10/24/17 | 130509-205CIP | Compositions and Methods of Screening for Compounds That Modulate Activity at a TWEAK Binding Site on a CRD of FN14 | Continuation In Part | United States | Issued | 9,797,882 |
| 12/05/17 | 120410-176US | Primers, Assays And Methods For Detecting An E. Coli Subtype | Nationalized PCT | United States | Issued | 9,834,823 |
| 12/26/17 | 130305-194US | Hybridoma Clones and Monoclonal Antibodies to Tetra Spanin 8 | Nationalized PCT | United States | Issued | 9,850,303 |

# 2017 Patent Applications Filed

| File/Nat'l Date | Tech Id | Title | App Type | Country | Status | Serial No. |
|---|---|---|---|---|---|---|
| 02/01/17 | 161021-260PROV | System And Method For Reducing Ancestry Related Germline False Positives In Tumor Only Somatic Variant Calling | Provisional | United States | Non-Provisional/ PCT In Process | 62/453,492 |
| 02/11/17 | 160210-254PCT | Systems and Methods for the Detection of Infectious Diseases (LymeSeq) | PCT | PCT | Filed | PCT/ US2017/017573 |
| 03/14/17 | 160314-255PCT | Methods and Kits to Identify Klebsiella Strains | PCT | PCT | Filed | PCT/ US2017/022211 |
| 02/23/17 | 110202-146CON | Biomarkers And Methods Of Use Thereof | Continuation | United States | Filed | 15/441,214 |
| 03/30/17 | 170308-262PROV | Global mutation rate as a biomarker of cancer risk, predisposition and early detection | Provisional | United States | Filed | 62/479,305 |
| 10/17/17 | 170308-263PROV | TREM2 Agonists for the Stimulation of Microglia and Methods of Identification | Provisional | United States | Filed | 62/573,400 |
| 04/26/17 | 151124-249PROV | Methods and Assays for Subtyping Staphylococcus Aureus Clonal Complex 8 Strains | Provisional | United States | Filed | 62/490,460 |
| 05/24/17 | 151215-252PCT | Molecular Taging Methods and Sequencing Libraries | PCT | PCT | Filed | PCT/ US2017/034329 |
| 07/21/17 | 170223-261PROV | Real-time PCR assay for the detection of Enterovirus D68 in complex samples | Provisional | United States | Filed | 62/535,813 |
| 05/31/17 | 160518-257PCT | Molecular Tagging Methods and Sequencing Libraries | PCT | PCT | Filed | PCT/ US2017/035330 |
| 11/15/17 | 170530-265PROV | Biomarker Proxies for Standard Blood Chemistry Tests and Related Methods | Provisional | United States | Filed | 62/586,301 |
| 07/28/17 | 170720-267PROV | Methods of Profiling Mass Spectral Data Using Neural Networks | Provisional | United States | Filed | 62/538,627 |
| 11/20/17 | 170923-268PROV | Methods for Enriching Microbial Cell-Free DNA in Plasma | Provisional | United States | Filed | 62/588,782 |
| 11/17/17 | 171116-270PROV | Quantifying mouse vs. human fraction in cell lines, tissue, and body fluids from xenograft models | Provisional | United States | Filed | 62/587,989 |
| 03/31/17 | 140513-223US2 | Genetic Signature of Vulnerability to Inhibitors of Base Excision Repair (BER) in Cancer | Continuation | United States | Prosecution by Other Party | 15/475,344 |
| 04/03/17 | 070723-044CON | Methods of Characterizing Sequences from Genetic Material | Continuation | United States | Filed | 15/477,808 |
| 04/18/17 | 091113-127CON2 | Methods And Kits Used In Classifying Adrenocortical Carcinoma | Continuation | United States | Filed | 15/490,871 |
| 04/21/17 | 130418-203CON | Methods of Detecting Breast Cancer Brain Metastasis with Genomic and Epigenomic Biomarkers | Continuation | United States | Filed | 15/494,426 |
| 08/01/17 | 121214-188CON | Targeted Therapies for Cancer (Mayo ref: 2014-404) | Continuation in Part | United States | Filed | 15/666,493 |
| 08/14/17 | 150914-247US | Methods for Detecting and Treating Fungal Infections | Utility | United States | Filed | 15/677,009 |
| 10/06/17 | 150226-234US2 | Methods Used to Treat Cancer | Nationalized PCT | United States | Filed | 15/564,917 |
| 10/11/17 | 150417-238US | Quality Assessment Of Circulating Cell-Free Dna Using Multiplexed Droplet Digital Pcr | Nationalized PCT | United States | Filed | 15/565,869 |
| 10/12/17 | 150316-235US | Predicting the Occurrence of Metastatic Cancer Using Epigenomic Biomarkers and Non-Invasive Methodologies | Nationalized PCT | United States | Filed | 15/566,174 |
| 10/20/17 | 140521-224EP | Biomarkers and Methods of Diagnosing and Prognosing Mild Traumatic Brain Injuries | Nationalized PCT | Europe | Filed | 16773955.6 |
| 10/23/17 | 150410-236US | Compositions and Methods for Augmenting the Nasal Microbiome | Nationalized PCT | United States | Filed | 15/568,793 |
| 11/16/17 | 150417-238EP | Quality Assessment Of Circulating Cell-Free Dna Using Multiplexed Droplet Digital Pcr | Nationalized PCT | Europe | Filed | 16781020.9 |
| 11/22/17 | 150522-241US | Enhanced Amplicon Sequencing Analysis | Nationalized PCT | United States | Filed | 15/576,495 |
| 12/21/17 | 150522-241EP | Enhanced Amplicon Sequencing Analysis | Nationalized PCT | Europe | Filed | 16731398 |
| 12/28/17 | 150608-242US | Systems and Methods for Treating Cancer | Nationalized PCT | United States | Prosecution by Other Party | 15/740,546 |


# Peer-Reviewed Laboratory Research Publications and Presentations

June 2017 marked TGen's 15th year of operations. We experienced significant scientific and medical progress across multiple areas of the institute, many of which reached new heights and forged the potential for significantly greater achievements in the future.

Building on our recent efforts around precision medicine, we continue to provide patients with new hope and answers. TGen researchers and clinicians – working hand-in-hand with a multitude of collaborators from across the nation and around the world --are finding ways at every level to move forward together, especially in immunotherapy and genomics, to rapidly gain new insights and expand opportunities for the design of new interventions.

In 2017, TGen researchers published their research results extensively in numerous scholarly peer-reviewed academic journals and through presentations at leading national and international conferences **(see Appendix B for complete listing).** The list below reflects publications and presentations resulting from projects funded by external sponsors, but supported by underlying technology provided for by State of Arizona funding via the $3M per year in general funds appropriation as distributed by Northern Arizona University, as well as the $2M per year in tobacco tax funding received from the Arizona Department of Health Services. These include publication in leading scientific journals such as *American Journal of Human Genetics, Nature, Nature Communications, Nature Genetics, Cancer Discovery, Clinical Cancer Research, MBio, Diabetes, Neuro Oncology.*

Our annual Scientific Retreat brought together nearly 200 registrants. The Scientific Retreat allows TGen faculty, staff and invited guests to share their latest research initiatives and long-term vision through competitive presentations, a poster session and hot topics discussions.

# 2017 Select Highlights (See Appendix B for complete listing)

1. Benyamin B, Maihofer AX, **Schork AJ**, Hamilton BA, Rao F, Schmid-Schönbein GW, Zhang K, Mahata M, Stridsberg M, Schork NJ, Biswas N, Hook VY, Wei Z, Montgomery GW, Martin NG, Nievergelt CM, Whitfield JB, O'Connor DT. Identification of novel loci affecting circulating chromogranins and related peptides. *Hum Mol Genet*. 2017 Jan 1;26(1):233-242.

2. Chewapreecha C, Holden MT, Vehkala M, Välimäki N, Yang Z, Harris SR, Mather AE, Tuanyok A, De Smet B, Le Hello S, Bizet C, Mayo M, Wuthiekanun V, Limmathurotsakul D, Phetsouvanh R, Spratt BG, Corander J, Keim P, Dougan G, Dance DA, Currie BJ, Parkhill J, Peacock SJ. Global and regional dissemination and evolution of Burkholderia pseudomallei. *Nat Microbiol*. 2017 Jan 23;2:16263.

3. Guzmán YF, Ramsey K, Stolz JR, Craig DW, **Huentelman MJ**, Narayanan V, Swanson GT. A gain-of-function mutation in the GRIK2 gene causes neurodevelopmental deficits. *Neurol Genet*. 2017 Jan 31;3(1):e129.

4. Arora N, Alsaied O, Dauer P, Majumder K, Modi S, Giri B, Dudeja V, Banerjee S, **Von Hoff D**, Saluja A. Downregulation of Sp1 by Minnelide leads to decrease in HSP70 and decrease in tumor burden of gastric cancer. *PLoS One*. 2017 Feb 13;12(2):e0171827.

5. Roos A, **Dhruv HD**, Mathews IT, Inge LJ, Tuncali S, Hartman LK, Chow D, Millard N, Yin HH, Kloss J, Loftus JC, Winkles JA, **Berens ME**, Tran NL. Identification of aurintricarboxylic acid as a selective inhibitor of the TWEAK-Fn14 signaling pathway in glioblastoma cells. *Oncotarget*. 2017 Feb 14;8(7):12234-12246.

6. Ding KF, Finlay D, Yin H, **Hendricks WP**, Sereduk C, Kiefer J, Sekulic A, LoRusso PM, Vuori K, **Trent JM, Schork NJ**. Analysis of variability in high throughput screening data: applications to melanoma cell lines and drug responses. *Oncotarget*. 2017 Feb 15. [Epub ahead of print]

7. Mateescu B, Kowal EJ, van Balkom BW, Bartel S, Bhattacharyya SN, Buzás EI, Buck AH, de Candia P, Chow FW, Das S, Driedonks TA, Fernández-Messina L, Haderk F, Hill AF, Jones JC, **Van Keuren-Jensen KR**, Lai CP, Lässer C, Liegro ID, Lunavat TR, Lorenowicz MJ, Maas SL, Mäger I, Mittelbrunn M, Momma S, Mukherjee K, Nawaz M, Pegtel DM, Pfaffl MW, Schiffelers RM, Tahara H, Théry C, Tosar JP, Wauben MH, Witwer KW, Nolte-'t Hoen EN. Obstacles and opportunities in the functional analysis of extracellular vesicle RNA - an ISEV position paper. *J Extracell Vesicles*. 2017 Mar 7;6(1):1286095.

8. Yeri A, Courtright A, Reiman R, Carlson E, Beecroft T, Janss A, Siniard A, Richholt R, Balak C, Rozowsky J, Kitchen R, Hutchins E, Winarta J, McCoy R, Anastasi M, Kim S, **Huentelman M, Van Keuren-Jensen K**. Total Extracellular Small RNA Profiles from Plasma, Saliva, and Urine of Healthy Subjects. *Sci Rep*. 2017 Mar 17;7:44061.

9. Ing KF, Finlay D, Yin H, Hendricks WPD, Sereduk C, Kiefer J, Sekulic A, LoRusso PM, Vuori K, Trent JM, Schork NJ. Analysis of variability in high throughput screening data: applications to melanoma cell lines and drug responses. *Oncotarget*. 2017 Apr 25;8(17):27786-27799.

10. Long T, Hicks M, Yu HC, Biggs WH, Kirkness EF, Menni C, Zierer J, Small KS, Mangino M, Messier H, Brewerton S, Turpaz Y, Perkins BA, Evans AM, Miller LA, Guo L, Caskey CT, **Schork NJ**, Garner C, Spector TD, Venter JC, Telenti A. Whole-genome sequencing identifies common-to-rare variants associated with human blood metabolites. *Nat Genet*. 2017 Apr;49(4):568-578.

11. Tigchelaar S, Streijger F, Sinha S, Flibotte S, Manouchehri N, So K, Shortt K, Okon E, Rizzuto MA, Malenica I, Courtright-Lim A, Eisen A, **Van Keuren-Jensen K**, Nislow C, Kwon BK. Serum MicroRNAs Reflect Injury Severity in a Large Animal Model of Thoracic Spinal Cord Injury. *Sci Rep*. 2017 May 3;7(1):1376.

12. Greenawalt DM, **Liang WS**, Saif S, Johnson J, Todorov P, Dulak A, Enriquez D, Halperin R, Ahmed A, Saveliev V, Carpten J, Craig D, Barrett JC, Dougherty B, Zinda M, Fawell S, Dry JR, Byth K. Comparative analysis of primary versus relapse/refractory DLBCL identifies shifts in mutation spectrum. *Oncotarget*. 2017 Jun 15.

13. Leti F, Legendre C, Still CD, Chu X, Petrick A, Gerhard GS, **DiStefano JK**. Altered expression of MALAT1 lncRNA in nonalcoholic steatohepatitis fibrosis regulates CXCL5 in hepatic stellate cells. *Transl Res*. 2017 Sep 19. pii: S1931-5244(17)30267-0.

14. Price EP, Sarovich DS, Webb JR, Hall CM, Jaramillo SA, Sahl JW, Kaestli M, Mayo M, Harrington G, Baker AL, Sidak-Loftis LC, Settles EW, Lummis M, Schupp JM, Gillece JD, Tuanyok A, Warner J, Busch JD, **Keim P**, Currie BJ, Wagner DM. Phylogeographic, genomic, and meropenem susceptibility analysis of Burkholderia ubonensis. *PLoS Negl Trop Dis*. 2017 Sep 14;11(9):e0005928.

15. Choi J, Xu M, Makowski MM, Zhang T, Law MH, Kovacs MA, Granzhan A, Kim WJ, Parikh H, Gartside M, **Trent JM**, Teulade-Fichou MP, Iles MM, Newton-Bishop JA, Bishop DT, MacGregor S, Hayward NK, Vermeulen M, Brown KM. A common intronic variant of PARP1 confers melanoma risk and mediates melanocyte growth via regulation of MITF. Nat Genet. 2017 Sep;49(9):1326-1335.

16. Viswanathan VS, Ryan MJ, **Dhruv HD**, Gill S, Eichhoff OM, Seashore-Ludlow B, Kaffenberger SD, Eaton JK, Shimada K, Aguirre AJ, Viswanathan SR, Chattopadhyay S, Tamayo P, Yang WS, Rees MG, Chen S, Boskovic ZV, Javaid S, Huang C, Wu X, Tseng YY, Roider EM, Gao D, Cleary JM, Wolpin BM, Mesirov JP, Haber DA, Engelman JA, Boehm JS, Kotz JD, Hon CS, Chen Y, Hahn WC, Levesque MP, Doench JG, **Berens ME**, Shamji AF, Clemons PA, Stockwell BR, Schreiber SL. Dependency of a therapy-resistant state of cancer cells on a lipid peroxidase pathway. *Nature*. 2017 Jul 27;547(7664):453-457.

17. Maura F, Petljak M, Lionetti M, Cifola I, **Liang W**, Pinatel E, Alexandrov LB, Fullam A, Martincorena I, Dawson KJ, Angelopoulos N, Samur MK, Szalat R, Zamora J, Tarpey P, Davies H, Corradini P, Anderson KC, Minvielle S, Neri A, Avet-Loiseau H, **Keats J**, Campbell PJ, Munshi NC, Bolli N. Biological and prognostic impact of APOBEC-induced mutations in the spectrum of plasma cell dyscrasias and multiple myeloma cell lines. *Leukemia*. 2017 Dec 6.

18. Peter B, Lancaster H, Vose C, Fares A, Schrauwen I, **Huentelman M**. Two unrelated children with overlapping 6q25.3 deletions, motor speech disorders, and language delays. Am J Med Genet. 2017 Oct;173(10):2659-2669.

# Presentations

## Gordon Research Conference – RNA Nanotechnology
**January 22-27, 2017, Venture Beach, CA**

**Kendall Van Keuren-Jensen**
*Extracellular RNAs for Monitoring Central Nervous System Injury and Disease*

## 2017 Precision LBx Summit
**January 30-31, San Diego, CA**

**Kendall Van Keuren-Jensen**
*Using exRNA to Monitor the Central Nervous System*

## Keystone Symposium on Epigenetics and Human Disease: Progress from Mechanisms to Therapeutics
**January 29 - February 2, 2017, Seattle, WA**

**Madeline Keenen and Suwon Kim.**
*ING4 tumor suppressor in breast cancer: a conditional transcription regulator.*

## KEY STONE SYMPOSIUM on Rare and Undiagnosed Diseases: Discovery and Models of Precision Therapy (C2)
**March 5–8, 2017, Boston, MA**

**Sampathkumar Rangasamy, Julius Dodson, Brittany Gerald, C4RCD Research Group, Vinodh Narayanan.**
*Studies on novel, de novo mutations in DNM1 causing epileptic encephalopathy.*

## 29th Fungel Genetics Conference
**March 14-19, 2017, Pacific Grove, CA**

**David Engelthaler**
*Epidemiology of Cryptococcus spp. using comparative genomics*

## ACMG 2017
**March 21-25, 2017, Phoenix, AZ**

**Jessica Lang, Megan Russell, William Hendricks, Yemin Wang, Pilar Ramos, Holly Yin, Jeffrey Kiefer, Anthony Karnezis, Victoria Zismann, Bernard Weissman, David Huntsman, Jeffrey Trent.**
*142: Pathognomonic SMARCA4 Mutations in Small Cell Carcinoma of the Ovary-Hypercalcemic Type (SCCOHT): Diagnostic and Therapeutic Implications.*

**Keri Ramsey, Vinodh Narayanan, Chris Balak, Ana Claasen, Amanda Courtright, David Craig, Matt De Both, Britney Gerald, Matthew Huentelman, Marcus Naymik, Sampath Rangasamy, Ryan Richholt, Megan Russell, Isabelle Schrauwen, Ashley Siniard, Szabolcs Szelinger, Tyler Izatt.**
*254: The Pitfalls and Triumphs of Whole Exome Sequencing in Rare Childhood Disorders.*

## 10th International Conference on Cryptococcus and Cryptococcosis
**March 26-30, 2017, Foz do Iguacu, Brazil**

**David Engelthaler**
*A phylogenomic view of the Cryptococcus species complexes*

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## TGen Participation at the AACR Annual Meeting 2017

AACR American Association for Cancer Research ANNUAL MEETING 2017 WASHINGTON, DC

| DATE & TIME | SESSION TYPE | LOCATION | SESSION TITLE | PRESENTATION TITLE/ROLE | AUTHOR |
|---|---|---|---|---|---|
| **SUN, APRIL 2** | | | | | |
| 1:00 - 5:00 PM | Poster Session | Section 29 | Childhood Cancer Clinical Translational Research | Antibody-based targeting of the cell surface receptor tyrosine kinase FGFR4 in rhabdomyosarcoma and other cancers | Martin Skarzynski, Nitya Shivaprasad, Baskar Subramanian, **David Azorsa**, Zhongyu Zhu, Dimiter Dimitrov, Javed Khan |
| 1:00 - 5:00 PM | Poster Session | Section 34 | Late-Breaking Research: Bioinformatics and Systems Biology | Leveraging spatial heterogeneity in tumor purity for improved somatic variant calling of archival tumor-only samples | **Rebecca F. Halperin, Winnie S. Liang, Erica Tassone, Jonathan Adkins**, Megan Russell, Nhan Tran, Nicole Hank, James Newell, Sandeep Gupta, **Michael Berens**, Ronald Korn, David W. Craig, **Sara A. Byron** |
| 2:00 - 4:00 PM | Meet and Greet | AACR Central (Booth 1125), MICR Resource Center, Lower Level, Washington Convention Center | Minorities in Cancer Research Council Meet and Greet | Meet and Greet | **Lisa L. Baumbach-Reardon** |
| 8:00 - 10:00 PM | Reception | Fairmont Hotel - Georgetown Colonnade Room 2401 M St NW Washington, DC 20037 | City of Hope/TGen AACR Reception | Reception | **City of Hope and TGen** |
| **MON, APRIL 3** | | | | | |
| 8:00 - 12:00 PM | Poster Session | Section 40 | Migration and Invasion 2 | mGluR1 drives invasion of proneural subtype of glioblastoma cells | **Alena Gladwin, Sen Peng,** Jeff Kiefer, Seugchan Kim, **Michael Berens, Harshil D. Dhruv.** |
| 8:00 - 12:00 PM | Poster Session | Section 4 | New Targets 1 | Novel target discovery for glioblastoma using chemical biology fingerprinting | Darren Finlay, Pedro Aza-Blanc, **Harshil Dhruv,** Alexey Eroshkin, Craig Hauser, Jeff Kiefer, Seungchan Kim, Tao Long, Robert G. Oshima, **Sen Peng, Gil Speyer, Michael Berens**, Kristina Vuori |
| 8:00 - 12:00 PM | Poster Session | Section 2 | Combination Therapy 1 | Synergistic drug combination prediction through drug differential dependency network analysis | Seungchan Kim, **Gil Speyer, Harshil Dhruv,** Jeff Kiefer, **Michael Berens** |
| 8:00 - 12:00 PM | Poster Session | Section 7 | Targeting Growth Factor and Intracellular Signaling | Targeting the platelet derived growth factor receptor (PDGFR) with the receptor tyrosine kinase inhibitor ponatinib in small cell carcinoma of the ovary, hypercalcemic type | **Jessica Diane Lang, William Hendricks,** Pilar Ramos, Holly Yin, Chris Sereduk, Jeffrey Kiefer, Yemin Wang, Anthony N. Karnezis, Bernard Weissman, David Huntsman, **Jeffrey Trent** |
| 8:00 - 12:00 PM | Poster Session | Section 5 | Novel Molecular Targets 1 | mTERT promoter as a target for treatment of glioblastoma | **Saumya R. Bollam, Harshil Dhruv,** Hyun-Jin Kang, **Sen Peng,** Vijay Gokhale, Laurence H. Hurley, **Michael E. Berens** |
| 1:00 - 5:00 PM | Poster Session | Section 44 | Tumor Microenvironment 4 | Discrete super-enhancer networks in pancreatic cancer cells and cancer associated fibroblasts are targeted and modulated by triptolide | **Pawan Noel, Serina Ng, Ruben Muñoz, Daniel Von Hoff, Haiyong Han** |
| 1:00 - 5:00 PM | Poster Session | Section 5 | Mechanism of Drug Action | Mechanism of action of pixantrone in non-Hodgkin's lymphoma cells | Serina Ng, Ruben Muñoz, Daniel Von Hoff, Haiyong Han |
| 1:00 - 5:00 PM | Poster Session | Section 32 | Predictive Biomarkers 2 | Assessing germline and somatic alterations in DNA repair pathway in cancer | **Gargi D. Basu[1], Tracey White[1], Janine LoBello[1], Ahmet Kurdoglu[1], Jeffrey Trent[1,2], Sen Peng[2], Matthew Halbert[1], Thomas Royce[1]**, [1]Ashion, Phoenix, AZ [2]Translational Genomics Research Institute, Phoenix, AZ |
| **TUES, APRIL 4** | | | | | |
| 8:00 - 12:00 PM | Poster Session | Section 16 | Genomic Landscape of Breast, Prostate, Ovarian, Melanoma, and Thyroid Cancers | 3389 / 20 - Integrated genomic analyses reveal frequent *TERT* aberrations in acral melanoma | **Winnie S. Liang, William Hendricks,** Jeffrey Kiefer, Jessica Schmidt, **Shobana Sekar,** John Carpten, David W. Craig, **Jonathan Adkins, Lori Cuyugan, Zarko Manojlovic, Rebecca F. Halperin, Adrienne Hellad, Sara Nasser, Christophe Legendre,** Laurence H. Hurley, **Karthigayini Sivaprakasam,** Douglas B. Johnson, Holly Crandall, Klaus J. Busam, **Victoria Zismann,** Valerie De Luca, Jeeyun Lee, **Aleksandar Sekulic,** Charlotte E. Ariyan, Jeffrey Sosman, **Jeffrey Trent** |
| 8:00 - 12:00 PM | Poster Session | Section 23 | Sequencing Analysis and Algorithms | A systematic approach toward gene annotation of the hallmarks of cancer | **Jeff Kiefer, Sara Nasser,** John Graf, Chinnappa Kodira, Fiona Ginty, Lee Newberg, Anup Sood, **Michael E. Berens** |
| 10:30 - 12:15 PM | Regulatory Science and Policy | Room 143, Level 1, Washington Convention Center | Reference Materials for Next Generation Sequencing (NGS)-Based Tests | Invited Speaker | **Jeffrey M. Trent** |

## World Federation of Neuro-Oncology Societies (WFNOS)

**May 4-7, 2017, Zurich, Switzerland**

***H. Dhruv***, S. Bollam, H. Kang, S. Peng, V. Gokhale, L. Hurley, ***M. Berens***. **mtTERT promoter as a target for treatment of Glioblastoma**. OS01.3

D. Finlay, ***H. Dhruv***, C. Hauser, J. Kiefer, S. Kim, T. Long, S. Peng, ***G. Speyer***, ***M. Berens***, K. Vuori. **New targets for glioblastoma revealed by chemical biology fingerprinting.** P01.11

R. Alison, M. Sabir, C. Sereduk, S. Tuncali, M. Pineda, N. Millard, ***H. D. Dhruv***, S. Peng, ***M. E. Berens***, J. C. Loftus, J. A. Winkles, N. L. Tran. **EGFRvIII induced GBM invasion and survival is dependent upon Stat5 activation and Fn14 expression**. P08.02

## 2017 GPU Technology Conference

**May 7-11, 2017, San Jose, CA**

**Gil Speyer**
*S7254 - GPU-Enabled Differential Dependency Network Analysis of Large Datasets*

## 2017 ASCO

**June 2-6, 2017, Chicago, IL**

Teresa Mercade Macarulla, Jens T. Siveke, Andrea Wang-Gillam, Chung-Pin Li, Gyorgy Bodoky, Andrew Peter Dean, Shan Yanshen, Gayle S. Jameson, Kyung-Hun Lee, Jean-Frédéric Blanc, Chang-Fang Chiu, Gilberto Schwartsmann, Fadi S. Braiteh, David Cunningham, Li-Tzong Chen, ***Daniel D. Von Hoff***, Khalid Kevin Mamlouk, Parul Bhargava, Floris A. de Jong, Richard Hubner. **Subgroup analysis by prior lines of metastatic therapy (mtx) in NAPOLI-1: A global, randomized phase 3 study of liposomal irinotecan (nal-IRI) ± 5-fluorouracil and leucovorin (5-FU/LV), vs. 5-FU/LV in patients (pts) with metastatic pancreatic ductal adenocarcinoma (mPDAC) who have progressed following gemcitabine-based therapy.** Abstract No: 4127

Andrea Wang-Gillam, Li-Tzong Chen, Chung-Pin Li, Gyorgy Bodoky, Andrew Dean, Kyung-Hun Lee, David Cunningham, Richard Hubner, Fadi S. Braiteh, J. Marc Pipas, Bruce Belanger, Floris A. de Jong, Purvi D. Mody, ***Daniel D. Von Hoff***, Jens T. Siveke. **The prognostic value of baseline neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) for predicting clinical outcome in patients with metastatic pancreatic ductal adenocarcinoma (mPDAC) treated with liposomal irinotecan (nal-IRI; MM-398) + 5-fluorouracil and leucovorin (5-FU/LV) vs 5-FU/LV.** Abstract No: e15795

David Goldstein, ***Daniel D. Von Hoff***, E. Gabriela Chiorean, Michele Reni, Josep Tabernero, Ramesh K. Ramanathan, Abdalla Aly, Marc Botteman, Julia Wilkersen, Sandra Margunato-Debay, Brian Lu, Chrystal Ursula Louis, Markus Frederic Renschler, Desmond Micahel Thomas McGovern, Chee Khoon Lee. **Nomogram for predicting overall survival (OS) in patients (pts) treated with *nab*-paclitaxel (*nab*-P) plus gemcitabine (Gem) or Gem alone for metastatic pancreatic cancer (MPC).** Abstract No: 4109

Charles Peterfy, Xin Ye, Heather Gelhorn, Rebecca M Speck, Peter J. Countryman, Vicki Leigh Keedy, Zev A. Wainberg, Arun S. Singh, Bartosz Chmielowski, ***Daniel D. Von Hoff***, Hani M. Babiker, Vivek Khemka, Gregory Michael Cote, Geoffrey Shapiro, Andrew J. Wagner, John H. Healey, Henry Hsu, Paul S. Lin, Sandra Tong, William D. Tap. **Tumor volume score (TVS), modified recist, and tissue damage score (TDS) as novel methods for assessing response in tenosynovial giant cell tumors (TGCT) treated with pexidartinib: Relationship with patient-reported outcomes (PROs).** Abstract No: 11048

## Circulating Nucleic Acids in Plasma and Serum International Symposium

**September 20-22, 2017, Montpellier, France.**

**Size distribution of urine cell-free DNA is consistent with sub-nucleosomes.**

**Muhammed Murtaza.** There is growing interest in cell-free DNA (cfDNA) in urine for liquid biopsy analysis. However, data on biological factors affecting urine cfDNA concentration, fragment size and positioning are limited. METHODS We collected 40 mL urine from each of 20 healthy volunteers. Within 1 hour of collection, we added 0.8 mL of 0.5 M EDTA, centrifuged 10 mL aliquots at 1600g for 10 minutes and stored at -80 °C. We extracted cfDNA from 10 mL urine using MagMAX Cell-Free DNA Isolation kit and eluted in 20-30 microliters. We measured DNA yield using an in-house digital PCR assay and performed low-pass whole genome sequencing to assess fragment size distribution. RESULTS Using digital PCR, median low molecular weight cfDNA yield was 231 genome equivalents (GE)/mL urine (IQR: 447 GE/mL) and LMW fraction was 88.6% (IQR: 10.4%). For whole genome sequencing, we generated an average of 0.58 million reads per sample. Urine cfDNA size distribution showed a pronounced 10 bp step and for 18 of 20 samples, the modal fragment size was 80-81 bp. CONCLUSION In contrast with plasma where cfDNA fragments of mono-nucleosome length are predominant, the length of most abundant fragments in urine is shorter and consistent with DNA wrapped in sub-nucleosomal structures and undergoing DNase I digestion. On-going analysis is evaluating factors affecting concentration, genome-wide distribution and positioning of urine cfDNA fragments.

Personalized treatment monitoring using multiplexed targeted digital sequencing of circulating tumor DNA.

**Muhammed Murtaza.** Circulating tumor DNA (ctDNA) analysis is a promising treatment monitoring biomarker. However, detection sensitivity and analytical precision suffer due to limited starting amounts of plasma DNA in clinically relevant blood volumes and inefficient incorporation of input material using current methods. Analysis of multiple patient-specific mutations can aid accuracy but multiplexed analysis from fragmented plasma DNA remains challenging METHODS We have developed an approach for TARgeted DIgital Sequencing (TARDIS) that combines linear pre-amplification, molecular tagging and targeted sequencing for multiplexed analysis of patient-specific mutations. For each patient, we perform tumor and germline exome sequencing, assess tumor cellularity, call copy number aberrations and call single nucleotide variants. We use these data to identify candidate founder somatic mutations and design target-specific primers for linear pre-amplification and for nested PCR. We analyze TARDIS data to leverage unique molecular identifiers to aid specificity of variant calling at each locus and we use multiple mutations to improve sensitivity and quantitative precision for ctDNA analysis. RESULTS TARDIS enables multiplexed analysis of up to 10 patient-specific mutations while minimizing loss of input plasma DNA and it achieves high specificity for mutations at <0.1% allele fraction. We will present results from longitudinal analysis of early and late stage patients with breast cancer and melanoma. CONCLUSION Simultaneous analysis of multiple founder somatic mutations in plasma DNA can improve sensitivity for ctDNA detection in early stage disease. It can also improve analytical precision and overcome sampling noise, enabling meaningful interpretation of serial changes in ctDNA levels.

Identification of pathogens in patients with sepsis using whole genome plasma DNA sequencing.

Odenheimer-Bergman A+, Kisat M+, Joseph B, Srivatsan SN+, Contente-Cuomo T+, Khalpey Z, Keim P, Fofanov V, Rhee P, **Murtaza M.** Direct sequencing of bacterial DNA in plasma is feasible and may allow rapid identification of pathogens in patients with sepsis. On-going efforts are focused on refinement of informatics approaches and enrichment of non-human DNA in plasma samples to increase assay accuracy and reduce cost of sequencing. METHODS We enrolled 30 consecutive patients in critical care suspected of sepsis and collected plasma samples at the time of diagnostic workup. For patients with positive blood cultures, we performed plasma DNA WGS. After subtracting human DNA reads, we used an informatics approach developed in-house to identify sources of non-human DNA. RESULTS 3/30 patients with sepsis had positive blood cultures growing Escherichia coli, Group B Streptococcus and Staphylococcus haemolyticus respectively. For these patients and 1 sample from a healthy volunteer, we generated 80-120 million WGS reads per sample. As expected, 95-98% of sequencing reads were of human origin. When ranked by number of informative reads, the expected bacterial species seen on blood culture was enriched and ranked 1/97, 7/307 and 4/55 candidates in patient samples. Corresponding ranks in the control sample were 119, 63 and 14 of 328 candidates. CONCLUSION Direct sequencing of bacterial DNA in plasma is feasible and may allow rapid identification of pathogens in patients with sepsis. On-going efforts are focused on refinement of informatics approaches and enrichment of non-human DNA in plasma samples to increase assay accuracy and reduce cost of sequencing.

Evaluation of pre-analytical factors affecting plasma DNA analysis.

Markus H+, Contente-Cuomo T+, Liang W, Borad M, Sivakumar S, Gollins S, Tran N, Dhruv H, Berens M, Bryce A, Sekulic A, Ribas A, Trent J, LoRusso P, **Murtaza M.** Pre-analytical factors such as venipuncture-to-plasma isolation time, blood tube additive and DNA extraction technique can significantly affect circulating cell-free DNA (cfDNA) analysis. However, there are few robust methods to rapidly assess sample quality and the impact of pre-analytical processing. METHODS To evaluate effects of DNA extraction methods and blood collection tubes on cfDNA yield and fragment size, we developed a multiplexed droplet digital PCR (ddPCR) assay with 5 short and 4 long amplicons targeting single copy genomic loci. We used this assay to compare 7 cfDNA extraction kits. We also compared 3 blood collection protocols using plasma samples from 23 healthy volunteers (EDTA tubes processed within 1 hour and Cell-free DNA BCT processed within 24 and 72 hours). To assess whether cell-stabilizing preservative introduced noise in cfDNA, we performed digital targeted sequencing. RESULTS We found cfDNA yield and fragment size vary significantly between cfDNA extraction kits. We found no significant differences in cfDNA yield, fragment size and background noise between the tested blood collection protocols. In 219 clinical samples tested for quality, cfDNA fragment size was significantly shorter in plasma samples immediately processed after venipuncture compared to archived samples, suggesting background DNA contributed by lysed peripheral blood cells. CONCLUSION Rapid, robust assessment of sample quality using minimal amounts of plasma DNA can improve accuracy and reproducibility of downstream assays. We have developed a digital PCR based method for sample quality assessment and compared potential pre-analytical variables.

## 7th International Coccidioidomycosis Symposium

**August 10-13, 2017, Stanford, California**

**D. Engelthaler,** *Genetic epidemiology: tracking Cocci around the Western Hemisphere.*

## NIA Workshop

**August 28, 2017, Bethesda, Maryland**

**N. Schork,** *Discovering and Validating Drug Targets for Anti-Aging Using Genomics.*

## 26th Annual Beaumont Symposium on Molecular Pathology

**September 13-14, 2017, Troy, Michigan**

**D. Engelthaler**, *Antibiotic resistance prediction through focused sequencing.*

## Sprit of the Senses

**Tempe, AZ. September 25th, 2017**

**M. Huentelman**, *Dog and Human Nutrigenomics*

## University of Arizona Cancer Center Symposium

**Phoenix, AZ, October 6, 2017**

**Elizabeth A. Raupach,** *An Identification of low abundance BRG1 containing Swi/Snf complex in small cell carcinoma of the ovary-hypercalcemic type cell lines.*

## San Antonio Breast Cancer Symposium

**San Antonio, Texas, December 5, 2017**

Botond Igyártó, *An integrative approach to the discovery of triplenegative breast cancer markers derived from extracellular vesicles.*

# Full-time positions filled (new and replacements)

In 2017, 25 new full-time equivalent positions were created with salaries and benefits totaling $2,991,274.00.

Salaries for temporary positions (those positions created for a finite period of time) totaled $181,937, which includes temporary TGen staff and temporary service fees. Student salaries were just over $312,600, bringing the overall 2017 total to $3,303,874.00.

In terms of education level, eighty-nice percent of full-time TGen staff holds a college degree and forty-nine percent holds an advanced degree.

2017 full-time positions filled (new and replacements) included:

- Accounts Payable Administrator
- Administrative Assistant
- Administrative Assistant, Executive
- Administrative Assistant, Sr
- Bioinformatician, Associate
- Biospecimen Data Coordinator
- Clinical Research Coordinator
- Computational Scientist
- Deputy Director, Clinical Sciences
- Director, Development
- Education and Outreach Specialist
- Intellectual Property and Contracts Database Assistant
- Manager, Research Operations
- Patent Attorney
- Payroll Administrator
- Post-Doc Fellow
- Professor
- Professor, Assistant
- Professor, Research Assistant
- Professor, Research Associate
- Research Associate
- Research Associate II
- Research Compliance Specialist
- Research Technician


Appendix A

# Appendix A - 2017 Grant Submissions

| PI | Type | Sub/Prime | Sponsor | Title | Date Submitted |
|---|---|---|---|---|---|
| Berens, Michael | R41 | Sub/RLL,LLC | NIH | Targeting caPCNA in Glioblastoma | 01/05/17 |
| Engelthaler, Dave | G01 | Sub FIND (Foundation of Innovative New Diagnostics) | Bill & Melinda Gates Foundation | ReSeq-ASAP: An Amplicon Sequence Data Bioinformatic Pipeline for ReSeq TB | 01/06/17 |
| Hendricks, William | P30 | Sub/DFCI | NIH | Cancer Center Support Grant: Canine Immunotherapy Administrative Supplement | 01/10/17 |
| Huentelman, Matthew | G01 | Sub/BHCS | Aging Foundation | Early Onset Alzheimer's Disease Genomic Study | 01/15/17 |
| Schork, Nicholas | U19 | Sub California Pacific Medical Center Research Institute | NIH | The Longevity Consortium | 01/25/17 |
| Cropp, Cheryl | U01 | Sub Mayo Clinic | NIH | Prostate Cancer Susceptibility: The ICPCG Study | 01/26/17 |
| Huentelman, Matthew | R01 | Sub/ASU | NIH | Necroptosis as a novel mechanism of neurodegenration in Alzheimer's disease | 02/06/17 |
| Rangasamy, Sampath | R01 | Sub/UNM | NIH | Novel Biomarkers and Genetics of Diabetic Retinopahty | 02/06/17 |
| Jensen, Kendall | R01 | Sub/UCI | NIH | Mesenchymal stem cell-derived exosomes for the treatment of multiple sclerosis: a new paradigm for cell free therapy | 02/06/17 |
| Engelthaler, David | R01 | Sub NAU | NIH | Interrupting Borrelia transmission in California using adaptive local pathogen management | 02/06/17 |
| Murtaza, Muhammed | R01 | Prime | NIH | Individualized monitoring of treatment response and resistance inpatients with metastatic melanoma | 02/06/17 |
| Jensen, Kendall | G01 | Sub/UCI | MS | Mesenchymal stem cell-derived exosomes for the treatment of multiple sclerosis | 02/08/17 |
| Engelthaler, David | R21 | Sub UCSD | NIH | Culture-free next generation sequencing for rapid detection of drug-resistant tuberculosis | 02/16/17 |
| Lewis, Candace | F01 | Prime | Brain & Behavior Research Foundation | Investigating Epigenetic Mechanisms of Psilocybin Induced persistent anti-depressant effects | 02/27/17 |
| Huentelman, Matthew | R21 | Prime | NIH | Identification of Circulating Extracellular RNA Biomarkers of Cocaine Use | 03/01/17 |
| Berens, Michael | U01 | Prime | NIH | Patient-curated preclinical models of glioblastoma | 03/01/17 |
| Huentleman, Matthew | R01 | SubASU | NIH | Dissecting early molecular events underlying Alzheimer's disease pathogenesis using models of Down syndrome | 03/06/17 |
| Hendricks, Will | U01 | Sub/Tufts | NIH | Enhancing the efficacy of immunotherapy in DLBCL using rational combination approaches | 03/07/17 |
| Jensen, Kendall | Supplement | Prime | NIH | UH3: Diversity and function of prevalent uncharacterized ex RNA species from tissue and biofluid. | 03/10/17 |
| Jensen, Kendall | Supplement | Sub UCSF | NIH | UCSF: RBP supplement | 03/10/17 |
| Trent, Jeff | U01 | Sub/COH | NIH | Clinical Cancer Genomics Community Research Network (CCGCRN) Cohort | 03/11/17 |
| Huentelman, Matthew | G01 | ASU | AFAR | Transcriptome characteristics of aging skeletal muscle: implications for age related muscle dysfunction and targeted exercise therapies | 03/28/17 |
| Hendricks, William | G01 | Prime | St. Baldrick's Foundation | Targeting Super-Enhancers in SWI/SNF-mutant Pediatric Cancers | 03/31/17 |
| Liang, Winnie | G01 | Banner Health | NOMIS Foundation | A Public Resource of RNA Sequencing Data from Different Human Brain Cells and Regions, Associated Whole Genome Sequencing, Longitudinal Clinical and Neiropathological Data, and Cell-Specific Multi-Scale Networks in the Alzheimer's and Aging Brain | 03/31/17 |
| Rangasamy, Sampath | G01 | sub UNM | American Diabetes Association | "Microglia-Vascular interaction on Blood-Retinal Barrier (BRB) Alteration in Diabetic Retinopathy | 03/18/16 |
| Jensen, Kendall | G01 | Sub/COH | Sidell Kagan | Advancing prevention of Alzheimer's disease | 4/17/17 |
| Engelthaler, Dave | G01 | Sub UCSF | Doris Duke Foundation | "Novel methods for | 04/20/17 |
| Banovich, Nicholas | G01 | Prime | Multiple Myeloma Research Foundation (MMRF) | Characterization of genetic vulnerabilities in multiple myeloma | 04/25/17 |
| Rangasamy, Sampath | G01 | Sub UNM | IRRF | Role of Pericytes on blood-retinal barrier alteration in diabetic retinopathy | 05/01/17 |
| Trent, Jeffrey | Admin Supplement | UNC Sub | NIH | The Tumor Suppressor Role of SMARCA4 in SCCOHT | 05/02/17 |
| Pirrotte, Patrick | G01 | Sub ASU | AAC | UofA Brinton: Psychology AARC 2017 project | 05/04/17 |

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| Dhruv, Harshil | R33 | Prime | NIH/NCI | Area B: Prediction of Synergistic Combinatorial Therapy for Treatment of Cancer Using Network Analysis Guided by Single Cell Sequencing | 05/10/17 |
| Huentelman, Matthew | G01 | sub AAC | ADHS | FY 18 TGen AAC projects | 05/18/17 |
| Jensen, Kendall | G01 | Prime | MJFF | RNAseq and miRNAseq in PPMI whole blood samples - Phase 2 | 05/24/17 |
| Von Hoff, Daniel | U01 | Sub to Baylor | NIH | Noncoding RNA Biomarkers for Noninvasive and Early Detection of Pancreatic Cancer | 05/26/17 |
| Von Hoff, Daniel | R01 | Sub to COH | NIH | Novel chimeric orthopoxvirus armed with anti-PD-L1 for the treatment of peritoneal carcinomatosis of gastrointestinal cancers | 06/05/17 |
| Engelthaler, Dave | R01 | Sub ASU | NIH | Biophysical Identification of Common Pathogens from Periprosthetic Joint Infections | 06/05/17 |
| Keats, Jonathan | R01 | Sub Mayo | NIH | Optimizing the immunomodulatory and anti-myeloma activities of IMIDs | 06/05/17 |
| Huentelman, Matthew | R01 | Sub UofA | NIH | Identifying a pathogenic fibroblast subpopulation to target for protection against cardiac fibrosis | 06/05/17 |
| Liang, Winnie | R01 | Sub/Dignity Health | NIH | "Expression changes in the dorsal memory network in cognitively normal individuals with | 05/23/16 |
| Jensen, Kendall | R01 | Mass General | NIH | Standarization and characterization of Evs for novel circulating biomarker discovery in gliomas | 06/13/17 |
| Jensen, Kendall | R21 | COH | NIH | Quantitative analysis of surface proteins to identify and isolate cancer-assocaite extracellular vesicles | 06/13/17 |
| Dhruv, Harshil | BRCP | Prime | DOD | Targets and Vulnerabilities of Breast Tumors Metastatic to Brain | 06/15/17 |
| Bereris, Michael | R01 | Sub/UNC | NIH | (PQ3) Dissecting the role of host genetics on glioblastoma evolution and treatment response using genetically-engineered mouse models and the Collaborative Cross | 06/16/17 |
| David Engelthaler | G01 | Prime | CDC | Topic 1.2 - System for Tracking Antibiotic Resistance with Targeted Sequencing (START-Seq) | 06/26/17 |
| David Engelthaler | G01 | Prime | CDC | Topic 1.6 - Considering Homologous and Non-homologous Recombination in Outbreak Analysis | 06/26/17 |
| Keats, Jonathan | R01 | Mayo Sub | NIH | MC1685 Phase I/II Clinical trial pembrolizumb, cryoablation, and intra-tumor dendritic cell (DC) injections to treat patients with relapsed, refractory non-Hodgkin lymphoma. | 07/12/17 |
| Engelthaler, David | G01 | Prime | USDA-NIFA-AFRI | Food-Path: Food-borne Pathogen Detection in Complex Samples | 07/27/17 |
| Keats, Jonathan | G01 | Prime | Chan Zuckerberg Initiative | Developing robust methods to process solid tissues for single cell RNA sequencing | 07/27/17 |
| Engelthaler, Dave | R01 | Sub NAU | NIH | Assessing the roles of peridomestic animals as sources of human leptospirosis in low income rural communities | 08/10/17 |
| Murtaza, Muhammed | R01 | Prime | NIH | Individualized monitoring of treatment response and resistance in patients with metastatic melanoma | 08/10/17 |
| Pirrotte, Patrick | G01 | Sub NAU | DHS | Predictive Modeling Clinical Outcomes Associated with Omic Attributes of Burkholderia pseudomallei Strains | 08/18/17 |
| Liang, Winnie | UH3 | Sub/UofA | NIH | Interplay between rod microglia neuroinflammation and post-traumatic sleep to track acute to post-acute trajectory after TBI | 08/21/17 |
| Lang, Jessica | G01 | Prime | DoD | "Characterization of the role of super-enhancers in ovarian cancer treatment response | 06/27/16 |
| Hendricks, Will | G01 | Salarius Sub | NIH/SBIR | Preclinical efficacy evaluation of a novel reversible LSD1 inhibitor SP-2577 for the treatment of SWI/SNF-mutant cancers | 09/05/17 |
| Dhruv, Harshil | G01 | Prime | Susan G. Komen | Elucidating Therapy Response in Breast Tumors Metastatic to Brain using scSeq. | 09/06/17 |
| Engelthaler, Dave | R01 | Sub UCSF | NIH | "Novel next-generation sequencing assay for monitoring multidrug resistant | 07/18/16 |
| Lewis, Candace | DP2 | Prime | NIH | Harnessing Experience-Based Epigenome Modification to Cure Mood Disorders | 09/08/17 |
| Engelthaler, Dave | DP2 | Prime | NIH | The Unseen Evolution of Resistance and Population Dynamics in Tuberculosis Infections" | 08/03/16 |
| Schork, Nicholas | G01 | Sub NYU | NSF | "Collaborative Research: Development of Covariate-corrected | 08/11/16 |
| Han, Haiyong | G01 | Sub COH | DoD | Discovery of gastric peritoneal carcinomatosis immune biomarkers that predict response to a novel chimeric immuno-oncolytic virus express anti-PD-L1 | 09/28/17 |
| Keats, Jonathan & Banovich, Nicholas | G01 | Sub ASU | MMRF | Sex Shromosomes in multiple myeloma: novel biomarkers & therapeutic targets | 10/02/17 |
| Pirrotte, Patrick | R01 | sub Baylor RI | NIH | Characterization of DC-targeting vaccines as possible novel immunotherapeutics | 10/05/17 |
| Liang, Winnie | G01 | Sub/ASU | DoD | The utility of peripheral blood test and neuroimaging to asses Alzheimer's disease risk in veterans with traumatic brain injury | 10/05/17 |
| Han, Haiyong | R01 | Sub/Wake Forest | NIH | Characterization of signaling pathways that modulate the immunosuppressive tumor microenvironment in pancreatic cancer | 10/05/17 |
| Murtaza, Muhammed | R01 | Sub/Mayo | NIH | Prognostic and Predictive Radiogenomics Biomarkers in Breast Cancer Patients Undergoing Neoadjuvant Systemic Therapy | 10/05/17 |
| Huentelman, Matthew | R01 | Sub UofA | NIH | Nrf2-based redox regulation of neural stem cell aging | 10/05/17 |
| Huentelman, Matthew | R01 | Sub ASU | NIH | Identify common mechanisms of neurodegeneration between Alzheimer's disease and Down syndrome | 10/05/17 |

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| Huentelman, Matthew | R01 | Sub ASU | NIH | The Utility of 3D Organoids Derived from human Neurogenic Niches to Model late onset alzheimer's disease | 10/05/17 |
| Rangasamy, Sampath | R01 | Prime | NIH | Molecular mechanisms linking dyanmin 1 and early infantile epileptice encephalopathy | 10/05/17 |
| Huentelman, Matthew | R01 | Sub Univ of Florida | NIH | Mechanisms of thyroid hormone action in circuit formation, maintenance, and function in visual cortex | 10/05/17 |
| Schork, Nicolas | R01 | Sub Univ Michigan | NIH | Long-lived mice and long-lived species as test beds for drug discovery | 10/05/17 |
| Engelthaler, David | R21 | ASU Sub | NIH | Innovative Isolation, Concentration and Characterization of Healthcare Associated Infection Pathogens | 10/16/17 |
| Jensen, Kendall | G01 | Sub NIH | MJFF | LRRK2 link to idiopathic PD (Variant Study) | 10/16/17 |
| Jensen, Kendall | G01 | Sub NIH | MJFF | The Foundational Data Initiative | 10/16/17 |
| Pirrotte, Patrick | R21 | Sub UofA | NIH | Functions of the nuclear form of IGF-1R in rhabdomyosarcoma | 10/16/17 |
| Huentelman, Matthew | G01 | Sub/Mayo | DoD | A multidisciplinary translational approach to investigate the mechanisms, predictors, and prevention of persistent post-traumatic headache | 10/26/17 |
| Hendricks, William | SBIR | Sub/One Health | NIH/CDC | Development and Validation of Non-Mouse Reagents to Enable Preclinical Development of Novel Therapeutics | 10/27/17 |
| Banovich, Nicholas | R01 | Sub/ASU | NIH | Germline genetic predisposition and somatic variation together predict tumor progression and response to treatment | 10/30/17 |
| Keats, Jonathan | R01 | Sub Mayo | NIH | Optimizing the immunomodulatory and anti-myeloma activities of IMIDs | 11/5/17 |
| Rangasamy, Sampath | R01 | Sub/UNew Mexico | NIH | Novel Biomarkers and Genetics of Diabetic Retinopathy | 11/6/17 |
| Pirrotte, Patrick | R01 | Sub/SJMHC | NIH | Immune mechanisms of rejection in human lung allografts | 11/6/17 |
| Huentelman, Matthew | R01 | Sub/ASU | NIH | Necroptosis as a novel mechanism of neurodegeneratori in Alzheimer's disease | 11/6/17 |
| Piras, Ignazio | G01 | Sub Univ of Calgliari (Italy) | Foundation of Sardinia | Early identification of schizophrenia by means of serum biomarkers? Predictive power of Neuronal Pentraxin 2 (NPTX2) in a sample of Sardinian schizophrenic patients | 11/14/17 |
| Piras, Ignazio | R21 | Prime | NIH | Multi-omics analysis in middle temporal gyrus of Alzheimer's Disease patients | 11/16/17 |
| David Engelthaler | G01 | Prime | ADHS - ABRC | Understanding Invasive Group A Strep in Arizona | 11/30/17 |
| Candace Lewis | G01 | Prime | ADHS - ABRC | Determining novel molecular targets for improved antidepressant treatments from psilocybin clinical trail | 11/30/17 |
| Ignazio Piras | G01 | Prime | Alz Assoc | Detection of functional SNPs in Sardinian gentic isolate (Italy) | 11/28/17 |
| John Altin | G01 | Sub NAU | ADHS - ABRC | Discovery of Coccidioides epitopes that stimulate adaptive T-cell responses for diagnostic assay development | 11/30/17 |
| Muhammed Murtaza | G01 | Sub ASU | ADHS - ABRC | Pilot Trial of Adaptive Therapy for Late Stage Breast Cancer | 11/30/17 |
| Nicholas Schork | G01 | Sub NYU | NSF | Collaborative Research: Development of General-Purpose Biclustering Methods | 12/1/17 |
| Von Hoff, Daniel | G01 | Prime | NFCR | "New therapeutics development for | 11/30/16 |
| pancreatic cancer" | 12/5/17 | Prime | NIH | Modeling Early Heteroresistance and Acquired Resistance Dynamics in Tuberculosis Infections | 12/12/16 |
| Kendall Jensen | G01 | Sub Wright | AFRL | WSARC-17-0075) Request for Proposal (RFP) for Revolutionary Intelligence and Influence Technologies (RIIT) Contract FA8650-11-C-6159 | 12/7/17 |
| Noel, Pawan | G01 | Prime | Pancreatic Cancer Action Network | Characterizing Tumor Heterogeneity in Pancreatic Ductal Adenocarcinoma by Single Cell RNA Sequencing to Guide Targeted Therapy | 12/5/17 |
| Pirrote, Patrick | R01 | Sub/Mayo | NIH | Precision analytics and nanotherapeutic treatment of recurrent glioblastoma | 12/14/17 |
| Ramsey Keri | G01 | Prime | Global Genes | Incorporating Latino families in the rare disease community at the C4RCD. | 12/13/17 |


# Appendix B

# Appendix B - Publications


1. Benyamin B, Maihofer AX, Schork AJ, Hamilton BA, Rao F, Schmid-Schönbein GW, Zhang K, Mahata M, Stridsberg M, **Schork NJ**, Biswas N, Hook VY, Wei Z, Montgomery GW, Martin NG, Nievergelt CM, Whitfield JB, O'Connor DT. Identification of novel loci affecting circulating chromogranins and related peptides. *Hum Mol Genet*. 2017 Jan 1;26(1):233-242.

2. Becerra CR, Yoshida K, Mizuguchi H, Patel M, **Von Hoff D**. A Phase 1, Open-Label, Randomized, Crossover Study Evaluating the Bioavailability of TAS-102 (Trifluridine/Tipiracil) Tablets Relative to an Oral Solution Containing Equivalent Amounts of Trifluridine and Tipiracil. *J Clin Pharmacol*. 2017 Jan 9. [Epub ahead of print]

3. Ferreira-Paim K, Andrade-Silva L, Fonseca FM, Ferreira TB, Mora DJ, Andrade-Silva J, Khan A, Dao A, Reis EC, Almeida MT, Maltos A, Junior VR, Trilles L, Rickerts V, Chindamporn A, Sykes JE, Cogliati M, Nielsen K, Boekhout T, Fisher M, Kwon-Chung J, **Engelthaler DM**, Lazéra M, Meyer W, Silva-Vergara ML. MLST-Based Population Genetic Analysis in a Global Context Reveals Clonality amongst Cryptococcus neoformans var. grubii VNI Isolates from HIV Patients in Southeastern Brazil. *PLoS Negl Trop Dis*. 2017 Jan 18;11(1):e0005223.

4. Hibar DP, Adams HH, Jahanshad N, Chauhan G, Stein JL, Hofer E, Renteria ME, Bis JC, Arias-Vasquez A, Ikram MK, Desrivières S, Vernooij MW, Abramovic L, Alhusaini S, Amin N, Andersson M, Arfanakis K, Aribisala BS, Armstrong NJ, Athanasiu L, Axelsson T, Beecham AH, Beiser A, Bernard M, Blanton SH, Bohlken MM, Boks MP, Bralten J, Brickman AM, Carmichael O, Chakravarty MM, Chen Q, Ching CR, Chouraki V, Cuellar-Partida G, Crivello F, Den Braber A, Doan NT, Ehrlich S, Giddaluru S, Goldman AL, Gottesman RF, Grimm O, Griswold ME, Guadalupe T, Gutman BA, Hass J, Haukvik UK, Hoehn D, Holmes AJ, Hoogman M, Janowitz D, Jia T, Jørgensen KN, Karbalai N, Kasperaviciute D, Kim S, Klein M, Kraemer B, Lee PH, Liewald DC, Lopez LM, Luciano M, Macare C, Marquand AF, Matarin M, Mather KA, Mattheisen M, McKay DR, Milaneschi Y, Muñoz Maniega S, Nho K, Nugent AC, Nyquist P, Loohuis LM, Oosterlaan J, Papmeyer M, Pirpamer L, Pütz B, Ramasamy A, Richards JS, Risacher SL, Roiz-Santiañez R, Rommelse N, Ropele S, Rose EJ, Royle NA, Rundek T, Sämann PG, Saremi A, Satizabal CL, Schmaal L, Schork AJ, Shen L, Shin J, Shumskaya E, Smith AV, Sprooten E, Strike LT, Teumer A, Tordesillas-Gutierrez D, Toro R, Trabzuni D, Trompet S, Vaidya D, Van der Grond J, Van der Lee SJ, Van der Meer D, Van Donkelaar MM, Van Eijk KR, Van Erp TG, Van Rooij D, Walton E, Westlye LT, Whelan CD, Windham BG, Winkler AM, Wittfeld K, Woldehawariat G, Wolf C, Wolfers T, Yanek LR, Yang J, Zijdenbos A, Zwiers MP, Agartz I, Almasy L, Ames D, Amouyel P, Andreassen OA, Arepalli S, Assareh AA, Barral S, Bastin ME, Becker DM, Becker JT, Bennett DA, Blangero J, van Bokhoven H, Boomsma DI, Brodaty H, Brouwer RM, Brunner HG, Buckner RL, Buitelaar JK, Bulayeva KB, Cahn W, Calhoun VD, Cannon DM, Cavalleri GL, Cheng CY, Cichon S, Cookson MR, Corvin A, Crespo-Facorro B, Curran JE, Czisch M, Dale AM, Davies GE, De Craen AJ, De Geus EJ, De Jager PL, De Zubicaray GI, Deary IJ, Debette S, DeCarli C, Delanty N, Depondt C, DeStefano A, Dillman A, Djurovic S, Donohoe G, Drevets WC, Duggirala R, Dyer TD, Enzinger C, Erk S, Espeseth T, Fedko IO, Fernández G, Ferrucci L, Fisher SE, Fleischman DA, Ford I, Fornage M, Foroud TM, Fox PT, Francks C, Fukunaga M, Gibbs JR, Glahn DC, Gollub RL, Göring HH, Green RC, Gruber O, Gudnason V, Guelfi S, Håberg AK, Hansell NK, Hardy J, Hartman CA, Hashimoto R, Hegenscheid K, Heinz A, Le Hellard S, Hernandez DG, Heslenfeld DJ, Ho BC, Hoekstra PJ, Hoffmann W, Hofman A, Holsboer F, Homuth G, Hosten N, Hottenga JJ, **Huentelman M**, Pol HE, Ikeda M, Jack CR Jr, Jenkinson M, Johnson R, Jönsson EG, Jukema JW, Kahn RS, Kanai R, Kloszewska I, Knopman DS, Kochunov P, Kwok JB, Lawrie SM, Lemaître H, Liu X, Longo DL, Lopez OL, Lovestone S, Martinez O, Martinot JL, Mattay VS, McDonald C, McIntosh AM, McMahon FJ, McMahon KL, Mecocci P, Melle I, Meyer-Lindenberg A, Mohnke S, Montgomery GW, Morris DW, Mosley TH, Mühleisen TW, Müller-Myhsok B, Nalls MA, Nauck M, Nichols TE, Niessen WJ, Nöthen MM, Nyberg L, Ohi K, Olvera RL, Ophoff RA, Pandolfo M, Paus T, Pausova Z, Penninx BW, Pike GB, Potkin SG, Psaty BM, Reppermund S, Rietschel M, Roffman JL, Romanczuk-Seiferth N, Rotter JI, Ryten M, Sacco RL, Sachdev PS, Saykin AJ, Schmidt R, Schmidt H, Schofield PR, Sigursson S, Simmons A, Singleton A, Sisodiya SM, Smith C, Smoller JW, Soininen H, Steen VM, Stott DJ, Sussmann JE, Thalamuthu A, Toga AW, Traynor BJ, Troncoso J, Tsolaki M, Tzourio C, Uitterlinden AG, Hernández MC, Van der Brug M, van der Lugt A, van der Wee NJ, Van Haren NE, van 't Ent D, Van Tol MJ, Vardarajan BN, Vellas B, Veltman DJ, Völzke H, Walter H, Wardlaw JM, Wassink TH, Weale ME, Weinberger DR, Weiner MW, Wen W, Westman E, White T, Wong TY, Wright CB, Zielke RH, Zonderman AB, Martin NG, Van Duijn CM, Wright MJ, Longstreth WT, Schumann G, Grabe HJ, Franke B, Launer LJ, Medland SE, Seshadri S, Thompson PM, Ikram MA. Novel genetic loci associated with hippocampal volume. *Nat Commun*. 2017 Jan 18;8:13624.

5. Chewapreecha C, Holden MT, Vehkala M, Välimäki N, Yang Z, Harris SR, Mather AE, Tuanyok A, De Smet B, Le Hello S, Bizet C, Mayo M, Wuthiekanun V, Limmathurotsakul D, Phetsouvanh R, Spratt BG, Corander J, **Keim P**, Dougan G, Dance DA, Currie BJ, Parkhill J, Peacock SJ. Global and regional dissemination and evolution of Burkholderia pseudomallei. *Nat Microbiol*. 2017 Jan 23;2:16263.

6. Barragan V, Nieto N, **Keim P**, Pearson T. Meta-analysis to estimate the load of Leptospira excreted in urine: beyond rats as important sources of transmission in low-income rural communities. *BMC Res Notes*. 2017 Jan 28;10(1):71. Review.

7. Nielsen HM, Chen K, Lee W, Chen Y, Bauer RJ 3rd, **Reiman E**, Caselli R, Bu G. Peripheral apoE isoform levels in cognitively normal APOE 3/ 4 individuals are associated with regional gray matter volume and cerebral glucose metabolism. *Alzheimers Res Ther*. 2017 Jan 30;9(1):5.

8. Guzmán YF, **Ramsey K**, Stolz JR, Craig DW, **Huentelman MJ**, **Narayanan V**, Swanson GT. A gain-of-function mutation in the GRIK2 gene causes neurodevelopmental deficits. *Neurol Genet*. 2017 Jan 31;3(1):e129.

9. Li Q, Wineinger NE, Fu DJ, Libiger O, Alphs L, Savitz A, Gopal S, Cohen N, **Schork NJ**. Genome-wide association study of paliperidone efficacy. *Pharmacogenet Genomics*. 2017 Jan;27(1):7-18.

10. Perdigones N, **Murtaza M**. Capturing tumor heterogeneity and clonal evolution in solid cancers using circulating tumor DNA analysis. *Pharmacol Ther*. 2017 Feb 3. [Epub ahead of print]

11. Jun GR, Chung J, Mez J, Barber R, Beecham GW, Bennett DA, Buxbaum JD, Byrd GS, Carrasquillo MM, Crane PK, Cruchaga C, De Jager P, Ertekin-Taner N, Evans D, Fallin MD, Foroud TM, Friedland RP, Goate AM, Graff-Radford NR, Hendrie H, Hall KS, Hamilton-Nelson KL, Inzelberg R, Kamboh MI, Kauwe JS, Kukull WA, Kunkle BW, Kuwano R, Larson EB, Logue MW, Manly JJ, Martin ER, Montine TJ, Mukherjee S, Naj A, Reiman EM, Reitz C, Sherva R, St George-Hyslop PH, Thornton T, Younkin SG, Vardarajan BN, Wang LS, Wendlund JR, Winslow AR; **Alzheimer's Disease Genetics Consortium**., Haines J, Mayeux R, Pericak-Vance MA, Schellenberg G, Lunetta KL, Farrer LA. Transethnic genome-wide scan identifies novel Alzheimer's disease loci. *Alzheimers Dement*. 2017 Feb 7. [Epub ahead of print]

12. Arora N, Alsaied O, Dauer P, Majumder K, Modi S, Giri B, Dudeja V, Banerjee S, **Von Hoff D**, Saluja A. Downregulation of Sp1 by Minnelide leads to decrease in HSP70 and decrease in tumor burden of gastric cancer. *PLoS One*. 2017 Feb 13;12(2):e0171827.

13. Roos A, Dhruv HD, Mathews IT, Inge LJ, Tuncali S, Hartman LK, Chow D, Millard N, Yin HH, Kloss J, Loftus JC, Winkles JA, Berens ME, **Tran NL**. Identification of aurintricarboxylic acid as a selective inhibitor of the TWEAK-Fn14 signaling pathway in glioblastoma cells. *Oncotarget*. 2017 Feb 14;8(7):12234-12246.

14. Ding KF, Finlay D, Yin H, **Hendricks WP**, Sereduk C, Kiefer J, Sekulic A, LoRusso PM, Vuori K, **Trent JM**, **Schork NJ**. Analysis of variability in high throughput screening data: applications to melanoma cell lines and drug responses. *Oncotarget*. 2017 Feb 15. [Epub ahead of print]

15. Laquente B, Lopez-Martin J, Richards D, Illerhaus G, Chang DZ, Kim G, Stella P, Richel D, Szcylik C, Cascinu S, Frassineti GL, Ciuleanu T, Hurt K, Hynes S, Lin J, Lin AB, **Von Hoff D**, Calvo E. A phase II study to evaluate LY2603618 in combination with gemcitabine in pancreatic cancer patients. *BMC Cancer*. 2017 Feb 15;17(1):137.

16. Babiker HM, Riaz IB, Shah SR, **Von Hoff DD**, Borad MJ. Hypoxia-activated prodrugs in the treatment of advanced pancreatic adenocarcinoma. *Anticancer Drugs*. 2017 Feb;28(2):127-132.

17. Borazanci E, Millis SZ, Kimbrough J, Doll N, **Von Hoff D**, Ramanathan RK. Potential actionable targets in appendiceal cancer detected by immunohistochemistry, fluorescent in situ hybridization, and mutational analysis. *J Gastrointest Oncol*. 2017 Feb;8(1):164-172

18. **DiStefano JK**. miRNA profiling for the early detection and clinical monitoring of diabetic kidney disease. *Biomark Med*. 2017 Feb;11(2):99-102. Epub 2017 Jan 18.

19. **Reiman EM**. Alzheimer disease in 2016: Putting AD treatments and biomarkers to the test. *Nat Rev Neurol*. 2017 Feb;13(2):74-76.

20. Bhattacharjee S, Oh YM, **Reiman EM**, Burke WJ. Prevalence, Patterns, and Predictors of Depression Treatment among Community-Dwelling Elderly Individuals with Dementia in the United States. *Am J Geriatr Psychiatry*. 2017 Mar 6. [Epub ahead of print]

21. Mateescu B, Kowal EJ, van Balkom BW, Bartel S, Bhattacharyya SN, Buzás EI, Buck AH, de Candia P, Chow FW, Das S, Driedonks TA, Fernández-Messina L, Haderk F, Hill AF, Jones JC, **Van Keuren-Jensen KR**, Lai CP, Lässer C, Liegro ID, Lunavat TR, Lorenowicz MJ, Maas SL, Mäger I, Mittelbrunn M, Momma S, Mukherjee K, Nawaz M, Pegtel DM, Pfaffl MW, Schiffelers RM, Tahara H, Théry C, Tosar JP, Wauben MH, Witwer KW, Nolte-'t Hoen EN. Obstacles and opportunities in the functional analysis of extracellular vesicle RNA - an ISEV position paper. *J Extracell Vesicles*. 2017 Mar 7;6(1):1286095.

22. Wood GC, Chu X, Argyropoulos G, Benotti P, Rolston D, Mirshahi T, Petrick A, Gabrielson J, Carey DJ, **DiStefano JK**, Still CD, Gerhard GS. A multi-component classifier for nonalcoholic fatty liver disease (NAFLD) based on genomic, proteomic, and phenomic data domains. *Sci Rep*. 2017 Mar 7;7:43238.

23. Reddy S, Amutha A, Rajalakshmi R, Bhaskaran R, Monickaraj F, **Rangasamy S**, Anjana RM, Abhijit S, Gokulakrishnan K, Das A, Mohan V, Balasubramanyam M. Association of increased levels of MCP-1 and cathepsin-D in young onset type 2 diabetes patients (T2DM-Y) with severity of diabetic retinopathy. *J Diabetes Complications*. 2017 Mar 10. [Epub ahead of print]

24. Ertz-Archambault N, **Keim P**, **Von Hoff D**. Microbiome and pancreatic cancer: A comprehensive topic review of literature. *World J Gastroenterol*. 2017 Mar 14;23(10):1899-1908.

25. Jeske YW, Ali S, **Byron SA**, Gao F, Mannel RS, Ghebre RG, DiSilvestro PA, Lele SB, Pearl ML, Schmidt AP, Lankes HA, Ramirez NC, Rasty G, Powell M, Goodfellow PJ, Pollock PM. FGFR2 mutations are associated with poor outcomes in endometrioid endometrial cancer: An NRG Oncology/Gynecologic Oncology Group study. *Gynecol Oncol*. 2017 Mar 14. [Epub ahead of print]

26. **Keim PS**, Walker DH, Zilinskas RA. Time to Worry about Anthrax Again. *Sci Am*. 2017 Mar 14;316(4):70-75.

27. Yeri A, Courtright A, Reiman R, Carlson E, Beecroft T, Janss A, Siniard A, Richholt R, Balak C, Rozowsky J, Kitchen R, Hutchins E, Winarta J, McCoy R, Anastasi M, Kim S, **Huentelman M**, **Van Keuren-Jensen K**. Total Extracellular Small RNA Profiles from Plasma, Saliva, and Urine of Healthy Subjects. *Sci Rep*. 2017 Mar 17;7:44061.

28. Qian J, Wolters FJ, Beiser A, Haan M, Ikram MA, Karlawish J, Langbaum JB, Neuhaus JM, **Reiman EM**, Roberts JS, Seshadri S, Tariot PN, Woods BM, Betensky RA, Blacker D. APOE-related risk of mild cognitive impairment and dementia for prevention trials: An analysis of four cohorts. *PLoS Med*. 2017 Mar 21;14(3):e1002254.

29. Juric D, Krop I, Ramanathan RK, Wilson TR, Ware JA, Sanabria Bohorquez S, Savage H, Sampath D, Salphati L, Lin R, Jin H, Parmar H, Hsu JY, **Von Hoff DD**, Baselga J. Phase I Dose Escalation Study of Taselisib (GDC-0032), an Oral PI3K Inhibitor, in Patients with Advanced Solid Tumors. *Cancer Discov*. 2017 Mar 22. [Epub ahead of print]

30. Pelzer U, Blanc JF, Melisi D, Cubillo A, **Von Hoff DD**, Wang-Gillam A, Chen LT, Siveke JT, Wan Y, Solem CT, Botteman MF, Yang Y, de Jong FA, Hubner RA. Quality-adjusted survival with combination nal-IRI+5-FU/LV vs 5-FU/LV alone in metastatic pancreatic cancer patients previously treated with gemcitabine-based therapy: a Q-TWiST analysis. *Br J Cancer*. 2017 Mar 28. [Epub ahead of print]

31. McNeill RS, Canoutas DA, Stuhlmiller TJ, **Dhruv HD**, Irvin DM, Bash RE, Angus SP, Herring LE, Simon JM, Skinner KR, Limas JC, Chen X, Schmid RS, Siegel MB, Van Swearingen AE, Hadler MJ, Sulman EP, Sarkaria JN, Anders CK, Graves LM, Berens ME, Johnson GL, Miller CR. Combination therapy with potent PI3K and MAPK inhibitors overcomes adaptive kinome resistance to single agents in preclinical models of glioblastoma. *Neuro Oncol*. 2017 Mar 30. [Epub ahead of print]

32. Korczak JF, Chung DW, Rosemond E, **Von Hoff DD**, Haspel RL, Waterbor JW, Chang S, Ramirez AG, Perkins S, Wiest J, Lei M. The National Cancer Institute R25 Cancer Education Grants Program: A Workshop Report. *J Cancer Educ*. 2017 Mar;32(1):3-10. Review.

33. Borazanci E, Dang CV, Robey RW, Bates SE, Chabot JA, **Von Hoff DD**. Pancreatic Cancer: A Riddle Wrapped in a Mystery inside an Enigma. *Clin Cancer Res*. 2017 Apr 1;23(7):1629-1637.

34. Vitucci M, Irvin DM, McNeill RS, Schmid RS, Simon JM, **Dhruv HD**, Siegel MB, Werneke AM, Bash RE, Kim S, **Berens M**E, Miller CR. Genomic profiles of low-grade murine gliomas evolve during progression to glioblastoma. *Neuro Oncol*. 2017 Apr 7. [Epub ahead of print]

35. Banuelos E, Ramsey K, Belnap N, Krishnan M, Balak C, Szelinger S, Siniard AL, Russell M, Richholt R, De Both M, Piras I, Naymik M, Claasen AM, **Rangasamy S**, **Huentelman MJ**, Craig DW, Campeau PM, **Narayanan V**, **Schrauwen I**. Case Report: Novel mutations in TBC1D24 are associated with autosomal dominant tonic-clonic and myoclonic epilepsy and recessive Parkinsonism, psychosis, and intellectual disability. *F1000Res*. 2017 Apr 24;6:553.

36. Ding KF, Finlay D, Yin H, **Hendricks WPD**, Sereduk C, Kiefer J, Sekulic A, LoRusso PM, Vuori K, **Trent JM**, **Schork NJ**. Analysis of variability in high throughput screening data: applications to melanoma cell lines and drug responses. *Oncotarget*. 2017 Apr 25;8(17):27786-27799.

37. Iacoviello BM, Steinerman JR, Klein DB, Silver TL, Berger AG, Luo SX, **Schork NJ**, Clickotine, A Personalized Smartphone App for Smoking Cessation: Initial Evaluation. *JMIR Mhealth Uhealth*. 2017 Apr 25;5(4):e56.

38. Pierobon M, Ramos C, Wong S, Hodge KA, Aldrich J, **Byron S**, Anthony SP, Robert NJ, Northfelt DW, Jahanzeb M, Vocila L, Wulfkuhle J, Gambara G, Gallagher RI, Dunetz B, Hoke N, Dong T, Craig DW, Cristofanilli M, Leyland-Jones B, Liotta LA, O'Shaughnessy JA, Carpten JD, Petricoin EF. Enrichment of PI3K-AKT-mTOR Pathway Activation in Hepatic Metastases from Breast Cancer. *Clin Cancer Res*. 2017 Apr 26. [Epub ahead of print]

39. Lee HC, Wang H, Baladandayuthapani V, Lin H, He J, Jones RJ, Kuiatse I, Gu D, Wang Z, Ma W, Lim J, O'Brien S, **Keats J**, Yang J, Davis RE, Orlowski RZ. RNA Polymerase I Inhibition with CX-5461 as a Novel Therapeutic Strategy to Target MYC in Multiple Myeloma. *Br J Haematol*. 2017 Apr;177(1):80-94.

40. **Liang WS, Hendricks W**, Kiefer J, Schmidt J, Sekar S, Carpten J, Craig DW, Adkins J, Cuyugan L, Manojlovic Z, Halperin RF, Helland A, Nasser S, Legendre C, Hurley LH, Sivaprakasam K, Johnson DB, Crandall H, Busam KJ, Zismann V, Deluca V, Lee J, Sekulic A, Ariyan CE, Sosman J, Trent J. Integrated genomic analyses reveal frequent TERT aberrations in acral melanoma. *Genome Res*. 2017 Apr;27(4):524-532.

41. Long T, Hicks M, Yu HC, Biggs WH, Kirkness EF, Menni C, Zierer J, Small KS, Mangino M, Messier H, Brewerton S, Turpaz Y, Perkins BA, Evans AM, Miller LA, Guo L, Caskey CT, **Schork NJ**, Garner C, Spector TD, Venter JC, Telenti A. Whole-genome sequencing identifies common-to-rare variants associated with human blood metabolites. *Nat Genet*. 2017 Apr;49(4):568-578.

42. Loomba R, Seguritan V, Li W, Long T, Klitgord N, Bhatt A, Dulai PS, Caussy C, Bettencourt R, Highlander SK, Jones MB, Sirlin CB, Schnabl B, Brinkac L, **Schork N**, Chen CH, Brenner DA, Biggs W, Yooseph S, Venter JC, Nelson KE. Gut Microbiome-Based Metagenomic Signature for Non-invasive Detection of Advanced Fibrosis in Human Nonalcoholic Fatty Liver Disease. *Cell Metab*. 2017 May 2;25(5):1054-1062.e5.

43. Tigchelaar S, Streijger F, Sinha S, Flibotte S, Manouchehri N, So K, Shortt K, Okon E, Rizzuto MA, Malenica I, Courtright-Lim A, Eisen A, **Keuren-Jensen KV**, Nislow C, Kwon BK. Serum MicroRNAs Reflect Injury Severity in a Large Animal Model of Thoracic Spinal Cord Injury. *Sci Rep*. 2017 May 3;7(1):1376.

44. Drees KP, Parise KL, Rivas SM, Felton LL, Puechmaille SJ, **Keim P**, Foster JT. Characterization of Microsatellites in Pseudogymnoascus destructans for White-nose Syndrome Genetic Analysis. *J Wildl Dis*. 2017 May 5. [Epub ahead of print]

45. Kari E, Schrauwen I, Llaci L, Fisher LM, Go JL, Naymik M, Knowles JA, **Huentelman MJ**, Friedman RA. Compound heterozygous mutations in MASP1 in a deaf child with absent cochlear nerves. *Neurol Genet*. 2017 May 11;3(3):e153.

46. Standish KA, Huang CC, Curran ME, **Schork NJ**. Comprehensive analysis of treatment response phenotypes in rheumatoid arthritis for pharmacogenetic studies. *Arthritis Res Ther*. 2017 May 12;19(1):90.

47. **Sekulic A**, Migden MR, Basset-Seguin N, Garbe C, Gesierich A, Lao CD, Miller C, Mortier L, Murrell DF, Hamid O, Quevedo JF, Hou J, McKenna E, Dimier N, Williams S, Schadendorf D, Hauschild A; ERIVANCE BCC Investigators. Long-term safety and efficacy of vismodegib in patients with advanced basal cell carcinoma: final update of the pivotal ERIVANCE BCC study. *BMC Cancer*. 2017 May 16;17(1):332.

48. Larsen J, Petersen A, Larsen AR, Sieber RN, Stegger M, Koch A, Aarestrup FM, **Price LB**, Skov RL; Danish MRSA Study Group. Emergence of livestock-associated methicillin-resistant Staphylococcus aureus bloodstream infections in Denmark. *Clin Infect Dis*. 2017 May 30. [Epub ahead of print]

49. Tran HJ, **Speyer G**, Kiefer J, Kim S. Contextualization of drug-mediator relations using evidence networks. *BMC Bioinformatics*. 2017 May 31;18(Suppl 7):252.

50. Weiss GJ, **Byron SA**, Aldrich J, Sangal A, Barilla H, Kiefer JA, Carpten JD, Craig DW, Whitsett TG. A prospective pilot study of genome-wide exome and transcriptome profiling in patients with small cell lung cancer progressing after first-line therapy. *PLoS One*. 2017 Jun 6;12(6):e0179170.

51. Buckley AR, Standish KA, Bhutani K, Ideker T, Lasken RS, Carter H, Harismendy O, **Schork NJ**. Pan-cancer analysis reveals technical artifacts in TCGA germline variant calls. *BMC Genomics*. 2017 Jun 12;18(1):458.

52. Kisiela DI, Radey M, Paul S, Porter S, Polukhina K, Tchesnokova V, Shevchenko S, Chan D, Aziz M, Johnson TJ, **Price LB**, Johnson JR, Sokurenko EV. Inactivation of Transcriptional Regulators during Within-Household Evolution of Escherichia coli. *J Bacteriol*. 2017 Jun 13;199(13).

53. Singh SK, Fiorelli R, Kupp R, Rajan S, Szeto E, Lo Cascio C, Maire CL, Sun Y, Alberta JA, Eschbacher JM, Ligon KL, **Berens ME**, Sanai N, Mehta S. Post-translational Modifications of OLIG2 Regulate Glioma Invasion through the TGF-β Pathway. *Cell Rep*. 2017 Jun 13;19(11):2410-2412.

54. **Engelthaler D**M, Meyer W. Furthering the Continental Drift Speciation Hypothesis in the Pathogenic Cryptococcus Species Complexes. *mSphere*. 2017 Jun 14;2(3). pii: e00241-17.

55. Metcalfe JZ, Streicher E, Theron G, Colman RE, Allender C, Lemmer D, Warren R, **Engelthaler DM**. Cryptic Micro-heteroresistance Explains M. tuberculosis Phenotypic Resistance. *Am J Respir Crit Care Med*. 2017 Jun 14. [Epub ahead of print]

56. Greenawalt DM, **Liang WS**, Saif S, Johnson J, Todorov P, Dulak A, Enriquez D, Halperin R, Ahmed A, Saveliev V, Carpten J, Craig D, Barrett JC, Dougherty B, Zinda M, Fawell S, Dry JR, Byth K. Comparative analysis of primary versus relapse/refractory DLBCL identifies shifts in mutation spectrum. *Oncotarget*. 2017 Jun 15.

57. Saito N, Mine N, Kufe DW, **Von Hoff DD**, Kawabe T. CBP501 inhibits EGF-dependent cell migration, invasion and epithelial-to-mesenchymal transition of non-small cell lung cancer cells by blocking KRas to Calmodulin binding. *Oncotarget*. 2017 Jun 22. [Epub ahead of print]

58. Venkateswaran K, Singh NK, Checinska Sielaff A, Pope RK, Bergman NH, van Tongeren SP, Patel NB, Lawson PA, Satomi M, Williamson CHD, Sahl JW, **Keim P**, Pierson D, Perry J. Non-Toxin-Producing Bacillus cereus Strains Belonging to the B. anthracis Clade Isolated from the International Space Station. *mSystems*. 2017 Jun 27;2(3). pii: e00021-17.

59. Caussy C, Soni M, Cui J, Bettencourt R, **Schork N**, Chen CH, Ikhwan MA, Bassirian S, Cepin S, Gonzalez MP, Mendler M, Kono Y, Vodkin I, Mekeel K, Haldorson J, Hemming A, Andrews B, Salotti J, Richards L, Brenner DA, Sirlin CB, Loomba R; Familial NAFLD Cirrhosis Research Consortium. Nonalcoholic fatty liver disease with cirrhosis increases familial risk for advanced fibrosis. *J Clin Invest*. 2017 Jun 30;127(7):2697-2704.

60. Jia P, Zhao Z, Hulgan T, Bush WS, Samuels DC, Bloss CS, Heaton RK, Ellis RJ, **Schork N**, Marra CM, Collier AC, Clifford DB, Gelman BB, Sacktor N, Morgello S, Simpson DM, McCutchan JA, Barnholtz-Sloan JS, Franklin DR, Rosario D, Letendre SL, Grant I, Kallianpur AR; CHARTER Study Group. Genome-wide association study of HIV-associated neurocognitive disorder (HAND): A CHARTER group study. *Am J Med Genet B Neuropsychiatr Genet*. 2017 Jun;174(4):413-426.

61. Lal D, **Keim P**, Delisle J, Barker B, Rank MA, Chia N, Schupp JM, Gillece JD, Cope EK. Mapping and comparing bacterial microbiota in the sinonasal cavity of healthy, allergic rhinitis, and chronic rhinosinusitis subjects. *Int Forum Allergy Rhinol*. 2017 Jun;7(6):561-569.

62. Peng Q, **Schork NJ**, Wilhelmsen KC, Ehlers CL. Whole genome sequence association and ancestry-informed polygenic profile of EEG alpha in a Native American population. *Am J Med Genet B Neuropsychiatr Genet*. 2017 Jun;174(4):435-450.

63. Rice GI, Kitabayashi N, Barth M, Briggs TA, Burton ACE, Carpanelli ML, Cerisola AM, Colson C, Dale RC, Danti FR, Darin N, De Azua B, De Giorgis V, De Goede CGL, Desguerre I, De Laet C, Eslahi A, Fahey MC, Fallon P, Fay A, Fazzi E, Gorman MP, Gowrinathan NR, Hully M, Kurian MA, Leboucq N, Lin JS, Lines MA, Mar SS, Maroofian R, Martí-Sanchez L, McCullagh G, Mojarrad M, Narayanan V, Orcesi S, Ortigoza-Escobar JD, Pérez-Dueñas B, Petit F, **Ramsey KM**, Rasmussen M, Rivier F, Rodríguez-Pombo P, Roubertie A, Stödberg TI, Toosi MB, Toutain A, Uettwiller F, Ulrick N, Vanderver A, Waldman A, Livingston JH, Crow YJ. Genetic, Phenotypic, and Interferon Biomarker Status in ADAR1-Related Neurological Disease. *Neuropediatrics*. 2017 Jun;48(3):166-184.

64. **Von Hoff DD**, Renschler MF. Letter to the Editor Re: Ahn DH, Krishna K, Blazer M, et al. A modified regimen of biweekly gemcitabine and nab-paclitaxel in patients with metastatic pancreatic cancer is both tolerable and effective: a retrospective analysis. *Ther Adv Med Oncol*. 2017 Jun;9(6):441-443.

65. **Price LB**. Bacterial Whack-a-Mole: Reconsidering the Public Health Relevance of Using Carbadox in Food Animals. *MBio*. 2017 Sep 26;8(5). pii: e01490-17.

66. Miller A, Asmann Y, Cattaneo L, Braggio E, **Keats J**, Auclair D, Lonial S; MMRF CoMMpass Network, Russell SJ, Stewart AK. High somatic mutation and neoantigen burden are correlated with decreased progression-free survival in multiple myeloma. *Blood Cancer J*. 2017 Sep 22;7(9):e612.

67. Leti F, Legendre C, Still CD, Chu X, Petrick A, Gerhard GS, **DiStefano JK**. Altered expression of MALAT1 lncRNA in nonalcoholic steatohepatitis fibrosis regulates CXCL5 in hepatic stellate cells. *Transl Res*. 2017 Sep 19. pii: S1931-5244(17)30267-0.

68. Shah R, Yeri AS, Das A, Courtright-Lim A, Ziegler O, Gervino E, Ocel J, Quintero Pinzon P, Wooster L, Shields Bailey C, Tanriverdi K, Beaulieu L, Freedman JE, Ghiran I, Lewis GD, **Van Keuren-Jensen K**, Das S. Small RNA-seq during acute maximal exercise reveal RNAs involved in vascular inflammation and cardiometabolic health. *Am J Physiol Heart Circ Physiol*. 2017 Sep 15:ajpheart.00500.2017.

69. Liu Y, Yau MS, Yerges-Armstrong LM, **Duggan DJ**, Renner JB, Hochberg MC, Mitchell BD, Jackson RD, Jordan JM. Genetic Determinants of Radiographic Knee Osteoarthritis in African Americans. *J Rheumatol*. 2017 Sep 15. pii: jrheum.161488.

70. Price EP, Sarovich DS, Webb JR, Hall CM, Jaramillo SA, Sahl JW, Kaestli M, Mayo M, Harrington G, **Baker AL**, Sidak-Loftis LC, Settles EW, Lummis M, Schupp JM, Gillece JD, Tuanyok A, Warner J, Busch JD, Keim P, Currie BJ, Wagner DM. Phylogeographic, genomic, and meropenem susceptibility analysis of Burkholderia ubonensis. *PLoS Negl Trop Dis*. 2017 Sep 14;11(9):e0005928.

71. Metcalfe JZ, Streicher E, Theron G, Colman RE, Penaloza R, Allender C, Lemmer D, Warren RM, **Engelthaler DM**. Mycobacterium tuberculosis subculture results in loss of potentially clinically relevant heteroresistance. *Antimicrob Agents Chemother*. 2017 Sep 11. pii: AAC.00888-

72. Podnecky NL, Rhodes KA, Mima T, Drew HR, Chirakul S, Wuthiekanun V, Schupp JM, Sarovich DS, Currie BJ, **Keim P**, Schweizer HP. Mechanisms of Resistance to Folate Pathway Inhibitors in Burkholderia pseudomallei: Deviation from the Norm. *MBio*. 2017 Sep 5;8(5). pii: e01357-17.

73. Vogler AJ, Andrianaivoarimanana V, Telfer S, Hall CM, Sahl JW, Hepp CM, Centner H, Andersen G, Birdsell DN, Rahalison L, Nottingham R, **Keim P**, Wagner DM, Rajerison M. Temporal phylogeography of Yersinia pestis in Madagascar: Insights into the long-term maintenance of plague. *PLoS Negl Trop Dis*. 2017 Sep 5;11(9):e0005887.

74. Masnada S, Hedrich UBS, Gardella E, Schubert J, Kaiwar C, Klee EW, Lanpher BC, Gavrilova RH, Synofzik M, Bast T, Gorman K, King MD, Allen NM, Conroy J, Ben Zeev B, Tzadok M, Korff C, Dubois F, **Ramsey K**, **Narayanan V**, Serratosa JM, Giraldez BG, Helbig I, Marsh E, O'Brien M, Bergqvist CA, Binelli A, Porter B, Zaeyen E, Horovitz DD, Wolff M, Marjanovic D, Caglayan HS, Arslan M, Pena SDJ, Sisodiya SM, Balestrini S, Syrbe S, Veggiotti P, Lemke JR, Møller RS, Lerche H, Rubboli G. Clinical spectrum and genotype-phenotype associations of KCNA2-related encephalopathies. *Brain*. 2017 Sep 1;140(9):2337-2354.

75. Richer AL, Cala JM, O'Brien K, Carson VM, Inge LJ, **Whitsett TG**. WEE1 Kinase Inhibitor AZD1775 Has Preclinical Efficacy in LKB1-Deficient Non-Small Cell Lung Cancer. *Cancer Res*. 2017 Sep 1;77(17):4663-4672.

76. **Babiker HM**, McBride A, Cooke LS, Mahadevan D. Therapeutic potential of investigational CHK-1 inhibitors for the treatment of solid tumors. *Expert Opin Investig Drugs*. 2017 Sep;26(9):1063-1072.

77. Choi J, Xu M, Makowski MM, Zhang T, Law MH, Kovacs MA, Granzhan A, Kim WJ, Parikh H, Gartside M, **Trent JM**, Teulade-Fichou MP, Iles MM, Newton-Bishop JA, Bishop DT, MacGregor S, Hayward NK, Vermeulen M, Brown KM. A common intronic variant of PARP1 confers melanoma risk and mediates melanocyte growth via regulation of MITF. *Nat Genet*. 2017 Sep;49(9):1326-1335.

78. Sims R, van der Lee SJ, Naj AC, Bellenguez C, Badarinarayan N, Jakobsdottir J, Kunkle BW, Boland A, Raybould R, Bis JC, Martin ER, Grenier-Boley B, Heilmann-Heimbach S, Chouraki V, Kuzma AB, Sleegers K, Vronskaya M, Ruiz A, Graham RR, Olaso R, Hoffmann P, Grove ML, Vardarajan BN, Hiltunen M, Nöthen MM, White CC, Hamilton-Nelson KL, ... **Huentelman MJ**... et. al. Rare coding variants in PLCG2, ABI3, and TREM2 implicate microglial-mediated innate immunity in Alzheimer's disease. *Nat Genet*. 2017 Sep;49(9):1373-1384.

79. Caccamo A, Branca C, Piras IS, Ferreira E, **Huentelman MJ**, Liang WS, Readhead B, Dudley JT, Spangenberg EE, Green KN, Belfiore R, Winslow W, Oddo S. Necroptosis activation in Alzheimer's disease. *Nat Neurosci*. 2017 Sep;20(9):1236-1246.

80. Infante JR, Korn RL, Rosen LS, LoRusso P, Dychter SS, Zhu J, Maneval DC, Jiang P, Shepard HM, Frost G, **Von Hoff DD**, Borad MJ, Ramanathan RK. Phase 1 trials of PEGylated recombinant human hyaluronidase PH20 in patients with advanced solid tumours. *Br J Cancer*. 2017 Sep 26.

81. Balak CD, Hunter JM, Ahearn ME, Wiley D, D'urso G, **Baumbach-Reardon L**. Functional characterizations of rare UBA1 variants in X-linked Spinal Muscular Atrophy. *F1000Res*. 2017 Sep 4;6:1636.

82. Rhodes J, Desjardins CA, Sykes SM, Beale MA, Vanhove M, Sakthikumar S, Chen Y, Gujja S, Saif S, Chowdhary A, Lawson DJ, Ponzio V, Colombo AL, Meyer W, **Engelthaler DM**, Hagen F, Illnait-Zaragozi MT, Alanio A, Vreulink JM, Heitman J, Perfect JR, Litvintseva AP, Bicanic T, Harrison TS, Fisher MC, Cuomo CA. Tracing Genetic Exchange and Biogeography of Cryptococcus neoformans var. grubii at the Global Population Level. *Genetics*. 2017 Sep;207(1):327-346.

83. Vitucci M, Irvin DM, McNeill RS, Schmid RS, Simon JM, **Dhruv HD**, Siegel MB, Werneke AM, Bash RE, Kim S, **Berens ME**, Miller CR. Genomic profiles of low-grade murine gliomas evolve during progression to glioblastoma. *Neuro Oncol*. 2017 Sep 1;19(9):1237-1247.

84. Whatcott CJ, Ng S, Barrett MT, Hostetter G, **Von Hoff DD**, **Han H**. Inhibition of ROCK1 kinase modulates both tumor cells and stromal fibroblasts in pancreatic cancer. *PLoS One*. 2017 Aug 25;12(8):e0183871.

85. Pierobon M, Ramos C, Wong S, Hodge KA, Aldrich J, **Byron S**, Anthony SP, Robert NJ, Northfelt DW, Jahanzeb M, Vocila L, Wulfkuhle J, Gambara G, Gallagher RI, Dunetz B, Hoke N, Dong T, Craig DW, Cristofanilli M, Leyland-Jones B, Liotta LA, O'Shaughnessy JA, Carpten JD, Petricoin EF. Enrichment of PI3K-AKT-mTOR Pathway Activation in Hepatic Metastases from Breast Cancer. *Clin Cancer Res*. 2017 Aug 15;23(16):4919-4928.

86. **Price LB**, Hungate BA, Koch BJ, Davis GS, Liu CM. Colonizing opportunistic pathogens (COPs): The beasts in all of us. *PLoS Pathog*. 2017 Aug 10;13(8):e1006369.

87. Barrett MT, Deiotte R, Lenkiewicz E, Malasi S, Holley T, Evers L, Posner RG, Jones T, Han H, Sausen M, Velculescu VE, Drebin J, O'Dwyer P, Jameson G, Ramanathan RK, **Von Hoff DD**. Clinical study of genomic drivers in pancreatic ductal adenocarcinoma. *Br J Cancer*. 2017 Aug 8;117(4):572-582.

88. Korn RL, **Von Hoff DD**, Borad MJ, Renschler MF, McGovern D, Curtis Bay R, Ramanathan RK. F-FDG PET/CT response in a phase 1/2 trial of nab-paclitaxel plus gemcitabine for advanced pancreatic cancer. *Cancer Imaging*. 2017 Aug 3;17(1):23.

89. Escott-Price V, Myers AJ, **Huentelman M**, Hardy J. Ann. Polygenic risk score analysis of pathologically confirmed Alzheimer disease. *Neurol*. 2017 Aug;82(2):311-314.

90. Bryce AH, Borad MJ, Egan JB, Condjella RM, **Liang WS**, Fonseca R, McCullough AE, Hunt KS, Ritacca NR, Barrett MT, Patel MD, Young SW, Silva AC, Ho TH, Halfdanarson TR, Stanton ML, Cheville J, Swanson S, Schneider DE, McWilliams RR, Baker A, Aldrich J, Kurdoglu A, Izatt T, Christoforides A, Cherni I, Nasser S, **Reiman R**, Cuyugan L, McDonald J, Adkins J, Mastrian SD, **Von Hoff DD**, Craig DW, Stewart AK, Carpten JD. Comprehensive Genomic Analysis of Metastatic Mucinous Urethral Adenocarcinoma Guides Precision Oncology Treatment: Targetable EGFR Amplification Leading to Successful Treatment With Erlotinib. *Clin Genitourin Cancer*. 2017 Aug;15(4):e727-e734.

91. Noel P, Muñoz R, Rogers GW, Neilson A, **Von Hoff DD**, Han H. Preparation and Metabolic Assay of 3-dimensional Spheroid Co-cultures of Pancreatic Cancer Cells and Fibroblasts. *J Vis Exp*. 2017 Aug 23;(126).

92. **Schork NJ**, Goetz LH. Single-Subject Studies in Translational Nutrition Research. *Annu Rev Nutr*. 2017 Aug 21;37:395-422.

93. Mun EJ, **Babiker HM**, Weinberg U, Kirson ED, **Von Hoff DD**. Tumor-Treating Fields: A Fourth Modality in Cancer Treatment. *Clin Cancer Res*. 2017 Aug 1.

94. Mine N, Yamamoto S, Saito N, Sato T, Sakakibara K, Kufe DW, **VonHoff DD**, Kawabe T. CBP501 suppresses macrophage induced cancer stem cell like features and metastases. *Oncotarget*. 2017 Jul 17;8(38):64015-64031.

95. Wang Y, Chen SY, Karnezis AN, Colborne S, Santos ND, Lang JD, **Hendricks WP**, Orlando KA, Yap D, Kommoss F, Bally MB, Morin GB, Trent JM, Weissman BE, Huntsman DG. The histone methyltransferase EZH2 is a therapeutic target in small cell carcinoma of the ovary, hypercalcaemic type. *J Pathol*. 2017 Jul;242(3):371-383.

96. Viswanathan VS, Ryan MJ, **Dhruv HD**, Gill S, Eichhoff OM, Seashore-Ludlow B, Kaffenberger SD, Eaton JK, Shimada K, Aguirre AJ, Viswanathan SR, Chattopadhyay S, Tamayo P, Yang WS, Rees MG, Chen S, Boskovic ZV, Javaid S, Huang C, Wu X, Tseng YY, Roider EM, Gao D, Cleary JM, Wolpin BM, Mesirov JP, Haber DA, Engelman JA, Boehm JS, Kotz JD, Hon CS, Chen Y, Hahn WC, Levesque MP, Doench JG, **Berens ME**, Shamji AF, Clemons PA, Stockwell BR, Schreiber SL. Dependency of a therapy-resistant state of cancer cells on a lipid peroxidase pathway. *Nature*. 2017 Jul 27;547(7664):453-457.

97. Shikanai-Yasuda MA, Mendes RP, Colombo AL, Queiroz-Telles F, Kono ASG, Paniago AM, Nathan A, Valle ACFD, Bagagli E, Benard G, Ferreira MS, **Teixeira MM**, Silva-Vergara ML, Pereira RM, Cavalcante RS, Hahn R, Durlacher RR, Khoury Z, Camargo ZP, Moretti ML, Martinez R. Brazilian guidelines for the clinical management of paracoccidioidomycosis. *Rev Soc Bras Med Trop*. 2017 Jul 20:0.

98. Piras IS, Krate J, Schrauwen I, Corneveaux JJ, Serrano GE, Sue L, Beach TG, **Huentelman MJ**. Whole transcriptome profiling of the human hippocampus suggests an involvement of the KIBRA rs17070145 polymorphism in differential activation of the MAPK signaling pathway. *Hippocampus*. 2017 Jul;27(7):784-793.

99. Byron SA, Tran NL, Halperin RF, Phillips JJ, Kuhn JG, de Groot JF, Colman H, Ligon KL, Wen PY, Cloughesy TF, Mellinghoff IK, Butowski NA, Taylor JW, Clarke JL, Chang SM, Berger MS, Molinaro AM, Maggiora GM, Peng S, Nasser S, **Liang WS**, **Trent JM**, **Berens ME**, Carpten JD, Craig DW, Prados MD. Prospective Feasibility Trial for Genomics-Informed Treatment in Recurrent and Progressive Glioblastoma. *Clin Cancer Res*. 2018 Jan 15;24(2):295-305. Epub 2017 Oct 26.

100. Mun EJ, **Babiker HM**, Weinberg U, Kirson ED, **Von Hoff DD**. Tumor-Treating Fields: A Fourth Modality in Cancer Treatment. *Clin Cancer Res*. 2018 Jan 15;24(2):266-275. Epub 2017 Aug 1. Review.

101. Palade J, Djordjevic D, **Hutchins ED**, George RM, Cornelius JA, Rawls A, Ho JWK, Kusumi K, Wilson-Rawls J. Identification of satellite cells from anole lizard skeletal muscle and demonstration of expanded musculoskeletal potential. *Dev Biol*. 2018 Jan 15;433(2):344-356. Epub 2017 Dec 25.

102. Walsh RR, Krismer F, Galpern WR, Wenning GK, Low PA, Halliday G, Koroshetz WJ, Holton J, Quinn NP, Rascol O, Shaw LM, Eidelberg D, Bower P, Cummings JL, Abler V, Biedenharn J, Bitan G, Brooks DJ, Brundin P, Fernandez H, Fortier P, Freeman R, Gasser T, Hewitt A, Höglinger GU, Huentelman MJ, Jensen PH, Jeromin A, Kang UJ, Kaufmann H, Kellerman L, Khurana V, Klockgether T, Kim WS, Langer C, LeWitt P, Masliah E, Meissner W, Melki R, Ostrowitzki S, Piantadosi S, Poewe W, Robertson D, Roemer C, Schenk D, Schlossmacher M, Schmahmann JD, Seppi K, Shih L, Siderowf A, Stebbins GT, Stefanova N, Tsuji S, Sutton S, Zhang J. Recommendations of the Global Multiple System Atrophy Research Roadmap Meeting. *Neurology*. 2018 Jan 9;90(2):74-82. Epub 2017 Dec 13.

103. Toro C, Hori RT, Malicdan MCV, Tifft CJ, Goldstein A, Gahl WA, Adams DR, Harper F, Wolfe LA, Xiao J, Khan MM, Tian J, Hope KA, Reiter LT, Tremblay MG, Moss T, Franks AL, **Balak C**; C4RCD Research Group, LeDoux MS. A recurrent de novo missense mutation in UBTF causes developmental neuroregression. Hum Mol Genet. 2018 Jan 2. [Epub ahead of print]

104. Davis J, Petterson M, Newell J, Lauwers GY, **Royce T**, Demeure MJ. Micrometastatic gastric glomus tumour confirmed by next-generation sequencing. *Histopathology*. 2018 Jan;72(2):351-354. Epub 2017 Oct 24.

105. Bell JB, Eckerdt F, **Dhruv HD**, Finlay D, Peng S, Kim S, Kroczynska B, Beauchamp EM, Alley K, Clymer J, Goldman S, Cheng SY, James CD, Nakano I, Horbinski C, Mazar AP, Vuori K, Kumthekar P, Raizer J, **Berens ME**, Platanias LC. Differential Response of Glioma Stem Cells to Arsenic Trioxide Therapy Is Regulated by MNK1 and mRNA Translation. *Mol Cancer Res*. 2018 Jan;16(1):32-46. Epub 2017 Oct 17.

106. Miotto P, Tessema B, Tagliani E, Chindelevitch L, Starks AM, Emerson C, Hanna D, Kim PS, Liwski R, Zignol M, Gilpin C, Niemann S, Denkinger CM, Fleming J, Warren RM, Crook D, Posey J, Gagneux S, Hoffner S, Rodrigues C, Comas I, **Engelthaler DM**, Murray M, Alland D, Rigouts L, Lange C, Dheda K, Hasan R, Ranganathan UDK, McNerney R, Ezewudo M, Cirillo DM, Schito M, Köser CU, Rodwell TC. A standardised method for interpreting the association between mutations and phenotypic drug resistance in Mycobacterium tuberculosis. *Eur Respir J*. 2017 Dec 28;50(6). Print 2017 Dec.

107. Mitchell CL, Andrianaivoarimanana V, Colman RE, Busch J, Hornstra-O'Neill H, **Keim PS**, Wagner DM, Rajerison M, Birdsell DN. Low cost, low tech SNP genotyping tools for resource-limited areas: Plague in Madagascar as a model. *PLoS Negl Trop Dis*. 2017 Dec 11;11(12):e0006077.

108. Ianov L, De Both M, Chawla MK, Rani A, Kennedy AJ, Piras I, Day JJ, Siniard A, Kumar A, Sweatt JD, Barnes CA, **Huentelman MJ**, Foster TC. Hippocampal Transcriptomic Profiles: Subfield Vulnerability to Age and Cognitive Impairment. *Front Aging Neurosci*. 2017 Dec 8;9:383.

109. Romero Arenas MA, Whitsett TG, Aronova A, Henderson SA, **LoBello J**, Habra MA, Grubbs EG, Lee JE, Sircar K, Zarnegar R, Scognamiglio T, Fahey TJ, Perrier ND, Demeure MJ. Protein Expression of PTTG1 as a Diagnostic Biomarker in Adrenocortical Carcinoma. *Ann Surg Oncol*. 2017 Dec 7.

110. Al-Hader A, Al-Rohil RN, **Han H**, **Von Hoff D**. Pancreatic acinar cell carcinoma: A review on molecular profiling of patient tumors. *World J Gastroenterol*. 2017 Dec 7;23(45):7945-7951. Review.

111. Aronova A, Min IM, Crowley MJP, Panjwani SJ, Finnerty BM, Scognamiglio T, Liu YF, **Whitsett TG**, Garg S, Demeure MJ, Elemento O, Zarnegar R, Fahey Iii TJ. STMN1 is Overexpressed in Adrenocortical Carcinoma and Promotes a More Aggressive Phenotype In Vitro. *Ann Surg Oncol*. 2017 Dec 6.

112. Maura F, Petljak M, Lionetti M, Cifola I, **Liang W**, Pinatel E, Alexandrov LB, Fullam A, Martincorena I, Dawson KJ, Angelopoulos N, Samur MK, Szalat R, Zamora J, Tarpey P, Davies H, Corradini P, Anderson KC, Minvielle S, Neri A, Avet-Loiseau H, **Keats J**, Campbell PJ, Munshi NC, Bolli N. Biological and prognostic impact of APOBEC-induced mutations in the spectrum of plasma cell dyscrasias and multiple myeloma cell lines. *Leukemia*. 2017 Dec 6.

113. Ramanathan RK, Weiss GJ, Posner RG, Rajeshkumar NV, Jameson G, Aziz M, Hoering A, Bolejack V, Maitra A, Fulk M, Stites EC, Hlavacek WS, Gatalica Z, Xiu J, Hidalgo M, **Von Hoff DD**, Barrett MT. A phase 2 trial of personalized cytotoxic therapy based on tumor immunohistochemistry in previously treated metastatic pancreatic cancer patients. *J Gastrointest Oncol*. 2017 Dec;8(6):925-935.

114. Leti F, Legendre C, Still CD, Chu X, Petrick A, Gerhard GS, **DiStefano JK**. Altered expression of MALAT1 lncRNA in nonalcoholic steatohepatitis fibrosis regulates CXCL5 in hepatic stellate cells. *Transl Res*. 2017 Dec;190:25-39.e21.

115. Manojlovic Z, Christofferson A, Liang WS, Aldrich J, Washington M, Wong S, Rohrer D, Jewell S, Kittles RA, Derome M, Auclair D, Craig DW, **Keats J**, Carpten JD. Comprehensive molecular profiling of 718 Multiple Myelomas reveals significant differences in mutation frequencies between African and European descent cases. *PLoS Genet*. 2017 Nov 22;13(11):e1007087.

116. Vivian CJ, Brinker AE, Graw S, Koestler DC, Legendre C, Gooden GC, **Salhia B**, Welch DR. Mitochondrial Genomic Backgrounds Affect Nuclear DNA Methylation and Gene Expression. *Cancer Res*. 2017 Nov 15;77(22):6202-6214. Epub 2017 Jun 29.

117. Hangauer MJ, Viswanathan VS, Ryan MJ, Bole D, Eaton JK, Matov A, Galeas J, **Dhruv HD**, **Berens ME**, Schreiber SL, McCormick F, McManus MT. Drug-tolerant persister cancer cells are vulnerable to GPX4 inhibition. *Nature*. 2017 Nov 9;551(7679):247-250. Epub 2017 Nov 1.

118. Ding Z, Roos A, Kloss J, **Dhruv H**, Peng S, **Pirrotte P**, Eschbacher JM, Tran NL, Loftus JC. A Novel Signaling Complex between TROY and EGFR Mediates Glioblastoma Cell Invasion. *Mol Cancer Res*. 2017 Nov 8.

119. Lessel D, Schob C, Küry S, Reijnders MRF, Harel T, Eldomery MK, Coban-Akdemir Z, Denecke J, Edvardson S, Colin E, Stegmann APA, Gerkes EH, Tessarech M, Bonneau D, Barth M, Besnard T, Cogné B, Revah-Politi A, Strom TM, Rosenfeld JA, Yang Y, Posey JE, Immken L, Oundjian N, Helbig KL, Meeks N, Zegar K, Morton J; DDD study, Schieving JH, Claasen A, **Huentelman M**, **Narayanan V**, Ramsey K; C4RCD Research Group, Brunner HG, Elpeleg O, Mercier S, Bézieau S, Kubisch C, Kleefstra T, Kindler S, Lupski JR, Kreienkamp HJ. De Novo Missense Mutations in DHX30 Impair Global Translation and Cause a Neurodevelopmental Disorder. *Am J Hum Genet*. 2017 Nov 2;101(5):716-724.

120. Piras IS, Mills G, Llaci L, Naymik M, Ramsey K, Belnap N, Balak CD, Jepsen WM, Szelinger S, Siniard AL, Lewis CR, LaFleur M, Richholt RF, De Both MD, Avela K, **Rangasamy S**, Craig DW, Narayanan V, Järvelä I, **Huentelman MJ**, Schrauwen I. Exploring genome-wide DNA methylation patterns in Aicardi syndrome. *Epigenomics*. 2017 Nov;9(11):1373-1386.

121. Liu Y, Yau MS, Yerges-Armstrong LM, **Duggan DJ**, Renner JB, Hochberg MC, Mitchell BD, Jackson RD, Jordan JM. Genetic Determinants of Radiographic Knee Osteoarthritis in African Americans. *J Rheumatol*. 2017 Nov;44(11):1652-1658. Epub 2017 Sep 15.

122. Metcalfe JZ, Streicher E, Theron G, Colman RE, Penaloza R, Allender C, Lemmer D, Warren RM, **Engelthaler DM**. Mycobacterium tuberculosis Subculture Results in Loss of Potentially Clinically Relevant Heteroresistance. *Antimicrob Agents Chemother*. 2017 Oct 24;61(11).

123. Halperin RF, Carpten JD, Manojlovic Z, Aldrich J, **Keats J**, Byron S, **Liang WS**, Russell M, Enriquez D, Claasen A, Cherni I, Awuah B, Oppong J, Wicha MS, Newman LA, Jaigge E, Kim S, Craig DW. A method to reduce ancestry related germline false positives in tumor only somatic variant calling. *BMC Med Genomics*. 2017 Oct 19;10(1):61.

124. Ezponda T, Dupéré-Richer D, Will CM, Small EC, Varghese N, Patel T, Nabet B, Popovic R, Oyer J, Bulic M, Zheng Y, Huang X, Shah MY, Maji S, Riva A, Occhionorelli M, Tonon G, Kelleher N, **Keats J**, Licht JD. UTX/KDM6A Loss Enhances the Malignant Phenotype of Multiple Myeloma and Sensitizes Cells to EZH2 inhibition. *Cell Rep*. 2017 Oct 17;21(3):628-640.

125. Gore L, Triche TJ Jr, Farrar JE, Wai D, Legendre C, Gooden GC, Liang WS, Carpten J, Lee D, Alvaro F, Macy ME, Arndt C, Barnette P, Cooper T, Martin L, Narendran A, Pollard J, Meshinchi S, Boklan J, Arceci RJ, Salhia B. A multicenter, randomized study of decitabine as epigenetic priming with induction chemotherapy in children with AML. *Clin Epigenetics*. 2017 Oct 5;9:108.

126. Peter B, Lancaster H, Vose C, Fares A, Schrauwen I, **Huentelman M**. Two unrelated children with overlapping 6q25.3 deletions, motor speech disorders, and language delays. *Am J Med Genet A*. 2017 Oct;173(10):2659-2669.

127. Manchia M, Piras IS, Huentelman MJ, Pinna F, Zai CC, Kennedy JL, Carpiniello B. Pattern of gene expression in different stages of schizophrenia: Down-regulation of NPTX2 gene revealed by a meta-analysis of microarray datasets. Eur Neuropsychopharmacol. 2017 Oct;27(10):1054-1063.

128. Robson ME, Reiner AS, Brooks JD, Concannon PJ, John EM, Mellemkjaer L, Bernstein L, Malone KE, Knight JA, Lynch CF, Woods M, Liang X, Haile RW, **Duggan DJ**, Shore RE, Smith SA, Thomas DC, Stram DO, Bernstein JL; WECARE Study Collaborative Group. Association of Common Genetic Variants With Contralateral Breast Cancer Risk in the WECARE Study. *J Natl Cancer Inst*. 2017 Oct 1;109(10).