

# Klein ISD and Harris-Galveston Subsidence District

Irrigation Control via Rainbird Installation

WC Grant 2020-003-IRR\_KISD

March 29, 2021

## Software Background:

Energy Management is the second largest budget in a school district, second only to personnel. Within that budget, electricity accounts for the majority: approximately 80%. Until recent years, water was considered to be the utility we worried about the least, thus it was used freely and without consequence. Because it was cheap, we developed bad habits and became “wasteful” in our everyday use of water. As we watch the cost of water rise steeply, now more than ever, we must find ways to identify and address our wasteful ways. The 2 consecutive tables below represent total water cost and cost/ft<sup>2</sup> for each fiscal year since 2007. Fiscal year 19-20 was a particularly odd year for obvious reasons, but Klein also shifted their fiscal year from Sept-Aug to July-June. This produced a 10-month fiscal year of Sept 1, 2019 – June 30, 2020.

	FY06-07	FY07-08	FY08-09	FY09-10	FY10-11	FY11-12	FY12-13
Square Footage (sqft)	6,415,053	6,556,467	6,638,813	6,810,854	7,169,458	7,302,070	7,617,972
Total Water Cost (\$)	\$751,852	\$936,632	\$998,724	\$944,789	\$1,277,982	\$1,136,429	\$1,166,573
Total Water CI (\$/sqft)	\$0.12	\$0.14	\$0.15	\$0.14	\$0.18	\$0.16	\$0.15

	FY13-14	FY14-15	FY15-16	FY16-17	FY17-18	FY18-19	FY19-20
Square Footage (sqft)	7,746,558	8,010,187	8,135,941	8,261,014	8,955,865	9,223,909	9,223,909
Total Water Cost (\$)	\$1,164,939	\$1,172,935	\$1,281,944	\$1,434,920	\$1,742,063	\$1,587,853	\$1,298,765
Total Water CI (\$/sqft)	\$0.15	\$0.15	\$0.16	\$0.17	\$0.19	\$0.17	\$0.14

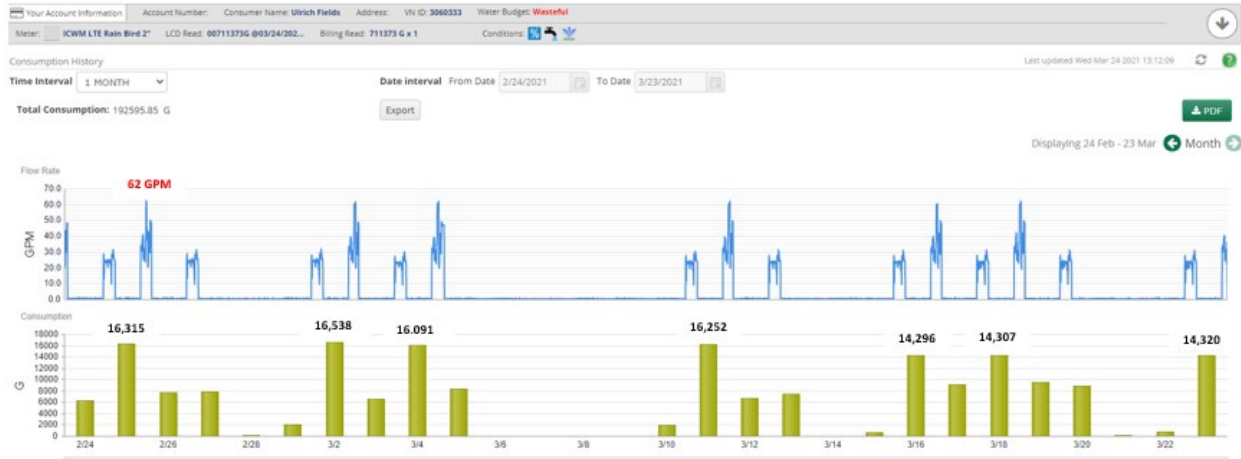
Although Klein ISD is very conservative in its scheduling of HVAC and lighting, we view irrigation control as one way to address the increasing cost of water. Ensuring that we have a system in place that works, a process that everyone understands, and a means to address identified issues will allow us to increase our conservation efforts.

## How are we using the available data to address issues?

Klein ISD uses Energy Manager Software to track water usage and cost, as well as energy usage and cost. Most campuses in Klein ISD do not have separate irrigation meters, and many campuses share meters with other campuses. Overall water usage and cost, by campus, can be found in the appendix of this report. The chart below, derived from Energy Manager Software, represents irrigation usage for the past 3 fiscal years for 3 participating campuses that benefitted from the grant.

	2018		2019		2020	
	Usage (Gal)	Cost	Usage (Gal)	Cost	Usage (Gal)	Cost
<b>Krimmel Intermediate</b>	917,076	\$ 5,613	583,000	\$ 3,972	211,000	\$ 1,740
<b>Ulrich Intermediate</b>	3,607,619	\$ 24,905	2,184,975	\$ 16,364	2,729,006	\$ 21,240
<b>Klein High School</b>	1,399,469	\$ 15,669	1,449,545	\$ 17,057	1,812,955	\$ 20,476

Clearly, we can see that Ulrich Intermediate has extremely high usage as compared to both Krimmel Intermediate as well as Klein High School. At this point, we have the opportunity to view the schedule and begin to identify where the problem could be:



By looking at this schedule, we are certain that the high usage is not due to a leak, but instead scheduling. According to the available report in the Rainbird system, Ulrich Intermediate has used 192,595 gallons between 2/24 and 3/23/2021 (6,420 GPD or the equivalent of running 2.5 hours daily). Based on the system, these were scheduled and not manual run times.

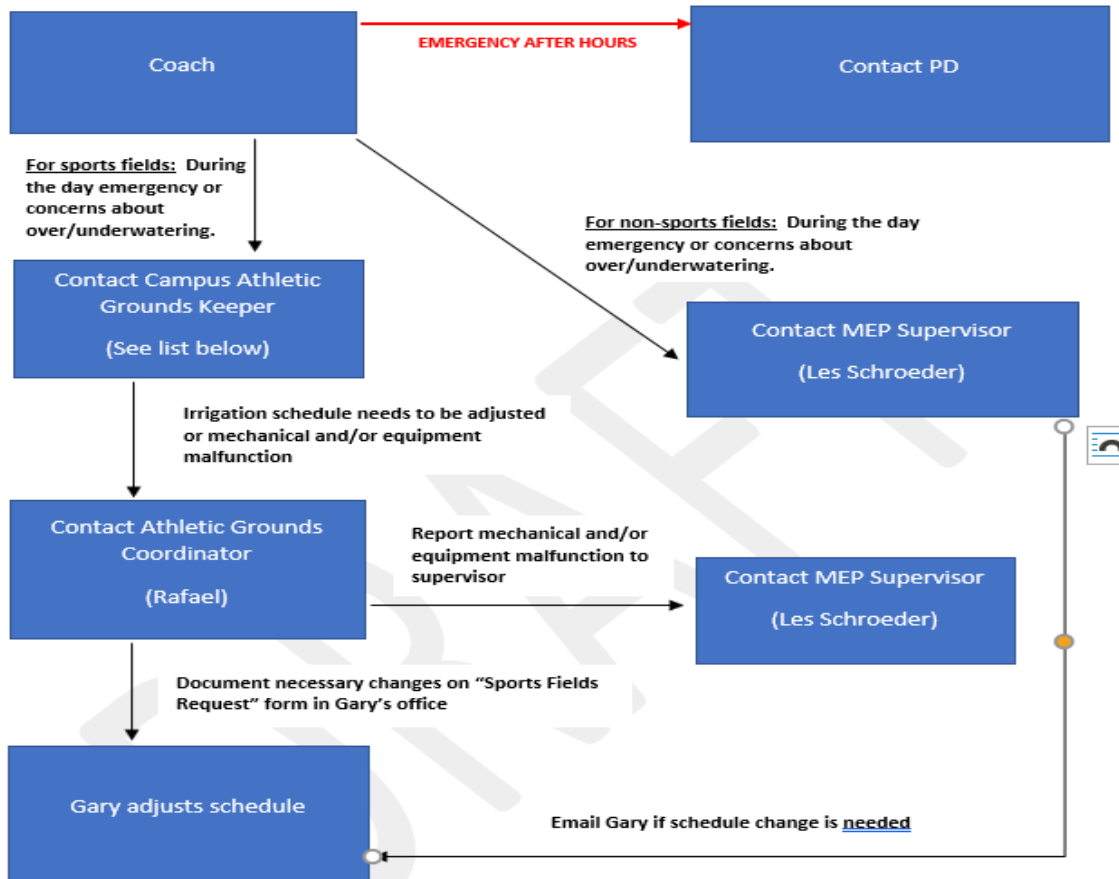
PGM A Total Run Time	59:05:00	08:05:00	51:00:00	631%
PGM B Total Run Time	00:00:00	00:00:00	00:00:00	0%
PGM C Total Run Time	00:00:00	00:00:00	00:00:00	0%
PGM D Total Run Time	00:00:00	00:00:00	00:00:00	0%
Total Manual Run Time	00:00:00	00:00:53	00:00:53	-100%
Total Run Time	59:05:00	08:05:53	50:59:07	630%
Actual Total Flow	**	**	**	**
Estimated Flow *	0.0 gal	0.0 gal	0.0 gal	0%
Evapotranspiration:	0.0 in	0.0 in	0.0 in	0%
Rainfall	0.0 in	0.0 in	0.0 in	0%

\* Based on current Station Flow Rates

A meeting was held on Wednesday, March 24<sup>th</sup> to discuss what needs to be done to address this. During this meeting between Energy Management and the supervisors of Environmental Quality, Athletics Grounds, and Irrigation, we determined that we needed to purchase hydrometers in order to determine if/when fields need to be watered rather than assuming that a brown patch signifies the need for additional water. Using tools that measure soil moisture, we'll be able to more quickly and accurately identify and respond to the coaches' needs on the field.

We are continuing to work with Environmental Quality, Athletic Grounds, and Irrigation, as well as the Director of Athletics and coaches to develop a "default" schedule for each Intermediate and High School. We will also be working collaboratively to develop and communicate a schedule regarding aerating, seeding, and fertilizing the fields. This has been an obstacle for us as we have simply been doing as the coaches request. Adding days and increasing run times without evidence of lack of water was the factor that was causing the reported issue. We will now be working directly with our representatives from Rainbird, Calsense, and Hydropint to gain knowledge and use tools to measure soil moisture.

It is important that processes be in place to ensure that everyone understands the critical need to find the balance between producing and maintaining healthy fields while conserving water. The diagram below represents the process which Klein ISD is beginning to implement:

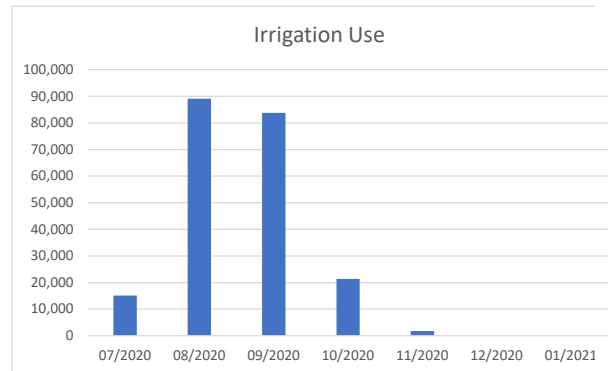


Since the completion of the project, we have seen a decrease in the irrigation. However, it should be noted that the system was installed at the hottest time of the year and when fields are being well-maintained for upcoming sports practices. We will continue to monitor irrigation closely as we approach summer and throughout.

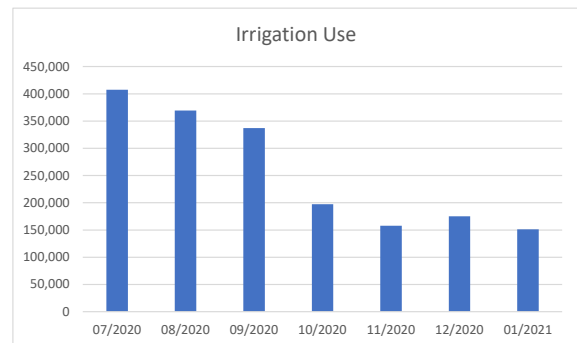
The following 3 tables and graphs represent the irrigation usage and cost of the 3 months prior to install as well as the 4 months following the install.

**Campus Data Since Irrigation Control Installation:**

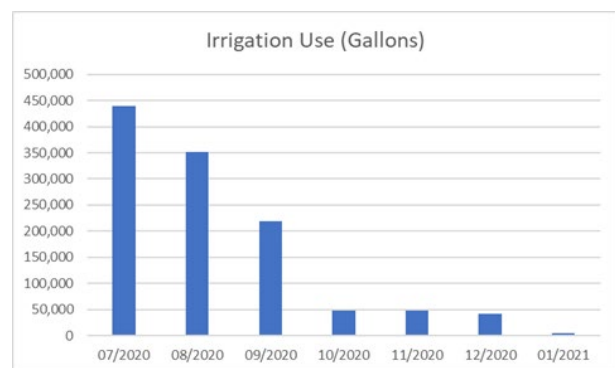
<b>Krimmel Intermediate School -- 7/2020 to 2/2021</b>		
Month	Irrigation Use (Gallons)	Irrigation Cost
07/2020	15,094	\$117
08/2020	89,094	\$606
09/2020	83,738	\$567
10/2020	21,324	\$159
11/2020	1,750	\$42
12/2020	0	\$38
01/2021	0	\$33



<b>Ulrich Intermediate School -- 7/2020 to 2/2021</b>		
Month	Irrigation Use (Gallons)	Irrigation Cost
07/2020	407,658	\$3,233
08/2020	369,267	\$2,928
09/2020	337,103	\$2,673
10/2020	197,497	\$1,566
11/2020	157,945	\$1,253
12/2020	175,055	\$1,388
01/2021	151,171	\$1,199



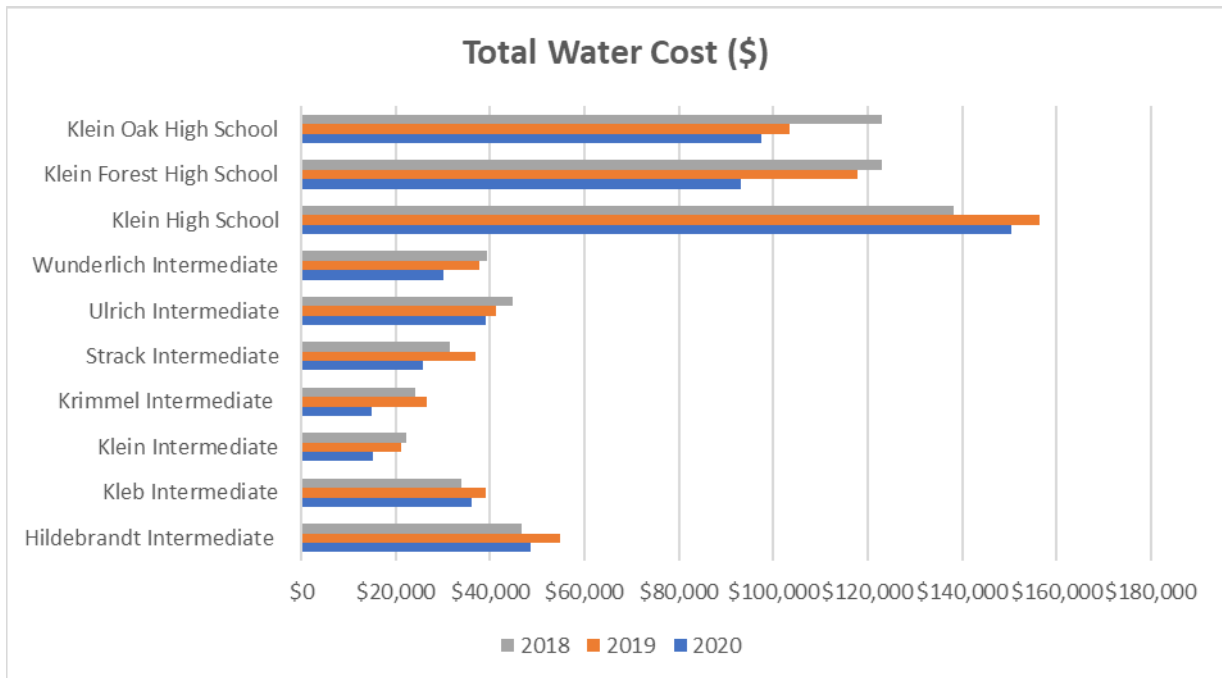
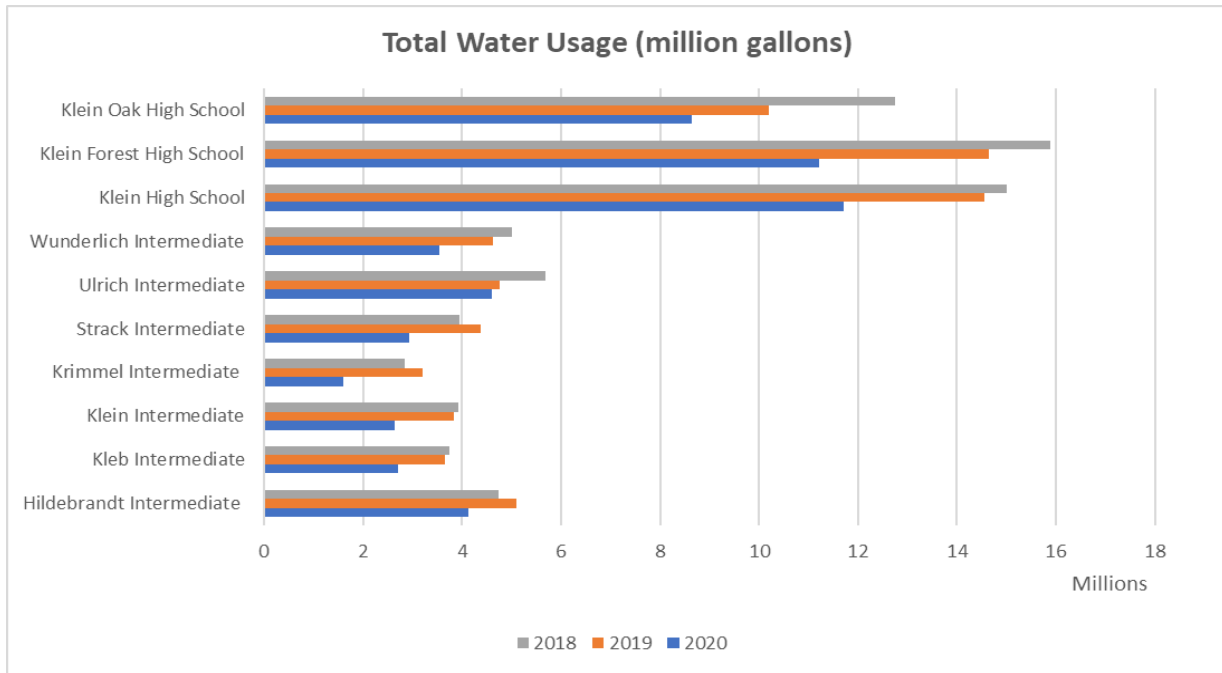
<b>Klein High School -- 7/2020 to 2/2021</b>		
Month	Irrigation Use (Gallons)	Irrigation Cost
07/2020	439,500	\$4,329
08/2020	352,313	\$3,547
09/2020	219,030	\$2,322
10/2020	48,313	\$814
11/2020	47,665	\$748
12/2020	42,559	\$718
01/2021	4,071	\$450



For Klein ISD, this is only the 1<sup>st</sup> step in our efforts to conserve water. We believe it is our responsibility to be mindful of our natural and financial resources, and gaining a better understanding of irrigation is a great place to start.

## APPENDIX

**Participating Campus Data Calendar Years 2018, 2019, 2020:**



Klein ISD / Harris Galveston Subsidence District Grant  
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March 29, 2021

Total Water Usage (gallons) for All Facilities	2018	2019	2020
Benfer Elementary	2,217,689	2,214,069	1,515,567
Benignus Elementary	1,016,550	1,025,444	1,401,807
Bernshausen Elementary	2,314,100	2,197,097	810,118
Blackshear Elementary	2,208,484	2,349,752	1,790,774
Brill Elementary	1,193,437	1,249,636	675,227
Central Office	1,502,200	1,460,550	3,419,971
Central Warehouse	214,600	208,650	488,567
Doerre Intermediate School	4,194,502	3,418,493	2,169,779
Ehrhardt Elementary	1,208,013	1,155,766	755,817
Eiland Elementary	974,206	831,603	565,272
Epps Island Elementary	979,037	699,076	785,000
Fox Elementary			4,328,786
Frank Elementary	2,038,811	1,437,964	829,707
French Elementary	3,326,571	1,545,968	658,195
Grace England	772,402	676,567	600,950
Greenwood Forest Elementary	1,345,952	1,258,333	664,022
Hassler Elementary	981,029	1,436,321	1,200,086
Haude Elementary	1,386,013	1,522,199	795,200
Hildebrandt Intermediate School	4,740,337	5,095,306	4,137,192
Hofius Intermediate School	1,023,188	4,349,361	4,433,000
Kaiser Elementary	1,402,975	1,511,482	908,977
Kleb Intermediate School	3,734,874	3,661,969	2,710,325
Klein Cain High School	18,814,490	17,331,403	13,143,394
Klein Collins High School	14,627,154	13,512,812	9,321,218
Klein Forest Agriculture Barn	220,507	232,177	162,161
Klein Forest High School	15,888,129	14,639,880	11,221,776
Klein High School	15,012,473	14,547,363	11,707,839
Klein Instructional Center	1,152,947	468,518	386,349
Klein Intermediate School	3,920,119	3,835,612	2,636,843
Klein Maintenance	751,100	730,275	1,709,985
Klein Oak High School	12,759,504	10,196,404	8,650,595
Klenk Elementary	1,303,207	1,400,342	700,387
Kohrville Elementary	1,092,039	1,658,859	2,217,999
Krahn Elementary	992,760	1,293,021	803,856
Kreinhop Elementary	1,907,890	1,762,541	1,215,681
Krimmel Intermediate School	2,829,360	3,195,097	1,608,746
Kuehnle Elementary	1,242,350	1,445,986	717,483
Lemm Elementary	562,965	647,226	450,165
Mahaffey Elementary	1,333,900	1,958,655	1,373,252
McDougle Elementary	1,835,483	1,703,200	1,015,400
Memorial Stadium	1,867,437	1,830,984	1,306,307
Metzler Elementary	1,006,542	1,342,716	917,355
Mittelstadt Elementary	2,107,648	2,420,330	1,166,813
Mueller Elementary	1,794,978	1,865,942	1,546,569
Multi-Purpose Center	1,482,667	1,842,500	1,931,524
Network Operations Center	321,900	312,975	634,751
Nitsch Elementary	1,449,907	1,296,084	1,097,664
Northampton Elementary	1,353,061	1,132,419	876,097
Otis Davis Transportation Center	1,502,200	1,460,550	3,419,971
Police Station	311,240	305,164	230,434
Roth Elementary	1,001,573	1,244,452	672,976
Schindewolf Intermediate School	4,663,730	4,308,433	2,972,331
Schultz Elementary	1,584,333	1,229,833	882,940
South Transportation Center	3,070,930	2,088,909	924,000
Strack Int. (Pre 2011-12 Inc Benfer)	3,952,168	4,368,207	2,926,700
Student Service Center	71,492	84,096	62,818
TEP/DAEP	1,348,705	1,322,378	1,041,824
Theiss Elementary	1,055,381	1,404,208	647,186
Ulrich Intermediate School	5,690,414	4,761,904	4,598,383
Vistas High School	888,498	627,083	477,129
Wunderlich Intermediate School	5,017,304	4,623,120	3,543,719
Zwink Elementary	2,816,075	1,847,800	2,026,467



<b>Irrigation Usage (gallons) for Facilities w/Irrigation Meters</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Benignus Elementary	900,300	758,000	540,000
Blackshear Elementary	230,068	253,000	558,097
Eiland Elementary	102,025	77,700	117,656
Fox Elementary			4,147,000
Frank Elementary	919,000	436,000	329,000
French Elementary	1,492,563	474,000	7,387
Grace England	416,002	349,000	382,750
Hofius Intermediate School	159,000	2,497,000	2,859,645
Klein Cain High School	12,448,574	9,941,743	7,550,400
Klein High School	1,399,469	1,449,546	1,812,955
Kohrville Elementary	165,793	254,000	414,387
Krimmel Intermediate School	917,076	583,000	211,000
Mahaffey Elementary	67,100	17,000	163,000
Mueller Elementary	894,576	993,000	1,017,000
South Transportation Center	706,968	5,000	657,500
Ulrich Intermediate School	3,607,620	2,184,975	2,729,006
Vistas High School	598,000	321,677	314,742
Zwink Elementary	1,002,531	146,000	422,067