
CITY OF LANCASTER

**LANDSCAPE AND IRRIGATION
DESIGN STANDARDS**

Public Works Department

October 2008

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INTRODUCTION AND DESIGN PHILOSOPHY

The City of Lancaster (City) desires to have landscape development in an attractive, water efficient, and high quality manner. These landscape and irrigation design standards will enable designers and developers to clearly understand the City's intent with respect to landscape design and management.

It is the intent of these landscape and irrigation design standards not only to establish an acceptable level of quality for approval, but to achieve harmony with, and bring continuity to, the existing developed areas in the City.

To permit and encourage a pleasing aesthetic interaction with the environment, a landscape design should provide a variety of shapes, textures, and colors as well as provide practical applications such as trees to produce shade and block high winds.

A well-founded design should:

- Integrate with, complement, and improve the existing permanent landscape.
- Relate to and complement the architecture of structures on the site.
- Mitigate erosion.
- Provide for screening of unsightly areas and noise, as well as provide for wind and sun control.
- Minimize the use of water by stressing water conservation.
- Provide for a variety of design elements.
- Reflect the needs and expectations of those persons affected by the landscape.
- Utilize plant material native to, or conducive to, the local environment.

The City is very concerned about proper water use management. The City requires design efforts to be conscious of water saving irrigation systems, as well as low water use plant materials.

These design standards shall apply to all single family, multi-family, commercial, institutional, and industrial projects containing landscaping.

For each applicable project a Landscape Documentation Package will be submitted to the City for approval.

These Landscape and Irrigation Design Standards will be presented in the form of a Resolution to the City Council of the City and may be updated as needed by the City departments.

DEFINITION OF TERMS

For the purpose of carrying out the intent of these design standards, the words, phrases, and terms included herein have the meaning ascribed hereinbelow.

“Anti-drain Valve” means a valve located under a sprinkler head to hold water in the system to prevent drainage from sprinkler heads when the system is off.

“Application Rate” means the depth of water applied to a given area, measured in inches per minute, inches per hour, or gallons per hour.

“Applied Water” means the quantity of water supplied by the irrigation system to the landscape.

“Backflow Prevention Device” means a safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.

“Backfill” means soil which is replaced in a hole after excavation and placement of irrigation lines or plant materials.

“Conversion Factor” (.62) means the number that converts the maximum applied water allowance from acre-inches per acre per year to gallons per square foot per year.

“Certificate of Completion” means the document required under by these design standards.

“Certified landscape irrigation Auditor” means a person certified to perform landscape irrigation audits by a professional trade organization or other educational organization.

“Certified Irrigation Designer” means a person certified to design irrigation systems by a professional trade organization or other educational organization.

“Check valve” means a “one-way” valve that prevents water from flowing backward though it. Spring loaded check valves are sometimes installed inside or at the inlet of sprinkler heads. The check prevents low head drainage.

“Common Interest Developments” means community apartment projects, condominium projects, planned developments, and stock cooperatives per Civil Code Section 1353.8.

“Controller” means an automatic timing device used to remotely control valves or heads to set an irrigation schedule. A weather-based controller is a controller that uses evapotranspiration or weather data. A self-adjusting irrigation controller is a controller that uses sensor data (i.e., soil moisture sensor).

“Development Proposal” means an application for approval of a specific plan, subdivision, conditional use permit, site plan review, tentative tract map, parcel map or any other discretionary development permit or entitlement application which has been filed with and is pending consideration by the City.

“Drip irrigation” means any non-spray low volume irrigation system utilizing emission devices with a flow rate equal to or less than two (2) gallons per hour.

“Drought Tolerant Plants” means plants from California and other dry areas that can survive on very little water, such as those which naturally grow in the high desert regions of southern California in normal rainfall years.

“Ecological Restoration Project” means a project where the site is intentionally altered to establish a defined, indigenous, historic ecosystem.

“Effective Precipitation” or “Usable Rainfall” means the portion of total precipitation that is used by the plants.

“Emitter” means a drip irrigation emission device that delivers water slowly from the system to the soil measured as gallons per hour.

“Erosion” means the transportation of soil particles, or mass movement of soil (mass wasting) by water, wind, or mechanical means.

“Engineer of Work” refers to the responsible designing professional of the respective project.

“Established Landscape” means the point at which plants in the landscape have developed significant roots growth into the site. Typically, most plants are established after one or two years of growth.

“Establishment period of the plants” means the first year after installing the plant in the landscape, or the first two years if irrigation will be terminated after establishment.

“Estimated Applied Water Use” means the portion of the estimated total water use that is derived from applied water, as described in Appendix C, Section C4 .

“Estimated Total Water Use” means the annual total amount of estimated water needed to keep the plants in the landscaped area healthy. It is based upon such factors as the local evapotranspiration rate, the size of the landscaped area, the types of plants, and the efficiency of the irrigation system, as described in Appendix C, Section C3.

“ET Adjustment Factor” means a factor of 0.7, that, when applied to reference evapotranspiration, adjusts for plant factors and irrigation efficiency, two major influences upon the amount of water that needs to be applied to the landscape. A combined plant mix with a site-wide average of 0.5 is the basis of the plant factor portion of this calculation. For purposes of the ET adjustment factor, the average irrigation efficiency is 0.71. Therefore, the ET adjustment factor is determined by the following formula $(0.7) = (0.5/0.71)$.

“Evapotranspiration Rate” means the quantity of water evaporated from adjacent soil and other surfaces and transpired by plants during a specific time.

“Flow Rate” means the rate at which water flows through pipes, valves, or emission devices, measured in gallons per minute, gallons per hour, or cubic feet per second.

“Hardscape” means any durable surface material (pervious and non-pervious). Hardscape shall be considered in the determination of the MAWA and storm water runoff flows.

“Hydrozone” means a portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A hydrozone may be irrigated or non-irrigated. For example, a naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non-irrigated hydrozone.

“Infiltration Rate” means the rate of water entry into the soil expressed as a depth of water per unit of time (i.e., inches per hour).

“Irrigation Efficiency” means the measurement of the amount of water beneficially used, divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices. The minimum irrigation efficiency for purposes of this ordinance is 0.71.

“Landscape Documentation Package” means the documents required under Title 8, Chapter 50 of the Lancaster Municipal Code (Lancaster Water Efficient Landscape Ordinance) and these design standards.

“Landscape Area” means all of the irrigated planting and turf areas, water features, and up to 10% of the square footage of pervious non-irrigated planting areas in a landscape design plan subject to the maximum applied water allowance (MAWA) calculation. The 10% of non-irrigated planting area shall be added to the low water use Hydrozone area, used in the Landscape Documentation Package. The following is not included in the landscaped area: footprints of buildings or structures, sidewalks, driveways, parking lots, decks, patios, gravel or stone walks, other pervious or non-pervious hardscape, and other non-irrigated areas designated for non-development (i.e., open spaces). Excessive use of impervious areas are discouraged as it will increase storm water runoff. Designated recreation areas and areas permanently and solely dedicated to edible plants, such as orchards and vegetable gardens, are subject to the MAWA with an ET adjustment factor not to exceed 1.0.

“Landscape Architect” means a person who holds a license to practice landscape architecture in the State under the authority of Government Code Section 5615 (Landscape Architects Practice Act).

“Landscape Contractor” means a person licensed (i.e., C-27 license) by the State to construct, maintain, repair, install, or subcontract the development of landscape systems and facilities per Business and Professions Code, Section 7058 and 7059.

“Landscape Irrigation Audit” means a process to perform site inspections, evaluate irrigation systems, and develop efficient irrigation systems. At a minimum, the audit shall be in accordance with the California Landscape Water Management Program as described in the Landscape Irrigation Auditor Handbook, the entire document that is hereby incorporated by reference. (See Landscape Irrigation Auditor Handbook, Dept. of Water Resources, Water Conservation Office, 2004)

“Landscape Project” means a project, for the purposes of this ordinance, meeting the requirements under 8.50.040 of the Lancaster Municipal Code.

“Landscaping” means a combination of trees, shrubs, perennial ground covers, and artifacts, arranged in such a manner as to effect a design that follows the intent of this document.

“Lateral Line” means the water delivery pipeline that supplies water to the emitters or sprinklers from the valve.

“Local Agency” when utilized within this document means the City of Lancaster.

“Low Volume Irrigation” means any irrigation system with a flow rate equal to or less than 0.75 inches per hour, including drip irrigation, subsurface drip, micro-sprinklers and similar irrigation types.

“Low Water Use Plant Material” means trees, shrubs, and ground covers that survive with a limited amount of supplemental water, as recommended by the City’s Landscape and Irrigation Design Standards, or as identified in the most recent edition of the following publication: Sunset Western Garden Book, Sunset Books, Lane Publishing Co., Menlo Park, California.

“Main Line” means the pressurized pipeline that delivers water from the water source to the valve or outlet.

“Maximum Applied Water Allowance” means, for design purposes, the upper limit of annual applied water for the established landscaped area as specified by these design standards. It is based upon the area’s reference evapotranspiration, the ET adjustment factor, and the size of the landscaped area. The estimated applied water use shall not exceed the MAWA.

“Microclimate” means the climate of a small, specific area that may contrast with the climate of the overall landscape area due to wind, sun exposure, plant density, and proximity to reflective surfaces.

“Mined Land Reclamation Projects” means any surface mining operation with a reclamation plan approved in accordance with the Surface Mining and Reclamation Act of 1975.

“Mulch” means any organic material such as leaves, bark, and straw or inorganic mineral materials such as rocks, gravel, and decomposed granite left loose and applied to the soil surface for the beneficial purposes of reducing evaporation and suppressing weeds.

“Operating Pressure” means the pressure at which an irrigation system is designed by the manufacturer to operate.

“Overhead Sprinkler Irrigation Systems” means systems that deliver water through the air (i.e., spray heads, rotors, etc.).

“Overspray” means the water that is delivered beyond the target area, wetting pavements, walks, structures, or other non-targeted areas.

“Parkway” means that area of a public street that is between the curb and sidewalk or between the sidewalk and the property line of the adjacent property owner which is used for landscape purposes.

“Plant Factor” means a factor that, in combination with irrigation efficiency, when multiplied by reference evapotranspiration, estimates the amount of water used by plants. For purposes of this document, the plant factor of low water use plants ranges from 0. to 0.3; the plant factor of moderate water use plants ranges from 0.4 to 0.6; and the plant factor of high water use plants ranges from 0.7 to 1.0.

“Precipitation Rate” means the rate of application of water measured in inches per hour.

“Project Applicant” means the individual or entity submitting a Landscape Documentation Package required under Title 8, Chapter 50 of the Lancaster Municipal Code (Ordinance 892 - Prohibition of Wasting Water and Ordinance 893 – Water Efficient Landscape) to request a permit, plan check, or design review from the City. A project applicant may be the property owner or his/her designee.

“Rain Sensor” or “Rain Sensing Shutoff Device” means a component that automatically suspends the irrigation event when it rains.

“Record Drawing” or “As-Builts” refers to a set of reproducible drawings which show significant changes in the work made during construction. Drawings are usually based on drawings that are marked up in the field and furnished by the contractor.

“Recreational Area” refers to portions of parks, playgrounds, sports fields, golf course, or schoolyards in public and private projects where turf provides a playing surface or serves other high use recreational purposes.

“Recycled Water, Reclaimed Water, or Treated Sewage Effluent Water” means treated or recycled waste water of a quality suitable for nonpotable uses such as landscape irrigation and water features. This water is not intended for human consumption.

“Reference Evapotranspiration” or “ETo” means a standard measurement of environmental parameters that affect the water use of plants. ETo is given in inches per day, month, or year as represented in Appendix A. . Reference evapotranspiration is used as the basis of determining the MAWA so that regional differences in climate can be accommodated.

“Rehabilitated Landscapes” means any re-landscaping project that requires a permit, plan check, or design review and meets the requirements of this document and Title 8, Chapter 50 of the Lancaster Municipal Code (Lancaster Water Efficient Landscape Ordinance).

“Runoff” means water that is not absorbed by the soil or landscape to which it is applied and flows from the landscape area. For example, runoff may result from water that is applied at too great a rate (application rate exceeds infiltration rate) or when there is a slope. Grading and landscape shall be designed to minimize runoff.

“Soil Moisture Sensor or Sensing Device” means a device that measures the amount of water in the soil.

“Soil Texture” means the classification of soil based on its percentage of sand, silt, and clay.

“Sprinkler Head” means a device that delivers water through a nozzle.

“Static Water Pressure” means the pipeline or municipal water supply pressure when water is not flowing.

“Station” means an area served by one valve or by a set of valves that operate simultaneously.

“Swing Joint” means an irrigation component that provides a flexible, leak-free connection between the sprinkler and lateral pipeline to allow movement in any direction and to prevent equipment damage.

“Street Trees” means trees planted in the public right-of-way along city streets for beautification and benefit of the general public.

“Topsoil” means soil within the A-2 horizon of a soil profile that contains organic matter, nutrients, and the micro-organisms necessary for normal plant growth.

“Turf” means a groundcover surface of mowed grass. Annual Bluegrass, Kentucky Blue grass, Perennial Ryegrass, Red Fescue, and Tall Fescue are common cool-season grasses. Bermuda grass, Kikyu grass, Seashore Paspalum, St. Augustine grass, Zoysia grass, and Buffalo grass are common warm-season grasses.

“Valve” means a device used to control the flow of water in the irrigation system. It may also mean all of the sprinklers or emitters in a line controlled by the valve.

“Water Conservation” means the conservation of water resources through proper water use management procedures, design, and maintenance procedures. There are many methods; one popular method is to use low volume irrigation and drought tolerant plant materials.

“Water Conserving Plant Species” means a plant species identified as using less water than other plants in the same water use category.

“Water Efficient Landscape Worksheet” means the document required under Title 8, Chapter 50 of the Lancaster Municipal Code (Lancaster Water Efficient Landscape Ordinance) and found in this document. Section I, Part A, Paragraph C has instructions for filling out the worksheet in Appendix B.

“Water Use Efficiency Statement” means a narrative summary of the water use efficiency practices to be applied in the landscape project.

“Wildlife” means indigenous or naturalized bird, reptile, mammal, fish, or invertebrate life found in the out of doom.

SECTION I – GENERAL REQUIREMENTS FOR ALL LANDSCAPE AND IRRIGATION
PART A – Landscape Documentation Package

A. GENERAL

Owner/Consultant shall submit to the City the required Landscape Documentation Package for all projects where landscaping is required as a part of the project development.

All packages submitted shall be prepared under the direct supervision of a Registered Landscape Architect (State of California), with all drawings bearing his/her signature or, upon approval of the City, a licensed and qualified Landscape Contractor (State of California).

In situations where plans and standards are in conflict, these design standards shall prevail.

Landscaping or the installation of an irrigation system in the City shall not be undertaken until the City has reviewed and approved plan submittals and specifications covering the proposed use of plant materials and irrigation systems in order to determine:

- That proposed plant material will be suitable aesthetically and ecologically for the particular planting situation.
- That proposed planting will meet minimum requirements as set forth by these design standards.
- That proposed irrigation system will be adequate to properly irrigate proposed planting.
- The improvements are permanent and of a nature and quality to assure low maintenance, operations costs, and survivability of the landscape.
- That all landscaping conditions are met.

1. Plan Check Submittals

Submit initial and all subsequent Landscape Documentation Packages to the Public Works Department.

The package shall consist of the following:

- Three (3) sets Landscape Design Plans;
- Three (3) sets Irrigation Design Plans;
- Three (3) sets Grading Design Plans;
- Three (3) sets Water Efficient Landscape Worksheet;
- Three (3) sets Soil Management Plan; and
- Payment of Plan Check fee.

All contract documents are subject to review (plans, general conditions of contract, specifications, etc.).

All plans are to be checked by the Engineer of Work for consistency, accuracy, clarity and conformity with City standard details, drawings, and design criteria before submission for

approval. If during initial review by the City, the Landscape Documentation Package is found to be incomplete, it will be returned unchecked to the Engineer of Work for completion.

2. Subsequent Review Submittal

Submit subsequent corrected Landscape Documentation Package's to the appropriate department.

Upon approval of the Landscape Documentation Package by the City, plans stamped "approved" will be returned to the owner or Engineer of Work.

3. Approved Drawings

All landscape plans must receive City approval prior to approval of the subdivision map by City Council. During the progress of the construction, the Developer's Contractor shall keep a print set copy of signed plans and permit on the job at all times for "As-Built" construction purposes.

Prior to approval for occupancy of any housing unit in a subdivision, the landscape area required for the Landscape Maintenance District shall be installed and accepted by the City.

B. LANDSCAPE AND IRRIGATION PLANS

1. Landscape Documentation Package

The Landscape Documentation Package shall include all of the following elements:

- a) Water Efficient Landscape Worksheet
 - 1) Section A - Project Information and Checklist
 - 2) Section B - Water Use Efficiency Statement
 - 3) Section C - Water Budget Calculation
 - (a) Section C1 - Maximum Applied Water Allowance (MAWA)
 - (b) Section C3 - Estimated Water Use (EWU) for Hydrozones and Estimated Total Water Use (ETWU)
 - 4) Section D - Hydrozone Information
 - (a) Section D1 - Hydrozone Map
 - (b) Section D2 - Hydrozone Table
 - (c) Section D3 - Hydrozone Calculation Summary
- b) Soil Management Plan
 - 1) Soil Analysis Report
 - 2) On-Site Soil Assessment with Recommendations
 - (a) Landscape Design Plan
 - (b) Irrigation Design Plan
 - (c) Grading Design Plan

Forms can be found in Appendix B.

The landscape plans and documents being submitted in response to a City requirement must be for the complete area of the project. For example, if a tentative map requirement calls for a landscape plan submitted for review and approval prior to recordation of the final map, then the plan which is submitted will be for the total area covered within the final map. The landscape plan specifically cannot be submitted piecemeal as in construction or other type phasing. The landscaping can be installed in phases and/or shown in phases on the overall map, but the entire plan must be submitted.

- Standard size sheets shall be used for all plans submitted. All plans shall be of the same size.
- Incomplete designs, details, etc., will not be accepted. Checking will be done only on plans which are complete in all phases of design.
- Number sheets consecutively, "Sheet ___ of ___."
- Scale: 1" = 20' only, unless prior approval by City. Scale shall appear on each sheet.
- "North" arrow shall appear on each sheet. North shall be to top of sheet or to left of sheet.
- Show all match lines clearly and label to provide easy plan reference.
- Vicinity map shall appear on title sheet and identify streets within the project and those directly adjacent to the project.

The following items related to landscape and irrigation development shall appear on all plan sheets:

- Property lines/project limits, street names;
- Building areas, existing and proposed paved areas (including street sidewalks), ponds, and water features;
- All walls and fences (including gates) to be constructed by developers;
- Other appropriate information (utilities, casements, street lights, fire hydrants, etc.) as they relate to landscape development; and
- Designated recreational areas.

Should revisions be made to plans after approval by the City, such revisions shall be approved by the City and noted on the Title Sheet prior to implementation in the field.

2. Cover/Title Sheet

The first sheet shall be a Title Sheet and shall include:

- a) Project location on location map;
- b) Vicinity map showing the following:
 - 1) Street configuration within or adjacent to the tract or project;
 - 2) Nearest arterial highway intersection; and
 - 3) Street names.

- c) North arrow Graphic indication of the following:
 - 1) Match lines, if applicable;
 - 2) Project limits;
 - 3) Sheet index; and
 - 4) Plan indicating portion of project each sheet covers.
- d) Title Block to contain the following:
 - 1) Project title;
 - 2) Subdivision number (tentative tract) and parcel map if drawings reflect only a portion of the complete development. These specific reference numbers shall conform to the approved subdivision map; and
 - 3) Project address and cross streets.
- e) Block for City Approval, including space for signature of approval and date;
- f) Engineer of Work's firm name, address, telephone number, date plans prepared, signature, and seal of Registered Landscape Architect; and
- g) Owner/Developer's name, address, and telephone number.

3. Plan Sheets

- a) Grading
 - 1) Indicate existing and proposed grades with contours and spot elevations.
 - 2) No slope in turf or planter areas shall exceed 5:1 or 20%.
 - 3) Note all grades, flow lines, etc., within public right-of-way.
 - 4) Bike Grades: 10% maximum slope.
 - 5) Handicap Grades: 12 - 1/2% maximum slope.
 - 6) Minimum grade within landscaped areas: 2%.
 - 7) Parkway and common areas where drainage is to be allowed to drain directly onto private property must be accomplished to the satisfaction of the Building and Safety Official. Subsurface drains shall connect into storm drain system or through curb-face.
 - 8) All grading and drainage within public right-ofway shall be subject to approval by the City Building and Safety Official.
- b) Crossings

All pedestrian, equestrian, and bicycle trails which cross arterial or collector streets shall receive appropriate signs, stripes, and pavement markings per State of California Standards and City Traffic Division Standards. Use of stamped concrete, various enriched paving, etc., shall require approval of City Building and Safety Official.
- c) Trails/Walks
 - 1) Equestrian Trails - Owner shall develop all trails including approved fencing or walls in accordance with City requirements applicable to the project.
 - 2) Non-expansive soil - Scarify trail area to a depth of 6", removing rocks, clods, and all undesirable material. Apply approved soil sterilant, fine grade, and compact native soils to the satisfaction of the Building and Safety Official.
 - 3) Bike Trails - In expansive soils, soil tests may be required in areas where bike trails are planned.

- 4) Pedestrian Trails/Walks - Concrete walks shall be constructed per City Building and Safety Official's requirements, with a 4 foot minimum width if parkway is between curb and sidewalk, and a 5 foot maximum width when adjacent to curb. Where tree wells occur within the sidewalk area, a 4 foot width must be maintained between tree well and back of sidewalk.
- d) Fencing/Walls
 - 1) Equestrian - Shall be constructed per City standard details and shall occur on both sides of trails unless approved otherwise by the City Building and Safety Official.
 - 2) Walls - All free standing block masonry perimeter walls shall be a maximum of six feet in height per City standard detail and submitted to Development Engineering Division for approval. Any walls retaining soil shall be subject to permit review by the City.
 - e) Lighting

Wherever possible, lighting designed to accent landscaping, buildings, signs, etc., shall be located on private property. Any lighting systems to be located within the public right-of-way shall be designed by a Registered Electrical Engineer or, upon approval of the City, by a Licensed Electrical Contractor (State of California). Electrical plans shall be submitted with standard landscape plans and shall be subject to approval by the City.
 - f) Street Trees

All trees planted within the dedicated right-of-way shall be of an approved species. Street trees shall conform to the City's Plant List, Appendix G. Plans (two sets) shall be submitted to the City for approval of tree species and quantity to be planted.
 - g) General Design Guidelines
 - 1) Turf grass limitations
 - (a) Single Family Residential - 30% of landscape area maximum, arranged in recreational areas no less than 8 feet wide and areas less than 200 square feet.
 - (b) Commercial & Institutional - NO turf grass allowed, except in approved recreational areas.
 - 2) 80% shrub/ground cover canopy coverage in the planters. If no lawn is used, the plant canopy coverage may be reduced to 50%.
 - 3) A separate water meter for the landscape is required.
 - 4) An approved ETo timer as set forth by these design standards.
 - 5) Street tree(s), as set forth in these design standards.
4. Irrigation
- A. General

The following guideline is to aid in the preparation of landscape irrigation drawings for practices and materials most commonly encountered in the field. However, any special conditions, which the Engineer of Work or the owner finds during the process of design drawings or field investigation not covered by these design standards, shall be submitted

to the City at the earliest possible date. Plan review by City staff may allow for variances where appropriate and justified.

B. Specific

Provide a complete automatic landscape sprinkler irrigation design for all landscaped areas as required as a part of the project development. The irrigation system shall be designed in compliance with the Uniform Plumbing Code most recently adopted by the City, and these design standards.

- 1) The landscape irrigation system shall be designed and operated to prevent runoff and discharge of irrigation water onto roadways, sidewalks, driveways, adjacent properties, and all areas not under City jurisdiction.
- 2) Included on the irrigation drawings shall be a complete and comprehensive irrigation legend, indicating sprinkler head manufacturer and model number. All other equipment and materials utilized in the design shall also be included as a part of the irrigation legend and shall indicate the following: manufacturer, model number, size, and brief description.
- 3) Indicate locations of irrigation water meters, irrigation points of connection, and electrical points of connection for automatic sprinkler controllers, electrical meter, and backflow prevention device on the irrigation drawings.
- 4) The following information shall be provided at each irrigation water meter or irrigation point of connection:
 - (a) Static and residual water pressures;
 - (b) Meter size;
 - (c) Peak irrigation demand in gallons per minute; and
 - (d) Finished grade at backflow unit and highest head served.
- 5) Submit pressure calculations for worst hydraulic condition at each point of connection. Water movement in system shall not-exceed 5' per second.
- 6) All irrigation systems shall be designed to minimize vandalism with special attention at schools, parks, along trails, roads, walks, etc.
- 7) Irrigation water system shall be designated to meet the peak moisture demand of all plant materials used within the design area.
- 8) Provide construction details indicating installation procedures and materials required for the installation of all major components used in the irrigation design in accordance with City standard details, Appendix G.
- 9) Provide check valves and/or anti-drain valves to prevent drainage of irrigation water from sprinkler system due to changes in elevation.
- 10) Provide anti-drain sprinkler heads along all sidewalks and driveways.
- 11) Valves are to provide uniform coverage and G.P.M. from control valves in each system.
 - (a) A shut off valve will be installed to isolate the irrigation system from the household water.
- 12) Slope Condition - Provide separate control valves for sprinkler lines operating systems of slopes. Sprinkler lines shall run parallel (or as close as possible) to contour lines.

- 13) System Pressure - Design systems to the lowest static pressure available, less 20% cushion for further system fluctuations.
 - (a) The maximum potential pressure should be considered in the design and regulators provided if required. If water pressure exceeds 80 psi, install pressure reducing valve(s) to maintain water pressure at no more than 20% higher than system design pressure.
- 14) A reduced pressure backflow preventer will be required.
- 15) Turf sprinklers shall be pop-up. Sprinklers shall be 6" or 12" to minimize safety hazards and vandalism.
- 16) Provide separate valving in landscape areas for:
 - (a) Turf along wall;
 - (b) Turf along walk;
 - (c) Shrub beds along walk (spray);
 - (b) Shrub beds along wall (spray);
 - (d) Tree bubblers;
 - (e) Shade areas that freeze and do not thaw in winter;
 - (f) Slopes;
 - (g) Trees in tree wells;
 - (h) Ground cover in tree wells;
 - (i) Special planters;
 - (j) Drip systems; and
 - (k) Differing hydrozones.

C. Plant Selection and Spacing

1) General

- (a) 80% plant canopy coverage in the planters. The plant list contains appropriate plants and canopy coverage area. If no lawn is used, the plant canopy coverage may be reduced to 50%.
- (b) The square footage value given for each plant is its mature size and will be used to determine the canopy coverage regardless of the size of the plant at the time of planting.
- (c) The City does not endorse or require the use of any or all plants found on the list.
- (d) All ornamental planting of trees/shrubs shall be in accordance with the appropriate City ordinances and conditions.
- (e) In no event shall trees or ornamental landscaping be placed so as to obstruct the vision of drivers and/or pedestrians within public right-of-way. Refer to line-of-sight requirements and details.
- (f) All plant material shall be of an appropriate species to survive in this particular zone and climate. The City will consider alternative plant material on a case by case basis. Final approval of plant material will be at the discretion of the City.
- (g) Plants shall be selected appropriately based upon their adaptability to the climate, geologic, topographical, and hydrological, and soil conditions of the site.

- (h) Plants having similar water use requirements shall be irrigated together on distinct hydrozones specific valves.
 - (i) Planting symbols shall be clearly drawn at and plants labeled by botanical name, common name, container size, spacing, and quantity of each group of plants indicated.
- 2) Street Trees
 - (a) Minimum acceptable size of trees shall be 15 gallon container size.
 - (b) Minimum 30' on center, each side of street as a solitary planting
 - (c) 20' from street light standards.
 - (d) 10' from fire hydrants.
 - (e) 10' from walks or driveways.
 - (f) 5' from water meters.
 - 3) Trees to be planted within dedicated City right-of-way.
 - (a) Trees planted within City right-of-way will be pre-approved by the City from the List of Acceptable Trees for Street Tree Planting.
 - 4) Shrubs
 - (a) Shrubs used for all except ground cover purposes shall be a minimum of five (5) gallon size.
 - 5) Ground Cover
 - (a) Container stock used for ground cover shall be either:
 - (1) One (1) gallon size at two (2) to three (3) feet on center; or
 - (2) Flatted ground cover material shall be planted six (6) inches on center.
 - 6) Turf
 - (a) Sod is required for lawn planting.
 - 7) Graphics/Signage
 - (a) All graphics and signing systems within public right-of-way for housing usage shall be subject to approval by the Planning Director and shall be in accordance with appropriate City zoning ordinances.
 - 8) Zoning Ordinance
 - (a) City Zoning Ordinance - All ornamental landscaping, both on private property and within public right-of-way, shall comply with City Zoning Ordinance in all respects (open space requirements, fencing, front and side yard landscaping, etc.).

C. WATER EFFICIENT LANDSCAPE WORKSHEET

A project applicant shall complete the Water Efficient Landscape Worksheet that contains four (4) sections to meet the criteria and specifications of the ordinance. See sample worksheet in Appendix B.

- 1) Section A shall contain general project information and a checklist of the required elements.
- 2) Section B shall contain the Water Use Efficiency Statement, which is a narrative summary of the water use efficiency practices applied in the landscape project.

- 3) Section C shall contain a water budget calculation for the project. For the calculation of the MAWA, a project applicant shall use the ETo values from Reference ETo Table in Appendix A.

The example calculations below are hypothetical to demonstrate proper uses of the equations and do not represent an existing and/or planned landscape project. The ETo values used in these calculations are historical data for planning purposes only. For actual irrigation scheduling, a project applicant shall use current reference evapotranspiration (ETo data, such as from the California Irrigation Management Information System (CIMIS) or other self-adjusting device (i.e., soil moisture sensor).

Also, monthly time steps are used for demonstration purposes only. A project applicant may use a time step of their choice (daily, weekly, biweekly, etc.) to complete these calculations.

1. Section C1 Maximum Applied Water Allowance (MAWA). The landscape project's Maximum Applied Water Allowance shall be calculated using this equation:

$$\text{MAWA} = (\text{ETo}) (0.7) (\text{LA}) (0.62)$$

Where:

- MAWA = Maximum Applied Water Allowance (gallons per year)
- ETo = Reference Evapotranspiration Appendix A (inches per year)
- 0.7 = ET Adjustment Factor
- LA = Landscaped Area (square feet)
- 0.62 = Conversion factor (to gallons per square foot)

- a. Example MAWA calculation: A hypothetical landscape project in Lancaster, California with an irrigated landscape area of 3,000 square feet. To calculate MAWA, the annual ETo value for Lancaster is 71.0 inches as listed in the Reference Evapotranspiration Table in Appendix A

$$\begin{aligned} \text{MAWA} &= (\text{ETo}) (0.7) (\text{LA}) (0.62) \\ \text{MAWA} &= (71.0 \text{ inches}) (0.7) (3,000 \text{ square feet}) (0.62) \\ &= 92,442 \text{ gallons per year} \end{aligned}$$

$$\begin{aligned} &\text{To convert from gallons per year to hundred-cubic-feet per year} \\ &= 92,442 / 748 = 124 \text{ hundred-cubic-feet per year} \\ &(\text{100 cubic feet} = 748 \text{ gallons}) \end{aligned}$$

2. Section C2 Estimated amount of water expected from Effective Precipitation (Eppt.). The City's annual precipitation is not significant enough to count for this portion of the equation.

3. Section C3 Estimated Water Use (EWU) for a hydrozone and Estimated Total Water use (ETWU). The landscape project’s EWU for each hydrozone is calculated using the following equation:

$$\frac{(ET_o) (PF) (HA) (0.62)}{EWU = (IE)}$$

Where:

- EWU = Estimated total water use for a hydrozone (gallons)
- ET_o = Reference evapotranspiration Appendix A (inches per month)
- PF = Plant Factor
- HA = Hydrozone area (square feet)
- 0.62 = Conversion Factor
- IE = Irrigation efficiency

- a. Example EWU calculations for three (3) hydrozones; the hypothetical Landscape project in Lancaster, California from the previous section. The following assumptions are made for the landscape: there are three hydrozones – one each for high, moderate, and low water using plants; each hydrozone has the same irrigation type; and soil characteristics and slopes are uniform over the total landscape area.

Hydrozone 1 – High water use plant. The following additional assumptions are made for the high water using plant; landscape coefficient/plant factor is 0.7, landscape area is 1,000 sq. ft., and IE is 0.65.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ET _o	2.1	3.0	4.6	5.9	8.5	9.7	11.0	9.8	7.3	4.6	2.8	1.7	71.0
PWR	1.47	2.1	3.22	4.13	5.95	6.79	7.7	6.86	5.11	3.22	1.96	1.19	49.7
IWR	2.26	3.23	4.95	6.35	9.15	10.45	11.85	10.55	7.86	4.95	3.02	1.83	76.46
Total for Hydrozone 1 (=76.46 X 1,000 sq. ft), inches													76,462

Where:

- ET_o = Reference evapotranspiration Appendix A (inches/monthly)
- PWR = Plant water requirement
= (ET_o) (PF)
- IWR = Irrigation water requirement
= (PWR)/(IE)

Hydrozone 2 – Moderate water use plant. The following assumptions are made: landscape coefficient/plant factor is 0.4; landscape area is 1,000 sq. ft.; and IE is 0.8

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ET _o	2.1	3.0	4.6	5.9	8.5	9.7	11.0	9.8	7.3	4.6	2.8	1.7	71.0
PWR	0.84	1.2	1.84	2.36	3.4	3.88	4.4	3.92	2.92	1.84	1.12	0.68	28.4
IWR	1.05	1.50	2.30	2.95	4.25	4.85	5.50	4.90	3.65	2.30	1.40	0.85	35.50
Total for Hydrozone 2 (=35.50 X 1,000 sq. ft.), inches													35,500

ET_o = Reference evapotranspiration Appendix A (inches/monthly)
PWR = Plant water requirement
= (ET_o) (PF)
IWR = Irrigation water requirement
= (PWR)/(IE)

Hydrozone 3 – Low water use plant. The following assumptions are made: landscape coefficient/plant factor is 0.2; landscape area is 1,000 sq. ft.; and irrigation efficiency (IE) is 0.8. If the landscape area includes non-irrigated planting area, 10% of the non-irrigated planting area may be added to the low water use plant hydrozone.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
ET _o	2.1	3.0	4.6	5.9	8.5	9.7	11.0	9.8	7.3	4.6	2.8	1.7	71.0
PWR	0.42	0.6	0.92	1.18	1.7	1.94	2.2	1.96	1.46	0.92	0.56	0.34	14.2
IWR	0.53	0.75	1.15	1.48	2.13	2.43	2.75	2.45	1.83	1.15	0.70	0.43	17.75
Total for Hydrozone 3 (= 17.75 X 1,000 sq. ft.), inches													17,750

Where:

ET_o = Reference evapotranspiration Appendix A (inches/monthly)
PWR = Plant water requirement
= (ET_o) (PF)
IWR = Irrigation water requirement
= (PWR)/(IE)

- b. Example calculation ETWU. The ETWU for the landscape is the sum total of estimated water uses for each hydrozone:

$$ETWU = \sum_{i=1 \text{ to } n} (EWU \ i)$$

Where:

i = hydrozone number
n = total number of hydrozones

$$\begin{aligned} \text{ETWU} &= 76,462 \text{ inches} + 35,500 \text{ inches} + 17,750 \text{ inches} \\ &= 129,712 \text{ inches per year} \end{aligned}$$

$$\begin{aligned} \text{To convert from inches per year to gallons per year:} \\ &= 129,712 \times 0.62 = 80,421 \text{ gallons per year} \end{aligned}$$

$$\begin{aligned} \text{Verify ETWU} + \text{Eppt} &\text{ is less than MAWA} \\ 80,421 + 0 &< 92,442 \end{aligned}$$

ETWU + Eppt < MAWA, therefore water budget is acceptable.

- c. Recreational areas (see definitions) and areas permanently and solely dedicated to edible plants, such as orchards and vegetable gardens, may require water in addition to the MAWA. A statement shall be included in the landscape design plan and the irrigation schedule designating those portions of the landscape to be used for such purposes and specifying any additional water needed above the MAWA. The total amount of irrigation water allowed for these areas shall not exceed 1.0 of the ETo.
4. Section D shall contain hydrozone information for the landscape project including a hydrozone map, hydrozone table, and hydrozone calculation summary. See sample worksheet in Appendix B.

D. COMPLIANCE WITH LANDSCAPE DOCUMENTATION PACKAGE

Prior to construction, the project applicant shall submit a Landscape Documentation Package to the City that meets all the criteria and specifications of this ordinance.

Upon approval of the Landscape Documentation Package by the City, applicant shall:

1. Receive a permit or approval of the plan check or design review and record the date of the permit, etc. in the Certificate of Completion,
2. Submit a copy of the approved Landscape Documentation Package along with the record drawings, and any other information to the property owner or his/her designee; and
3. Submit a copy of the Water Efficient Landscape Worksheet to the local retail water purveyor.

PART B• IRRIGATION AND LANDSCAPING MATERIALS AND INSTALLATION

A. IRRIGATION - GENERAL

5. Irrigation Schedules

For the efficient use of water, all irrigation schedules shall be developed, managed, and evaluated to utilize the minimum amount of water required to maintain plant health. Irrigation schedules meeting the following requirements shall be submitted with the Certificate of Completion.

- a) Irrigation scheduling shall incorporate the use of evapotranspiration data such as those from the California Irrigation Management Information System (CIMIS) weather stations or other validated weather data or soil moisture monitoring systems to apply the appropriate levels of water for different climates. See CIMIS data for Lancaster area in the City of Lancaster Landscape and Irrigation Design Standards.
- b) Overhead irrigation shall be scheduled between 10:00 p.m. and 10:00 a.m. unless weather conditions are unfavorable. If allowable hours of irrigation differ from the local retail purveyor, the stricter of the two shall apply.
- c) For implementation of the irrigation schedule, particular attention must be paid to the irrigation run times emission device, flow rate, and current ETo, so that applied water meets the EAWU. Total annual applied water shall be less than or equal to MAWA.
- d) Using an appropriate controller, an annual irrigation program with monthly irrigation schedules shall be developed and submitted for each of the following:
 - (1) The plant establishment period;
 - (2) The established landscape; and
 - (3) Temporarily irrigated areas.
- e) Each Irrigation Schedule shall include for each station all that apply:
 - (1) Irrigation interval (days between irrigation);
 - (2) Irrigation run times (hours or minutes per irrigation event to avoid runoff);
 - (3) Number of cycle starts required for each irrigation event to avoid runoff;
 - (4) Amount of applied water scheduled to be applied on a monthly basis;
 - (5) Application rate setting;
 - (6) Root depth setting;
 - (7) Plant type setting;
 - (8) Soil type;
 - (9) Slope factor setting;
 - (10) Shade factor setting; and/or
 - (11) Irrigation uniformity or efficiency setting.

6. Permits and Fees

The Contractor shall obtain and pay for any and all necessary permits and fees as required.

7. Manufacturer's Directions

Manufacturer's directions and detailed drawings shall be followed in all cases where the manufacturers of articles used furnished directions covering points not shown in the drawings and specifications.

8. Ordinance and Regulations

All local, municipal, state laws, and rules and regulations governing or relating to any portion of irrigation work are hereby incorporated into and made a part of these design standards; and their provisions shall be carried out by the Contractor. Anything contained in these design standards shall not be construed to conflict with any of the above rules and regulations or requirements of the same. However, when these design standards call for or describe materials, workmanship, or construction of a better quality, higher standard, or larger size than is required by the above rules and regulations, the provisions of these design standards and drawings shall take precedence.

9. Explanation of Drawings

Due to the scale of drawings, it is not possible to indicate all offsets, fittings, sleeves, etc., which may be required. The Contractor shall carefully investigate the structural and finished conditions affecting all of its work and plan its work accordingly, furnishing such fittings, etc., as may be required to meet such conditions. Drawings are generally diagrammatic and indicative of the work to be installed. The work shall be installed in such a manner as to avoid conflicts between irrigation systems, planting, and architectural features.

10. Contacting Responsibilities

- a) It is the responsibility of the Contractor to familiarize himself with all grade differences, location of walls, and utilities. The Contractor shall repair or replace all items damaged by its work. Contractor shall coordinate its work with other contractors for the location and installation of pipe sleeves and laterals under roadways and paving, etc.
- b) Contractor shall be responsible for locating and staking all sewer, utility, and water main lines prior to beginning work. Contractor shall be responsible for any damage or replacement of said utilities. Any digging in areas where public type utility substructures may exist requires an Underground Service Alert (USA). The alert must be obtained at least forty-eight (48) hours prior to digging. USA's telephone number is (800) 422-4133. This will allow such utilities to mark their facilities to minimize interference and disruption of service.
- c) Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that unknown obstructions, grade differences, or differences in the area dimensions exist that might not have been considered in the engineering. Such obstructions or differences should be brought to the attention of the owner. In the event

this notification is not performed, the Contractor shall assume full responsibility for any revisions necessary.

- d) The intent of the design is to provide adequate water coverage to plant material to insure survival. As part of the scope of work, Contractor shall provide any additional heads, special nozzles, or patterns to achieve proper coverage with a minimum of overspray, at no additional cost to the owner.
- e) After all new sprinkler pipelines and risers are in place and connected, all necessary diversion has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.

B. IRRIGATION – SUBMITTALS

1. Materials List

The Contractor shall furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the City.

Equipment or materials installed or furnished without prior approval of the City may be rejected and the Contractor required to remove such materials from the site at its own expense.

Manufacturer's warranties shall not relieve the Contractor of its liability under the guarantee. Such warranties shall only supplement the guarantee.

2. Records and As-Built Drawings

The Contractor shall provide and keep up-to-date complete “As-Built” drawings indicating locations, sizes, and kinds of equipment installed. Prints for this purpose may be obtained from the Architect at cost. This set of drawings shall be kept on the site and shall be used only as a record set.

These drawings shall also serve as work progress sheets and the Contractor shall make neat and legible annotations on a daily basis as the work proceeds, showing the work as actually installed. These drawings shall be available at all times for inspection and shall be kept in a location designated by the City.

Before the date of the final inspection, the Contractor shall turn over all information recorded on the “As-Built” prints to the Engineer of Work.

The Contractor shall dimension from two (2) permanent points of reference (building corners, sidewalk, or road intersections, etc.) the location of the following items:

- a) Connection to existing water lines;

- b) Connection to existing electrical power;
- c) Gate valves;
- d) Routing of sprinkler pressure lines (dimension maximum 100' along routing);
- e) Significant changes in routing of lateral lines from those indicated on plans;
- f) Sprinkler control valves;
- g) Routing of control valves;
- h) Quick coupling valves; and
- i) Other related equipment as directed by the City.

C. IRRIGATION – MATERIALS

Use only new materials on drawings, specified herein, or approved equals.

1. PVC Pressure Mainline Pipe and Fittings

The Contractor is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe fittings. All PVC pipe is to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has been dented or damaged will be discarded and, if installed, shall be replaced with new piping. Pipe and fittings shall not be stored in direct sunlight.

- a) Rubber gasket type pressure main line piping for sizes 3" and larger shall be Ring-Tite PVC Class 200.
- b) Pipe shall be made from NSF approved Type I, Grade I, PVC Compound conforming to ASTM Resin Specifications D1784. All pipe must meet requirements as set forth in Federal Specifications PS-22-70, with an appropriate standard dimension (S.D.R.) (Ring-Tite Pipe).
- c) Ring-Tite PVC fittings shall be fabricated from Schedule 40, 1-2, II-I NSF solvent weld PVC fittings conforming to ASTM Testing Procedure D-2466 and PVC Ring-Tite bell adapted using solvent and solvent welding procedures recommended by the manufacturer.
- d) Fabrication shall be performed at the manufacturer's plant location or at an authorized distributor shop location. Field fabrication of Ring-Tite fittings will not be allowed.
- e) Solvent welded type pressure main line piping for sizes 2" and larger shall be PVC Class 315.
- f) Pipe shall be made from NSF approved Type I, Grade I PVC Compound conforming to ASTM Resin Specifications D1788. All pipe must meet requirements as set forth in Federal Specification PS-22-70, with an appropriate standard dimension (S.D.R.) (Solvent-weld Pipe).
- g) Pressure main line piping for sizes 1½" and smaller shall be PVC Schedule 40 with solvent welded joints.
- h) Pipe shall be made from NSF approved Type I, Grade I PVC Compound conforming to ASTM Resin Specification 1785. All pipe must meet requirements as set forth in Federal Specification PS-21-70 (solvent weld pipe).
- i) PVC solvent weld fittings shall be Schedule 40, NSF approved, conforming to ASTM Test Procedure D2466.
- j) Solvent cement and primer for PVC solvent weld pipe and fittings shall be of type and installation methods prescribed by the manufacturer.
- k) All PVC must bear the following markings:

- (1) Manufacturer's name;
- (2) Nominal pipe size;
- (3) Schedule or class;
- (4) Pressure rating psi;
- (5) NSF (National Sanitation Foundation) approval.;
- (6) Date of extrusion;
- (7) U.P.C. Shield Logo (IAPMO approval); and
- (8) All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable I.P.S. schedule, and NSF seal of approval.

2. PVC Non-Pressure Lateral Piping

- a) Non-pressure buried lateral line piping shall be PVC Class 200 with solvent weld joints.
- b) Pipe shall be made from NSF approved, Type I, Grade II PVC Compound conforming to ASTM Resin Specification D1784. All pipes must meet requirements set forth in Federal Specification PS-22-70 with an appropriate standard dimension ratio.
- c) Except as noted in Paragraph 1 of PVC Pressure Main Line Pipe and Fittings, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent weld pressure main line pipe and fittings as set forth in said section.

3. Brass Pipe and Fittings

- a) Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification WW-P-351.
- b) Fittings shall be red brass conforming to Federal Specification WW-P 460.

4. Galvanized Pipe and Fittings

- a) Galvanized pipe and fittings shall not be allowed under any circumstances without prior written approval from the City.

5. Copper Pipe and Fittings

- a) Copper pipe shall be Type "K", hard tempered ASTM B88 and fittings shall be wrought solder joint type in accordance with ASNI-B 16-22.
- b) Joints shall be soldered with silver solder, 45% silver, 15% copper, 16% zinc, 24% cadmium and solidus at 1,125 F and liquidus at 1,145 F, conforming to ASTM B206 and Federal Specification QQB 00655.

6. Thrust Blocks

- a) Concrete thrust blocks for all specified piping shall be the size and type required by the manufacturer's installation guide.
- b) Form thrust blocks in such a manner to prevent any concrete from coming in contact with the pipe. Solid pipe shall be between thrust block and the fitting to prevent direct contact of thrust block and fitting.
- c) Thrust blocks shall be installed on all pressure lines over 1½" in diameter whenever pressure line changes direction. Thrust blocks are required at backflow prevention device.

7. Quick Coupling Valves

- a) Quick coupling valves shall have a two-piece brass body designed for working pressure of 150 psi operable with quick coupler.
- b) Quick coupling valves shall be 1" in size and shall be equipped with a locking vinyl cover.

8. Backflow Prevention Units

- a) Backflow preventers shall be a reduced pressure type and shall be of a size as indicated on the drawings. All sprinkler irrigation systems shall require backflow prevention. All backflow prevention units shall be as set forth by local codes, the Los Angeles County Health Department, and Water District. The device shall be installed at least twelve inches (12") above grade measuring from the bottom of the device. (Current Los Angeles County Codes and Inspections required).
- b) Wye strainers at backflow prevention units shall have a bronzed screwed body for sizes 2" and smaller and 125 lb. cast iron flange body for sizes 2" and larger. All wye strainers shall have a minimum 30 mesh screen and shall be similar to Bailey #100B or approved equal. Wye strainer shall not have a hose bib and shall be installed as per standard details. Smaller mesh screens may be required as necessary.
- c) Backflow prevention devices shall have a minimum size equal to the size of the water meter.
- d) The backflow device shall be wrapped/winterized.
- e) The backflow prevention device must be tested and certified by the Los Angeles County Department of Health Services - Cross Connections and Water Pollution Control Program and a copy of the test report submitted to the City.

9. Gate Valves/Ball Valves

- a) Gate valves 2½" and larger shall be iron body, bronze stem, flanged, full port, resilient seat, or wedge shut-off which can be serviced from the top while the valve is in line.
- b) Gate valves 4" and larger shall have 2" square operating nut, with arrow cast in metal indicating direction of opening.
- c) Gate valves 4" and larger shall have ends compatible with pipe in which they are being installed.
- d) Ball valves 2" and smaller shall be 200 psi SWP bronze ball valve with a stainless steel ball and handle.
- e) Ball valves 2" and smaller shall have threaded ends.
- f) All gate and ball valves shall be installed per standard details.

10. Control Wiring

- a) The electrical system shall be installed in accordance with the National Electrical Code most recently adopted by the City. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-U.F. 600 volt. Pilot wires shall be a different color wire for each automatic controller. Pilot wires for single controller installations shall be black, 14 gauge minimum.

Common wires shall be white with a different color stripe for each automatic controller. Common wires shall be installed in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.

- b) Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
- c) Where more than one (1) wire is placed in a trench, the wiring shall be taped together at intervals of ten (10) feet.
- d) An expansion curl should be provided within three (3) feet of each wire connection and at each change in direction. Expansion curls shall be formed by wrapping at least five (5) turns of wire around a one-inch diameter pipe, then withdrawing the pipe.
- e) All splices shall be made with waterproof connectors.
- f) Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the City.
- g) Where additional stations remain on controller, up to two (2) additional wires may be required by the City. These wires shall be pulled to the farthest point in the project and coiled in a pull box for future use.

11. Smart Controller Specification

- a) All irrigation controllers shall meet the Irrigation Association's protocol for Smart Controllers (SWAT protocol report, www.irrigation.org).
- b) The performance standard for the Smart Water Irrigation Technologies (SWAT) protocol product report shall be 100% Adequacy and 0% Excess scores in order for the City to maximize water use efficiency and runoff reduction.
- c) The SWAT reported technology shall include an automated "scheduling engine" that changes irrigation schedules as weather changes without the need for people interactions.
- d) The SWAT reported technology shall have sufficient independent "field" tests and studies that validate the SWAT bench test protocol report.
- e) The SWAT reported technology shall be specifically tested for runoff reduction by an independent agency study that validates success in controlling non point-source water pollutants.
- f) The SWAT reported technology shall utilize real-time localized weather data that establishes daily ET for the varied City microclimates; ET data must match/conform to the State and Federal accepted Penman Montieth ET equation data, and may not be based on historical ET, single weather sensors, or individual non-government maintained weather collection devices that will need ongoing maintenance.
- g) Training/Product Service: Approved controllers/manufacturers shall include training (City staff, contracted landscapers) and be able to perform ongoing customer service in order to achieve long-term water conservation and runoff goals.

12. Electric Control Valves

- a) The electric control valve shall be a normally closed, 24-volt, 60 cycle valve.
- b) The valve shall have a slow uniform closure to eliminate water hammer or chatter.
- c) All valves shall have a manual flow adjustment.
- d) Valve shall be pressure rated to 150 psi.

13. Outdoor Automatic Controller Enclosure

- a) The outdoor controller enclosure shall be of appropriate size to adequately house specified controller, be made of weather resistant and collision resistant 12 gauge hot rolled steel, and finished with weather resistant medium green epoxy paint. Lockable hinged doors shall be equipped with full length stainless steel gasket hinges.

14. Control Valve Box (only for in-ground valves)

- a) If in-ground valves are used, an irrigation valve box must be used. The valve box shall be large enough for easy access to the valves.

15. Sprinkler Heads

a) General

- 1) All sprinkler heads shall be of the same size, type, and shall deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans.
- 2) Spray heads shall have a screw adjustment.
- 3) Riser nipples for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
- 4) All sprinkler heads of the same type shall be of the same manufacturer.
- 5) All sprinkler heads shall have low precipitation rate and a spray angle less than 10 degrees.

a. Type "A" Pop-Up Lawn Spray

- I. Pop-up lawn spray heads shall have a minimum 6" pop-up nozzle piston with a stainless steel retraction spring. The sprinkler body shall be manufactured of a corrosion resistant material such as high strength, ultra-violet, and impact resistant plastic.

- II. Nozzles for 6" pop-up lawn spray sprinklers shall be of plastic construction and shall be adjustable.

b. Type "B" Pop-Up Shrub Spray

- I. Pop-up shrub spray heads shall have a minimum, 18" pop-up nozzle piston with a stainless steel retraction spring. The sprinkler body shall be manufactured of a corrosion resistant material such as high strength, ultra-violet, and impact resistant plastic.

- II. Nozzles for 18" pop-up spray heads should be used within low growing ground cover areas only, and shall have an adjustable radius.

c. Type "C" Bubbler

- I. Bubblers to be pressure compensating type, pre-set gallonage.

16. Drip Systems

- a) Valves used in drip irrigation applications shall be designed to operate at minimal flow rates.
- b) Pre-set pressure regulators may be used and are to be sized to the manufacturer's recommended pressure setting for the emitters being used.
- c) Pressure regulators will be installed after the remote control valves.

- d) All drip components will have filtration after each remote control valve for mixed systems. Filters will be compatible with the brand of drip components being used and with fine enough mesh screen to filter all objectionable foreign material. Filters must be easily accessible for cleaning.
- e) The number and size of emitters will be as per manufacturer's recommendation for size of plants to be irrigated.
- f) All emitters will be pressure compensating.
- g) All emitter tubing will be staked to the ground.
- h) Separate drip systems will be used for plants of differing water requirements (hydrozones).
- i) All drip lateral lines shall be PVC schedule 40 or class 200 pipe.
- j) Multi-outlet emitters used for shrubs and ground covers will be placed in 6" round valve boxes.

17. Booster Pump

- a) Pump shall be equipped with tapped holes for pressure gauges on suction and discharge posts of pump.
- b) All fittings shall be brass.
- c) Suction line assembly shall be sized the same as the pump suction inlet.
- d) All pumps shall be equipped with a pump panel within 10 feet of pump location. Pump panel shall be housed in a lockable, weatherproof enclosure with the following components:
 - (1) HOA (Hand, Off, Automatic) switch. "Hand" position shall be spring loaded to return to "Off" position;
 - (2) 24 volt transformer; and
 - (3) Minimum run timer with settings from 0-10 minutes.
- e) Irrigation plan submittals shall include a complete detailed drawing of pump assembly and all electrical installation from electric meter through panel and to pump motor.
- f) All booster pumps and electric panels shall have a slump stone, or approved equal, block wall installed around them for anti-vandalism as well as aesthetic purposes.

D. IRRIGATION-INSTALLATION PROCEDURES

1. Site Conditions

- a) Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by its operations or neglect. Check existing utilities drawings for existing utility locations. Call out mark-out crews for each utility.
- b) Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction, or difficulty in planting trees, shrubs, and ground covers.
- c) Carefully check all grades to satisfy itself that it may safely proceed before starting work on the sprinkler irrigation system.

2. Water Supply

- a) Sprinkler irrigation system shall be connected to water supply points of connection as indicated on the drawings.
- b) Contractor is responsible for minor changes by actual site conditions.

3. Trenching

- a) Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted.
- b) Provide a minimum of 18" of cover for all pressure supply lines 1½" and smaller.
- c) Provide a minimum cover of 12" for all non-pressure lines.
- d) Provide a minimum cover of 18" (or directly below mainline where possible) for all control wiring.

4. Backfilling

- a) The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.
- b) If settlement occurs, all subsequent adjustments in pipe, valves, sprinkler heads, lawn or plantings, or other construction necessary, the Contractor shall make all required adjustments.

5. Trenching and Backfill Under Paving

- a) Generally, piping under existing walks may be accomplished by jacking or boring; but where any cutting or breaking of sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost.
- b) Provide for a minimum cover of 18" between the top of the sleeve and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving. All sleeves under paving shall be Schedule 40 PVC. Sleeves shall be installed

under all paving/concrete areas. Provide sleeve a minimum of 2 times the diameter of water pipe for irrigation pipe, 1" sleeve for wires.

- c) All control wire installed where mainline is not called for shall be installed in Schedule 40 PVC conduit.

6. Automatic Controller

- a) Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings.
- b) Installer must be certified by the manufacturer to install their ETo Timers.

7. High Voltage Wiring for Automatic Controller

- a) 120 volt power connection to the automatic controller.
- b) All electrical work shall conform to local codes, ordinances, and authorities having jurisdiction.
- c) Timers installed outdoors must be direct wired.

8. Remote Control Valves

- a) Install as per manufacturer's instructions.
- b) Install where shown on drawings and details.
- c) Valves to be located in planters.

9. Lawn Sprinkler Heads

- a) Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed shall be equivalent in all respect to those itemized on plans and in details.
- b) Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended spacing by the manufacturer for wind speeds at 3-5 miles per hour.
- c) Heads shall be placed around the perimeter of the turf areas directing spray into the turf area. Use full head sprays to water the middle of lawn areas. Irrigation efficiency shall be uniform and meet or exceed 85 percent.
- d) Sprinklers shall not be installed any closer than two inches from hard surface edges and lawn edges.
- e) The cap height of pop-up sprinklers, mounted in turf areas, should be at grade level, to avoid damage to lawn mowers. There should be no depression around sprinkler heads.
- f) All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.
- g) The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadway, and buildings as much as possible.
- h) If it is determined that adjustments in the irrigation equipment are needed to provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

10. Shrub Sprinkler Heads

- a) Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed shall be equivalent in all respect to those itemized on plans and in details.
- b) Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended spacing by the manufacturer for wind speeds at 3-5 miles per hour.
- c) Sprinklers shall face away from the house and hard surfaces to prevent water spray on house and hard surfaces.
- d) Sprinklers shall not be installed any closer than two inches from hard surface edges and lawn edges.
- e) The cap height of pop-up sprinklers shall be at finished grade plus height of mulch. There should be no depression around sprinkler heads.
- f) All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans.
- g) The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadway, and buildings.
- h) If it is determined that adjustments in the irrigation equipment are necessary to provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required.

11. Drip Irrigation Systems

- a) Installation will be as per manufacturer's recommendation, unless otherwise required by the City.

12. Existing Trees

- a) Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where 2" and larger roots occur shall be done by hand. All roots 2" and larger in diameter, except directly in the path of pipe or conduit, shall be tunnelled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than 2" in diameter, the wall of the trench adjacent to the trees shall be hand trimmed, making clean cuts. Trenches adjacent to trees should be filled within twenty-four (24) hours; and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

13. Inspection Schedule for Irrigation

- a) Contractor shall be responsible for notifying the City 24 hours (one working day) in advance for all inspections.
- b) No work shall be backfilled until appropriate inspections and tests have been completed and approved by the City.
- c) No irrigation inspection will commence without "As-Built" drawings. In the event the Contractor calls for an inspection without "As-Built" drawings, without completing

previously noted corrections, or without preparing the system for inspection, no inspection will be made. Work will be redone at the Contractor's expense.

14. Clean-Up

- a) Clean-up shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all paving shall be broomed or washed down, and any damage sustained shall be repaired to original conditions.

E. LANDSCAPING MATERIALS

1. Plant Materials

- a) Nomenclature - The scientific and common names of plants specified shall conform with the approved names given in "Sunset New Western Garden Book" published by Lane Publishing Co. (latest Edition).
- b) Labeling - Each group of plant materials delivered to the site shall be clearly labeled as to species, variety, and nursery source.
- c) Quality and Size
 - 1) Plants shall be in accordance with the California State Department of Agriculture's regulation for nursery inspections, rules and grading.
 - 2) All plants shall have a normal habit of growth and shall be sound, healthy, vigorous, and free of insect infestations, plant diseases, sun scalds, fresh abrasions of the bark, or other objectionable disfigurements.
 - 3) Tree trunks shall be sturdy and well "hardened off". All plants shall have normally well developed branch systems and vigorous and fibrous root systems which are not root or pot bound. In the event of disagreement as to condition of root system, the root condition of the plants furnished by the Contractor in containers will be determined by removal of earth from the roots of not less than two plants of each species or variety. Where container grown plants are from several sources, the roots of not less than two plants of each species or variety from each source will be inspected. In case the sample plants inspected are found to be defective, all plants will have to be replaced.
 - 4) The size of the plants will correspond with that normally expected for species and variety of commercially available nursery stock or as specified in the drawings. The minimum acceptable size of all plants, measured before pruning with the branch in normal position, shall conform with the measurements, if any, specified on the drawings in the list of plants to be furnished.
- d) Rejection or Substitution - All plants not conforming to the requirements herein specified shall be considered defective and such plants, whether in place or not, shall be marked as rejected and immediately removed from the site of work and replaced with new plants. The plants shall be of the species, variety, size, and condition specified on the drawings.
- e) Pruning - At no time shall the tree or plant materials be pruned, trimmed, or topped prior to delivery. Main leaders shall not be cut or removed.
- f) Protection - All plants at all times shall be handled and stored so that they are adequately protected from drying out, wind burn, or any other injury.

2. Topsoil
 - a) Topsoil shall consist of a natural, fertile, friable, sandy loam soil. The topsoil shall be free from subsoil, refuse, heavy roots, clay lumps, stones larger than 1" in size, noxious weeds, sticks, brush, liner material, and other deleterious substances.
3. Soil Amendments
 - a) Soil amendments shall be a wood or bark product. The soil amendment shall not contain any bio-waste, noxious weeds, or weed seeds, pathogens, herbicides, or other chemicals that could inhibit plant growth.
 - b) Soil amendments shall be nitrified to prevent soil nutrient problems.
4. Sod Pre-plant Fertilizers
 - a) Approved pre-plant fertilizers: Ammonium Phosphate Sulfate (16-20-0), Triple 16 (16-16-16), Triple 15 (15-15-15).
 - b) Apply at the manufacturer's and/or sod provider's recommendation.
5. Tree/Shrub Pre-plant Fertilizers
 - a) Two-year time release fertilizer tablets.
 - b) Minimum tablet size is 20 grams.
 - c) Apply at the following rates: 1 per 1 gallon, 2 per 5 gallon, 5 per 15 gallon.
6. Tree Ties
 - a) Tree ties shall be installed per City standard details. The tree shall be fastened to the stakes with a No. 12 BWG galvanized iron wire covered with a new rubber garden hose in a manner which permits tree movement and supports the tree. Two (2) double ties shall be used near the top of the main tree trunk and near the middle of the main tree trunk.
7. Tree Stakes
 - a) Eight foot tree stakes shall be a heavy weight (1.33 lb/ft) metal forest green tee post. Ten foot tree stakes shall be 1½" diameter schedule 20 galvanized steel painted forest green. Stakes shall be 10' long for 24" box trees and 8' long for 15 gallon trees, and shall be driven into soil a minimum of 24" depth and a minimum distance of 12" from the tree trunk.
8. Trunk Guards/Root Barriers
 - a) Trunk guards shall be installed at base of all trees planted in turf areas.
9. Mulch
 - a) Mulch may be decorative bark, rock, or decomposed granite. All planters shall have added mulch and no bare ground. Mulch shall be at least 2 inches deep. The soil mulch shall not contain any bio-waste, noxious weeds or weed seeds, pathogens, herbicides, or other chemicals that could inhibit plant growth. Mulch shall be free of dirt and any other foreign material.

10. Sod

- a) Sod shall be fully mature, well maintained, and a variety of either 100% Tall or Hybrid Fescue mixture, or Hybrid Bermuda. The sod shall be free of all other grasses or weeds, and shall be evenly cut with a conventional sod cutting machine. All material shall be from the same growing ground and delivered fresh to the job site.

F. LANDSCAPE - INSTALLATION PROCEDURES

1. Grading and Soil Preparation

- a) All rough grading, mounding, and irrigation shall be completed prior to soil preparation.
- b) Rototill entire landscape area (planters and sod) to a minimum depth of 6 inches to remove construction compaction.
- c) Rototill in 3 cubic yards of soil amendment per 1,000 square feet of landscape area.
- d) Planting areas shall be free of all weeds (plants not specified in planting areas), stones, stumps, roots or other debris 1" in diameter or larger for a minimum of 6 inch depth.
- e) Soil shall be graded to a smooth and even surface conforming to required finish grade. Finish grade adjacent to walks, paved areas, curbs, manholes, clean outs, valve boxes, and similar features shall be 1" below the surface in turf and 2" below the surface in ground cover/shrub areas. Grades between such features shall be carefully sustained and blended to eliminate abrupt changes.
- f) Soil shall be graded to prevent water from running towards the home or patio and to prevent standing water near the home.
- g) Planting areas to receive sod shall sustain a finish grade of such depth that installed sod shall be flush with finish surfaces (walks, paved areas, etc.).
- h) All planting areas shall have a finish grade conforming to approved plans and specifications after full settlement has occurred.

2. Ground Cover

- a) Ground cover plants shall be grown in flats. Flat grown plants (rooted cuttings) shall remain in those flats until transplanting. The soil of the flat shall contain sufficient moisture so that it will not fall apart when lifting the plants.
- b) To avoid drying out, plantings shall be immediately sprinkled after planting until the entire area is soaked to the full depth of each hole. Evenly spread approved mulching material in the area planted with ground cover to a depth of 2".

3. Planting of Trees Shrub and Vines

- a) Excavation for Planting
 - 1) Excavation for planting shall include the stripping and staking of all acceptable topsoil encountered within the areas to be excavated for trenches, tree holes, plant pits, and planting beds.
 - 2) All excavated holes shall have vertical sides with roughened surfaces. The holes shall be, in all cases, large enough to permit handling and roots or root balls.
 - 3) Excess soil generated from the planting holes may be distributed on the site and amended as specified in general soil preparation.

b) Planting

- 1) No more plants shall be distributed in the planting area on any day than can be planted and watered on that day.
- 2) Plants shall be removed in such a manner that the ball of earth surrounding the roots is not broken, and they shall be planted and watered as herein specified immediately after removal from the container.
- 3) Acceptable topsoil which was salvaged during the digging of planting holes may be used for backfill.
- 4) After the plant has been placed, backfill shall be added to the hole to cover approximately one-half the height of the root ball. At this stage, water shall be added to the top of the partly filled hole to thoroughly saturate the root ball and adjacent soil.
- 5) Use Best 20-10-5 two-year time release fertilizer tablets, or equal, at the following rates: 1 per 1 gallon, 2 per 5 gallon, 3 per 15 gallon.
- 6) After the water has completely drained, the remainder of the hole shall then be backfilled.
- 7) After backfilling, a temporary earthen basin shall be constructed around each plant. Each basin shall be a depth sufficient to hold at least 6" of water. Basins shall be extended 6 inches from the edge of the root ball of each individual plant.
- 8) Immediately after planting apply water to each tree and shrub.
- 9) Plant basins shall be irrigated at least twice over two days prior to removing the berm and applying mulch.

4. Turf

- a) After preparation of soil in accordance with the section "Grading and Soil Preparation", the areas to be planted to lawn shall be rolled, raked, and floated to finish grade by any acceptable method with the finish grade being smooth and even, free of rocks and clods, and reasonably well firmed. Prior to planting, the surface of the area shall be sufficiently loose and viable to receive sod.
 - 1) Pre-fertilization – Just prior to the planting of turf, evenly broadcast appropriate fertilizer as specified by manufacturer's recommendation.
 - 2) Sod - Lay sod in one direction only, with close fitting butt joints. The ends of each strip shall be staggered to eliminate continuous joining.

5. Compliance With The Certificate Of Completion

- a) The project applicant shall:
 - 1) Prior to backfilling, have a licensed landscape architect, certified irrigation auditor, or licensed landscape contractor conduct a preliminary field observation of the irrigation system;
 - 2) Upon project installation, have a licensed landscape architect or licensed landscape contractor conduct a final field observation for the approval of the certificate;
 - 3) Upon project installation, have a certified irrigation auditor conduct a landscape irrigation audit as required under Title 8, Chapter 50 of the Lancaster Municipal Code (Lancaster Water Efficient Landscape Ordinance) and described in these design standards.
 - 4) Submit the signed Certificate of Completion to the City for approval;

- 5) Receive the Certificate of Occupancy or equivalent from the City; and
- 6) Submit copies of the approved Certificate of Completion to the local retail water purveyor and the property owner or his/her designee.

SECTION II: SPECIAL REQUIREMENTS FOR RESIDENTIAL LANDSCAPE AND IRRIGATION

- A. Turf is prohibited in commercial and industrial development proposals except where approved as a recreational area.
- B. Turf is not to exceed 30% of the landscape areas in residential development proposals, nor exceed maximum allowable turf areas described in the table below.
- C. Pool and spa covers are required.

Maximum Allowable Turf Areas for Residential Development

Table A

Type of Residential Development	R-7000 SFR lots or smaller	R-10,000 SFR lots	½ Acre lot or larger
Maximum Turf (sq. footage)	1,500	2,000	4,000

SECTION III: SPECIAL REQUIREMENTS FOR COMMERCIAL, INSTITUTIONAL, AND INDUSTRIAL LANDSCAPE AND IRRIGATION

- A. Turf is prohibited in commercial, institutional, and industrial development proposals except where approved as a recreational area.

SECTION IV: SPECIAL REQUIREMENTS FOR LANDSCAPE MAINTENANCE DISTRICTS AND PUBLIC RIGHTS-OF-WAY LANDSCAPE AND IRRIGATION

- A. Organic mulch is required to be three inch minimum depth.

APPENDIX A

Appendix A – Reference ETo

Reference Evapotranspiration (ETo) Table for the City of Lancaster, Los Angeles County, California

(inches of water)

Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual ETo
2.1	3.0	4.6	5.9	8.5	9.7	11.0	9.8	7.3	4.6	2.8	1.7	71.0

The values in this table were derived from: 1) California Irrigation Management Information System (CIMIS); 2) Reference EvapoTranspiration Zones Map, UC Dept. of Land, Air & Water Resources and California Dept of Water Resources 1999; 3) Reference Evapotranspiration for California, University of California, Department of Agriculture and Natural Resources (1987) Bulletin 1922; and 4) Determining Daily Reference Evapotranspiration, Cooperative Extension UC Division of Agriculture and Natural Resources (1987), Publication Leaflet 21426.

APPENDIX B

Appendix B – Water Efficient Landscape Worksheet

Please complete the entire worksheet. This worksheet is part of the Landscape Documentation Package

SECTION A. PROJECT INFORMATION

Date: _____

Project Name _____

Project Applicant _____

Project Address and Location

Street Address		Parcel Number
City		Tract or Lot Number(s)
State	Zip Code	Latitude/Longitude Coordinates (optional)

Please use the checklist below to indicate completion of the Landscape Documentation Package.

Landscape Documentation Package

- Water Efficient Landscape Worksheet
- Soil Management Plan (Soil Analysis Report and On-site soil Assessment with Recommendations)
- Landscape Design Plan
- Irrigation Design Plan
- Grading Design Plan

Please fill in the information below to describe the landscape project, where applicable:

Total Project area _____ (sq. feet)

Total irrigated landscape area * _____ (sq. feet)

Turf area _____ (sq. feet)

Non-turf area _____ (sq. feet)

Recreational areas _____ (sq. feet)

Areas permanently and solely dedicated to edible plants _____ (sq. feet)

*Additional information is also required in Part # 3 of the worksheet

Total non-irrigated landscape area _____ (sq. feet)

Water supply type. Please check all that apply.

- Potable water
- Recycled Water
- Graywater
- Mixed Use
- Rainwater
- Other _____

Groundwater or Well Water

Project Type. Please check only one

- Public or community facility (i.e., park, playground, etc.)
- Commercial
- Industrial
- Institutional (i.e., school, etc.)
- Other _____

- Single Family Residence
- Multi-Family Residential
- Model Home
- Mixed Use

Project Contacts

The project applicant and other individuals may receive inquiries or notifications of all proceedings regarding the Water Efficient Landscape Worksheet from the local agency. Please provide the name, address, and telephone, etc. of each person to receive such inquiries and notifications.

1. Project Applicant

Name	Telephone #	
	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

2. Property Owner

Name	Telephone #	
	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

3. Licensed Landscape Architect

Name	Telephone #	
	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

4. Certified Irrigation Designer

Name	Telephone #	
	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

5. Landscape Installation Contractor

Name	Telephone #
------	-------------

	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

6. Landscape Maintenance Contractor (if known)

Name	Telephone #	
	Fax #	
Title	Email address	
License #		
Company	Street Address	
City	State	Zip

7. Local retail water purveyor

Name of contact at water purveyor	Telephone No.	
	Fax No.	
Title	Email address	
Name of Company or Water Purveyor	Street Address	
City	State	Zip Code

SECTION B. WATER USE EFFICIENCY STATEMENT

Provide a narrative summary of the water use efficiency practices applied to the landscape project and answer all of the following questions (attach additional sheets if necessary):

Narrative Statement _____

Questions:

- 1) Did you review the ordinance to learn about the criteria and specifications for landscape design plans? Yes _____ No _____

2) Did you coordinate with the local agency or local retail water purveyor on the landscape design plan?

3) Which criteria and specifications did you apply to the landscape design plan?

4) Did you review the ordinance to learn about the criteria and specifications for the irrigation design plans?

5) Did you coordinate with the local agency or local retail water purveyor on the irrigation design plan?

6) Which criteria and specifications plan did you apply to your irrigation design plan?

7) Did you ask for assistance from the local agency/local retail water purveyor to calculate a project water budget?

8) Did you receive any water efficient landscape publications from the local agency or local retail water purveyor?

9) How will you assure the overall quality of the irrigation system?

10) How will you manage the irrigation system for optimum operation and performance?

11) How will you manage the irrigation system to respond to the changing requirement for water in the landscape?

12) Did you apply any stormwater best management practices to the design?

13) If recycled water was available, did you design and install a dual distribution system?

14) Did you select plants from the City approved plant list?

SECTION C. Water Budget Calculation

Section C1. Maximum Applied Water Allowance

The Project's Maximum Applied Water Allowance shall be calculated using this equation:

$$MAWA = (ET_o) (0.7) (LA) (0.62)$$

- MAWA = Maximum Applied Water Allowance (gallons per year)
- ET_o = Reference Evapotranspiration (inches per year)
- 0.7 = ET Adjustment Factor
- LA = Landscaped Area (square feet)
- 0.062 = Conversion factor (to gallons)

Maximum Applied Water Allowance = _____ gallons

Show calculations

If the irrigation water (recycled water or blended water) has electrical conductivity equal to, or greater than, 3 deci Siemens per meter (dS/m) or 3 millimhos per centimeter (mmh/cm) or 2000 mg per liter total dissolved solids (TDS), a leaching factor of up to 10% may be included in the MAWA calculation. The leaching factor shall not exceed 10% of MAWA.

Section C2. Estimated amount of water expected from effective precipitation has been eliminated because the City of Lancaster does not receive enough reliable rainfall in any given year to utilize this information.

Section C3. Estimated Water Use for hydrozones and Estimated Total Water Use

The project's Estimated Total Water Use is calculated using the following formula:

$$EWU = \frac{(ET_o) (PF) (HA) (0.62)}{(IE)}$$

- EWU = Estimated total water use for a hydrozone (gallons)
- ET_o = Reference evapotranspiration (inches per month)
- PF = Plant Factor
- HA = Hydrozone area (square feet)
- 0.62 = Conversion factor
- IE = Irrigation efficiency

Show calculations for each hydrozone (attach additional sheets if necessary).

$$ETWU = \sum_{i=1 \text{ to } n} (EWU_i)$$

i = hydrozone number

n = total number of hydrozones

Estimated Total Water Use = _____

Show calculations:

Section C4. Estimated Applied Water Use section has been eliminated because the City of Lancaster does not utilize effective rainfall in these calculations

Section C5. Additional Water Requirements

Recreational areas and areas permanently and solely dedicated to edible plants may require water in addition to the Maximum Applied Water Allowance. Please be sure to provide a statement in the landscape design plan and in the irrigation schedule, designating those portions of the landscape to be used for such purposes and specifying any additional water needed above the Maximum Applied Water Allowance. The total amount of irrigation water allowed for these areas shall not exceed 1.0 of ETo.

Show calculations:

SECTION D. HYDROZONE INFORMATION

Section D1. Hydrozone Map

Attach a hydrozone map to the Water Efficient Landscape Worksheet. Hydrozones shall be designated by number, letter, or other designation. Designate the areas irrigated by each valve, and assign a number to each valve. Use this valve number in Section D2 – Hydrozone Table. This map can also assist with pre and final inspections of the irrigation system, and programming the controller.

Section D2. Hydrozone Table (Blank Form)

Please complete the hydrozone table(s) for each irrigation point of connection. Use as many worksheets as necessary to provide square footage of landscape area per valve. Blank forms are provided on the next page.

Section D3. Hydrozone Calculations Summary (Blank Form)

Please complete a hydrozone calculation summary for each irrigation point of connection.

Irrigation Point of Connection #		
Hydrozone	Total Square Feet	% of Total Landscape Area
Cool Season Turf		
Warm Season Turf		
High Water Use Plants		
Moderate Water Use Plants		
Low Water Use Plans		
High and Medium Water Mix		
Medium and Low Water Mix		
Total		

Comments

The hydrozone table and hydrozone calculation summary are provided below as examples only.

Irrigation Point of Connection (P.O.C.) #1 Main Street					
Controller #	Valve Circuit #	Plant Type	Irrigation Method	Area (sq.ft.)	% of Landscape Area
1	1	HW/MW	Bubbler	275	2.8%
1	2	HW	Bubbler	275	2.8%
1	3	LW	Drip	1,040	10.5%
1	4	CST	Spray	496	5.0%
1	5	LW	Drip	600	6.1%
1	6	CST	Spray	1,600	16.2%
1	7	LW	Drip	724	7.3%
1	8	MW/LW	Drip	1,852	18.8%
2	1	CST	Spray	1,600	16.2%
2	2	HW	Bubbler	80	0.8%
2	3	LW	Drip	780	7.9%
2	4	LW	Drip	548	5.6%

Irrigation Point of Connection # (P.O.C.)		#1 (Main Street)
Hydrozone	Total Square Feet	% of Total Landscape Area
Cool Season Turf	3,696	37.0
Warm Season Turf	0	0
High Water Use Plants	355	3.6
Moderate Water Use Plants	0	0
Low Water Use Plants	3,692	37.6
High and Medium Water Mix	275	2.3
Medium and Low Water Mix	1,852	18.7
Total	9,870	100%

SIGNATURES

I further acknowledge and agree under penalty of perjury under the laws of the State of California that the information contained in the Water Efficient Landscape Worksheet is true and correct.

Signature of Project Applicant

Date

THIS SECTION BELOW IS FOR LOCAL AGENCY USE ONLY.

Signature of the Local Agency Representative	
Name of the Local Agency Representative	
Title	
Telephone Number	
Email Address	
Name of Local Agency	
Name of Department/Division/Unit	
Street Address	
City	
State and Zip Code	

For this project the Permit, Plan Check, or Design Review has been:

Issued

Date: _____

Notes: _____

Denied:

Date: _____

Notes: _____

Comments: _____

APPENDIX C

Appendix C – Sample Certificate of Completion

CERTIFICATE OF COMPLETION

This certificate is completed by the project applicant upon installation at the final field observation of a landscape project.

Please complete all sections below

SECTION A. PROJECT INFORMATION

Date _____

Project Name: _____

Project Applicant _____

Project Address and Location

Street Address		Parcel Number
City		Tract or Lot Number
State	Zip Code	Latitude/Longitude (optional)

Please answer the questions below:

1) Did you submit a Landscape Documentation Package to your local agency?

Yes No

2) Was your Landscape Documentation Package approved by the local agency?

Yes No

3) When were you issued a permit or approval for the plan check or design review?

Date: _____

4) Did you submit the Water Efficient Landscape Worksheet (including the Water Budget Calculations) to your local retail water purveyor?

Yes, Date: _____ No

SECTION B. FINAL INSPECTION

Please use this checklist to verify the following has been completed:

- The preliminary field observation of the irrigation system or plumbing, prior to backfilling, is completed. Date of preliminary field observation: _____
- Date of final field observation by project applicant: _____
- The plant materials are installed as specified.
- The Irrigation system is designed as specified.
- If applicable, the dual distribution system for recycled water is installed as specified.
- There is minimal run off or overspray from the irrigation system.
- The irrigation schedule is submitted for the plant establishment period.
- The project submittal package including any as built modifications to the landscape design or irrigation system design and a copy of this Certificate of Completion has been provided to the property owner or his/her designee.

Fill in any additional criteria or specifications from the ordinance.

- _____
- _____
- _____
- _____
- _____

Comments:

SECTION C. IRRIGATION (WATERING) SCHEDULE

Attach the irrigation schedule.

SECTION D. LANDSCAPE IRRIGATION AUDIT REPORT

Attach the Landscape Irrigation Audit Report .

SECTION E. SCHEDULE OF LANDSCAPE IRRIGATION AUDITS

Attach the schedule of Landscape Irrigation Audits.

SECTION F. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE

Attach the schedule of Landscape and Irrigation Maintenance.

SECTION G. SIGNATURES

Attach signatures.

CONTRACTOR

“I/we certify that work has been installed in accordance with the contract documents.”

<i>Signature of Contractor</i>		Date
Name of Contractor –(print)	Telephone No.	
	Fax No.	
Title	Email address	
License No.		
Company Name		Street Address
City	State	Zip Code

LANDSCAPE ARCHITECT, CERTIFIED IRRIGATION DESIGNER, OR LICENSED LANDSCAPE CONTRACTOR

“I/we certify that based upon periodic site observations, the work has been substantially completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package.”

<i>Signature of Landscape Architect/Certified Irrigation Designer/ Landscape Contractor</i>		Date
Name of Landscape Architect/Certified Irrigation Designer/ Landscape Contractor (print)	Telephone No.	
	Fax No.	
Title	Email address	
License No. or Certification No.		
Company Name		Street Address
City	State	Zip Code

PROPERTY OWNER

“I/we that I/we have received all of the contract documents and that it is our responsibility to see that the project is maintained in accordance with the contract documents and to comply with the provisions of the ordinance pertaining to landscape irrigation audits.”

<i>Signature of Property Owner or his/her Designee</i>		Date	
Property Owner or his/her designee (print)		Telephone No.	
		Fax No.	
Title		Email address	
Company Name		Street Address	
City		State	Zip Code

THIS SECTION BELOW IS FOR LOCAL AGENCY USE ONLY.

<i>Signature of the Local Agency Representative</i>		<i>Name of the Local Agency Representative</i>	
Phone #	Email address	Title	
Name of local agency		Name of Department, Division, or Unit	
Street Address		City	
State		Zip Code	

For this project, the **Certificate of Completion** has been

Approved

Date: _____

Notes: _____

Denied

Date: _____

Notes: _____

For this project, the **Certificate of Occupancy or Equivalent** has been:

Issued

Date: _____

Notes: _____

Denied

Date: _____

Notes: _____

APPENDIX D

Appendix D – Effective Precipitation Disclosure Statement

This portion of the formula has been eliminated, as the City does not receive enough annual precipitation to utilize in this formula.

APPENDIX E

Appendix E – Conversion Factors and Calculations

A. Conversion Factors

To convert from	To	Multiply By
inches of water	Gallon	Landscape area (sq.ft.) x 0.62
cubic feet	Gallons	7.48
ccf	Gallons	748
acre feet	Gallons	325,851
acre feet	Cubic feet	43.560
gallons	Pounds	8.34
cubic feet per second (cfs)	Gallons per minute (gpm)	448.83
hectare	Acres	2.47
acres	Square feet	43,560

B. Calculations

ET Adjustment Factor

$$ETAF = (PF)/(IE)$$

Where:

- ETAF = Evapotranspiration adjustment factor
- PF = Plant factor
- IE = Irrigation efficiency
= (Distribution Uniformity) X (Management Efficiency)

Landscape Coefficient (refer to Water Use Classification of Landscape Species or WUCOLS for details)

$$K_L = (K_s) (K_d) (K_{mc})$$

- K_L = landscape coefficient or plant factor.
- K_s = *species factor*
- K_d = *density factor*
- K_{mc} = microclimate factor

Maximum Applied Water Allowance

$$MAWA = (ET_o) (0.7) (LA) (0.62)$$

- MAWA= Maximum Applied Water Allowance (gallons per year)
- ET_o = Reference Evapotranspiration (inches per year)
- 0.7 = ET Adjustment Factor
- LA = Landscaped Area (square feet)
- 0.62 = Conversation factor

Estimated Water Use (for a Hydrozone)

$$EWU = \frac{(ET_o) (PF) (HA) (0.62)}{(IE)}$$

EWU	=	Estimated total water use for a hydrozone (gallons)
ET _o	=	Reference evapotranspiration (inches per month)
PF	=	Plant factor (or landscape coefficient)
HA	=	Hydrozone area (square feet)
0.62	=	Conversion Factor
IE	=	Irrigation Efficiency (fraction)

APPENDIX F

Appendix F – Standard Details

APPENDIX G

Appendix G – Plant List

-----End of STANDARDS-----