



Memorandum

Date: May 8, 2008
To: Jill Duerig, General Manager
From: David W. Lunn, Water Resources Manager
Subject: ANNUAL REVIEW OF THE SUSTAINABLE WATER SUPPLY

SUMMARY:

Each year Zone 7 staff prepares a water supply assessment of the Livermore-Amador Valley sustainable water supply. Every 5 years Zone 7 includes this information in an update of the Urban Water Management Plan. This report updates the May 2007 Sustainable Water Supply Report provided to the Zone 7 Board. The current sustainable supply is 81,200 acre-feet. This is a reduction from former projections based on the following three basic assumptions:

- Development and the associated increases in demand would proceed in a linear fashion to current General Plans (no densification or development has been included beyond what has already been adopted by the planning entities)
- DWR's December analysis (which includes only Wanger's delta smelt decision) would be the basis for long-term pumping reductions (i.e., any further reductions that might be ordered by the courts related to other ESA issues such as salmon and long-fin smelt have not been considered; on the other hand, no improvements due to a good OCAP decision or construction of State Water Project enhancements have been considered)
- Per Capita Demand would remain about the same

Even with these new constraints, Zone 7 projects sufficient supply to meet future demands through the projected level of development in the year 2015 but after that if our demands continue to rise and there is no improvement in the current restrictions in Delta pumping Zone 7 would be using our drought storage reserves if we continued to meet full demands.

In other words, our long term projected demands at build-out exceed our supply by about 6,000 acre-feet a year. However, if any one of these basic assumptions is changed, the analysis changes. For instance, the current slow-down in development could extend the adequate water supply period beyond 2015. Or, if the Laird bill (AB 2175) passes, mandating 20% conservation as measured by reductions in per capita use, we could have adequate supplies through build-out. Increases in recycled water use could also lessen the impacts. Or, if the BDCP and related near- and long-term improvements are implemented, reliability could be restored and we would return to the pre-Wanger analysis of sustainable supplies.

Following are the current components of the Livermore-Amador Valley’s sustainable water supply:

SOURCE	ACRE-FEET/YEAR
State Water Project future average delivery (reduced from 76%(60,900 af) to 66% reliability)	53,200
Lake Del Valle future average yield	9,300
Byron Bethany Irrigation District (BBID)	2,000
Subtotal- Zone 7 Sustainable Supply	64,500
Safe groundwater yield from Main Basin	13,400
Recycled Water	3,300
Subtotal: Non-Zone 7 supply	16,700
TOTAL SUSTAINABLE WATER SUPPLY	81,200

Again, the reduction in sustainable supply is due to recent federal court rulings related to endangered species that mandate reduced pumping from the Delta. These restrictions in Delta pumping are believed to be temporary. Zone 7 is participating in the Bay-Delta Conservation Planning process and is optimistic that progress is being made. Scoping sessions for the BDCP Environmental Impact Report are ongoing. There is also the possibility of short-term variations in available flows if interim improvements are constructed. But the fact remains that there are uncertainties surrounding the timing of an agreement regarding a preferred permanent solution and the time it would take to construct the needed facilities to convey water through the Delta while preserving the habitat for the many species that call the Delta home.

BACKGROUND- Prior to the 2007 Delta pumping restrictions:

Following the most recent multi-year drought (1987-92), the Zone 7 Board requested an annual report of the Sustainable Water Supply. Typically each Spring since 1992, the Zone staff has reviewed the Livermore Valley’s long-term “sustainable water supply” and has prepared a summary report. Since the last drought, Zone 7 has purchased additional long-term water supplies from the State Water Project (SWP). Zone 7’s maximum annual contract amount, now referred to as our “Table A Contract Amount”, has increased from 46,000 to 80,619 acre-feet. (Note that the Table A contract amount was previously referred to as SWP maximum annual “entitlement” or MAE, but due to potential confusion over the use of the word “entitlement”, the SWP no longer uses that term.) With these “new” purchases, Zone 7 had sufficient sustainable water supplies to provide for all potable water demands through buildout and for all currently contracted non-potable (untreated) water demands.

The scope of the analysis has expanded over the years and has adapted to incorporate changes in State Water Project operations and new Zone 7 facilities. For a few years, staff incorporated both multi-year operations modeling and salt balance calculations into the review but the salt balance calculation has shifted to the annual report of the Groundwater Management Program since the adoption of the Groundwater Management Plan in 2005. The water supply modeling includes an evaluation of all past hydrologic events from the past 80 years and includes the worst single-year drought of record (1977) and the two worst multi-year droughts of record (1928-34 and 1987-92). In 2004, staff expanded the multi-year modeling to incorporate the new version of the DWR CALSIM II that included coordinated operation of State and Federal operations and included the Environmental Water Account. In 2004 the CALSIMII 2021B version was considered the most effective study for future conditions.

In September 2005, Zone 7 updated its Urban Water Management Plan and based it on the most recent data available at that time. DWR had not finalized the “SWP Delivery Reliability Report” and only a draft report (June 2005) was available. At that time Zone 7 utilized “Study Number 7” in the draft report as the most appropriate data source for future SWP delivery. In August 2005, Zone 7 prepared an updated Sustainable Water Supply report to document the data used in the 2005 UWMP update. In August 2005, Zone 7 had sufficient storage to maintain a sustainable water supply and meet full deliveries through about 2014 without pumping the local groundwater basin storage below historic lows. In 2006 Zone 7 purchased additional groundwater storage capacity in the Cawelo Water Storage District Banking Program and made the first deliveries of water into storage. With the recent addition of Cawelo Water Storage District, Zone had sustainable water supplies to meet all potable and non-potable demands through buildout based on projected State Water Project reliability of 76-77%.

In June 2006 DWR published “The State Water Project Delivery Reliability Report 2006” (http://baydeltaoffice.water.ca.gov/SWPRel05_final.pdf) In the summer of 2006, Zone 7 approved the purchase of storage and pump back capacity in Cawelo Water Storage District and transferred 10,000 acre-feet of water to Cawelo for long term drought reliability. In 2006, prior to the Delta Pumping restrictions of 2007, Zone 7 projected that it had sufficient supplies and storage capacity to meet full deliveries through buildout.

DISCUSSION OF CHANGES IN 2007

In 2007 DWR downgraded the water delivery reliability of the State Water Project due to federally imposed pumping restrictions in the Delta. These restrictions were brought about due to significant endangered species concerns focused on the pelagic organism decline in the Delta, primarily the decline of Delta Smelt. In February 2008 DWR released a Draft of The State Water Project Delivery Reliability Report 2007. The report quantified the two most significant changes facing the SWP system: Delta pumping restrictions and climate change. This report is still in draft form and the pumping restrictions may change when California’s long-term Operations, Criteria and Plan (OCAP) is revised in the fall of 2008. This report does provide the best current assessment of the reliability of the SWP system under current conditions based on the regulatory controls to conveyance through the Delta and the current Delta infrastructure. The report also quantifies the projected impacts of climate change on our future water supply.

In May 2007, in response to a continued decline of the Delta Smelt, the SWP voluntarily shut

down pumping at Banks Pumping plant to prevent the movement of Delta Smelt towards the pumping plants. In December 2007, a federal court imposed interim rules that will significantly restrict SWP deliveries. A revised biological opinion and revised rules will be developed and finalized in late 2008. The SWP draft reliability study expanded the modeling from earlier years and added several model runs that evaluated draft restrictions in Delta pumping. In addition the report evaluated the results of several possible global warming models which indicate changes in future SWP yield. The draft reliability study recommends that a combination of the different Delta conveyance restrictions and some climate change must be incorporated in the proper analysis of the reliability of the SWP supply.

Our revised current sustainable water supply from the State Water Project is now estimated at 53,200 acre-feet, a reduction of 7,700 acre-feet from the earlier estimate of 60,900 acre-feet a year. In the new study, as summarized in Table 2 and Figure 1, the estimated future yield of the SWP has been reduced from 76% to 66% of Table A. Most of the reduction is due to anticipated regulatory restrictions in Delta pumping. Only about 18% of the reduction is due to climate change. For Zone 7, the total reduction is 14% of SWP supplies or 7,700 acre-feet. (It is important to note that DWR estimates losses this year (2008) to date at nearly 10,000 acre-feet.) Table 2 also compares the percent of Table A received for various dry through wet periods for both the 2005 report and the new 2007 report. As shown in Table 2, the 2007 report shows a 35% reduction in supply during a 2 year drought. The 2007 report shows the 6 year drought has only a 13% reduction which fits the 14% long term average reduction. The data in table 2 is from tables 6-14 and 6-15 in the Draft SWP Delivery Reliability Report 2007.

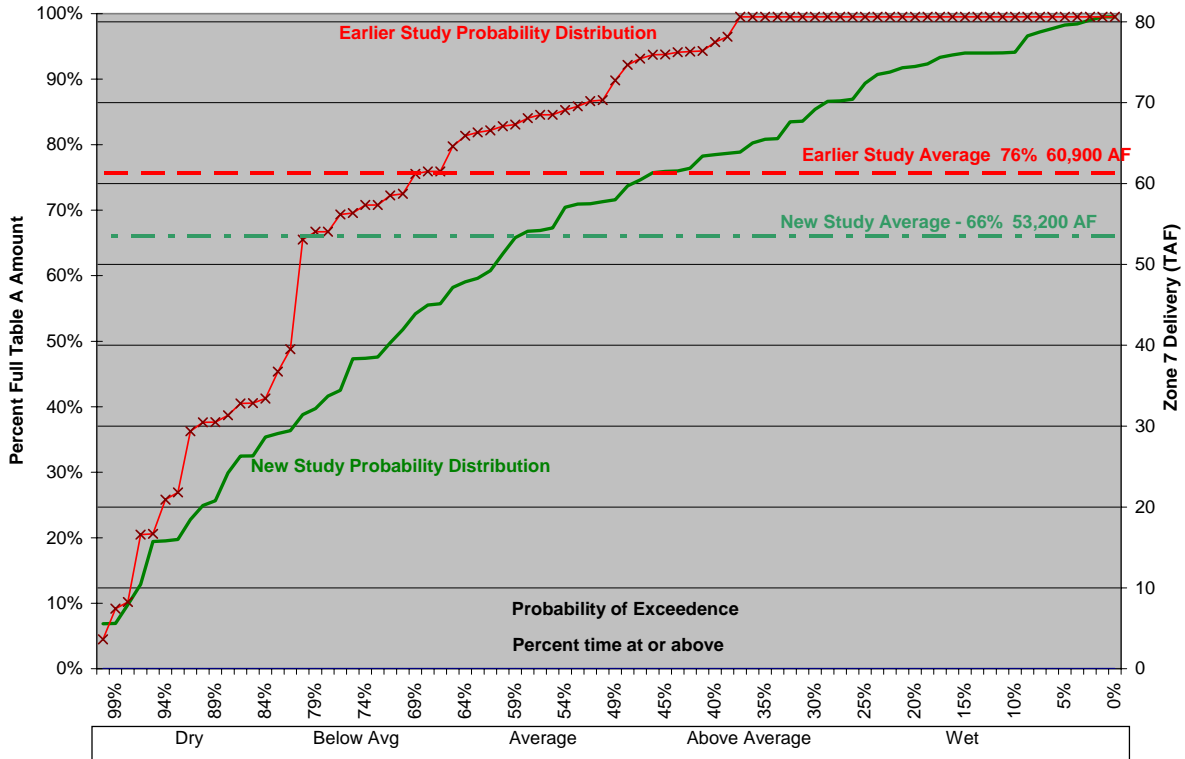
Table 2 Average, dry & wet period SWP Table A deliveries from Delta under Future Conditions

Study or Future Conditions	Long term average	Single Dry Year 77	2-year Drought 1976-77	4-year drought 1931-34	6 year Drought 1928-34	Single Wet Year	6 year Wet Period
2005 report	77%	5%	40%	33%	38%	95%	93%
2007 report	66%	7%	26%	32%	33%	94%	84%
% difference	-14%	140%	-35%	-3%	-13%	-1%	-10%

Figure 1 displays and compares results of the new 2007 reliability study with the earlier 2005 study in graphical form. The percent of SWP deliveries ranges from about 7% in very dry years on the lower left up to 100% in the very wet years on the top right. The top red curve displays the results from the earlier (2005) study. The lower green curve displays the results from the new (2007) study. This figure is a probability distribution graph showing SWP deliveries to Zone 7. The horizontal axis represents the probability distribution in percent of time at or above a given amount. Dry years are plotted towards the left and are represented by the 80-99% probability of exceedence. Dry years have a low percent delivery of SWP water. Wet years are plotted towards the right and are represented by the 20%-1% probability of exceedence. Wet years have a very high percent delivery of SWP water and typically result in 100% delivery of "Table A" contract amount.

**SWP Probability Distribution
State Water Project Deliveries to Zone 7**

Figure 1



On figure 1, the left vertical axis represents the amount of SWP water delivered to Zone 7 each year as a percent of our “Table A” contract amount. In the very dry years, as little as 7% of Table A water would be delivered to Zone 7. In the very wet years the full amount (100%) would be delivered to Zone 7. The right axis of the graph shows the amount of water to be delivered to Zone 7 in thousand acre feet (TAF).

Deliveries are significantly lower under the recent study conditions. The “worst case” dry year is shown on the far left side of the graph. Deliveries in the “worst case”- “critical dry year” would only be about 7%. The most probable or median year is the 50% probability of exceedence condition shown in the middle of the horizontal axis. Deliveries in the median year would be about 70% under new study conditions (shown in green solid line). Deliveries in the median year for the earlier study would be about 95%. This is a reduction of about 20,000 acre-feet in deliveries for a median year. As mentioned earlier it is important to note that in 2008 DWR estimates the losses to Zone 7 at about 10,000 acre-feet. This value generally fits the numbers shown on figure 1. The wet years are shown on the far top right. In the new study, only in the very wet years representing about only 5% of the time we would get 100% of our supply.

The difference between earlier study shown in the top line and the new study shown in the lower line varies from a small amount in dry years on the left to large amounts in below and above average cases and then back to small amounts in wet years on the right. The reduction in deliveries is greatest in the middle half between the 80% probability of exceedence and the 30% probability of exceedence. The long term average is reduced from about 76% (75.54%) to only 66%. This is a reduction of about 7,700 acre-feet in long term sustainable supply.

Climate Change impacts are another consideration. The slow process of climate change is expected to cause earlier snow melt in the Sierras and rising sea level changes in the Bay-Delta area. Some of the models also indicate a slight increase in total precipitation. The DWR reliability report recommended using averaged results from several climate models. As stated earlier, climate change represents about 18% of this projected reduction in SWP supplies.

ANALYSIS OF IMPACTS TO ZONE 7

Each year Zone 7 reviews our long term water operations to determine the current status of our sustainable water supply. The analysis involves an integrated water operations evaluation of our continued water operations over a long period of record that includes a wide range of hydrologic years including two long term droughts (1929-34 & 1987-92) and the worst case single drought year (1977). The study also evaluated our ability to refill storage during wet years. During the study adjustments are made in operational rules for using storage or refilling storage. Knowledge gained through these operational studies is used in our water operations planning each year to insure that Zone 7 operates in an optimal manner to maintain a reliable supply of water.

The integrated use of our facilities was studied over the 77 year hydrologic period 1922-1998 utilizing new 1922-2003 SWP delivery estimates. Several different studies in the reliability report were used in the modeling including the worst case individual studies and several other variations. These were analyzed to determine of the sensitivity of our analysis to changes in the use of different hydrologic sequences. We also evaluated several worst case scenarios including the possibility that Zone 7 will not be able to add any additional water to Cawelo. The results of the analysis indicate that Zone 7 has sufficient flexibility to manage our water supplies until the projected 2015 level of demand (based on a 5 year delivery requests and a linear development growth model to buildout in about 2030) and provide full deliveries under any historic hydrologic event.

Based on DWR's current downgrading of SWP reliability from 76% to 66%, starting in 2015 the growth projections indicate that demands may start to exceed our long term sustainable supply. Figure 2 shows the Zone 7 average supplies and forecasted demands for 2007 through expected buildout in 2030. The demands include about 2300 acre-feet a year of losses due to utilization of banking programs. The graph shows that total demand is estimated to start exceeding available supply in about 2015. After 2015, assuming projections are correct, we will need to take one of two actions: reduce demands or increase supplies. By 2020 projected demands will exceed sustainable supply by about 2,000 acre-feet per year. By 2025 projected demands will exceed sustainable supplies by 5,000 acre-feet per year.

Simply stated, the problem is insufficient water supply to meet projected demands of the Livermore-Amador Valley. The long term water supply to meet 100% of the projected demands is no longer available under the reduced Delta pumping conditions, should they remain permanent. Zone 7 has sufficient storage facilities but the reduced water supply is not adequate to maintain the storage facilities sufficiently full to provide drought supply past 2015.

The cause of the current situation is primarily the pumping restrictions in the Delta which restrict the SWP from conveying the water that is available from the Sacramento Watershed. Estimates of lost water in 2008 to date due to pumping restrictions are about 500,000 acre-feet for the SWP. This is equivalent to about 10,000 acre-feet of supply for Zone 7. DWR also reports that in

2008 the lost water could not be stored in Oroville reservoir but has already been lost to the ocean. Unfortunately in this dry year we lost the opportunity to put this water to beneficial use.

“On the positive side, there are significant and promising processes underway that could take us to a much more reliable and sustainable Delta water conveyance system for the SWP” Lester A. Snow, Director DWR Draft State Water Project Delivery Reliability Report 2007.

COMPONENTS OF THE LIVERMORE VALLEY’S SUSTAINABLE WATER SUPPLY

State Water Project (SWP) future average delivery In 1962, Zone 7 became the first State Water Project Contractor to accept water deliveries. Since 1962 Zone 7 has increased our share of water and currently has a long-term contract with the SWP for delivery of 80,619 acre-feet of water a year. This “Table A Amount” was previously referred to as “Maximum Annual Entitlement.” Typically the SWP with its present configuration and lower demands can deliver a slightly higher percent of requested amounts and this quantity will decrease as the demands by all SWP contractors increase. In the 1990’s, DWR’s early operation studies using the older DWRSIM (computer model) under the Monterey Agreement indicate an average future (2020) yield of 75.57% (60,900 acre-feet). As the models improved with additional hydrologic data and the incorporation of more operational criteria, DWR revised their estimates of long term yield. In December 1992 DWR published the first “State Water Project Delivery Reliability Report”. This report utilized the CALSIM II model and the results indicated an average yield of 75-76% (74.59% for Study 2021A, 75.73% for Study 2021B). In 2005 the new DWR Reliability Report indicated an average yield of 77 percent. For the past several years Zone 7 staff has reviewed this report and others and concluded that an estimate of 75.57% as the average future yield was still generally valid. But in 2007, conditions changed, and the new 2007 Reliability Report shows significantly lower long term yield of the SWP. (See Table 2)

As discussed in an earlier section the 2007 reliability report evaluated two important changes: Delta pumping restrictions and climate change. The estimated future yield of the SWP has been reduced from 76% to 66% of contract amount. Our revised current sustainable water supply from the State Water Project is now estimated at 53,200 acre-feet, a reduction of 7,700 acre-feet from the previous 60,900 acre-feet a year.

Lake Del Valle future average yield is water developed by the Zone under its water rights permit for the Arroyo Del Valle. This water is captured and made available in the Del Valle Reservoir through operating agreements with the State Department of Water Resources. The 30-year historic yield to Zone 7 is about 8,000 acre-feet. The future and long-term yield (2020) is calculated at 9,300 acre-feet based on modeling of historic runoff data and future Zone 7 winter season demands. Changes have occurred in our local water operations and future changes may increase or decrease our local yield. Factors which may increase our yield include the future Chain of Lakes which have the potential to allow the capture of more local water which previously had been released into the arroyo and out to the Bay as flood releases. Factors that may decrease our yield include environmental issues associated with conveying water through Sycamore Grove Park, possible flow requests for in stream environmental concerns and possible reductions in future precipitation associated with global warming. The current estimated yield of 9,300 is still considered to be a reasonable estimate of the long term yield.

Byron Bethany Irrigation District (BBID) This water is purchased from BBID and imported via the South Bay Aqueduct for use in our service area. Zone 7 entered into a long-term (15 year renewable every 5 years) contract with BBID for up to 5,000 acre-feet annually. In 1999 the Zone 7 Board certified the EIR for this water supply. Although we could take up to 5,000 acre-feet per year and have taken up to about 4,000 acre-feet per year, we are using 2,000 acre-feet as a conservative estimate of the sustainable supply from this source.

Other supplemental sources of water When available, Zone 7 takes delivery of SWP Article 21 water (formerly called surplus water) and SWP turnback water. Zone 7 would incorporate any Article 21 water into the calculation our average SWP yield. When available Zone 7 purchases SWP water from the turn back pool. This is a provision that allows contractors with excess water to sell their water to contractors that have water needs. Typically there is very little water available. This water is purchased when available by Zone 7 but is not expected to be generally available in the future. Any supply from this source is included in our long term SWP yield. In 2008 Zone 7 entered into an agreement to purchase Yuba water. The annual amount of water available in dry years is small, only about 455 acre-feet. This is about a half of one percent of our SWP contract amount. This water is conveyed to Zone 7 by the SWP. As Zone 7 gains experience using this water in 2008 and determines how much of this water can actually be delivered to Zone 7 across the delta then Zone 7 will incorporate it into our sustainable supply in future years.

Subtotal: Zone 7 component of Valleywide sustainable water supply This is the sum of the three sources described above. Zone 7 Water Agency, over our 50 year history, has developed over 64,500 acre-feet of sustainable water supply for the Livermore-Amador Valley and is responsible for the management of 80 percent of the valleywide supply.

Safe Groundwater Yield From Main Basin is defined as the amount of water that can annually be pumped from the groundwater basin and replenished by average annual **natural** recharge. More water can be and is pumped from the main basin each year as long as Zone 7 artificially recharges the basin with additional water from our other sources. The long-term baseline safe yield is based on natural recharge and over a century of hydrologic records and projections of future recharge conditions. The safe yield in the main groundwater basin is 13,400 acre-feet annually. From this baseline safe yield, the Valley's major water retailers are permitted to pump a combined 7,200 acre-feet annually. This amount, referred to as the Groundwater Pumping Quota, is limited as part of our Municipal and Industrial water supply contract with each retailer. The remaining balance of the safe yield is pumped for other municipal, agricultural and gravel mining area uses. Zone 7's pumpage for our treated water deliveries does not use the baseline safe yield from the basin; instead we pump only water that has been recharged as a part of our artificial recharge program.

Recycled water is tertiary-treated recycled water distributed for irrigation by the City of Livermore and Dublin-San Ramon Services District - Livermore at the Livermore Municipal Golf Course, along Isabel Avenue, the Dublin Sports Ground and for other irrigation needs within the Valley. Recycled water is a very reliable supply; however, the use of recycled water was historically discouraged due to the potential of salt buildup in our groundwater basin. As part of the Regional Water Quality Control Board's (RWQCB) issuance of the regional recycle water master permit, a "Salt Management Plan" for the groundwater basin was required. The total recycled water includes all recycled water produced by DSRSD and Livermore.

The City of Livermore has been using recycled water since the mid-1960's at the Livermore Municipal Golf Course and has expanded to irrigate lands north of 580, along Isabel and in Oaks Business Park west of Isabel. Since 1994, Livermore has been denitrifying their recycled water supply to minimize impacts to the groundwater quality.

Dublin San Ramon Service District (DSRSD) started recycled water irrigation in 1999 at the Dublin Sports Ground and has expanded recycled water use for irrigation for most of east Dublin and Dougherty Valley.

The current sustainable supply of 3,300 acre-feet is simply the current estimated amount used for irrigation. This amount is expected to increase.

TOTAL SUSTAINABLE WATER SUPPLY is the sum of the previously discussed sources: The State Water Project future average delivery, 53,200 acre-feet per year; the Lake Del Valle future average yield, 9,300 acre-feet per year, the 2,000 acre-feet of BBID water per year, the safe groundwater yield, 13,400 acre-feet per year; and the recycled water use 3,300 acre-feet per year, for a total of 81,200 acre-feet per year.

These sustainable water supply quantities are long-term average quantities and in dry years the supply from surface water sources will be greatly reduced. Zone 7 Water Agency stores water from our surface water sources in wet years when the SWP and LDV supplies are above average. Then in dry years, Zone 7 pumps more of the stored water out of the Main Basin or transfers water back from our Semitropic and Cawelo Water Storage District accounts.

Zone 7 is able to meet full deliveries through 2015 demand levels, even in the worst credible drought including the worst historic single-year drought and any multi-year drought of record. But if demands increase past 2015 level of development without progress on Delta pumping then Zone 7 will not be able to provide full deliveries to our customers.

Appendix

Zone 7 maintains a working table that contains “Average Livermore Amador Valley Water Supply and Demand” quantities for the 2008-2030. The attached table presents the current estimates of supply and demand.