

**IMPERIAL VALLEY TRANSIT  
ANNUAL PASSENGER MILE SAMPLING METHODOLOGY  
AND FINAL RESULTS  
JULY 1, 2013-JUNE 30, 2014**



**Prepared for:  
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**ICTC**

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**IMPERIAL VALLEY TRANSIT  
ANNUAL PASSENGER MILE SAMPLING METHODOLOGY  
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The County of Imperial provides fixed route bus service throughout the County through the services of Imperial Valley Transit, which was created in 1989. Imperial Valley Transit began as a 5 route system with 3 buses running Monday through Friday. The passenger ridership initially averaged approximately 3,000 passengers a month.

The transit service is operated as a turnkey operation by First Transit, Inc. The service is administrated and funded by the Imperial County Transportation Commission (ICTC). The Commission members represent each City, the County and the Imperial Irrigation District.

Funding is provided annually through the ICTC adopted Overall Work Program Budget and Finance Plan. The source of the funding includes but is not limited to federal FTA 5307, 5311 and 5317 funds, State Transportation Development Act (TDA) including Local Transportation (LTF) and State Transit Assistance (STA), and local fare revenue.

The Federal Register of September 25, 1987, specifies that certain operating data must be collected from federally funded transit systems as part of the Section 15 Uniform System of Accounts and Records and Reporting System. One such required set of data that is required is an annual estimate of unlinked passenger trips and passenger miles that is reliable with 95 percent confidence to a margin of error of +/- 10 percent. The Urban Mass Transportation Administration and Federal Transit Administration (FTA) developed several suggested sampling techniques for collecting annual estimates of unlinked passenger trips and passenger miles. A transit agency may use a technique other than the UMTA recommended techniques as long as it meets the prescribed precision and confidence levels.

ICTC contracted with Rea & Parker Research of San Diego, California to conduct the study that would require Rea & Parker Research personnel to ride randomly selected Imperial Valley Transit bus trips for a one year period that covered July 1, 2013-to-June 30, 2014. Rea & Parker Research had conducted the most recent passenger mile sampling studies for Imperial Valley Transit in 2010-2011 and 2008-2009.

Transit systems have been offered the opportunity to convert to a new method of sampling supported by the National Transit Database (NTD). This new method would likely result in fewer samples required but in a highly irregular schedule that could make the securing and retention of employees to conduct the requisite counts to be problematic. The decision was made to conduct this passenger mile estimate using the older, but still approved methodology. All individual bus trip data was tracked and recorded electronically in 2010-2011 and in 2013-2014 so that the new methodology could be considered in the future, when and if savings from fewer samples might be substantial enough to merit the change in methodology. At present, that is not the case.

The option was also available to devise a statistically valid method that differed from both the new and the established NTD methodologies. Rea & Parker Research elected to utilize the NTD methodology inasmuch as it is specifically designed to address small transit systems. As such, no determination of variance, standard deviation, margin of error, confidence levels or intervals was undertaken by Rea & Parker research independent of this established methodology. These statistics would have been required to develop a method of sampling unique to Imperial Valley Transit. Attached as an appendix to this report are the academic and professional consultative experiences of Richard A. Parker, Ph.D. and Louis M. Rea, Ph.D., the principal investigators and analysts for this study.

There were a number of increases in bus service that took place during the year. Initially, the number of daily trips and 6-day service indicated that for the 6 days per week that Imperial Valley Transit operated, two bus trips could be tallied every operating day for one year, or three trips every other day, 5 trips every third day, 8 trips every fourth day, 12 trips every fifth day or 19 trips every sixth day. The method chosen was for 5 trips to be sampled every third day—one week on Monday and Thursday, another week on Tuesday and Friday, and another week on Wednesday and Saturday.

On holidays when the buses were not operating, days of operation were exchanged among weeks. The FTA sample size macro for this initial period of July-through-September, 2013 is shown below. For example, if Thanksgiving Day were the scheduled Thursday, that week may have been rearranged with the Wednesday and Saturday pairing so that for those two weeks only, buses were sampled on Monday and Wednesday one week and Thursday and Saturday in the

previous or succeeding week. Missed trips, of which there were very few, were made up on the same day of the week as the missed trip during the succeeding week.

**INITIAL SAMPLING (July-September, 2013)**

**Sample Size Table**

**95 Percent Confidence Level @ Tolerance of 10 Percent**

**Number of Days Service Operated (m)**

<b>313</b>
<b>115</b>

**Number of One-Way Trips per Day (N)**

	<b>Sampling Interval (Every _ Day)</b>					
	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
<b>Trips/Day</b>	2	3	5	8	12	19
<b>Annual Trips</b>	626	468	520	624	744	988

In August, 2013, the number of daily bus trips increased very slightly and still for only six days. No change in the number of samples was required by this change. In October, 2013, the number of daily trips increased to 126, but also only for six days, again resulting in no change in the number of samples required. However, when the Gold Line opened in December, the number of daily trips increased to 138 and the number to be sampled increased to 6 every third day. This increase lasted only until January, 2014 when Sunday service was added, resulting in the following FTA sample size macro. After January, the number of sampled daily trips returned to 5, but this was to be performed every third day such that certain weeks had three sample days and others remained at two days. This new schedule held for the balance of the study.

In preparation for the commencement of the study, Rea & Parker Research entered each bus trip into an SPSS (Statistical Package for the Social Sciences) database as a code, indicating weekday, Saturday, and Sunday (starting in 2014), bus route number, and the number of the trip on that day. For example, after the October service increase, Route 1S on a weekday at 9:30am would have been coded and entered as 1s-06, the sixth Route 1s trip on weekdays and Saturday's 3:00 pm Route 2N would have been coded 2n-sat-07, the seventh Saturday Route 2N trip. Five trips were randomly selected by the SPSS program for counting every three days, with the exception of the two-week period in December, when 6 trips were selected every third day.

Certain buses run on some days per week but not on others. Still others curtail their trips when Imperial Valley College is not in session. Random selection of any bus that was not running on a given day caused a randomly selected replacement to be chosen.

**SAMPLING (January-June, 2014)**

**Sample Size Table**

**95 Percent Confidence Level @ Tolerance of 10 Percent**

**Number of Days Service Operated (m)**

<b>365</b>
<b>138</b>

**Number of One-Way Trips per Day (N)**

	Sampling Interval (Every _ Day)					
	1	2	3	4	5	6
<b>Trips/Day</b>	2	3	5	7	10	14
<b>Annual Trips</b>	730	546	605	637	730	840

One other variable required attention for this year’s study and that pertains to overflow buses that ran on occasion between July, 2013 and October, 2013, when service was increased. Imperial Valley Transit experiences considerable demand for boarding at the border in Calexico, and there are occasions when the existing Route 1N bus could not accommodate that demand. At such times Imperial Valley Transit dispatched another bus to absorb this overflow demand. The overflow bus was added to the list of bus routes and selected for sampling similar to all other routes. Inasmuch as it was not known if the overflow bus was going to be needed on any particular day, a sixth trip was selected randomly for backup when the overflow was selected for sampling. On days when the overflow was not part of the sample but was needed, Imperial Valley Transit notified Rea & Parker Research and that bus trip was added to the tally of trips run for that week.

On board personnel were given an assignment log (as depicted in the Exhibit A example) and trip sheets (Exhibit B example), as demonstrated on the succeeding pages. The assignment log provided specific instructions about where to board each bus, where and when to exit, and if that trip was one that was selected for sampling. If the trip was selected, trip sheets were attached

onto which the Rea & Parker Research counting employee on board was to record boardings and alightings, with some on-board counts between stops.

The Rea & Parker Research supervisor, who was based in the City of Imperial, collected and distributed these forms to the counting personnel and sent the manually completed forms twice per month to San Diego for data entry by Rea & Parker Research staff and math and logic checks by either Richard A. Parker, Ph.D. or Louis M. Rea, Ph.D. At that point in time, the manual information was entered electronically, the distance between stops was added to the forms, and the total number of passenger miles could be determined. A completed trip sheet (Exhibit C) also follows in the next pages of this report for illustrative purposes. These completed forms were then compiled into an Excel file that maintained a running balance of counts and mileage. A sample of that Excel file also follows (Exhibit D), and it is this format that can facilitate consideration of NTD alternative sampling for future analyses.

## Imperial Valley Transit Passenger Sampling Assignment Log (EXHIBIT A)

Assignment# <u>63a</u>	Employee: _____
DATE: <u>1-30-14</u>	Day of Week: <u>Thurs</u>

**SPECIAL INSTRUCTIONS FOR REPORTING/FINISHING IF OTHER THAN FIRST OR LAST STOP**

Reporting Time: \_\_\_\_\_ Reporting Place: \_\_\_\_\_  
 Finishing Time: \_\_\_\_\_ Finishing Place: \_\_\_\_\_

### On-Board Bus Schedule

<u>Bus Route</u>	<u>Trip Serial #</u>	<u>Beginning Stop</u>	<u>Begin Stop Time</u>	<u>Last Stop</u>	<u>Last Stop Time</u>	<u>Bus Scheduled for Data Collection?</u>	<u>Special Instructions after Last Stop</u>
1n	1n04	Calexico Hacienda	8:05a	El Centro State & 7th	9:20a	YES	Stay on bus? Verify with driver
2n	2n03	El Centro State & 7th	9:20a	Brawley E Street & Rio Vista	10:20a	YES	
2s		Brawley E Street & Rio Vista	10:25a	Imperial Valley College	11:10a	No	Board bus already on route and exit before end. 1+ hour break
21-IVC Express	21-IVC-pm01	Imperial Valley College	12:30p	Calexico Cole & 111	1:30p	YES	At gas station across from Denny's (west side of 111), you should signal southbound bus on 111 to stop at about 1:40p— then exit immediately at Hacienda at 1:45
1s		Calexico Cole & 111	1:40p	Calexico Hacienda	1:45p	No	

SURVEY TRIP SHEET—EXHIBIT B							# of Pages <u>1 of 2</u>	
(1) Trip Serial No. _____			(2) Date _____		(3) Day of Week _____		(4) Time Period _____	
(5) Route No. <u>1 north</u>			(6) Vehicle Inventory Number _____		(7) Total Capacity _____		(8) Seated Capacity _____	
(9)	(10)	(12)	(13)	(14)	(15)	(16)	(17)	
Stop No.	Stop Description	Odometer Reading	Passengers Boarded	Passengers De-Boarded	Passengers On Board	Distance Between Stops	Passenger Miles (15) x (16)	
1	Hacienda/Scaroni/Cole				0		0	
2	Hacienda/Ollie St.				0		0	
3	Ollie/Birch St. - Post Office				0		0	
4	Kloke St/Birch St/ Hwy 98				0		0	
5	Kloke St./Grant St.				0		0	
6	Grant St./Eady				0		0	
7	Grant St./Cesar Chavez St.				0		0	
8	Emerson/6th				0		0	
9	Third St./Paulin				0		0	
10	Mary/4th St.				0		0	
11	Encinas/7th (Church)				0		0	
12	Encinas/Belcher.(Library)				0		0	
13	Blair/Preston (Hospital/Clinic)				0		0	
14	Rockwood/Vega				0		0	
15	Rockwood/Robert Kennedy				0		0	
16	Cole Rd./Rockwood				0		0	
17	Cole/111				0		0	
0	(26) Capacity Miles (7) x (22)	Totals	0	0	0	0	0	
			(20)		(21)	(22)	(23)	
0	(27) Seat Miles (8) x (22)							



**SURVEY TRIP SHEET**

# of Pages 2 of 2

<b>(1) Trip Serial No.</b> _____			<b>(2) Date</b> _____		<b>(3) Day of Week</b> _____		<b>(4) Time Period</b> _____	
<b>(5) Route No.</b> <u>1 north</u>			<b>(6) Vehicle Inventory Number</b> _____		(7) Total Capacity _____		(8) Seated Capacity _____	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
18	Heber/Pitzer				0		0	
19	Heber Post Office				0		0	
20	Heber Family Apts.				0		0	
21	Imperial Valley Mall				0		0	
22	4th St. / Wake St.				0		0	
23	Lucky's Market				0		0	
24	Aurora / 4th St.				0		0	
25	Aurora / 8th St.				0		0	
26	Aurora/14th				0		0	
27	Imperial Ave. / Pepper St.(Hospital)				0		0	
28	Ross St. / 10th St.				0		0	
29	4th St. / Wensley				0		0	
30	4th St. / Brighton				0		0	
31	State St. / 5th St.				0		0	
32	State St. / 7th St.				0		0	
0	(26) Capacity Miles (7) x (22)	Totals	0	0	0	0	0	
			(20)		(21)	(22)	(23)	
0	(27) Seat Miles (8) x (22)			Mean On Board	0			

**SURVEY TRIP SHEET**

# of Pages 1 of 2

<b>(1) Trip Serial No.</b> _____			<b>(2) Date</b> _____		<b>(3) Day of Week</b> _____		<b>(4) Time Period</b> _____	
<b>(5) Route No.</b> <u>2 north</u>			<b>(6) Vehicle Inventory Number</b> _____		(7) Total Capacity _____		(8) Seated Capacity _____	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
1	State/7th				0		0	
2	State/8th				0		0	
3	State/14th				0		0	
4	Imperial/Commercial				0		0	
5	Imperial/Euclid				0		0	
6	Bradshaw/86 (Costco)				0		0	
7	La Brucherie/Bradshaw (WalM)				0		0	
8	Aten / La Brucherie				0		0	
9	Aten/Myrtle				0		0	
10	Aten / Cross				0		0	
11	Imperial Valley College				0		0	
12	Barioni Ave./K St. (IID)				0		0	
13	Imperial Post Office				0		0	
14	15th & Imperial				0		0	
15	Legion Rd. / Hwy 86 (Hospital)				0		0	
16	Brawley--K St./ 2nd St.				0		0	
0	(26) Capacity Miles (7) x (22)	Totals	0	0	0	0	0	
			(20)		(21)	(22)	(23)	
0	(27) Seat Miles (8) x (22)							

**SURVEY TRIP SHEET**

# of Pages 2 of 2

<b>(1) Trip Serial No.</b> _____			<b>(2) Date</b> _____		<b>(3) Day of Week</b> _____		<b>(4) Time Period</b> _____	
<b>(5) Route No.</b> <u>2 north</u>			<b>(6) Vehicle Inventory Number</b> _____		(7) Total Capacity _____		(8) Seated Capacity _____	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
17	Brawley--K St./South Plaza				0		0	
18	Brawley--K St./S. 9th				0		0	
19	Brawley--K St./S. Palm St.				0		0	
20	Brawley--Palm St. / J St.				0		0	
21	Brawley--S. Main St. / Palm				0		0	
22	Brawley--Main St. / 10th St.				0		0	
23	Brawley--Main/3rd St.				0		0	
24	Brawley--E St./Rio Vista				0		0	
25	Westmorland--Center/Main				0		0	
26	Westmorland--Center/6th				0		0	
27	Calipatria--Main St. / Park				0		0	
28	Calipatria--111/Main				0		0	
29	Niland--111/Main				0		0	
					0		0	
0	(26) Capacity Miles (7) x (22)	Totals	0	0	0	0	0	
			(20)		(21)	(22)	(23)	
0	(27) Seat Miles (8) x (22)			Mean On Board	0			

SURVEY TRIP SHEET						# of Pages 1 of 1	
(1) Trip Serial No. _____		(2) Date _____		(3) Day of Week _____		(4) Time Period _____	
(5) Route No. 21-IVC Express-PM Calexico _____		(6) Vehicle Inventory Number _____		(7) Total Capacity _____		(8) Seated Capacity _____	
(9)	(10)	(12)	(13)	(14)	(15)	(16)	(17)
Stop No.	Stop Description	Odometer Reading	Passengers Boarded	Passengers De-Boarded	Passengers On Board	Distance Between Stops	Passenger Miles (15) x (16)
1	Imperial Valley College				0		0
2	Hacienda/Scaroni				0		0
3	Hacienda/Ollie St.				0		0
4	Ollie/Birch St. - Post Office				0		0
5	Kloke St/Birch St				0		0
6	Kloke St./Grant St.				0		0
7	Grant St./Eady				0		0
8	Grant St./Cesar Chavez St.				0		0
9	Emerson/6th				0		0
10	Third St./Paulin				0		0
11	Mary/4th St.				0		0
12	Encinas/7th St.(Library)				0		0
13	Blair/Preston (Hospital/Clinic)				0		0
14	Rockwood/Vega				0		0
15	Rockwood/Robert Kennedy				0		0
16	Cole Rd./Rockwood				0		0
17	Cole/111				0		0
0	(26) Capacity Miles (7) x (22)	Totals	0	0	0	0	0
			(20)		(21)	(22)	(23)
0	(27) Seat Miles (8) x (22)			Mean On Board	0		

SURVEY TRIP SHEET—EXHIBIT C						# of Pages 1 of 2	
(1) Trip Serial No. 1n04		(2) Date 1-30-14		(3) Day of Week Thurs		(4) Time Period AM	
(5) Route No. 1 north		(6) Vehicle Inventory Number 1209		(7) Total Capacity 75		(8) Seated Capacity 41	
(9)	(10)	(12)	(13)	(14)	(15)	(16)	(17)
Stop No.	Stop Description	Odometer Reading	Passengers Boarded	Passengers De-Boarded	Passengers On Board	Distance Between Stops	Passenger Miles (15) x (16)
1	Hacienda/Scaroni/Cole	77483.5	28		28	0.2	5.6
2	Hacienda/Ollie St.				28		0
3	Ollie/Birch St. - Post Office	77483.7	2		30	2.4	72
4	Kloke St/Birch St/ Hwy 98				30		0
5	Kloke St./Grant St.				30		0
6	Grant St./Eady				30		0
7	Grant St./Cesar Chavez St.				30		0
8	Emerson/6th	77486.1	10	2	38	0.3	11.4
9	Third St./Paulin	77486.4	17	18	37	0.4	14.8
10	Mary/4th St.	77486.8	1	2	36	0.4	14.4
11	Encinas/7th (Church)	77487.2	4	1	39	0.3	11.7
12	Encinas/Belcher.(Library)	77487.5	1	5	35	1.1	38.5
13	Blair/Preston (Hospital/Clinic)				35		0
14	Rockwood/Vega	77488.6	2	2	35	0.3	10.5
15	Rockwood/Robert Kennedy	77488.9	3	1	37	0.4	14.8
16	Cole Rd./Rockwood				37		0
17	Cole/111	77489.3	2	6	33	4.1	135.3
742.5	(26) Capacity Miles (7) x (22)	Totals	70	37	568	9.9	329
			(20)		(21)	(22)	(23)
405.9	(27) Seat Miles (8) x (22)						

**SURVEY TRIP SHEET**

							# of Pages <u>2 of 2</u>	
<b>(1) Trip Serial No.</b> <u>1n04</u>			<b>(2) Date</b> <u>1-30-14</u>		<b>(3) Day of Week</b> <u>Thurs</u>		<b>(4) Time Period</b> <u>AM</u>	
<b>(5) Route No.</b> <u>1 north</u>			<b>(6) Vehicle Inventory Number</b> <u>1209</u>		<b>(7) Total Capacity</b> <u>75</u>		<b>(8) Seated Capacity</b> <u>41</u>	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
18	Heber/Pitzer	77493.4	1	2	32	0.2	6.4	
19	Heber Post Office	77493.6		8	24	3.6	86.4	
20	Heber Family Apts.				24		0	
21	Imperial Valley Mall	77497.2		3	21	1.9	39.9	
22	4th St. / Wake St.	77499.1		4	17	0.3	5.1	
23	Lucky's Market	77499.4	2	2	17	2	34	
24	Aurora / 4th St.				17		0	
25	Aurora / 8th St.				17		0	
26	Aurora/14th				17		0	
27	Imperial Ave. / Pepper St.(Hospital)				17		0	
28	Ross St. / 10th St.	77501.4	7	3	21	0.9	18.9	
29	4th St. / Wensley	77502.3	2	1	22	0.4	8.8	
30	4th St. / Brighton	77502.7	3	1	24	0.3	7.2	
31	State St. / 5th St.	77503	4	2	26	0.3	7.8	
32	State St. / 7th St.	77503.3		1	25		0	
33	State St / 14th St.				25		0	
1485	(26) Capacity Miles (7) x (22)	Totals	89	64	914	19.8	543.5	
811.8			(20)		(21)	(22)	(23)	

**SURVEY TRIP SHEET**

							<b># of Pages</b> 1 of 2	
<b>(1) Trip Serial No.</b> 2n03			<b>(2) Date</b> 1-30-14		<b>(3) Day of Week</b> Thurs		<b>(4) Time Period</b> Mid	
<b>(5) Route No.</b> 2 north			<b>(6) Vehicle Inventory Number</b> 1209		<b>(7) Total Capacity</b> 75		<b>(8) Seated Capacity</b> 41	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
1	State/14th	77503.3	17		17	0.6	10.2	
2	Imperial/Commercial	77503.9	2	2	17	0.2	3.4	
3	Imperial/Euclid	77504.1	5	3	19	1	19	
4	Bradshaw/86 (Costco)	77505.1	3	4	18	1.5	27	
5	La Brucherie/Bradshaw (WalM)				18		0	
6	Aten / La Brucherie	77506.6	1	3	16	4.8	76.8	
7	Aten/Myrtle				16		0	
8	Aten / Cross				16		0	
9	Imperial Valley College	77511.4		7	9	4.7	42.3	
10	Barioni Ave./K St. (IID)	77516.1	1	2	8	0.4	3.2	
11	Imperial Post Office	77516.5	3	1	10	8.7	87	
12	15th & Imperial				10		0	
13	Legion Rd. / Hwy 86 (Hospital)	77525.2	1	2	9	1.3	11.7	
14	Brawley--K St./ 2nd St.	77526.5		1	8	1.1	8.8	
15	Brawley--K St/Imperial Ave				8		0	
16	Brawley--K St./S. 9th				8		0	
1822.5	(26) Capacity Miles (7) x (22)	Totals	33	25	207	24.3	289.4	
996.3	(27) Seat Miles (8) x (22)							

**SURVEY TRIP SHEET**

							<b># of Pages</b> <u>2 of 2</u>	
<b>(1) Trip Serial No.</b> <u>2n03</u>			<b>(2) Date</b> <u>1-30-14</u>		<b>(3) Day of Week</b> <u>Thurs</u>		<b>(4) Time Period</b> <u>Mid</u>	
<b>(5) Route No.</b> <u>2 north</u>			<b>(6) Vehicle Inventory Number</b> <u>1209</u>		<b>(7) Total Capacity</b> _____ 75		<b>(8) Seated Capacity</b> _____ 41	
<b>(9)</b>	<b>(10)</b>	<b>(12)</b>	<b>(13)</b>	<b>(14)</b>	<b>(15)</b>	<b>(16)</b>	<b>(17)</b>	
<b>Stop No.</b>	<b>Stop Description</b>	<b>Odometer Reading</b>	<b>Passengers Boarded</b>	<b>Passengers De-Boarded</b>	<b>Passengers On Board</b>	<b>Distance Between Stops</b>	<b>Passenger Miles (15) x (16)</b>	
17	Brawley--K St./S. Palm St.	77527.6	1	2	7	0.1	0.7	
18	Brawley--Palm St. / J St.	77527.7		1	6	0.3	1.8	
19	Brawley--S. Main St. / Palm	77528	3	2	7	0.2	1.4	
20	Brawley--Main St. / 10th St.	77528.2	1		8	0.8	6.4	
21	Brawley--Main/South Plaza				8		0	
22	Brawley--Main/3rd St.	77529	2	2	8	0.6	4.8	
23	Brawley--E St./Rio Vista	77529.6	2	4	6		0	
24	Westmorland--Center/Main				6		0	
25	Westmorland--Center/6th				6		0	
26	Calipatria--Main St. / Park				6		0	
27	Calipatria--111/Main				6		0	
28	Niland--111/Main			6	0		0	
1972.5	(26) Capacity Miles (7) x (22)	Totals	42	42	281	26.3	304.5	
			(20)		(21)	(22)	(23)	
1078.3	(27) Seat Miles (8) x (22)			Mean On Board	19.413793 1			



SURVEY TRIP SHEET						# of Pages 1 of 1	
(1) Trip Serial No. <u>21ivc-pm01</u>		(2) Date <u>1-30-14</u>		(3) Day of Week <u>Thurs</u>		(4) Time Period <u>Mid</u>	
(5) Route No. <u>21-IVC Express-PM Calexico</u>		(6) Vehicle Inventory Number <u>1202</u>		(7) Total Capacity <u>75</u>		(8) Seated Capacity <u>41</u>	
(9)	(10)	(12)	(13)	(14)	(15)	(16)	(17)
Stop No.	Stop Description	Odometer Reading	Passengers Boarded	Passengers De-Boarded	Passengers On Board	Distance Between Stops	Passenger Miles (15) x (16)
1	Imperial Valley College	77956.3	77		77	9.7	746.9
2	Hacienda/Scaroni	77966		3	74	1.4	103.6
3	Hacienda/Ollie St.				74		0
4	Ollie/Birch St. - Post Office	77967.4		1	73	0.7	51.1
5	Kloke St/Birch St	77968.1		2	71	0.7	49.7
6	Kloke St./Grant St.	77968.8		2	69	0.3	20.7
7	Grant St./Eady	77969.1		3	66	0.4	26.4
8	Grant St./Cesar Chavez St.	77969.5		1	65	1.4	91
9	Emerson/6th				65		0
10	Third St./Paulin	77970.9		44	21	0.7	14.7
11	Mary/4th St.	77971.6		3	18	0.7	12.6
12	Encinas/7th St.(Library)	77972.3		5	13	0.7	9.1
13	Blair/Preston (Hospital/Clinic)	77973		7	6	0.7	4.2
14	Rockwood/Vega	77973.7		2	4	0.7	2.8
15	Rockwood/Robert Kennedy	77974.4		4	0	1.4	0
16	Cole Rd./Rockwood				0		0
17	Cole/111	77975.8			0		0
1462.5	(26) Capacity Miles (7) x (22)	Totals	77	77	696	19.5	1132.8
			(20)		(21)	(22)	(23)
799.5	(27) Seat Miles (8) x (22)			Mean On Board	43.5		

## EXHIBIT D EXCEL COMPUTERIZED TRIP-BY-TRIP DATA ENTRY (EXAMPLE: WEEK 52 INPUT)

Date	Day of Week	Week #	Route	Time Period	Boarded-UPT	Sum of Boardings	On-Board	Sum of On-Board	Bus Trip Distance	Sum of Distance	Passenger Miles=PMT	Sum of PMT	Capacity Miles	Sum of Capacity Miles	Seat Miles	Sum of Seat Miles	Avg. Route Length	PP MT	AP TL	PM T/P	
6/2/13	Mon	52	21-IVC	-am	1	28	14027	7	4	16.7	4.5	362.8	7	.5	743637	.7	7.1	77876	7	5	328
6/2/13	Mon	52	Green		2	8	14035	74	8	14.3	8.8	40.7	4	9	743965	.9	6	77876	3	4	328
6/2/13	Mon	52	Blue		2	8	14043	61	9	14.7	3.5	44.8	2	1	744304	.1	4.1	77876	9	2	328
6/2/13	Mon	52	21-IVC	-pm	3	14	14123	6	3	16.8	0.1	195.3	4	1260	747049	.8	4.7	77876	9	8	328

6																		31	10.	
2																		56	35	0.04
6		21-										146						27.	59	479
1	Thur	IVC				12	13645		1245			412.	1252	748301.	684	43993	22.324	27.	59	479
4	s	52	-am	1	15	14138	6	9	16.7	6.8	210.4	8	.5	5	.7	9.4	77876	7	8	328
6																				
2																				
6												146						31	10.	0.04
1	Thur						13646		1246			420.	142.	748443.	142	44008	22.324	56	35	479
4	s	52	4w	1	1	14139	8	7	7.9	4.7	7.9	7	2	7	.2	1.6	77876	50	58	328
6																				
2																				
6												146						31	10.	
1	Thur						31	13678		1247		705.		749523.	590	44067	22.324	64	35	0.04
4	s	52	1s	2	35	14174	6	3	14.4	9.1	284.7	4	1080	7	.4	2	77876	4	2	328
6																				
2																				
6												147						31	10.	
1	Thur						71	13750		1250		401.	2032	751556.	111	44178	22.324	76	35	0.04
4	s	52	2s	3	56	14230	7	0	27.1	6.2	696.4	8	.5	2	1.1	3.1	77876	6	2	328
6																				
2																				
6												147						31	10.	
1	Thur						52	13802		1252		686.		753041.	811	44259	22.324	87	34	0.04
4	s	52	1n	3	49	14279	5	5	19.8	6	285	8	1485	2	.8	4.9	77876	75.	29	479
																		5	4	328

FTA Form 406A was used to compile the Daily Trip-by-Trip Excel file totals for the year and to display the final results for the yearlong study.<sup>1</sup> Form 406A shows that a total of 14,369 unlinked boardings (Line 1) were counted for the year on the 565 sampled bus trips (Line 70, averaging 25.43 boardings per bus trip). In 2008-2009 there were 32.28 boardings per sampled trip. It is noted here and below that a substantial service increase occurred in October, 2013 along with other, smaller ones during the 2013-2014 and still others after the 2010-2011 study. Such an increase will dilute the passenger load per bus, which was, in many cases, the objective of the service increase.

- 21.69 passengers on 108 sampled weekday a.m. peak hour bus trips (prior to 9:00 a.m.)—2010-2011 = 27.89 boardings per sampled trip. This decrease per trip is consistent with the increase in number of trips from service increases.
- 30.68 boardings on 180 sampled midday weekday trips (9:00 a.m.—3:00 p.m.)—2010-2011 = 38.54 boardings per sampled trip, again consistent with the increased number of scheduled trips.
- 22.31 boardings on 137 weekday p.m. peak bus trips (3:00 p.m. –7:00 p.m.)—2010-2011 = 26.16 boardings per sampled trip.
- 11.20 boardings on 10 nighttime trips (after 7:00 p.m.)—2010-2011 = 19.89 boardings per sampled trip. This is a real decrease in that the number of nighttime trips did not increase; however, the sample is so small that this difference is not statistically significant.
- Saturdays averaged 26.57 boardings per sampled trip (85 sampled trips)—2010-2011 = 37.32 boardings per sampled trip—again with more Saturday trips in this sample period (54 versus 31 in 2010-2011).
- New Sunday service averaged 23.98 boardings per sampled trip for its six months of operation.

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<sup>1</sup> The original Form 406A was modified from its published version to accommodate the requisite weighting and to correct some errors in the form. The original Form 406A follows on the next page, with errors noted by yellow highlight. These errors were as follows:

- 1) Lines 11-12 on the original were repeats of lines 9-10 rather than the data shown on the modified Form 406A on lines 12-13, which was the clear intent, and
- 2) Line 10 on the original is shown as being calculated by dividing line 1 by line 7; whereas, the correct determination is line 4 divided by line 7

**Form 406A (Modified)**  
**ANNUAL DATA TO FTA: IMPERIAL**  
**VALLEY TRANSIT**  
**July 1, 2013-June 30, 2014**

Line No.	ITEM	WEEKDAYS				SATURD AY	SAMPLE		WEIGHTED SAMPLE **
		AM PEAK	MIDDAY	PM PEAK	NIGHT		SUNDAY	TOTAL	TOTAL
	<b>Accumulations from Trip by Trip Record</b>								
1	(20) Passengers Boarded	2342	5522	3056	112	2258	1079	14369	14142.857
2	(21) Passengers on Board	21577	54721	28065	1208	21526	11889	138986	135253.718
3	(22) Bus Trip Distance	2418.6	3782.7	2842.8	169.2	2579	821.2	12613.5	12369.690
4	(23) Passenger Miles	28001.4	53777.5	30917.2	1157.6	24816.1	9710.3	148380.2	147574.917
5	(26) Capacity Miles	135485.6	218467.7	158143	4403.6	181298.8	61805	759603.7	711871.830
6	(27) Seat Miles	81811.7	130742.6	95098	3723.6	101014.4	33792.1	446182.4	424945.766
7	(28) Trips in Sample	108	180	137	10	85	45	565	
8	(29) Total Number of Bus Trips	9110	11837	9982	1015	2713	468	35125	
9	<b>WEIGHTS**</b>	1.358729	1.059272	1.173641	1.63495	0.514126	.167522		
	<b>Sample Averages</b>								
10	Unlinked Passengers (Boardings) per Trip (1/7)	21.6853	30.678	22.307	11.200	26.565	23.978	25.432	25.032
11	Passenger Miles per Trip (4/7)	259.272	298.764	225.673	115.760	291.954	215.784	262.620	261.195
12	Capacity Miles per Trip (5/7)	1254.496	1213.709	1154.328	440.360	2132.927	1373.444	1344.431	1259.950
13	Seat Miles per Trip (6/7)	757.516	726.348	694.146	372.306	1188.405	750.936	789.703	752.116
14	% Passenger Miles to Seat Miles per Trip (11/13)	34.227%	41.132%	32.511%	31.088%	24.567%	28.735%	33.255%	34.728%
15	% Passenger Miles to Capacity Miles per Trip (11/12)	20.667%	24.616%	19.550%	26.288%	13.688%	15.711%	19.534%	20.731%
	<b>Annual Totals (weighted by number of trips)</b>								
16	Annual Weighted Unlinked Passenger Trips (10*8*9)	197553	363135	222668	11368	72071	11222		878017
17	Annual Weighted Total Passenger Miles (11*8*9)	2361967.9	3536469.5	2252667.9	117496.4	792071.2	100986.9		9161659.8

Inasmuch as Saturdays and Sundays were oversampled relative to weekday trips, with 85 out of 565 sampled trips (15.0 percent of all sampled trips) on Saturday and 45 (8.0 percent) on Sunday in contrast to the actual bus trips of 7.7 percent and 1.3 percent respectively, the overall 25.43 sample boarding average requires weighting. When weights are applied<sup>2</sup>, the mean number of boardings per trip for the system-wide sample is reduced slightly to 25.03 (2010-2011 = 31.20 boardings per trip).

Applying these mean numbers of unlinked boardings and correspondingly determined passenger miles (based on number of passengers on-board and distance between stops) reveals the final estimates required for the federal database. **Form 406A shows that the annual estimated unlinked passenger boardings and mileage is determined (with a margin of error of +/- 10 percent at 95 percent confidence) to be 878,017 riders who traveled 9,161,660 passenger miles during the year (Lines 16 and 17).** In 2010-2011, the corresponding estimates were 918,578 passengers and 9,871,209 passenger miles, indicating statistical consistency between the two periods, with 2013-2014 showing a decrease of 4.4 percent in unlinked passenger trips and 7.2 percent passenger miles, both of which are well within the +/- 10 percent margin of error, indicating that no statistical difference between the study periods has been found.

Form 406A also breaks down the weighted total ridership and mileage by time of day (Lines 16 and 17). Weekday ridership appeared to decline from 2010-2011, but still within the margin of error—and weekend ridership increased in excess of the margin of error.

- There were 197,553 unlinked boardings annually during weekday a.m. peak periods, traveling 2,361,968 miles. Corresponding totals from 2010-2011 were 209,054 unlinked boardings and 2,576,057 passenger miles.
- Peak riders during the weekday p.m. periods total 222,668 and 2,252,668 miles (2010-2011 = 237,567 boardings and 2,570,906 miles)
- Weekday midday boardings totaled 363,135 for the year and 3,536,470 miles. In 2010-2011, there were 390,010 unlinked boardings and 3,793,996 miles.

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<sup>2</sup> Inasmuch as the sample distribution does not precisely mirror the actual distribution of trips weighting was appropriate for the upper portion of Form 406A. Weights are equal to the total trips in the sample (Line 7—Sample Total column) divided by total number of bus trips sampled (Line 8—Sample Total column). Then, for each time period, that result is divided by the total number of trips in the sample by time period (7) divided by the total number of bus trips sampled by time period (8). These weights are then multiplied by sample totals to obtain sample data that is weighted to reflect the actual distribution of bus trips in Lines 16-17 and the right-hand column.

- Weekday night ridership seemed to fall substantially (again, however, the small sample size renders this difference as not statistically interpretable). Boardings included 11,368 riders traveling 117,496 miles, which equaled fewer riders and miles than in 2010-2011 (22,978 boardings and 162,119 passenger miles).
- Weekend travel increased. Saturdays had 72,071 boardings and 792,071 miles, an increase from 2010-2011 (58,999 boardings and 768,180 miles). Sunday service, with only 18 scheduled trips per Sunday, added 11,222 boardings and 100,987 passenger miles during its six months of operation.

Imperial Valley Transit vehicles experience their highest percentage occupancy (Line 14) during midday on weekdays, with 41.13 percent of seat miles occupied (2010-2011 = 51.7%--again reflecting the increased service), followed by the weekday morning peak period (34.23 percent—2010-2011 = 41.2). Sundays, not unexpectedly, display the lightest occupancy (24.57 percent of seat miles). Overall, for all buses, 34.73 percent of seats miles were occupied with 20.73 percent of the combined seated and standing capacity occupied. In 2010-2011, the corresponding occupancies were 43.6 percent of seat miles of seats and 31.6 percent of seated and standing capacity, again reflecting the increased service levels in 2013-2014.

ANNUAL DATA TO FTA

Transit ID \_\_\_\_\_

Level \_\_\_\_\_

Fiscal Year End \_\_\_\_\_

Type of Service \_\_\_\_\_

Mode \_\_\_\_\_

Line No.	ITEM	WEEKDAYS				SATURDAY	TOTAL
		AM PEAK	MIDDAY	PM PEAK	OTHER		
	Accumulations from Daily Record Sheet						
1	(20) Passengers Boarded						
2	(21) Passengers on Board						
3	(22) Bus Trip Distance						
4	(23) Passenger Miles						
5	(26) Capacity Miles						
6	(27) Seat Miles						
7	(28) Trips in Sample						
8	(29) Total Number of Bus Trips						
9	Unlinked Passengers per Trip (1/7)						
10	Passenger Miles per Trip (1/7)						
11	Unlinked Passengers per Trip (1/7)						
12	Passenger Miles per Trip (4/7)						

\*DO = Directly Operated PT = Purchased Transportation

Sample Plan Used \_\_\_\_\_

Date Prepared \_\_\_\_\_

Date Updated \_\_\_\_\_



**APPENDIX: Qualifications of Rea & Parker Research**

**Richard A. Parker, Ph.D.**

**Louis M. Rea, Ph.D.**